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University College Cork, Ireland

IT-Enabled Innovation Contest Platforms: An Exploration of the Impacts and Mechanisms of Social Capital

Stephen Treacy, BSc MSc

A Thesis Submitted for the Degree of Doctor of Philosophy of the National University of Ireland

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September 2016

The Author declares that, except where duly acknowledged, this thesis is entirely his own work and has not been submitted for any degree in the National University of Ireland, or any other University.

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“*Sic parvis magna*.”

-Sir Francis Drake

ABSTRACT

IT-enabled innovation contest platforms are quickly growing in prominence due their provision of a cost effective, yet far reaching method of allowing organisations to connect with a global network of innovation solvers. Borne of the open innovation movement, this phenomenon and the research surrounding it have emerged suddenly and proliferated rapidly. Although conceptual support for the relevance of social capital as an antecedent of innovation seems compelling, there is a distinct lack of research to support this in existing literature. The result is that little is understood by scholars and practitioners in terms of its influence in the overall contest setting.

This research study explores the heretofore unexplored influences of social capital toward these contests. Empirical data was gathered through two rounds of data collection, a pilot study of Trend Micro along with case studies of 15 separate IT-enabled innovation contest platforms. Through this analysis, three theoretical models emerged from the findings, which in turn formed:

i. A preliminary theory of social capital for innovation contest platforms
ii. A preliminary theory of social capital for competitive markets
iii. A preliminary theory of social capital for collaborative communities

The study contributes to IS theory and practice in several ways. Firstly, it provides the first investigation of social capital theory within the innovation contest domain. Through the research strategy implemented, social capital theory is revealed to be a valid and appropriate theoretical lens that can be implemented by future researchers. Secondly, this investigation provides a solid foundation for further investigations, and the academic community is encouraged to validate and refine the theorisations presented herein. Thirdly, the findings serve to identify the strategic value of social capital constructs, while also presenting the mechanisms used to facilitate their development. Fourthly, the findings of this study highlight the need for an understanding of appropriate management strategies towards social capital within the innovation contest platforms.

CHAPTER 1: INTRODUCTION

1.1 Introduction

Crowdsourcing innovation activities through IT-enabled innovation contests have become increasingly popular among organisations in a variety of private and public sectors. As a result, it has attracted the attention of multi-disciplinary researchers who conceptualize such contests as having novel social, economic and organisational implications. A key feature of IT-enabled innovation contests is the solution being sought, which can range from idea creation and need identification, to concept and solution development (Bockstedt et al., 2015, Füller et al., 2014, Juell-Skielse et al., 2014). Contest platforms therefore rely on communities of solvers to generate submissions, varying from simple designs and recommendations, to developing highly sophisticated algorithms and solutions to complex problems. However, typical of a young scholarship around an emerging phenomenon, prior research suffers from a certain level of theoretical dissonance and a lack of comprehensive empirical data (Adamczyk et al., 2012, Natalicchio et al., 2014).

This chapter begins by explaining the rationale for this study (Section 1.2). This section illustrates the emergence of the open innovation model, while also outlining the current health of IT-enabled innovation contests literature. Section 1.3 subsequently addresses the overall research objective, while presenting the study's primary research questions. Section 1.4 provides the reader with a summary of each chapter within this study, while Section 1.5 concludes by outlining the key contributions of this study.

1.2 Problem Area

In recent years there has been an increased growth in the number of organisations that seek to actively integrate external input into new product development (Piller and Walcher, 2006), with IT-enabled innovation contests emerging as an effective mechanism for doing so (Leimeister et al., 2009). These innovation contests can be understood as a mechanism for crowdsourcing, which was first defined by

Howe (2006a) as being "*...the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call... The crucial prerequisite is the use of the open call format and the large network of potential labourers.*"[1]

This process can involve amateurs, experts, or indeed a mixture of both with participation incentivized by both financial and non-financial rewards. Crowdsourcing can have many goals but often the process seeks to create or develop innovative goods, ideas or services (Archak and Sundararajan, 2009). When this is the case, it is useful to understand crowdsourcing in the related concept of open innovation, which argues that approaches to innovation have become increasingly essential, if not inevitable, and represent a dramatic organisational, technological and economic change (Chesbrough, 2003). IT-enabled innovation contest platforms have therefore recently emerged as an attractive method of connecting organisations searching for specific innovative solutions with a global network of problem solvers.

While existing literature has explored the various reasons involved in solver participation (Adamczyk et al., 2012, Füller et al., 2014, Hutter et al., 2015, Kathan et al., 2015), the theoretical lens of social capital has received little, if any, attention or consideration. This is particularly surprising as social capital has been previously investigated in the realms of virtual knowledge sharing (Ardichvili et al., 2003), entrepreneurship (Gedajlovic et al., 2013), organisational advantage (Nahapiet and Ghoshal, 1998) ,and innovation (Landry et al., 2002). Social capital is defined by Nahapiet and Ghoshal (1998) as being "*the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit*" (p.243). This theoretical lens can be categorised into three distinct dimensions, which encompasses six constructs: the structural dimension which describes the strength of the social ties present between individuals; the relational dimension, which

[1] http://crowdsourcing.typepad.com/cs/2006/06/crowdsourcing_a.html

outlines the levels of trust, reciprocity and self-identity; and, the cognitive dimension which reveals the levels of both shared language and shared vision present within the solver group.

This lack of occurrence of social capital is particularly surprising given the inherent social nature of many of these contest platforms. Furthermore, while the perspective of the competing solvers is often the target demographic for studies within the area, there has been sparse research that approaches this phenomenon from the point of view of the key decision makers (KDMs) of the innovation platforms in question. The perspective of the KDM is arguably more revealing in many respects as it provides the researcher with a more detailed insight to how social capital shapes the fundamental structure of the contest platform. Furthermore, the KDMs will also have more knowledge and experience about how the contest platforms seek to develop certain aspects of social capital, and what the net impact of these processes are as a whole toward their solver communities.

Given these research gaps, this research will investigate the relationship between social capital and IT-enabled innovation contest platforms from the KDM's perspective. This research approach is both novel and exploratory, and seeks to understand whether it is important for these platforms to develop social capital, and if so, how they develop the various social capital constructs through their own platforms.

1.3 Rationale for Study

Inherent to IT-enabled innovation contests, which shall be discussed in Chapter 2, open innovation is a model whereby firms are capable of commercializing both internal and external resources to create value (Chesbrough, 2003, Chesbrough and Spohrer, 2006). Business strategies have, in the past, relied on developing defensible positions against their competition rather than promoting a sense of openness (Chesbrough and Appleyard, 2007). However we are now beginning to see traditional business strategies of internal "experts" designing processes and products within companies being challenged by this concept of open innovation. Indeed, Chesbrough and Appleyard (2007) suggest that open innovation embraces

the benefits of openness as a means of expanding value creation for organisations. Therefore, organisations must be able to combine both their internal ideas, along with those from external sources to create value, while also identifying mechanisms to claim a portion of that value (Chesbrough, 2003).

The emergence of IT-enabled innovation contests challenges the traditional notions of governance that have long been dominated by hierarchical and market mechanisms for organizing production (Benkler, 2002). According to Coase (1937), the traditional approach of organisations has been that individuals organize their productive activities in two ways:

i. In response to market signals
ii. As employees in firms following the directions of managers

IT-enabled innovation contests present an interesting alternative, in that they do not rely on traditional managerial hierarchies, or markets to organize production (Benkler, 2002). Instead, they involve the collaboration of solvers in order to cocreate value (West and Gallagher, 2006). Existing theories of the firm however do little to generate a clear perspective for both practitioners and researchers as to why and how solvers engage with such platforms. Examples of theories utilized previously include the knowledge based view (Grant and Baden-Fuller, 1995) and the resource based view of the firm (Mata et al., 1995), however both are significantly introspective as they examine resources and capabilities that are specifically housed within the firm (Vanhaverbeke and Cloodt, 2006). As such, the gaps in literature are significant, which is also intensified by the lack of foresight from existing theories.

Open innovation contest success will be therefore determined not by what the organisations are asking their participants to achieve, but by how fast they can learn and develop the exploited knowledge, emphasizing a heightened importance for both social and relational success. Prior literature has already attempted to suggest how such success might come about. Baker (2000) for example focuses on achieving success through developing and leveraging social capital, with Cross and

Prusak (2002) arguing that it is increasingly through informal networks that progress is achieved, not through the traditional organisational hierarchies.

A significant contribution to this study is the identification of social capital as a vital resource for the key decision makers (KDMs) of these IT-enabled innovation contest platforms. Social capital has previously been used to explain a variety of phenomena across various disciplines. For example, political scientists have used the term to refer to an asset that communities utilize in creating informal institutions, such as trust and social norms (Liu and Duff, 1972, Wasko and Faraj, 2005, Putnam, 1995a, Portes, 2000, Liff, 2005). Researchers have also demonstrated the role of social capital in technology adoption (Fountain, 1998b, Hampton and Wellman, 2003, Negoita et al., 2012) and firm productivity (Walter et al., 2007, Tsai, 2002, Spence and Schmidpeter, 2003, Nahapiet and Ghoshal, 1998). While there have been several criticisms levelled at these studies for theoretical or empirical reasons (Uzzi, 1997, Adler and Kwon, 2002, Halpern, 1999, Gedajlovic et al., 2013), prolific use and empirical significance of social capital suggests that it provides new understanding into private and corporate human behaviour.

1.4 Research Objective and Research Questions

Given the absence of prior literature addressing the social capital phenomenon within the IT-enabled innovation contest setting (further developed in Chapter 2), the objective of this research is to:

"*Theorize the relationship between social capital and IT-enabled innovation contest platforms.*"

Research Questions	
1	*What are the impacts of social capital on innovation contest platforms?*

2	*What are the mechanisms used in innovation contest platforms to enable the development of social capital?*

Table 1-1: Research Questions

An extensive review of prior literature was performed where peer-reviewed research articles were analysed, revealing that the concept of social capital within IT-enabled innovation contest platforms has not been adequately addressed. These IT-enabled innovation contest platforms represent an open platform for individuals and/or organisations to seek solutions from the crowd, allowing for the exploitation of their requisite experience, skills, and talents in exchange for a reward being either monetary or non-monetary. It is capacity for hosting these challenges online and being able to challenge a global network of solvers that make them stand apart from their non IT-enabled counterparts. As explored further in Chapter 2, these IT-enabled innovation contest platforms can be classified based on particular traits exhibited. For the purpose of this study, the classification of competitive markets and collaborative communities as described by Boudreau and Lakhani (2009) is investigated as it provides a rich juxtaposition by which to study the effects of social capital. On the one hand, competitive markets are where individual solvers compete to attain, assimilate, and utilise knowledge in order to generate a winning solution in exchange for monetary compensation. On the other hand however, collaborative communities are platforms that promote a collaborative approach among solvers where participation is based on a common interest, a common problem, or a common desire between solvers in addition to the prospect of a monetary reward.

Furthermore, within these IT-enabled innovation contest platforms there have been little, if any, existing research that seeks to investigate social capital from the perspective of the KDMs, leading to a unique research gap this study seeks to address. These KDMs represent the target participants of this study within IT-enabled innovation contest platforms, whose roles can range from CEOs and founders, to platform managers. These individuals are highly knowledgeable, and are in positions to not only witness the effects of social capital on their platforms, but also have the authority to implement guidelines and practices that develop social capital.

This knowledge gap led to the formation of the research objective of this study, which was aimed at theorising how social capital influences IT-enabled innovation contest platforms. This led to the formation of the two research questions outlined above in Table 1-1.

1.5 Key Contributions

Given the scarcity of empirical work in this area, this study makes a number of key contributions to both IS theory and practice. Firstly, this study identifies the current state (or more appropriately the lack thereof) of social capital literature within the IT-enabled innovation contest phenomenon.

Secondly, through a pilot study of *Trend Micro*, along with field studies of 15 separate IT-enabled innovation contest platforms, the six constructs of social capital are empirically investigated and analysed, providing a rich understanding of their necessity for a successful innovation contest platform. In doing so, the study identifies the previously unheralded importance of social capital within the open innovation contests. Thirdly, due to the novel investigations of this study, the net impacts of social capital constructs are identified for the first time in research, along with the mechanisms used to facilitate their development within the innovation contest setting. Three preliminary theoretical models were generated from this analysis, providing the first evidence of social capital influence within the IT-enabled innovation contest setting. Three theoretical models (Figures 1-1, 1-2 and 1-3) emerged through this investigation:

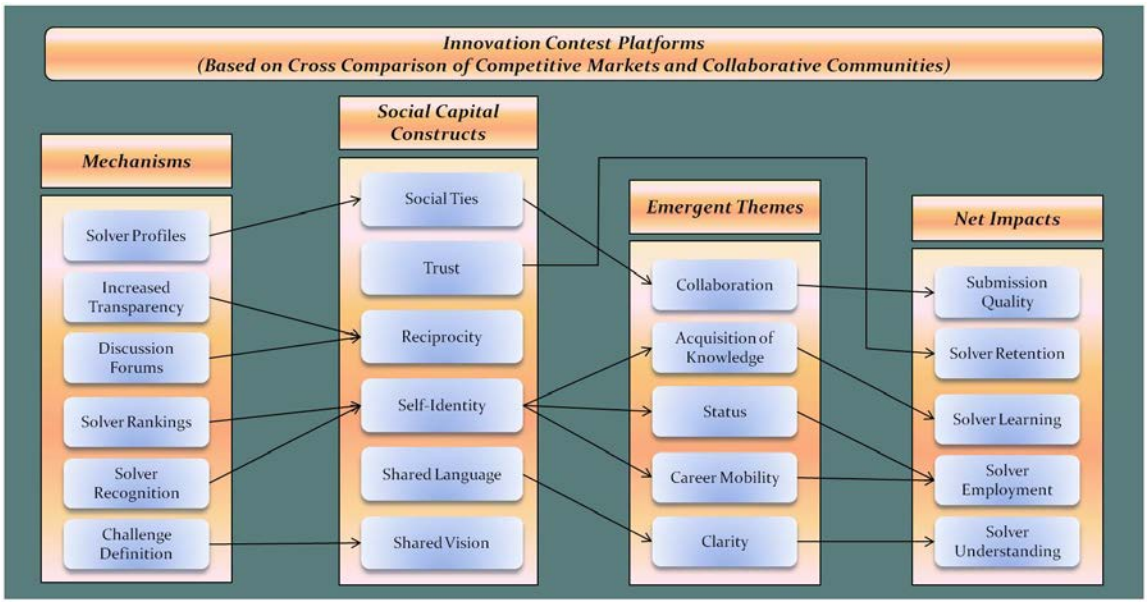


Figure 1-1: A shared social capital preliminary theory for innovation contests

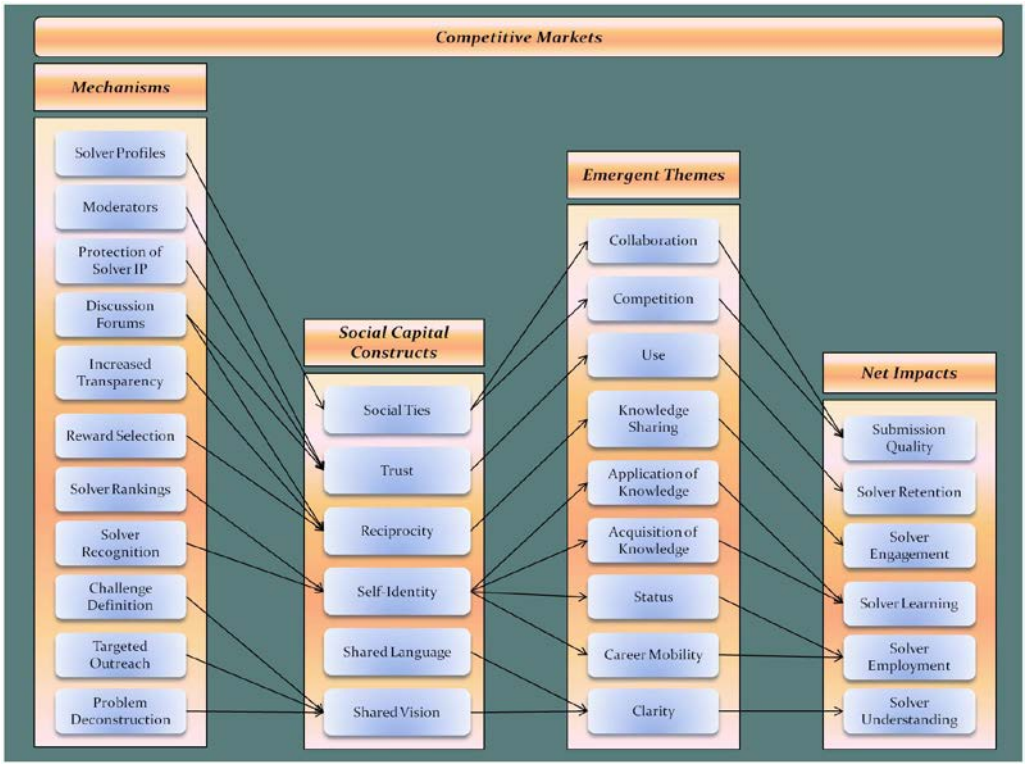


Figure 1-2: A social capital preliminary theory for competitive markets

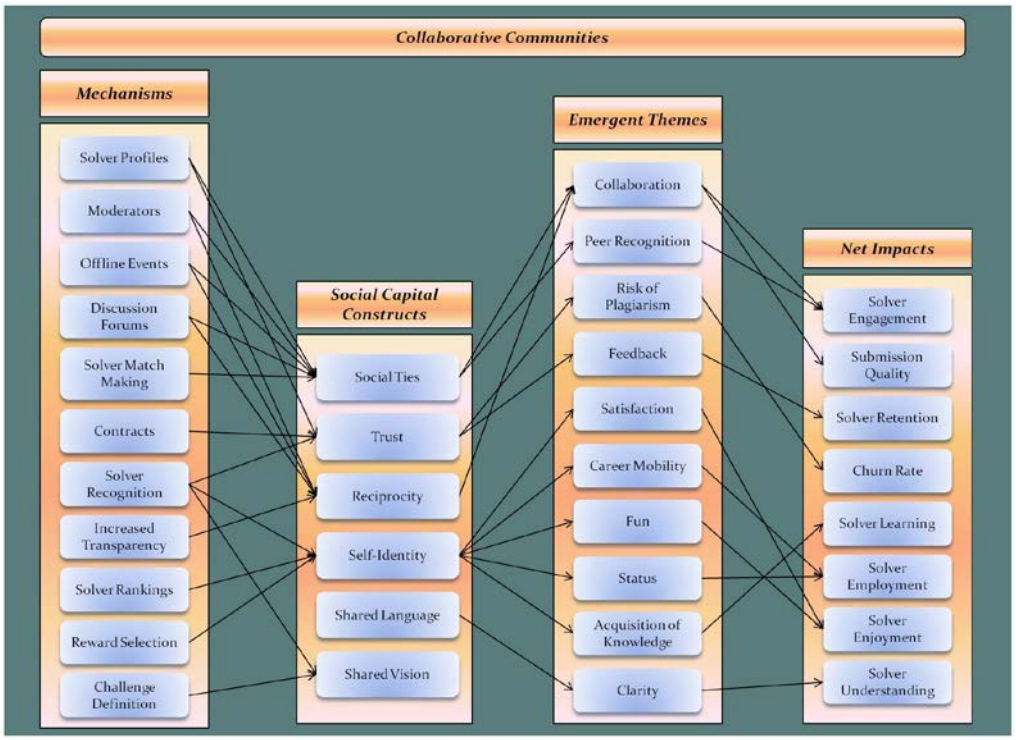


Figure 1-3: A social capital preliminary theory for collaborative communities

These preliminary models provide future researchers with a useful starting point in testing the theory of social capital from the perspective of KDMs. First and foremost, it reveals a number of important advantages to integrating the range of resources provided by the structure of social relations under the concept of social capital. For example, competitive markets that promote reciprocity within their platforms are shown to have a net impact of increased solver engagement. Similarly, for collaborative communities the development of social ties within the platform is shown to have net impacts of increased solver engagement and submission quality from the solver community. The impacts and mechanisms of these models are discussed further in length in Chapters 5 and 6, with a summary of their propositions listed below in Table 1-3.

As noted, this represents the first undertaking to investigate social capital within the domain of innovation contest platforms. By applying the theoretical lens of social capital lens provided herein within future studies, it provides the academic community with an area rich with exploratory potential. For example, Figures 1-2

and 1-3 reveal that through this investigation neither the competitive markets, nor the collaborative communities analysed pursued dedicated mechanisms to develop the social capital construct of shared language. This was particularly surprising given that both platform sets commented on the importance it has in organising a successful innovation contest. The research approach described herein can thus be replicated and even extended by future researchers to validate these preliminary theoretical models, and provide further exploration to social capital as a theoretical lens.

This investigation also contributes to the practitioner community by identifying the strategic value of certain social capital constructs, while also highlighting the need for an understanding of appropriate management strategies towards social capital. In addition, it also alerts KDMs to consider not only the social capital mechanisms in which they invest, but also the relationships between the individual social capital constructs and the emergent impacts as a result of their development.

Proposition 1	Social ties generate a higher level of submission quality from participating solvers within innovation contest platforms.

Proposition 2 (a)	In a competitive setting, both shared language and shared vision impact on solver understanding.
Proposition 2 (b)	In a collaborative setting, shared vision does not impact solver understanding.
Proposition 2 (c)	Innovation contest platforms do not seek to develop a shared language among their solvers.
Proposition 3	Increased levels of trust result in increased levels of solver retention within the innovation contest platform.
Proposition 4 (a)	Within a collaborative setting, increased levels of trust will reduce the risk of plagiarism between solvers.
Proposition 4 (b)	Within a collaborative setting, increased levels of trust will result in a reduced level of solver churn.
Proposition 5 (a)	Solvers that self-identify most with the contest process will acquire a higher degree of knowledge.
Proposition 5 (b)	Solvers that self-identify most with the contest process will increase their likelihood of career mobility.
Proposition 6	Solvers find the setting of a collaborative contest more enjoyable than a competitive contest setting.
Proposition 7	Promoting transparency among the solvers will increase reciprocity within innovation contest platforms.
Proposition 8 (a)	In a competitive setting, solver recognition will increase the levels of self-identity for the solvers.
Proposition 8 (b)	In a collaborative setting, solver recognition increases the levels of trust, self-identity and shared vision within the solver community.
Proposition 9 (a)	In a competitive setting, the reward on offer will impact the levels of reciprocity among solvers.
Proposition 9 (b)	In a collaborative setting, the reward on offer will impact the levels of self-identity among solvers.
Proposition 10	Innovation contest platforms use challenge definitions as the primary mechanism of developing a shared vision within their contests.

Table 1-2: List of propositions from theoretical models

1.6 Thesis Design

This section will summarize the key points of each chapter, thereby providing a high level overview of this documents structure, illustrated below in Table 1-4.

1.6.1 Chapter 2: Motivation of Study

This chapter encompasses the literature review that was undertaken as part of this study. Section 2.2 outlines the strategy in collecting research artifacts within both the social capital and the innovation, while Section 2.3 provides an introduction to the concept of innovation, distinguishing between the two paradigms of open and closed. Section 2.4 introduces the term crowdsourcing, while Section 2.5 presents the theoretical lens of social capital to the reader. Section 2.6 describes the emergence of IT-enabled innovation contest platforms, while also distinguishing between the two platform subsets selected for this study: competitive markets and collaborative communities. Section 2.7 outlines the chapter conclusion.

1.6.2 Chapter 3: Research Strategy

This chapter presents the research strategy adopted for this study. Section 3.2 begins by reaffirming the research objective and the research questions being targeted by this study. Section 3.3 identifies the various research approaches available to the researcher, and discusses the paradigms of positivism, critical theory, post-positivism and interpretivism, ultimately explaining why a post-positivist approach was undertaken. Section 3.4 continues by outlining the reasons for choosing semi-structured interviews as the best means of gathering data for subsequent analysis. Section 3.5 describes the data collection phase, presenting examples of the data coding that formed the basis of the findings, while Section 3.6 illustrates the approaches taken for the data analysis, including the reduction, display, and the drawing/verifying of conclusions throughout. Section 3.7 subsequently provides a chapter summary.

Chapter 2: Literature Review
Defines closed innovation
Examines open innovation
Explores crowdsourcing
Describes "Social Capital" theory and its appropriation to the study
Presents IT-enabled innovation contest platforms
Highlights two specific classifications of IT-enabled innovation contest platforms: • Competitive markets • Collaborative communities
Chapter 3: Research Strategy
Presents the methodological approach
Describes the study design • Phase 0-Interview protocol validation • Phase 1- Pilot study of Trend Micro • Phase 2-Field studies of 15 IT-enabled innovation contest platforms
Outlines how the data analysis was achieved
Presents examples of coding strategy
Chapter 4: Pilot Study
Validates coding strategy outlined in Chapter 3
Presents the findings of the pilot study
Chapter 5: Findings Part 1-Impacts of Social Capital
Addresses Research Question 1
Analyzes the data gathered from the field studies
Investigates the social capital impacts of each construct within both competitive markets and collaborative communities
Provides a cross comparison between both platform sets
Presents three preliminary theoretical models
Chapter 6: Findings Part 2-Mechanisms of Social Capital Development
Addresses Research Question 2
Analyses the data gathered from the field studies
Investigates the mechanisms of social capital development for each construct within both competitive markets and collaborative communities
Provides a cross comparison between both platform sets
Extends the previous three preliminary theoretical models
Chapter 7: Conclusions
Presents the summary and discussion of research findings
Details the research study contributions to both theory and practice
Describes the limitations of the study
Highlights future research opportunities

Table 1-3: Chapter Summaries

1.6.3 Chapter 4: Pilot Study

This chapter presents the findings of the study's pilot study of *Trend Micro*. Given the exploratory nature of this research, it was necessary to validate whether social capital was indeed an influencing factor within the realm of innovation contests. Accordingly, Section 4.2 investigates the perceived importance of each social capital construct, Section 4.3 outlines the impacts, while Section 4.4 illustrates the mechanisms used by *Trend Micro* to develop social capital. Section 4.5 thereafter presents the key outcomes from the pilot study, while Section 4.6 provides a chapter summary.

1.6.4 Chapter 5: Findings Part 1-Impacts of Social Capital

Having confirmed the importance of social capital within innovation contest platforms in the previous chapter, Chapter 5 investigates the phenomenon through field research, addressing the first research question of this study. As described in Chapter 2, the innovation contest platforms that were investigated were divided into two distinct categories:

i. Competitive Markets:
ii. Collaborative Communities

Section 5.2 outlines the key impacts of social capital that were evident within the competitive markets investigated, with Section 5.3 doing similar for the collaborative communities. Section 5.4 offers a comparative analysis between the two platform sets, outlining the shared impacts present between the two, before Section 5.5 provides a conclusion of the Chapter's findings. This chapter presents three initial preliminary theoretical models, highlighting the impacts and emergent themes of social capital within a competitive market, and a collaborative community setting, before also presenting a theoretical conceptualisation of social capital impacts within a generic innovation contest platform based on the comparative findings.

1.6.5 Chapter 6: Findings Part 2-Mechanisms Used to Develop Social Capital

Chapter 6 investigates the second research question of this study: the mechanisms used to develop various social capital constructs. Section 6.2 identifies the mechanisms used to develop social capital by competitive markets only, before Section 6.3 does likewise for the collaborative communities investigated. Section 6.4 subsequently presents the comparative findings, identifying similar mechanisms used by both platforms to facilitate the same social capital constructs. This chapter then extends the previous preliminary theoretical models presented in Chapter 5, by providing further details as to the mechanisms through which the social capital impacts can be developed.

1.6.6 Chapter 7: Summary of Research Findings

Chapter 7 outlines the research conclusions by providing a conceptual overview on what the aims of the study were, along with outlining the main findings. Section 7.2 provides a summary of the research findings, while Section 7.3 discusses the implications in more detail. Within Section 7.3, the three preliminary theoretical models of social capital for competitive markets, collaborative communities and innovation contest platforms are presented and, where applicable, validated through prior literature. In doing so, the discussion describes the eight distinct impacts of social capital that were revealed throughout the findings, along with the fourteen mechanisms of social capital facilitation that were also uncovered.

1.6.7 Chapter 8: Conclusions

Chapter 8 presents the overall conclusion to this investigation. Section 8.2 provides a recap on the research background of the study, reaffirming the research questions that were pursued throughout this investigation. Section 8.3 subsequently presents the research study contributions, implications and limitations, before offering several avenues for future research to build upon this body of work.

1.7 Chapter Conclusion

This chapter presents a high level overview of what this research investigation involved, and the strategy behind how it was accomplished. In doing so, it presents the reader with both the problem area (Section 1.2) and the rationale for this study (Section 1.3), illustrating that there is a significant research gap that fails to link the theoretical lens of social capital with the rapidly proliferating phenomenon of IT-enabled innovation contest platforms. This chapter subsequently presents the research objective of this investigation (Section 1.4) which is to "*theorize the relationship between social capital and IT-enabled innovation contest platforms.*" In doing so, two specific research questions are presented:

i. *What are the impacts of social capital on innovation contest platforms?*
ii. *What are the mechanisms used in innovation contest platforms to enable the development of social capital?*

The chapter then presents the key contributions of this research (Section 1.5), before illustrating the thesis design to the reader by providing a succinct description of what each chapter involves (Section 1.6).

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In order to explore the current state of literature surrounding the IT-enabled innovation contest platform phenomenon and social capital, an extensive review of existing literature investigating the area was conducted. The method employed in this study reflects those recommended by Cooper (1998). A literature review should be concept centric where possible, as author centric literature often fails to adequately synthesise the literature and allow critical, constructive concept development (Levy and Ellis, 2006). This process is crucial for any academic research (Webster and Watson, 2002), and was accomplished in a rigorous and comprehensive manner. Creating a concept-centric matrix through this process also enabled the researcher to think about little understood phenomenon in a more concrete way (Whetten, 1989).

A broad, hierarchical search strategy was adopted to capture high-quality and relevant peer-reviewed articles by searching the major multi-disciplinary databases (EBSCO, JSTOR, Web of Knowledge, ACM Digital and Science Direct) for research articles investigating IT-enabled innovation contests. Searches were manually performed for each term in each database. The article abstracts were subsequently assessed and were excluded if:

i. The subject matter was too far removed from the phenomenon of interest.
ii. No new theoretical/empirical knowledge was presented (e.g. book reviews).

The reviewed articles originated in different disciplines, including economics, organisation and management theory and information systems, and applied a variety of qualitative and quantitative research designs.

Before presenting the concepts of social capital and innovation contest platforms however, the next section first explores our understanding of the term “innovation”. In doing so, Section 2.2 presents an existing dichotomy based on the closed and open innovation paradigms, before debating whether the open innovation phenomenon is a fresh term or an old concept. This section also

illustrates that while the re-emergence of open innovation has gathered significant attention from both a practitioner and an academic setting, it is arguably a fresh term for an old concept. Consequently, the concept of crowdsourcing is defined and explored in Section 2.3 while also distinguishing the knowledge dimensions that organisations are looking to exploit by issuing their innovation challenges along with the motivation of the solvers.

Section 2.4 introduces the theory of social capital, illustrating its development in literature and implementation in various disciplines. This section serves to justify why social capital theory is a justifiable theoretical lens to adopt when studying innovation contest platforms. In describing social capital theory, the three dimensions of social capital are presented and investigated:

i. Structural Dimension
ii. Relational Dimension
iii. Cognitive Dimension

The capability of hosting innovation contests on dedicated online platforms is presented in Section 2.5, emphasizing both their importance, and their history within various disciplines and industries. This section identifies and frames the two established classifications of IT-enabled innovation contest platforms that emerged from the literature analysis:

i. Competitive Markets
ii. Collaborative Communities

These two classifications further serve to illustrate how the IT-enabled innovation contest market place, while relatively new, is experiencing rapid growth, leading to the proliferation of distinct business models, targeting specific demographics of solvers.

Section 2.6 summarizes the overall chapter contributions, while also briefly outlining what Chapter 3 shall discuss.

2.2 Definitions of Innovation

It is firstly important to define what the term "*innovation*" encapsulates as various meanings and implications of the term are invasively prevalent within the IS community. Current definitions proposed in prior literature suggest that the value of innovation merely lies in its contribution to economic value or profits (Goswami and Mathew, 2005), however it was initially Joseph Schumpeter who was among the first economists to highlight the potential of innovation for economic growth. In doing so, five varying types of innovation were identified (Schumpeter, 1934):

i. Introduction of a new product or a considerable alteration to an existing product
ii. New methods of production
iii. The opening of a new market
iv. New sources of supply of raw materials
v. A new industry structure

From this Schumpeter argued that it was predominately entrepreneurs that drove innovation, whose role it was to "*reform or revolutionize the pattern of production by exploiting an invention or, more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way, opening a new source of supply of materials or a new outlet for products, by reorganizing a new industry*" (p. 132). Innovation must be distinguished from invention however, with various authors (Myers and Marquis, 1969, Rogers and Shoemaker, 1971, Trott, 2004) arguing that innovation is concerned with the commercial and practical application of ideas or inventions. One of the more comprehensive definitions of innovation is offered by Myers and Marquis (1969): *"Innovation is not just a single action, but a total process of interrelated sub processes. It is not just the conception of a new idea, nor the invention of a new device, nor the*

development of a new market. The process is all these things in an integrated fashion[2]."

While invention involves the conversion of new knowledge into a new product, process or service, it is innovation that adds the vital step of putting this new product, process or service into use (Johnson et al., 2008). In a similar fashion, Mowery and Rosenberg (1991) also argue that the process of innovation involves the exploration and exploitation of opportunities for a new product, process or service. Innovation can therefore be realised through hard work from various individuals, before converting their efforts into products that will enhance organisational performance. This view is shared by Cohen and Levinthal (1990), who state that "*interactions among individuals who each possess diverse and different knowledge structures will augment the organisation's capacity of making novel linkages and associations... innovating beyond what any individual can create alone*" (p. 133). Invention is therefore the conception of the idea, whereas innovation is the resulting translation of the invention into the economy.

From the above definitions, innovation can be described in process terms as the pursuit of applications new to an organisation, being created by the emergence of enabling technologies that are new in their own right (Swanson and Ramiller, 2004). While innovating with IT is at one level an organisational process (Fichman, 2000), it also has the potential to take place on a wider institutional field (DiMaggio and Powell, 1983). In other words, while the firm is often the site where the material instantiation of innovations occurs, the very concept of innovation enjoys an existence far beyond the boundaries of any particular enterprise. As such, the organisation's engagement with external contributors may extend over time, leading firms to potentially open their innovation process. This facilitates external

[2] Quoted in Trott, P. (2005): "Innovation Management and New Product Development" 3rd Edition, Prentice Hall, Harlow, pg. 15.

collaborators to participate in the development and commercialization of new ideas/products.

This school of thought is a recent departure from the more traditional approach of closed innovation which is outlined in detail below.

2.2.1 Closed Innovation: The Traditional Paradigm

The closed innovation paradigm represents the traditional view of ensuring research and development (R&D) primarily takes place within the boundaries of the organisation. Closed innovation advocates that in order for innovation processes to be successful, firms must be strongly self-reliant due to the uncertainty associated with the quality, availability and capability of others' ideas (Chesbrough, 2003).

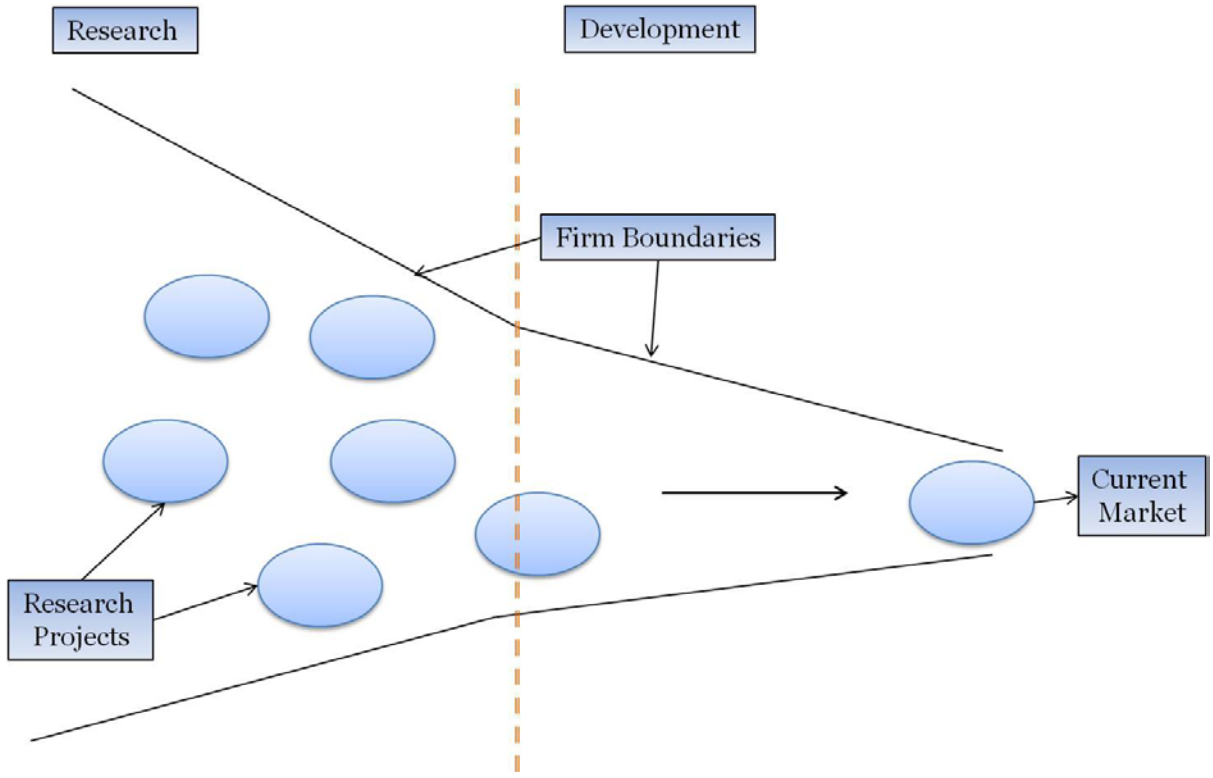


Figure 2-1: Closed Innovation Model (Chesbrough 2003)

From Figure 2-1 outlined above, the basic characteristics of the closed innovation paradigm can be defined as being:

i. A company should hire the best people in the industry.
ii. In order to bring new products and services to the market, a company must discover and develop them internally.
iii. If a company makes an innovation, they get it to market first.
iv. A company that gets an innovation to a market first will usually win.
v. If a company leads the industry in R&D investments, it will discover the best and the most ideas, and hence will lead a market as well.
vi. A company needs to control their intellectual property (IP) to prevent competitors to profit from it.

The industry structure is now defined by the well-known "five forces" being: potential entrants, buyers, substitutes, suppliers and industry competitors (Porter, 1980). Such a structure determines the nature of competition within the industry, leaving the processes of innovation to be strictly directed and controlled. For organisations that sought successful long-term maintenance of competitive advantage, closed innovation was seen to be the logical innovation process (Herzog, 2011). For example, a company making investments in internal R&D will aim to uncover scientific discoveries that can then be commercialized in the shape of new products/services. The resulting increase in sales and profits from the innovations garnered would be then frequently reinvested in order to enhance the firm's innovation capabilities leading to further breakthroughs. With this traditional view of strategy, only a select number of products are likely to achieve success, and even fewer to compete with competitive forces.

The closed innovation model is ideally structured to meet the operating environment as presented in the traditional view of organisational strategy outlined by Porter (1980), due to conventional economic wisdom telling companies to hoard their technology and knowledge (Tapscott and Williams, 2008). Fears of knowledge sharing however can drive organisations to develop a myopia of protectiveness, with excessive focus on protection strategies and secrecy (Laursen and Salter, 2006) driving organisations to forego any level of openness altogether.

However, in the absence of periodic market stability, it is increasingly difficult to maintain these traditional views of fixed positions with respect to competitive advantage (D'Aveni and Gunther, 2007). Indeed, recent literature illustrates that advantage is fleeting, quickly eroding as soon as it is created compelling organisations to constantly innovate in order to capture new positions of competitive advantage (Gould, 2012). Successful organisations are now seeking ways to reorder industrial boundaries, and by constructing new configurations, increase demand and create new markets (Kim and Mauborgne, 2015, Kim and Mauborgne, 2009).

2.2.2 Open Innovation: The Emerging Paradigm

Given that an organisation's strategy must be continually evolve due to the continuous forces of change, an exclusive reliance on closed innovation no longer makes strategic sense (Chesbrough, 2003). With the traditional boundaries of innovation breaking up, organisations are now able to exploit the increased availability and mobility of knowledge workers, leading to a radical change in how companies commercialize knowledge. Based on an almost axiomatic belief on which innovations are seen as a foundation for sustainable growth and prosperity (Grant, 1997, Foss et al., 2009), Chesbrough (2003) has argued that many contemporary organisations should shift to an open innovation model. This serves to increase their exposure to a wide range of external sources outside their hierarchical boundaries for their innovations is increased. It is this movement that has been termed "*Open Innovation*". Open innovation is therefore a paradigm that proposes organisations could and should use external ideas to complement and enhance their internal ideas as they look to advance their market position.

While this term was only popularized somewhat recently by Professor Henry Chesbrough in 2003, the fundamental premise of open innovation is viewed as the opposite model of traditional closed innovation. In contrast to the closed innovation paradigm, organisations that operate through the open innovation approach realize that they alone cannot attract the requisite level of talent required to sustain heightened levels of innovation. Organisations have thus come to accept

the necessity of ensuring a flow of external ideas as the increasing dispersion of geographical knowledge represents a significant asset.

However, existing literature has shown that researchers tend to utilize different definitions and focus their research toward different aspects of the phenomenon, leading to the adaptation of various definitions (Huizingh, 2011).

Author	***Definitions of Open Innovation***
Chesbrough (2003, p. 24)	*"... the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation, respectively"*
Laursen and Salter (2006, p. 1204)	*"The number of different sources of external knowledge that each firm draws upon in its innovative activities"*
West and Gallagher (2006, p. 82)	*"systematically encouraging and exploring a wide range of internal and external sources for innovation opportunities, consciously integrating that exploration with firms capabilities and resources and broadly exploiting those opportunities through multiple channels"*

Table 2-1: Definitions of Open Innovation

The lack of depth illustrated in Table 2-1 makes it increasingly hard to build a coherent body of knowledge (di-Benedetto, 2010, Duarte and Sarkar, 2011). This is primarily due to the very concept of openness not being a clear cut concept, with various paradigms in existence. While such paradigms do admittedly add to the richness of the concept, it also serves to hinder theory development. When investigated, theoretical modelling in open innovation has been limited, and has often been dominated by attempts to identify structural categories, with insufficient attention being paid to the culture (Savitskaya et al., 2010) and the industry-specific aspects of processes and interactions (Ozman, 2011).

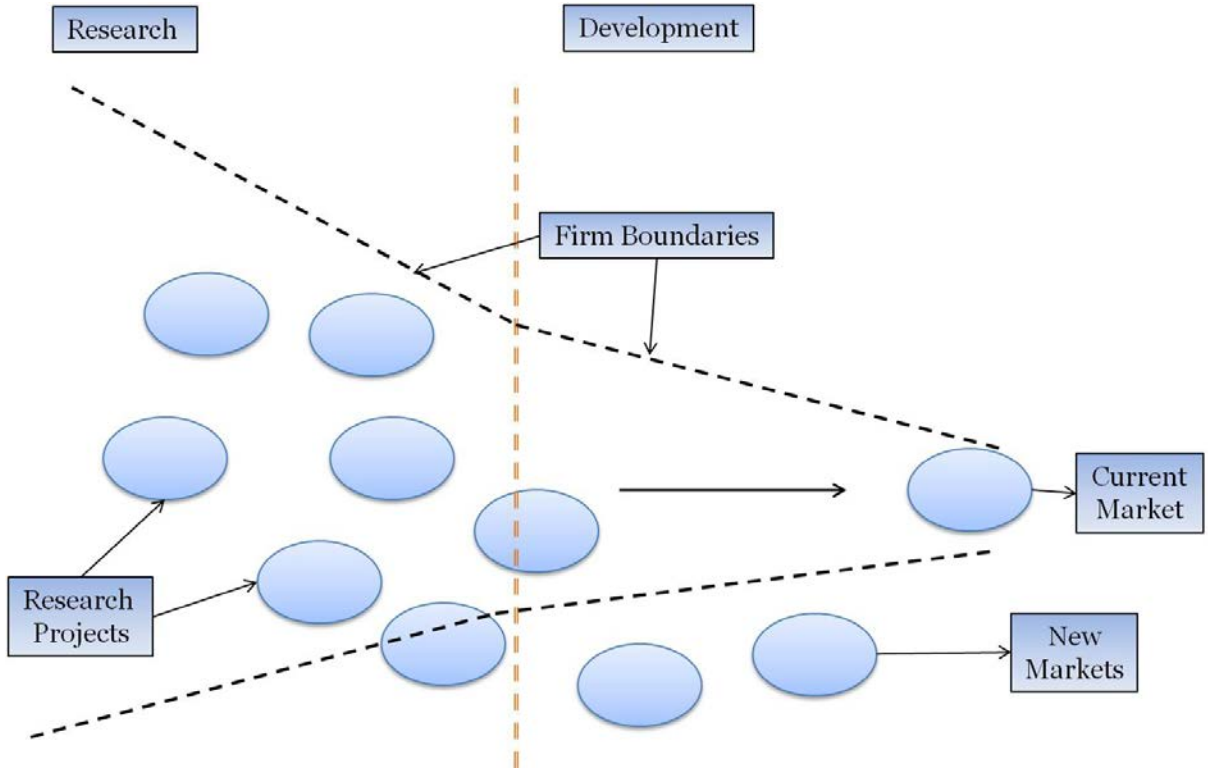


Figure 2-2: Open Innovation Model (Chesbrough 2003)

The basic characteristics of the open innovation paradigm (as illustrated in Figure 2-2) are:

i. Not all best people work within an organisation. An organisation should work with smart people both inside and outside it.
ii. External R&D can create good value while internal R&D is needed to claim some portion of that value.
iii. An organisation does not have to be the origin for a research to profit from it.
iv. Building a good business model is essential, because an inferior technology with a good business model will often trump a superior technology commercialized through a bad business model.
v. An organisation should profit from external use of their IP, and they should buy IP in order to innovate faster.

This model of open innovation expands the innovation potential of organisations by exploring new ways to work jointly with external partners, while treating R&D

as an open system. As explored previously, this method is often contrasted to the traditional closed model where internal R&D activities lead to internally developed ideas and products that are then distributed by the organisation. Here, open innovation suggests that valuable ideas can come from both inside and outside the organisation and can go to market from inside or outside the organisation as well. This approach places external ideas and external paths to market on a similar level of importance to internal ideas and paths to market in the previous era (Chesbrough, 2006c).

The paradox of open innovation however, lies in the conflict between the perceived benefits of collaboration against the potential of knowledge leakage and misappropriation of the results of the process. The very concept of the process may cause the organisation to lose control of specific information which, in the hands of a competitor could compromise competitive advantage. This makes the open innovation model substantially more complex than the traditional closed approach (Wayne Gould, 2012, Van de Vrande et al., 2009). Involvement within the open innovation process requires both interaction, as well as disclosure of information that may or may not have been the intention of the innovating organisation. Such information may be about the nature of the problem, the knowledge retained, or the solution generated. The external innovators in the open innovation process are part of an extended network, with such participants having significant interaction with other participants outside the control of the innovating organisation (Wayne Gould, 2012).

This practice-based representation of the open innovation phenomenon highlights a structural tension. The fundamental desire to exploit the benefits of open innovation stands in conflict with the risk that other institutional individuals may misappropriate those benefits. The very nature of open innovation implies an inherent lack of control to both the processes themselves, along with the potential results (Mahr et al., 2010). Participants in open innovation processes risk the loss, both intentional and unintentional, of the very fruits of their efforts to other participants in the process (Wadhaw et al., 2011).

Upon closer inspection, such a model draws comparisons to similar topics associated with the innovation process such as the concept of user innovation by Von-Hippel (1988). The concept of user innovation proposes that it is not the specific manufacturers, rather the knowledge and the desire of users to develop their own solutions to problems. Another comparison can be drawn with the model of cumulative innovation, as proposed by Scotchmer (2004) whereby four types of cumulative innovation are outlined:

i. Improvements to pre-existing innovations
ii. Cost reductions for the production of existing products
iii. New applications for older technologies
iv. Enabling technologies

The core strength of these criteria gives weight to organisations engaging in open innovation. While at the outset very similar, there are various distinctions that can be further identified between the concepts of Chesbrough, Scotchmer and Von-Hippel. Von-Hippel's model concentrates on the end users such as suppliers and customers, whereas Scotchmer identifies the focal firm as the subject of his study.

Conversely, Chesbrough proposes that all parties are capable of engaging in the innovation process which has since led to various authors providing a much broader application than was firstly envisioned by Chesbrough. Nevertheless, exploiting such external thinking in combination with ongoing internal efforts requires a radical change, as aptly described by Witzeman et al. (2006): "*The firm must review the new product development processes, the supply chain, the strategic planning process, the reward system, the technology roadmap, and many other systems for their ability to incorporate external innovation...*" (p. 27). These sources of external innovation are therefore responsible for solving problems the challenging organisation is having difficulty with. These problem solvers generate ideas and solutions for the organisation, providing them the opportunity to improve, and in some cases, reconceptualise existing products and services.

While the practice of open innovation has recently experienced significant growth due to advances in IT capabilities, upon further study the core concept of this practice has a rich history in various industries and disciplines, which will be explored in the section below.

2.2.3 Open Innovation-Fresh Term for an Old Concept?

Chesbrough (2003) characterises the movement of organisations towards such open models of innovation as no less than a paradigm shift. While this description is quite sensationalist, implying that this is a sudden departure from what has always been the norm, closer examination suggests otherwise. For example, using contests to reward technological innovations is well established; with early forms of open innovation have a long standing history. In 1714 for example, the British Parliament offered a prize of £20,000 for anyone who was able to successfully determine longitude at sea. Contrary to beliefs, it was not Isaac Newton, but an unknown clockmaker and carpenter who came up with the winning idea by constructing a high accuracy marine chronometer (Hrastinski et al., 2010, Khurana and Rosenthal, 1997).

Similarly, in 1869 Napoleon III offered a prize for anyone who could discover a process to manufacture a butter substitute (Khan, 2005). Thus, margarine was first produced and the solver (historians still remain divided as to whom it was, debating between Mège-Mouriez or Michel-Eugene Chevreul) was granted a 15 year patent for the processing and production of animal fats (Bullinger and Moeslein, 2010). A further example highlights that through the diversity of the crowd a group under certain conditions can often outperform a group of experts in solving problems in the experts' area of expertise. During World War 2, the British intelligence enlisted twelve thousand people to help break the Nazi code. While a majority of the crowd was composed of mathematicians and cryptographers, there was also a diverse spectrum of specialties including philosophers, historians, linguists and crossword puzzle experts. Although these individuals were not trained in cryptography, Page (2008) argues that the success from this endeavour was mainly driven by the diversity of the group undertaking the task. Organisations

are now in the position to post their scientific problems to IT-enabled innovation contest platforms such as *InnoCentive* and *CrowdANALYTIX*.

The very concept of open innovation as proposed by Chesbrough can also be compared and contrasted to Robert Allen's phenomenon of collective invention (Allen, 1983). Allen (1983) used the term of collective invention to describe "*the free exchange of information about new techniques and plant designs among firms in an industry*" (p.2). While investigating this phenomenon, Allen observed that this happened in the iron production industry throughout the 19th century where it was commonplace for innovators to share their ideas with potential entrants and competitors, by means of published material as well as verbal exchange.

This free exchange of information was justified according to Allen (1983) with the mind-set that "*each individual has some cherished bit of knowledge, some trade secret which he hoards carefully. Perhaps by sharing it with others, he might impart useful information; but by an open discussion and interchange he would, almost for certain, learn a dozen things in exchange for the one given away. General increase in knowledge would give general improved practice, most likely a larger use of the materials in which a manufacturer is interested.*" (p. 19). These practices resulted in collective invention where firms built upon each other's work in an open and collaborative manner, leading to continual improvements in blast furnish practice.

Over the course of the last decade, and in particular with the introduction of new technologies, there is a fundamental transformation taking place making it much easier to outsource idea creation to the crowd. Arguably all organisations to some extent connect with their external environment in order to source fresh ideas while also collaborating on innovations (Cohen and Levinthal, 1990). For example, there have been several studies carried out on strategic alliances (Hamel et al., 1989, Hamel, 1991, Lichtenthaler and Lichtenthaler, 2010), innovation ecosystems (Han et al., 2012, Lee et al., 2012) and value networks (Chanal and Caron-Fasan, 2010, Eisenmann et al., 2008, Fitzgerald and Agerfalk, 2008, Wayne Gould, 2012). Much

of this research suggests that the very nature of these collaborations, accentuated by their permeable boundaries and self-organisation, makes them a powerful locus of collective creativity and innovation.

Through open innovation, organisations are capable of leveraging a global network of solvers, which consequently raises important issues that are not easily addressed in frameworks proposed in prior research. Grover and Kohli (2012) for instance argue the majority of existing research is currently directed toward exploring the relationships between investments and organisational outcomes. Such research streams have posed new questions involving the creation of value (Currie and Parikh, 2006, Gronroos, 2011), along with capability building (Mithas et al., 2011), adoption (Fink and Neumann, 2009), absorption (Anand and Khanna, 2000), risk allocation (Otim et al., 2012), and complementary investments (Dehning and Richardson, 2002).

Taking the depth of existing literature on the importance of external knowledge and collaboration, what then (if anything) is new about the open innovation paradigm? Chesbrough (2006b) maintains that there are various key differences surrounding open innovation. Firstly, equal importance is placed on the role of external knowledge as well as internal knowledge as a source of innovation. Previous theorising about innovation shows that external innovation was merely viewed as surplus to requirements, while the locus of innovation remained with the firm as the central object of studies revolved around internal activities (Van de Ven, 1986, Maier, 1998, Nooteboom, 1994).

A second difference is the importance of the business model in the open innovation paradigm. Previous research sought to place more emphasis on securing the smartest people and then trusting that cutting edge innovations would shortly follow and force their way into the market (Salickaitė and Banytė, 2008, Shane and Ulrich, 2004). With the open innovation model, companies are now seeking smart people from both inside and outside the firm to enhance their offerings. However, following such an approach, organisations must be able to identify the correct levels of motivation to encourage a community of solvers to engage in their

problem solving activities. Although open innovation provides the problem seeker with a global network of problem solvers, depending on the reward structure of the challenge only a select handful of solutions that are submitted will subsequently be rewarded. The motivations of the crowd therefore are a crucial element towards the creation of a successful open innovation initiative.

A third distinction shows that prior concepts give little, if any recognition to outbound flows of technology and knowledge (Ying and Mengqing, 2011). Even when firms sourced external knowledge to absorb, it was primarily for the purpose of internal development, manufacture and sales (Chesbrough, 2006a). However, the paradigm of open innovation enables the outward flow of technologies that have been developed internally, yet suffer from under-utilisation. As a result, the firm competes with these external channels to market, e.g. spin-offs and ventures, for new technologies (Tapscott and Williams, 2008).

Another distinction involves the changing of attitudes to the knowledge landscape. For example, in the closed model of innovation, useful knowledge is relatively scarce and almost viewed as untrustworthy to depend upon, while conversely in the open innovation paradigm, useful knowledge is widely distributed and usually of a high quality (Chanal and Caron-Fasan, 2010). Through this concept, the most capable and sophisticated R&D organisations need to be well connected to these external sources of valuable knowledge, including universities, specialised small companies, research institutes etc. (Chesbrough, 2003).

While some critics (Trott and Hartmann, 2009) argue that the differences between closed and open innovation are really more evolutionary rather than transformational, the increased adoption of the open innovation concept over the past decade cannot be denied (Giannopoulou et al., 2010, Huizingh, 2011, Lichtenthaler and Frishammar, 2011). Companies such as *IBM* and *Cisco* have adopted the openness paradigm (Gassmann and Enkel, 2004), in contrast to *Xerox* who have lost many innovations due to its closed systems approach (Lundstrom et al., 2013). Although still in its early adolescence, open innovation has become a normative model. While some organisations have reported severe challenges in

actively managing this process (Lichtenthaler, 2008, Van de Vrande et al., 2009), others such as *Procter and Gamble* (P&G) and *Eli Lilly* have achieved great benefits from it (Feller et al., 2009). However, even the successful firms had to overcome major challenges at the beginning of their open innovation initiatives (Laursen and Salter, 2006), with Tapscott and Williams (2008) noting that "*as new forms of mass collaboration take root in the scientific community, smart companies have an opportunity to completely rethink how they do science, and even how they compete*" (p.152).

2.3 Open Innovation and Crowdsourcing

While open innovation can be attributed to continuously gaining competitive advantage for the company involved, analysis of the literature shows a deep understanding of this process is still sorely lacking (Bullinger and Moeslein, 2010). Based on the research articles later identified in Section 2.6, research in the field displays a growing, but only rudimentary intertwined body of publications on this topic. For example, Loren (2011) suggests that open innovation can be implemented using one, or a combination of strategies:

i. Utilising a combination of internally and externally generated ideas
ii. Growing an ecosystem of partners, utilising suppliers, customers, and other external but interested parties
iii. Contracting or paying for work
iv. Crowdsourcing, or the issuance of a challenge to a group of experts and non-experts found outside the organisation using an internet based platform

From a planning and public policy point of view, it is the strategy of crowdsourcing that has the most direct application in relation to a desire for robust user involvement (Seltzer and Mahmoudi, 2012). Aitamurto et al. (2011) further identify crowdsourcing as an open innovation mechanism based on and enabled by information and communication technologies. The relationship between open innovation and crowdsourcing is further illustrated through the various definitions afforded to the term, presented below in Table 2-2.

Author	Definition: Crowdsourcing is...
Alonso and Lease (2011) p. 1	"...the outsourcing of tasks to a large group of people instead of assigning such tasks to an in-house employee of contractor."
Bederson and Quinn (2011) p. 1	"...people being paid to do web-based tasks posted by requestors."
Brabham (2008b) p. 75	"...an online, distributed problem solving and production model already in use by for profit organisations such as Threadless, iStock..."
Chanal and Caron-Fasan (2008) p. 5	"...the opening of the innovation process of a firm to integrate numerous and disseminated outside competencies through web facilities. These competencies can be those of individual (for example, creative people, scientists, engineers) or existing organised communities."
DiPalantino and Vojnovic (2009) p. 1	"...[a set of] methods of soliciting solutions to tasks via open calls to large scale communities."
Kleemann et al. (2008) p. 22	"...a form of the integration of users or consumers in internal processes of value creation. The essence of crowdsourcing is the intentional mobilisation for commercial exploitation of creative ideas and other forms of work performed by consumers."
Mazzola and Distefano (2010) p. 3	"...an intentional mobilisation, through Web 2.0, of creative and innovative ideas or stimuli, to solve a problem, where voluntary users are included by a firm within the internal problem-solving process, not necessarily aimed to increase profit or to create product or market innovations, but in general, to solve a specific problem."
Oliveira et al. (2010) p. 413	"...a way of outsourcing to the crowd tasks of collective assets creation, often collaboratively, with the aim of having easier access to a wide variety of skills and experience."
Reichwald and Piller (2006) p. 58	"...interactive value creation: in terms of isolated activity of individual as directed toward one unit of the product, involving cooperation between firm and users in the development of a new product."
Vukovic et al. (2010) p. 539	"...a new online distributed problem solving in which people collaborate and may be awarded to complete a task."

Table 2-2: Definitions of Crowdsourcing (Adapted from Estellés-Arolas and González-Ladrón-de-Guevara (2012))

The emergence of this prominent term "*crowdsourcing*" was first coined by Jeff Howe in a Wired magazine article (Howe, 2006b): "*Simply defined, crowdsourcing represents the act of a company or institution taking a function*

once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call. This can take the form of peer-production (when the job is performed collaboratively), but is often undertaken by sole individuals. The crucial prerequisite is the use of the open call format and the large network of potential labourers." Brabham (2008a) stress that "*crowdsourcing is not merely a web 2.0 buzzword, but is instead a strategic model to attract an interested, motivated crowd of individuals capable of providing solutions superior in quality and quantity to those that even traditional forms of business can*" (p.79). As explored previously, most organisations do not possess all required knowledge within their formal boundaries and must rely on external linkages to acquire knowledge (Anand et al., 2002). In dynamic fields, organisational innovation derives from knowledge exchange and learning from network connections that cross organisational boundaries (Nooteboom, 2000). Organisations partake in crowdsourcing because they gain access to new information, expertise and ideas not available locally, and can interact informally, free from hierarchical constraints (Wasko and Faraj, 2005). Even though the engaging participants might often be direct competitors, informal and reciprocal knowledge exchanges between participants are valued and sustained over time (Bouty, 2000).

This recent resurgence of crowdsourcing has developed with it various business paradigms, describing how certain individuals (customers, end users, competitors etc..) can be involved as active participants in the design and development of products, services and experiences (Prahalad and Ramaswamy, 2004). Crowdsourcing can thus be studied from various perspectives and can be connected to many different developments such as advances in IT, globalisation processes, as well as the availability of new and sophisticated IT tools (Gassman, 2006). Ramaswamy (2009) argue that developing these paradigms "*change the very nature of engagement and relationship between the institution of management and its employees, and between them and... (their) customers, stakeholders, partners and other employees*" (p.33).

Crowdsourcing involves amateurs, experts, or indeed a mixture of both with participation involving monetary, intrinsic, or mixed incentives and can be used to produce goods, ideas or services (Archak and Sundararajan, 2009). Crowdsourcing therefore covers a broad range of activities that were initially performed in-house, but are now capable of being outsourced to the crowd. However, making the clear distinction between crowdsourcing and other forms of peer production on the Web is often difficult. For example, open source software (OSS) has been cited as one of the most prominent examples of revolutionising the conventional innovation process (West and Gallagher, 2006, West, 2007) by challenging mainstream economics and organisational theory. OSS involves invention whereby the source code can be freely modified and redistributed (Fitzgerald, 2006). However as outlined previously, it is only when commercial exploitation takes place can the innovation process be deemed to have taken place. By its definition crowdsourcing is related to a single firm extracting economic value from the process.

2.3.1 Crowdsourcing through Online Platforms

Online crowdsourcing platforms make it possible to share information globally, quickly, and with large numbers of participants. Prior studies have shown that these platforms support organisational knowledge flows between geographically dispersed co-workers (Constant et al., 1996) and distributed research efforts (Ahuja et al., 2003). By participating in these platforms, problem solvers become active stakeholders in defining the context of the innovation being sought, including their unique personal understanding (Lenssen et al., 2007). It is this personal experience that generates new dimensions of value, based on these solvers influencing their own unique end products, experiences and services. These dimensions place the external solvers at the centre of the innovation experience. Through these outcomes, this paradigm represents a targeted, market-orientated approach to the adoption of an open innovation business philosophy (Bullinger et al., 2009).

Crowdsourcing through innovation contests is therefore about crossing boundaries to create a network of synergistic interactions across solver communities, with the

prospect of an economic gain for the winner. These communities are comprised of complex, interconnected webs of interacting individuals and organisations focused on producing knowledge-intensive innovative outputs (West and Lakhani, 2008). For organisations seeking to implement such an open-innovation philosophy in practice it is very communication intensive. Multi-layered webs of interactions by stakeholders emerge both within and outside the organisation to generate, connect and coordinate the required ideas, processes and outputs (Lundstrom et al., 2013). These factors create further complicated issues for organisations and researchers because they are more multifaceted than technology-enabled groups; they are a mix of power and knowledge, liberty and enlightenment, progress and intervention (Kelty, 2009). The technology used is only one half of the process, with the other, equally important half including the reflective, active and interactive practices that the community members engage in.

With all the aforementioned benefits of crowdsourcing, there are also inherent limitations within the model. As management in many organisations have discovered, the utilisation of crowdsourcing platforms is no guarantee that knowledge sharing will actually take place (Orlikowski, 1992). Indeed, one of the problems with accessing external knowledge is that it requires depending upon the kindness of strangers (Constant et al. 1996). Another possible challenge preventing adoption might involve the quality of the work being undertaken. The skill level of the crowd might arguably be lower than that of the employees and professionals dedicated to the task as part of their job, rather than the crowd who are under less pressure to perform high quality work (Chanal and Caron-Fasan, 2010). The organisation may consequently have to spend time reviewing low quality results. Within some crowdsourcing models such as Threadless[3], companies are now turning increasingly to the crowd to review the different entries of their peers' work, leaving them in a position of only having to review the highest entries themselves (Brabham, 2010, Lakhani and Kanji, 2008). While this strategy is far

[3] Threadless is an online clothing company that holds an ongoing t-shirt design competition on its website.

more efficient, it is also dependent on whether the organisation has enough trust in the crowd performing the reviews.

Furthermore, while the crowd may perform quick, short term tasks effectively, to be reliant on them for long term projects may be ill judged for a variety of reasons. Firstly, the crowd has no obligation to the company, leaving them free to perform as much or as little work as they see fit. For the crowd to be motivated to work for an extended period of time, the resultant reward would have to be significantly appealing, and be monetary in nature (Janzik, 2010). Secondly, while long-term projects may be broken down into smaller parts to best suit the exploitation of the crowd, common task components can make it difficult to coordinate crowd efforts (Lindermann et al., 2012). These reasons impose limits on initiatives that could otherwise be potentially crowd sourced.

2.3.2 Knowledge Contribution

Knowledge contribution through innovation contests primarily occurs when participants are motivated to access a platform (further detailed in Section 2.6) where they can then review posted challenges, select those which they believe they are capable of developing a solution, and take time and effort to formulate a solution (Pawlowsky, 2001). This knowledge is defined by Leonard (1998) as being "*information that is relevant, actionable, and based at least partially on experience*" (p. 113). Organisations posting innovation challenges have no control over who responds to their call, or the quality of responses.

These contests therefore rely heavily on participants who are willing to contribute their own forms of knowledge, in return for varying levels of motivation (outlined in Section 2.4.3). It is these levels of motivation that provides the innovation platforms with specific means by which to engage participants. Thus for knowledge to be contributed, solvers must believe that their ideas will be worth the effort and that some new value will be created, with the expectations of receiving some of that value for themselves (Nahapiet and Ghoshal, 1998). These benefits are more likely to be gained by individuals who actively participate and in some cases help others (Von Hippel and Krough, 2003). The expectation of personal benefits can motivate

participants to contribute knowledge in the absence of personal acquaintance, similarity or the likelihood of direct reciprocity (Constant et al., 1996). Furthermore, it is proposed that when solvers engage in a common area, knowledge flows readily across that area enabling the creation social networks to support knowledge exchange (Brown and Duguid, 2002). On the other hand, this mode of knowledge creation may be equally difficult for organisations to achieve if solvers perceive there is a potential risk of losing power and advantage (Stenmark, 2000). After all, problem solvers have no assurances that those they are helping will ever acknowledge their endeavours, while also being conscious of their peers who might be more inclined to hoard knowledge without contributing anything in return (Wasko and Faraj, 2005).

Contributions of knowledge to open innovation communities in practice therefore seem paradoxical. Previous literature argues that giving away knowledge will eventually cause the possessor to lose their unique value (Thibaut and Kelley, 1959), while benefitting all others except the contributor (Thorn and Connolly, 1987). This is in sharp contrast with traditional communities of practice involving face to face knowledge exchanges where participants typically become familiar with each other and interact over time. Such actions create expectations of obligation and reciprocity that are enforceable through social sanctions. Existing literature consistently finds that knowledge sharing is positively related to factors including demographic similarity (Pelled, 1996), a history of prior relationship (Krackhardt, 1992), co-location (Allen, 1977) and strong ties (Wellman and Wortley, 1990), all factors that are not readily applicable in contest platforms. And yet such knowledge management is central to achieving organisational effectiveness (Anand et al., 1998). Chen and Edgington (2005) for example outline that knowledge is strategically linked to innovation and operationally related to both performance quality and production efficiency. Similarly, Gold and Arvind Malhotra (2001) believe such knowledge to be the foundation of competitive advantage as it is the primary driver of the organisation's value.

2.3.3 Why Do Solvers Participate?

In discussing the knowledge contribution that occurs within these settings, it is important to emphasise that the reasons for engagement within innovation contest platforms has emerged as a rich literature stream in its own right, with several in-depth investigations already outlining the various motivations of solvers to participate (Antikainen and Vaataja, 2010, Brabham, 2010, Frey et al., 2011a). This level of motivation is defined by Locke and Latham (2004) as being "*the internal factors that impel action and the external factors that can act as inducements to action*" (p.388). Atkinson (1964) also define motivation to be "*the contemporary (immediate) influence on direction, vigour and persistence of action*" (p.2). Both these definitions are primarily concerned with events that energise, channel and sustain human behaviours over time, eventually leading to task performance and psychological wellbeing (Steers et al., 2004). From these emergent definitions, several theories have been put forth to explain an individual's motivation (Kanfer, 1990, Pinder, 2014), including the first systemic formulation of expectancy theory (Vroom, 1964), theory of goal setting (Locke and Latham, 1990), and self-determination theory (Deci and Ryan, 1985). The majority of these theories make meaningful developments to our understanding of motivation, as it is a very complex process.

However, current literature is also guilty of treating motivation as a unitary concept that varies in amount, as opposed to type (Meyer et al., 2004). This means that the total motivation a person has is often treated as a single variable that provides the basis for making decisions. As a result, these theories focus on the amount of total motivation a person may have for a task, rather than the types of motivation that is used in making their decisions. Even theories that do distinguish between intrinsic and extrinsic motivation (Porter and Lawler, 1968) consider them to be supplementary, with the total motivation being the critical predictor (Meyer et al., 2004).

The very concept of motivation involves the search for the cause and driver of human behaviour (Reeve, 2001). Psychologically it refers to releasing, controlling

and maintaining physical activities (Schunk et al., 2008). Motivation therefore describes a process that arises between the inherent motives of individual factors and the incentives of situational factors (Atkinson, 1958). The first fundamental question of motivation reflects the causation behind it, or the reasons to why it is needed (Reeve, 2001). It is not enough to ask how solvers engage in these open calls for innovation, as in order to gain a sophisticated understanding of why they engage we must also ask what motivates them to take part in the first place. This question determines a contest's success by outlining the motivation of solvers to actively engage in community knowledge contribution and sharing activities (Ardichvili et al., 2003).

The second fundamental question of motivation relates to why a users' behaviour varies in its intensity. Within the individual the motivations are expected to vary (Hars and Ou, 2001, Lakhani and Von-Hippel, 2003, Roberts et al., 2006). As user motivations vary, so too does solver behaviour resulting in some solvers showing a higher affinity for engagement. The incentives that compel solvers to engage with platform communities highlight that the motivations themselves are based on the goals of the solver. This idea of end motives dates back to Aristotle, who divided motives into ends and means (Reiss, 2000). An end motive is something that people enjoy for their own sake. The means are the tools; in this case the challenges that are used to satisfy these end motives. While some solvers share many of the same basic motivations, they also clearly differ in what actually motivates them in the first place.

While such diverse motivations animate solvers, there also exists various ranges of the human experience where monetary rewards are inversely related to the presence of other, social-psychological rewards (Benkler, 2002). Incentives such as cash rewards, prizes, and other such promotions have long been proven to be effective in stimulating individuals to participate in various types of crowdsourcing, for which explicit rewards seem to matter greatly on user response. Interestingly, Jeffrey (2009) reveals that offering participants non-cash rewards has led to better performance.

Other models of contests seem to involve personal recognition having a far greater impact than that of monetary compensation. For example, *TopCoder* provide a ranking system to highlight the most successful solvers (Archak, 2010). While these rewards have been highlighted in literature for playing a key role in getting individuals to participate (Fuller, 2010), research on the effectiveness of rewards is still limited and controversial (Ryan and Deci, 2000b, Schuhmacher and Kuester, 2012). IT-enabled innovation contest platforms therefore need to consider why external innovators would be drawn to participate in the innovation process in the first place, beyond the financial reward on offer (Boudreau and Lakhani, 2009). Given how not all solvers that submit a solution will receive a reward, diverse motivations are necessary to ensure that innovation solvers, seekers and the hosting platforms themselves derive sufficient value from engagement (Feller et al., 2012).

The absence of such motivations to participate in IT-enabled innovation contest platforms can often be viewed by the crowd as unethical and exploitive (Hoffman, 2009). These contest platforms need to ensure that their incentives are designed to inhibit such impressions, and to receive good-faith efforts from the crowd. The innovations achieved through these contests are therefore inherently social due to the knowledge being gained from members of an open community.

As a result, the means to manage and motivate participants to share their knowledge will grow in importance in today's knowledge based economy. Wolfe and Loraas (2008) outline how motivating knowledge sharing is already a major issue leading organisations. Understanding what motivates users to participate in IT-enabled innovation contest platforms and the value this participation produces from their perspective is important knowledge for strengthening the democratising features of open innovation (Von Hippel, 2005). However despite the proliferation of these contests, very little is known about factors leading to their success or failure (Bullinger et al., 2009).

2.4 Social Capital

The concept of social capital has become increasingly popular in a wide range of social science disciplines, with a growing number of sociologists, economists, and political scientists incorporating this theory into their works (Adler and Kwon, 2002). The core idea of social capital according to Putnam (2000) is that social networks have value, even going so far as to define social capital as being the "*connections among individuals-social networks and the norms of reciprocity and trustworthiness that arise from them*" (p.21). Putnam argued that these communities and norms are important to societal cooperation, coordination and collaboration. Social capital has also been defined by Nahapiet and Ghoshal (1998) as being "*the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit*" (p. 243).

Existing literature has revealed social capital as being a motivating factor for solvers engaging within innovation contest platforms (Adamczyk et al., 2011, Andersen et al., 2013, Bayus, 2013, Jeppesen and Frederiksen, 2006, Reinhardt et al., 2010) (further reviewed in Section 2.5). However, there is a failure within the research articles gathered in Section 2.2 to appreciate that social capital is not merely a source of motivation to participate, but it is in fact a complex, multi-dimensional theory. The reviewed articles view social capital as being a generic reward for peer collaboration, often choosing to focus on individual social capital constructs thereby falling short of fully comprehending the implications of social capital. This stark absence of studies seeking to investigate social capital as a theory represents a vital shortcoming in the current literature streams of IT-enabled innovation contest platforms. This is quite surprising given that factors influencing knowledge sharing from the human behaviour perspective in virtual learning communities were previously examined by Chen and Chen (2009) where it was found that social capital was positively and significantly associated with knowledge-sharing intention. Furthermore, social capital has also been investigated within the realms of virtual knowledge sharing (Ardichvili et al.,

2003), entrepreneurship (Gedajlovic et al., 2013), organisational advantage (Nahapiet and Ghoshal, 1998), and innovation (Landry et al., 2002).

This study therefore provides a viable practical setting, with which to investigate this theory that has thus far been overlooked by the research community.

2.4.1 Defining Social Capital

The tenet of social capital theory is that social relationships among people can be productive resources (Coleman, 1989). This refers to the social networks, the reciprocities that arise from them, and their value within the business environment (Sen and Cowley, 2013). Social capital is defined by Nahapiet and Ghoshal (1998) as being "*the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit*" (p.243). According to Putnam (2000), it has "*forceful, even quantifiable effects on many aspects of our lives*" and is more than just "*warm, cuddly feelings or frissons of community pride*" (p.23).

Social capital is further defined by Lin et al. (2001) as "*resources embedded in a social structure that are accessed and/or mobilised in purposive action*" (p. 29). These resources, according to Baker (2000), includes "*information, ideas, leads, business opportunities, financial capital, power, emotional support, goodwill, trust, and cooperation*" (p.25). It is the resource emphasis of social capital that distinguishes it from the common practice of networking.

Definitions of Social Capital	
Authors	*Definitions*
Baker (1990) p.619	*"A **resource that actors derive from specific social structures** and then use to pursue their interests; it is created by changes in the relationship among actors"*
Bourdieu (1983) p. 243	*"Made up of social obligations (connections), which is **convertible, in certain conditions, into economic capital**"*
Boxman et al. (1991) p. 52	*"The **number of people who can be expected to provide support** and the resources those people have at their disposal"*
Brehm and Rahn (1997) p.999	*"The web of cooperative relationships between citizens that **facilitate resolution of collective action problems**"*
Fukuyama (1995) p.10	*"The **ability of people to work together for common purposes in groups** and organisations"*
Knoke (1999) p.18	*"The process by which social actors create and mobilise their network connections within and between organisations to **gain access to other social actor's resources**"*
Loury (1992) p.100	*"Naturally occurring social relationships among persons which **promote or assist the acquisition of skills and traits valued in the marketplace.**"*
Nahapiet and Ghoshal (1998) p.243	*"The **sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit**. Social capital thus comprises both the network and the assets that may be mobilised through that network"*
Pennar and Mueller (1997) p.154	*"The web of social relationships that influences individual behaviour and thereby **affects economic growth**"*
Portes and Sensenbrenner (1998) p.1323	*"Those expectations for action within a collective that **affect the economic goals and goal seeking behaviour of its members**, even if these expectations are not orientated toward the economic sphere"*
Putnam (1995a) p.67	*"Features of social organisation such as networks, norms, and social trust that **facilitate coordination and cooperation for mutual benefit**"*

Table 2-3: Definitions of Social Capital

The key difference between social capital and other forms of capital is that social capital is embedded in the social realm (Wasko and Faraj, 2005). While other forms of capital are based on individuals or assets, social capital involves the fabric of relationships between individuals and in individuals' connections with their communities (Putnam, 1995b). Social capital can therefore be conceptualised and defined at the individual level, community level, state level and even national level with definitions varying accordingly (O'Brien et al., 2004). Further definitions of social capital are presented above in Table 2-3.

Adler and Kwon (2002) for instance argue that the source of social capital lies in the structure and content of an actor's social relations. These relations effect the influence, information and solidarity available to the solver (Sen and Cowley, 2013). Such impacts have always been associated with the development of technology (Buchanan, 1994, Castells, 2000, Westrum, 1991), with interactions between IT and social capital in organisations drawing considerable academic attention (Yang et al., 2009). Cohen and Prusak (2001) argue that many organisations with high social capital have survived for a long time without paying much attention to what social capital truly entails. That is, organisations themselves often ignore social capital and seldom understand, analyse or even discuss the networks and communities integral to it.

In recent years, social capital concepts have been offered as explanations for a variety of pro-social behaviours, including community involvement and collective action (Coleman, 1989). This makes it a critical component in the knowledge transfer process (Reagans and McEvily, 2003). Indeed, the innovative solutions organisations are seeking do not arise spontaneously. They are instead the result of conscious, semiconscious and unconscious mental sorting, matching, grouping and melding. Interpersonal interactions at the conscious level stimulate and enhance these activities, with prior literature suggesting that interplay among individuals appears to be essential to the innovation process (Leonard, 1998). In particular, the strength of interactions between participants have been suggested to influence knowledge sharing behaviour, with the strength of the community able to be measured by determining the strength of the ties (Borges, 2012). Strong ties are expected to facilitate knowledge

sharing as they involve trust among participants, resulting in an emotional attachment and increased frequency of engagement (Reagans et al. 2003).

Various contradictions and challenges of organisations have been identified, yet without social capital, collaboration in virtual organisations is unlikely to succeed (Riemer and Klein, 2004). This is due to social capital residing in the very relationships of the problem solvers, with these relationships created through exchange (Bourdieu, 1983). The pattern of linkages and the relationships built through them are the foundations for social capital. What we ultimately observe, is a complex and dialectical process in which social capital is created and sustained through exchange, and which in turn, facilitates knowledge exchange (Nahapiet and Ghoshal, 1998). For example, research suggests that where parties trust each other, they are more willing to engage in cooperative activity through which further trust may be generated (Fukuyama, 1995).

The contribution of social capital to innovation is therefore achieved by lowering transaction costs between firms and other actors, specifically search and information costs (Maskell, 2000). Thus, the hypothesis of social capital theory with regards to innovation according to Maskell (2000) is that "*firms in communities with a large stock of social capital will....always have a competitive advantage to the extent that social capital help reduce malfeasance, induce reliable information to be volunteered, cause agreements to be honoured, enable employees to share tacit information and place negotiators on the same wavelength. This advantage gets even bigger when they proves of globalisation deepens the division of labour*" (p. 7).

While a number of conceptual and empirical contributions to social capital have been made, studies have utilised social capital inconsistently and in limited ways (Adler and Kwon, 2002). In particular, scholars have criticized such research for failing to measure intervening mechanisms that link relationships with outcomes (Anderson, 2008, Lin, 1999). Indeed, in both the conceptual and empirical literature on social capital, there exists a looseness and imprecision as to how constructs are conceived and operationalised (Gedajlovic et al., 2013). Therefore, while scholars may be generally consistent with the basic definition of social capital, how social capital is

actually operationalised and modelled in research varies greatly. Furthermore, there is a distinct lack of literature exploring the relationship between social capital and these open innovation contest platforms.

2.4.2 Social Capital as a Theory

While the earliest use of the term can be traced back to the early twentieth century (see Hanifan (1916)), inspiration for most of the current body of literature stems from the seminal research of Coleman (1989) on education, and Putnam (1993) on institutional performance. To that end, there are two theoretical models underpinning the concept of social capital: one pioneered by Bourdieu (1983), and the other by Putnam (1993).

While Bourdieu (1983) focused on the role played by different forms of capital in the reproduction of unequal power relations, Coleman (1989) took a more rational perspective. Coleman (1989) defined social capital through its function of facilitating "*certain action of individuals who are within the structure*" (p.302). This led him to believe in three forms of social capital:

i. Obligations and expectations which depend on the trustworthiness of the social environment.
ii. The presence of norms.
iii. The capacity of information to flow through the social structure in order to provide a basis for action.

Both Coleman and Bourdieu saw social capital as an attribute of an individual. Putnam (1993) however, regarded it as an attribute of the community. This led Putnam to believe that it stemmed from the networks, norms and trust that develop within a group. Putnam (1993) argued that these factors provide the incentive to pursue shared objectives of all members belonging to a group.

Even though social capital theory[4] provides the right conceptualisation for understanding the exchange of knowledge resources, theoretical gaps remain in our understanding, especially when the social exchanges are voluntary (Chiu et al., 2006). Furthermore, despite the breadth of its application and apparent significance as a concept, social capital remains elusive and difficult to identify, resulting in diverse definitions. Some emphasize the type of social interactions that yield social capital (Anheier et al., 1995), with others emphasizing the functionality of social capital (Pahlke, 2012). Such a diversity of definitions reveals an underlying problem in the social capital literature, specifically the absence of an adequate theoretical framework for its implementation within innovation contest platforms. It is therefore not surprising that the empirical results from social capital studies are considered questionable due to perceived econometric problems. There have been succinct criticisms toward the empirical literature (Durlauf, 2002, Durlauf and Fafchamps, 2004), focusing on identifying parameters from the given data and the heterogeneity caused by non-social capital group effects. In addition, Paldam (2000) criticizes the ad hoc proxies and model specifications used to analyse the relationship between social capital and other socio-economic phenomena.

Accordingly, Pahlke (2012) argues that social capital is primarily accumulated by participants to leverage potential information and knowledge sources leading to knowledge accumulation and increased awareness of their environment Social capital theory was therefore selected as being the appropriate theoretical lens for this study. With this in mind, the following section describes the nature of social capital, determining what it is for, and how it can be used for solvers engaging in IT-enabled innovation contest platforms.

[4] It is worth noting also that several other theoretical lenses were considered before presenting social capital. These theories are subsequently listed in the Appendix.

2.4.3 Development in Literature

While the term social capital is admittedly still in its infancy with research still being in its early stages, the notions behind it are not new but rooted in early sociological studies (Grootaert and Van Bastelaer, 2002) and connected to scholars such as Durkheim (1884), Marx (1894), and Weber (1947). From these early studies, it has been suggested that involvement and participation in groups can have positive consequences for both the individual and the community (Portes, 2000). The actual term "social capital" is thought to have been first used by Hanifan (1920), whereby it was defined as "*good will, fellowship, sympathy and social intercourse among the individuals and families who make up a social unit*". However research on this concept did not seem to attract wide attention and it wasn't until the 1980's was the concept revived with the works of Bourdieu (1983), Coleman (1989) and Putnam (1995a) being largely credited.

Coleman (1989) began the process of describing social capital and differentiating it from other forms of capital. This differentiation justified both the prior concepts along with the subsequent attention in has received. Putnam (1993) further developed a theoretical foundation of social capital by explaining how social capital is formed and its impact on society. Empirical works, particularly those in economics, incorporate Putnam's concepts. The major tenant of Coleman (1989) is that social capital is a unique form of capital, distinguished from other forms in that it is derived from social structures and it facilitates certain actions within those structures. Coleman (1989) describes social capital as a form of capital, observing that it is useful in producing other goods but remains distinct from the goods produced. The durability of social capital also generates both immediate and long term effects where individuals can use it to meet current or future needs.

The conceptual extension of social capital from an individual to a community was further refined by Putnam (1993; 1995; 2000), where he identified a mechanism for social capital formation. This made it possible to discuss the social capital possessed by communities, along with the consequent effects of their development. Putnam (1993) refers to networks, norms and trust as the manifestations of social capital. In

doing so, Putnam emphasised social capital's productive capacity to "*improve the efficiency of society by facilitating coordinated actions*" (p.167). However Putnam (1993) also focused on the importance of reciprocity, thereby providing a mechanism for social capital formation. Putnam defined reciprocity as being "*the continuing relationship of exchange that is at any given time unrequited or imbalanced, but that involves mutual expectations that a benefit granted now should be repaid in the future*" (p.172). Reciprocity is therefore an inherently social phenomenon predicated upon social interactions among individuals which dictates the opportunities for social capital formation.

As a set of resources rooted in literature, social capital has various attributes and therefore requires multidimensional measurement (Grootaert et al., 2003, O'Brien et al., 2004). The most stable and widely agreed dimensions of social capital in the literature, regardless of the disciplines, are social networks, trust, and norms of reciprocity. A social network concerns the extent of an individual's participation in various types of social organisations and informal networks, in this instance the contest platform, while also concerning the social support that one can obtain (Grootaert et al., 2003). Trust is defined by Commission (2003) as "*the level of confidence that people have that others will act as they say or are expected to act, or what they say is reliable*" (p.10) as it acts as the bedrock for most personal relationships while facilitating various day to day interactions. Norms of reciprocity refers to shared understandings, informal rules and conventions on continuing relationships of exchange that are at any given time unrequited or imbalanced (Yang et al., 2009). It also involves the mutual expectation where a benefit granted, should be repaid in the future (Putnam, 1993). The notion that reciprocity is related to social capital is well researched as an important element that facilitates the way in which interactions are structured between group members (Commission, 2003, Putnam, 2000, Battistella and Nonino, 2012).

At the individual level, the processes alluded to by social capital can cut both ways. For example, social ties can bring about greater control over wayward behaviour and provide privileged access to resources. Alternatively, they can also restrict individual freedoms, and deny outsiders from gaining access to the same resources through

particularistic preferences (Portes, 2000). Social capital thus facilitates knowledge acquisition by affecting the conditions necessary for the creation of value though the exchange and combination of existing resources (Nahapiet and Ghoshal, 1998).

The extent to which organisations acquire external knowledge from problem solvers however depends on the ability of the organisation to recognize the value of repeated, intense interaction, and the willingness of the solver to share information (Cohen and Levinthal, 1990, Dyer and Singh, 1998). Social capital therefore strongly influences the extent to which interpersonal knowledge sharing occurs (Nahapiet and Ghoshal, 1998), with participants capable of increasing the depth, breadth and efficiency of mutual knowledge exchange (Lane and Lubatkin, 1998). Nahapiet and Ghoshal (1998) present social capital as an integrative framework for understanding the sharing and creation of knowledge in organisations, suggesting that the exchange of knowledge is facilitated when:

i. Participants are motivated to engage in its exchange
ii. There are structural links or connections between participants
iii. Participants have the cognitive capability to understand and apply knowledge
iv. Relationships have strong, positive characteristics

Each of these facets of social capital constitutes an aspect of the social structure, while facilitating the combination and exchange of knowledge between participants (Wasko and Faraj, 2005). With the increasing popularity of the concept, they will continue to be considered important in various subject matters, particularly in their applications to new technologies (Yang et al., 2009).

In recent years, research on social capital has grown rapidly across various disciplines including economics (Wasko and Faraj, 2005), sociology (Brands, 2013), and politics (Kavanaugh et al., 2005, Walter et al., 2007). Such diversity accentuates the complexity of this concept, as researchers and practitioners approach it from various disciplines and backgrounds. Studies have argued that social capital is positively related to a range of economic and sociological outcomes, while also expressing concern regarding its detriments to social practices (Adler and Kwon, 2000). Of further importance is the absence of a commonly agreed upon definition of social

capital. Previous literature seems to suggest that the definition adopted by a particular study depends on the discipline and the level of investigation (Robinson et al., 2002). As a result, there are still significant variations and disagreements when it comes to the measurement, sources and outcomes of the concept stressing the need for further clarification.

2.4.4 Dimensions of Social Capital

Although the concept of social capital has found widespread acceptance, there also remains widespread uncertainty about its meaning and effects (Koka and Prescott, 2002). Following Nahapiet and Ghoshal (1998), social capital can be broken down as encompassing three particular dimensions:

i. Structural Dimension-manifested through social interaction ties
ii. Relational Dimension-manifested through trust, reciprocity and self-identification
iii. Cognitive Dimension-manifested through shared vision and shared language

Not all these dimensions of social capital are mutually reinforcing (Nahapiet and Ghoshal, 1998). For example, an efficient network in structural terms may not be the best way to develop the strong cognitive or relational social capital that may be required to ensure the effective operation of such networks. Table 2-4 outlines each social capital dimension along with their corresponding constructs and definitions. Each of the dimensions outlined are explored further in the sections below.

Dimension	Construct	Definition	Source
Structural	*Social Ties*	*"A combination of the amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services which characterise that tie."*	Granovetter (1973) p. 1361
		"Produce a social-structural framework that permits enlarged diffusion of information as compared to information networks that are tightly integrated by highly homophilous relationships."	Liu and Duff (1972) p. 362
Relational	*Trust*	*"A generalised expectancy held by an individual that the word, promise, oral or written statement of another individual or group can be relied upon."*	Rotter (1980) p.1
	Reciprocity	*"Actions that are contingent on rewarding reactions from others and that cease when these expected reactions are not forthcoming."*	Blau (1964) p.6
	Self-Identity	*"Individuals see themselves as one with another person, or group of people."*	Nahapiet and Ghoshal (1998) p.256
Cognitive	*Shared Language*	*"The acronyms, subtleties and underlying assumptions that are the staples of day-to-day interactions."*	Lesser and Storck (2001) p.836
	Shared Vision	*"Embodies the collective goals and aspirations of the members of an organisation."*	Tsai and Ghoshal (1998) p.467
		"The bonding mechanism that helps different parts of an organisation to integrate or combine resources."	

Table 2-4: Social Capital Dimensions, Constructs, and Definitions

2.4.4.1 Structural Dimension

Theories of social capital and collective action propose that the connections between participants, or the structural links created through the social interactions between participants, are important predictors of collective action (Putnam, 1995b). When contests are dense, consisting of a large proportion of strong, direct ties between participants, collective action is relatively easy to achieve (Krackhardt, 1992). The more participants that are in contact with each other, the more likely they are to establish a habit of cooperation and act collectively (Marwell and Oliver, 1993). Therefore, collectives characterised by high levels of structural capital are more likely to sustain collective action.

The structural dimension of social capital is also relevant for examining individual actions, such as knowledge contribution within a collective (Wasko and Faraj, 2005), as it involves the pattern of relationships between the problem solvers (Inkpen and Tsang, 2005). Participants who are centrally embedded in platforms are more likely to understand and comply with group norms and expectations (Rogers and Kincaid, 1981). Thus, a participant's structural position should influence their willingness to contribute their knowledge. Existing literature suggests that one method of measuring a participant's embeddedness is to determine the number of social ties the individual has with others on the platform (Ahuja et al., 2003). Social interaction in these platforms is similar to a conversation that occurs through the interaction with other participants, thus creating a structural link between participants. The structural dimension is facilitated through the development of social interaction ties.

Social Interaction Ties

Social interactions develop over time in dyadic relationships as exchange participants become comfortable with each other's competence and reliability in resource exchanges (Larson, 1992, Ring and Van de Ven, 1994). The more these social interactions build, the greater the intensity, breadth and frequency of information exchanged (Yli-Renko et al., 2001). Social interaction ties are thus considered to be the channels for information and resource flows (Tsai and Ghoshal, 1998). Social ties are defined by Granovetter (1973) as being "*a combination of the amount of time, the*

emotional intensity, the intimacy (mutual confiding) and the reciprocal services that characterise that tie" (p.1361). Tie strength is described as a combination of both the amount of time and the emotional intensity that participants have invested to the endeavour (Granovetter, 1973). Liu and Duff (1972) argue that these social ties "*produce a social-structural framework that permits enlarged diffusion of information as compared to information networks that are tightly integrated by highly homophilous relationships"* (p.362).

Greater levels of social interaction have therefore been argued to increase knowledge mobility through intensifying role interactions (Ring and Van de Ven, 1994). This occurs by enhancing an organization's ability to recognise and evaluate pertinent knowledge (Cohen and Levinthal, 1990, Lane and Lubatkin, 1998), and by increasing the incentives to exchange and absorb information (Dyer and Singh, 1998, Larson, 1992). These ties are a fundamental aspect of social capital because a solver's network of social ties creates opportunities for social capital transactions (Adler and Kwon, 2002). The strength of a tie is a combination of the amount of time, emotional intensity, mutual confiding and reciprocal services that characterise the tie (Berkowitz, 2013, Fischer, 1982, Granovetter, 1973). Wellman (1982) characterises strong ties as encompassing:

i. An interest in participants being together as much as possible through frequent interactions over a long period
ii. A sense of mutuality in the relationship
iii. A voluntary investment in the tie and a desire for interaction with other solvers

Chiu et al. (2006) subsequently describe social ties as representing the strength of the relationships, the amount of time spent communicating, and the communication frequency among solvers. Social ties therefore provide the opportunity to combine and exchange knowledge, with recent studies presenting empirical support for the influence of social interaction on knowledge sharing among units that compete with each other (Tsai, 2002) and knowledge acquisition (Yli-Renko et al., 2001). Argote and Ingram (2000) argue that social networks play an important role in knowledge transfer, yet related research is inadequate (Inkpen and Tsang, 2005).

2.4.4.2 Relational Dimension

Knowledge contribution is also facilitated by the affective nature of the relationships within a collective, referred to as relational capital (Nahapiet and Ghoshal, 1998). This exists when members develop a strong identification with the collective (Lewick and Bunker, 1996), perceive an obligation to participate in the collective (Coleman and Coleman, 1994), trust others (Putnam, 1995b) while also recognising and abiding by the cooperative norms (Putnam, 1995a). The main function of this relational aspect of social capital is to facilitate actions for participants within the contests. This makes relational capital an important asset that benefits both the community and its members (Coleman and Coleman, 1994). Solvers are willing to help other members, even strangers, because everybody is part of the collective (Leana and Van Buren, 1999).

This relational dimension describes the personal relationships solvers develop with each other through a history of interactions (Granovetter, 1992). This concept focuses on the relationships people have, such as respect and friendship that influence their behaviour. It is through these ongoing personal relationships that solvers fulfil social motives such as sociability, approval and prestige (Nahapiet and Ghoshal, 1998). The relational dimension is facilitated through the development of trust, reciprocity, and self-identity.

Trust

Trust is defined by Rotter (1980) as being *"a generalised expectancy held by an individual that the word, promise, oral or written statement of another individual or group can be relied upon"* (p.1). Social capital depends on trust as it involves the set of specific beliefs that deal with the integrity, benevolence and ability of another party (Gefen et al., 2003, Mayer et al., 1995). Trust has previously been recognised as an important antecedent of IS group performance (Nelson and Cooprider, 1996), organisational value creation (Tsai and Ghoshal, 1998) and intellectual capital exchange. These research streams outline that when trust exists between two parties, they become more willing to engage in cooperative behaviours (Nahapiet and Ghoshal, 1998). Trust therefore plays a key role in the willingness of solvers to share knowledge.

Kavanaugh et al. (2005) outline that trust increases as participants get to know each other, learn who is trustworthy, and experience things through voluntary associations.

An atmosphere of trust should contribute to the free exchange of knowledge between committed exchange partners (Blau, 1964), because problem solvers should not feel that they have to protect themselves from others' opportunistic behaviour. As trust develops over time, opportunities for knowledge transfer between problem solvers should increase. Conversely, a lack of trust may lead to competitive confusion about the problem, thus impeding the chances for a successful resolution. Misztal (2013) observed that "*trust, by keeping our mind open to all evidence, secures communication and dialogue*" (p.10). This suggests that trust may both open up access to people for the exchange of knowledge, while also increasing the anticipation of value through such exchanges. Boisot (1995) also highlight the importance of interpersonal trust for knowledge creation in contexts of high ambiguity and uncertainty.

Coleman (1989) contends that a system of mutual trust is an important form of social capital on which future obligations and expectations may be based. In general, trust develops when a history of favourable past interactions leads to an expectation about positive future interactions (Wasko and Faraj, 2005). This makes trust a complex phenomenon, with several dimensions of trust operating at multiple levels of analysis within organisational settings (Ring and Van de Ven, 1994, Tsai and Ghoshal, 1998). Mishra et al. (1996) argue that trust is multidimensional and indicates a willingness to be vulnerable to another party, a willingness arising from confidence in four aspects:

i. A belief in the good intent and concern of exchange partners (Ring and Van de Ven, 1994)
ii. A belief in their competence and capability (Sako, 1992)
iii. A belief in their reliability (Giddens, 1990)
iv. A belief in their perceived openness (Ouchi, 1981)

Trust has been studied in a variety of settings, with results indicating that trust in others' ability and integrity is related to the desire to give and receive information (Ridings et al., 2002) and improve performance in distributed groups (Jarvenpaa et

al., 1998). Indeed, this inter-personal trust is a vital component for organisations looking to create an environment for knowledge sharing (Nonaka, 1994).

Trust therefore primarily deals with integrity which refers to an individual's expectation that members in a virtual community will follow a generally accepted set of values, norms and principles (Chiu et al., 2006). The close relationship between trust and social capital is partly due to their similar origins or sources. Drawing an analytical distinction between trust and social capital allows researchers to examine their relationship more closely and parsimoniously.

Reciprocity

According to Blau (1964), reciprocity implies "*actions that are contingent on rewarding reactions from others and that cease when these expected reactions are not forthcoming*" (p.6). Reciprocity thus refers to knowledge exchanges that are mutual and perceived by the parties as fair. Although scholars widely recognise that innovation generally occurs through the combination of different knowledge and experiences, meaningful communication is an essential part of such social exchange, resulting in the sharing of context between solvers (Boisot, 1995, Boland Jr and Tenkasi, 1995).

Indeed, social exchange theory suggests that participants in virtual communities expect mutual reciprocity that ultimately justifies their expense in terms of effort and time spent sharing their knowledge (Thibaut and Kelley, 1959). The idea of a knowledge market, as described by Davenport and Prusak (2000) involves reciprocity as one of the key factors that drive knowledge sharing. Prior literature also shows that knowledge sharing in electronic networks is facilitated by a strong sense of reciprocity (Wasko and Faraj, 2005).

A basic norm of reciprocity is a sense of mutual indebtedness, so participants usually reciprocate the benefits they receive from others, ensuring ongoing supportive exchanges (Shumaker and Brownell, 1984). Although exchanges in electronic networks of practice occur through weak ties between strangers, there is also evidence of reciprocal supportiveness (Wellman and Gulia, 1999). Previous literature indicates

that knowledge sharing is facilitated by a strong sense of reciprocity, i.e. favours given and received, along with a strong sense of fairness (Wasko and Faraj, 2000). Thus, when there is a strong norm of reciprocity in the collective, participants trust that their knowledge contribution efforts will be reciprocated, thereby rewarding participant efforts and ensuring ongoing contribution (Wasko and Faraj, 2005).

Self-Identification

Self-identification refers to a participation's perception of self in terms of the defining features of self-inclusive virtual community (Bagozzi and Dholakia, 2002). Nahapiet and Ghoshal (1998) describe it as the process where "*individuals see themselves as one with another person or group of people*" (p.256). Chiu et al. (2006) describe the concept as being akin to an individual's sense of belonging and positive feelings, similar to emotional identification as proposed by Ellemers et al. (1999).

IT-enabled innovation contest platforms are informal entities, which exist in the minds of their participants. As such the platforms are often impacted by the connections the participants have with each other, along with their specific problems or areas of interest (Ardichvili et al., 2003). When considering that valuable knowledge is embedded in solvers and that individuals have a tendency to hoard this knowledge, Chiu et al. (2006) argue that solvers do not often contribute their knowledge unless another solver is recognised as a peer. In addition, such contribution must be conducive to their welfare. This perception of social unity of the community serves to elevate participant's activeness to share knowledge and thus, increase the breadth and depth of shared knowledge.

Kramer and Tyler (1996) find that self-identification with a group or collective enhances concern for collective outcomes, thereby increasing the chances that the opportunity for knowledge exchange will be realised. Self-identification therefore acts as a resource that influences both the anticipation of value to be achieved through knowledge exchange and the motivation to combine and exchange knowledge. This is also supported by Lewick and Bunker (1996) whose evidence suggests that identification may not only increase the perceived opportunities for knowledge exchange, but also may enhance the actual frequency of cooperation. In contrast to

this, groups that have distinct and contradictory identities constitute significant barriers to information sharing, learning and knowledge creation (Child and Rodrigues, 1996, Pettigrew, 1973, Simon and Davies, 1996). Self-identification fosters citizenship behaviours and loyalty in the group setting (Bergami and Bagozzi, 2000, Meyer et al., 2002) and is used to explain a participant's willingness to maintain committed relationships with virtual communities (Bagozzi and Dholakia, 2002, Dholakia et al., 2004).

2.4.4.3Cognitive Dimension

The cognitive dimension of social capital refers to the resources that make shared representations, interpretations and systems of meanings within a collective possible (Wasko and Faraj, 2005). Engaging in a meaningful exchange of knowledge requires some level of shared understanding between solvers, such as a shared language and vocabulary (Nahapiet and Ghoshal, 1998). Solvers must also understand the context in which their knowledge is relevant (Orr, 1996). A solver's cognitive capital develops as they interact over time with others sharing the same interests and learn the skills, knowledge and norms of practice.

Even if a solver is motivated to contribute knowledge to the platform, contribution is still unlikely unless they have the requisite cognitive capital, i.e. whether they have the knowledge to contribute. Existing literature suggests that solvers with higher levels of expertise are more likely to offer useful advice (Constant et al., 1996). Similarly, solvers are less likely to contribute when they feel their expertise is inadequate (Wasko and Faraj, 2000). Therefore, solver expertise (such as the skills and the abilities they possess) should increase the likelihood they will contribute knowledge. Cognitive capital also consists of solvers aiming to master the application of expertise, which also takes experience. Solvers with longer tenure in the shared practice are likely to better understand how their expertise is relevant, and are thus able to contribute their knowledge (Wasko and Faraj, 2005). This results in cognitive capital consisting of either solver expertise, or experience of participating in the platform. The cognitive dimension is facilitated through the development of a shared language and a shared vision.

Shared Language

Shared language goes beyond language itself, with Lesser and Storck (2001) arguing that it also addresses "*the acronyms, subtleties and underlying assumptions that are the staples of day-to-day interactions*" (p.836), referring to the degree to which norms of behaviour govern relationships. While these are sometimes spelled out in formal contracts, most often they are simply understandings that evolve between participants (Zaheer et al., 2000). Shared language thus facilitates a common understanding of collective goals and the proper ways of participating in open communities (Tsai and Ghoshal, 1998). Shared language also influences the conditions for the combination and exchange of intellectual capital in several ways (Chiu et al., 2006, Nahapiet and Ghoshal, 1998, Pondy and Mitroff, 1979):

i. Shared language enhances knowledge sharing capabilities.
ii. Shared language has a direct and important function in social relations, as it is how solvers discuss and exchange information, ask questions, and formulate their proposals. Similarly, if language between solvers is different, it will restrict their sharing to a greater degree.
iii. Shared language provides a common conceptual apparatus for evaluating the likely benefits of information combination and exchange.
iv. Shared language also accounts for the overlap in knowledge by enhancing the capability of different participants to combine the knowledge they gained through social exchange.

Shared language is thus vital for learning through virtual communities, as it provides an avenue through which participants understand each other and build common vocabulary in their areas of interest. From this point of view, shared language not only facilitates the sharing of ideas, but also increases the efficiency of communication between solvers with similar backgrounds or practical experience. This arguably should further motivate solvers to become more actively involved in knowledge exchange.

Shared Vision

Innovation contests as previously outlined are reliant on groups of people that are brought together by common goals and interests. According to Tsai and Ghoshal (1998), shared vision "*embodies the collective goals and aspirations of the members of an organisation*" (p.467) while acting as a "*bonding mechanism that helps different parts of an organisation to integrate or combine resources*" (p.467). Shared vision represents the degree to which solvers share a common understanding and approach to the achievement of problem tasks and outcomes.

These shared goals and interests bind the participants of these contests, making cooperation possible for the problem seeking organisation to benefit from (Cohen and Prusak, 2001). Depending on the problem however, the tasks and outcomes may vary in clarity and definition. Contest members that share a vision will more likely foster a relationship, leading to the sharing or exchanging of ideas and knowledge (Inkpen and Tsang, 2005). The common interests, goals and visions that solvers share will help them see the meaning of their knowledge sharing (Chiu et al., 2006).

2.4.5 Summary of Social Capital

Unlike the economic view of human action that perceives individuals as resources that can be developed and that can shape environmental factors, social capital takes a sociological view of human action, and perceives individuals as actors who are shaped by societal factors (Dakhli and De Clercq, 2004). Social capital involves various constructs, including: social ties, trust, reciprocity, self-identity, shared language and shared vision (Dasgupta and Serageldin, 2000, Fountain, 1998a, Lesser and Storck, 2001, Putnam, 1993).

Social capital has received increased attention in literature, and has been studied at multiple levels, including the individual (Burt, 1992), organisational (Nahapiet and Ghoshal, 1998), and societal (Dasgupta and Serageldin, 2000, Putnam, 1993). The central proposition in the social capital literature is that the networks of relationships constitute, or lead to, resources that can be used for the good of the individual or the collective. At the individual level, social capital has been defined as the resources

embedded in one's relationships with others (Burt, 1992). At the organisational level, social capital can be defined as the value to an organisation in terms of the relationships formed by its members for the purpose in engaging in collective action (Nahapiet and Ghoshal, 1998, Freel, 2000).

Several studies that have focused on social capital support the arguments for the positive effect of social capital on innovation. For example, in a study of social capital in 29 market economies, Knack and Keefer (1997) found social capital to be associated with better economic performance. Similarly, previous researchers have argued that social capital, both within organisations and interorganizational settings may also foster innovation. For example, trust has been found to be important to innovation in that it lessens the need for rigid control systems (Quinn, 1979). Tight monitoring and control mechanisms reduce creative thinking, while freedom from rigid rules and job definitions enhances idea generation (Dakhli and De Clercq, 2004). Social capital should enhance intensive and repeated interactions, as well as the creation of trust, reciprocity and mutual expectations among the actors in the setting (Laursen et al., 2012). In addition, social interactions develop over time in dyadic relationships as actors become more comfortable with and confident about each others' competencies and reliability in economic exchange (Larson, 1992, Ring and Van de Ven, 1994). Repeated interactions may also increase the solvers incentives to exchange information relevant to the particular innovation challenge being issued.

However, in terms of investigating these levels of social capital from the perspective of the KDMs within the realm of open innovation and IT-enabled innovation contest platforms, there have been no explorations to date.

2.5 IT-Enabled Innovation Contest Platforms

Crowdsourcing processes require that host platforms invest in resources that go far beyond the efforts of required for setting up traditional IT systems. The exploitation of such platforms is increasingly being regarded as part of an emerging area in the information systems field (Adamczyk et al., 2012). The overall purpose of these platforms is to determine how they can support knowledge and the innovation process (Kane and Alavi, 2007, Lundstrom et al., 2013).

Analysis of the literature shows that an increasing number of organisations continue to implement innovation contests worldwide, not merely for innovation purposes, but also for a variety of other reasons, primarily of which as a means of promoting sustainability (Adamczyk et al., 2012). Indeed, Levinthal and March (1993) have recognised that "*the long term survival of an organisation depends on its ability to engage in enough exploitation to ensure the organisation's current viability and engage in enough exploration to ensure its future viability*" (p.105).

Author	***Definition***
Battistella and Nonino (2013)	*"Instrument for the aggregation and integration of different members (individuals and companies) in an innovation community"*
Frey et al. (2011b)	*"These virtual environments, (invite) external experts or users... to contribute to solving predefined innovation challenges"*
Von Hippel (2005)	*"a platform where new ideas or approaches from various internal and external sources are applied differently to create new value or experience for all stakeholders, including consumers"*

Table 2-5: Definitions of Innovation Contest Platforms based on Prior Literature

The participation of solvers within the open innovation movement is facilitated in part through the design and development of IT-enabled innovation contest platforms, yet there have been various definitions suggested for what they entail, as outlined in Table 2-5 above. For example, Battistella and Nonino (2012) define it as an *"instrument for the aggregation and integration of different members (individuals and companies) in an innovation community"* (p. 557). Adamczyk et al. (2012) define such activities as being "*IT-based and time limited competitions arranged by an organisation or individual calling on the general public or a specific target group to make use of their expertise, skills or creativity in order to submit a solution for a particular task previously defined by the organiser who strives for an innovative solution" (p. 335).*

Frey et al. (2011b) also define them to be *"virtual environments (where) external experts or users are invited to contribute to solving predefined innovation challenges" (p. 398).*

While these definitions give succinct descriptions of the process, they overlook the fundamental criteria of offering an incentive to the participant offering the solution. IT-enabled innovation contest platforms are therefore defined here as being "*an open platform for individuals and/or organisations to seek solutions from the crowd, allowing for the exploitation of their requisite experience, skills and talents in exchange for a reward, being either monetary or non-monetary*." Such IT-enabled innovation contest platforms differ considerably from conventional organisational innovation endeavours. There is no concrete reward system in place to reinforce the mechanisms of interaction, trust and reciprocity among participants. Online knowledge sharing cannot be successful without the active participation of online members and a lack of solver motivation ultimately serves to impede this (Chiu et al., 2006).

The deployment of these contests has gained momentum with the development of information technology, which has allowed for online competitions. With these advances, individuals, private and public organisations and non-profit organisations can act as organisers of innovation contests (Piller and Walcher, 2006). As a result, innovation contests have left the realm of political organisers, being increasingly adopted by industrialists as a powerful means of problem solving instead. Goldcorp for example, a Canadian gold mining firm, experienced declining productivity in the latter part of the nineties and turned to an innovation contest platform for assistance. In March 2000, they made the conscious decision to provide the public with geologic data through their own platform, and challenged them to submit proposals of suggested locations to find the estimated 6 million ounces of gold on Goldcorp's property. The reward was that the top 25 finalists would receive over $500,000. The firm went on to receive approximately 475,000 entries from over 1,400 individuals in 51 countries. The submitted solutions confirmed many suspected deposits, as well as identifying many new ones. Goldcorp subsequently followed up with a second offer that increased the winning pool to $2 million (Billington and Davidson, 2013).

Examples such as this illustrate that innovation contests are well suited not only for the generation of minor improvements, but also to realise radical breakthrough innovations.

These platforms allow organisations with the human and technological resources the tools and mechanisms to benefit from the engagement experiences of individuals and communities. Customers have thus become more active, knowledgeable and willing to use these virtual environments to impact and shape existing products and services (Boudreau and Lakhani, 2009). This ability of innovation contest platforms to enable the personalisation of innovative products and services challenges the operational presuppositions of traditional marketing techniques by promoting a service-dominant logic (Vargo and Lusch, 2004). Such logic enables firms to strive for a better fit between what a customer needs and what the firm offers, while acknowledging the requisite shift from value chains to value networks.

The increased importance of innovation contests as tools for open innovation is widely acknowledged in both research and practice as companies such as *BMW* (Füller et al., 2006), *IBM* (Bjelland and Wood, 2008) and *Siemens* (Schepers et al., 1999) frequently participate in such innovation practices. From an organisational point of view, companies that participate in organising innovation contests are motivated by both private and common interests. On the one hand, firms pursue such endeavours with the goal of internalising potential innovations and talent, thereby deepening their specialisation (Lakhani et al., 2007). On the other hand, firms also participate in order to develop innovative technological products that enhance their overall profitability. Such perspectives have been largely ignored by the IS literature to date (Han et al., 2012). While IT-enabled innovation contest platforms are not a solution to all projects, their supported leverage, economics and flexibility represent viable approaches to why organisations should participate (Fitzgerald, 2006).

Many researchers have sought to study such innovation contests from diverse perspectives which have ultimately led to the generation of various strands of research with differing foci. This is to be expected given the broad spectrum of industries where innovation contests have been utilised, including agriculture (Balaneji et al., 2013),

aviation (Simula and Vuori, 2012), navigation (Gassmann and Enkel, 2004) and software (Archak, 2010) to name but a few. Academic work surrounding these innovation have shown them to be a powerful method of aggregating the efforts of the crowd (Bonabeau, 2009, Bothos et al., 2009, Mataric, 1993). These efforts come in the form of knowledge contributions, generated by the solver communities engaging in the innovation challenge and are explored in the following sections.

2.5.1 Classifications of Contest Platforms

With information technologies continuing to provide an avenue for cost-effective and ubiquitous networks (Afuha, 2003), such attributes offer a global medium with unprecedented reach, surpassing the traditional constraints of geography and distance. In doing so, it also allows firms to overcome the perceived trade-off between richness and reach due to its interactive nature (Evans and Wurster, 1999). Different companies have therefore grasped these opportunities on offer by creating specific virtual environments to tap into external knowledge.

While reviewing the research articles described in Section 2.2, several types of IT-enabled innovation contest platforms were identified. This can be done primarily by recognising that open innovation reflects not so much a dichotomy between open versus closed innovation, rather than a continuum with varying degrees of openness (Dahlander and Gann, 2010). According to literature, these innovation contest platforms can be grouped by distinguishing between the actual processes themselves along with the outcome. For example, open innovation involves various activities based on their inbound, outbound or coupled activities (Gassmann and Enkel, 2004), with each of these having the potential to be more or less open.

Similarly, Feller et al. (2009) make the distinction between direct and mediated platforms when examining how firms utilise hierarchical relationships and market systems to acquire IP. Direct models evolve from the organisation's own expertise in relation to sourcing their own problem solvers. Mediated platforms however facilitate direct dialogue between the organisations and the solvers (Ndou et al., 2011). The role of these intermediaries is to mediate the contact between organisations that have difficult challenges, with a large pool of potential problem solvers. Although the

offerings of these platforms differ, there are similarities as they become increasingly relevant to companies for various reasons such as:

i. Access to a wide range of worldwide participants
ii. Intermediaries incur searching costs to find appropriate solutions
iii. Lower cost to exchange information
iv. Provides an efficient match between solvers and seekers

The classification selected for this study was presented by Boudreau and Lakhani (2009), who classified IT-enabled innovation contests as being either a competitive market, or a collaborative community. Given the nature of social capital explored previously in Section 2.5, the stark contrast between these two opposing models advocating an individualistic or collaborative approach is one that offers significant potential for a rich comparative analysis and an ideal setting for this study's investigation.

Competitive Markets	***Collaborative Communities***
Accenture Innovation Contest	Atizo
Boot's Centre for Innovation	Battle of Concepts
CrowdANALYTIX	Chaordix
Crowding	Design by Humans
Cisco's I-Prize	Idea Connection
Connect and Develop - P&G	Idea Wicket
Dell Idea Storm	Innovation Exchange
IBM Innovation Jam	One Billion Minds
InnoCentive	Threadless
Innoget	TopCoder

Intel App Innovation Contest	99 Designs
My Starbucks Idea	100% Open
Netflix' Recommendation Capability Contest	Quirky
NineSigma	WePC
Presans	Zooppa

Table 2-6: Classifications and Examples of IT-Enabled Innovation Contest Platforms

Many contest platforms have emerged that promote an open and transparent approach within their contest communities for example *Battle of Concepts* and *100%Open*. These collaborative communities are governed loosely by social norms to encourage open access to information, joint development, transparency and the sharing of IP. Competitive markets on the other hand, are remarkably different. Rather than collaborating, solvers will compete to develop various ideas, concepts, goods or components, with the challenging organisation then choosing from among the offerings. An example herein is the competitive market of *InnoCentive*. Innovation seekers post their challenges to the *InnoCentive* platform which acts as an intermediary between the seekers and the solvers. The solvers then compete with other for the grand prize. In a competitive marketplace, solvers are busy focusing on their own economic interests, which often ends in promoting fierce competition, and little cooperation between them (Boudreau and Lakhani 2009). A classification of the respective platforms is outlined in Table 2-6 above, while the dynamics of such platforms are also presented below in Table 2-7.

	Competitive Markets	***Collaborative Communities***
Objective	Solvers supply bespoke solutions.	Contributions of solvers range from mix-and-match offerings to co-production.
Governance	Governance is formal with orientation toward arm's-length, rule-based, contractually orientated and market relationships.	Governance is informal, with orientation toward highly socially embedded norm based interactions.

Relationship	Solvers primarily have competitive relationships with each other.	Solvers primarily have cooperative relationships among each other.
Motive	Profit motive is central to driving distributed innovation.	A range of extrinsic and intrinsic motivations may drive solvers' activities.

Table 2-7: Dynamics of competitive markets and collaborative communities (Adapted from Boudreau and Lakhani (2009))

As outlined, for the purpose of this research the classification presented by Boudreau and Lakhani (2009) will be investigated herein, and also subsequently used during the data gathering phase of this study.

The previously described research articles were further coded as to whether they investigated competitive markets or collaborative communities. Such unified analysis can be used to establish theoretical correspondence across paradigms, meaning findings can be carried over from one paradigm to another, thereby facilitating the discovery and reconciliation of areas of theoretical conflict or neglect (Gioia and Pitre, 1990). This process of discovering and resolving theoretical conflict in a way that can withstand multi-paradigmatic scrutiny can be an essential mechanism for creating scientific breakthroughs (Kuhn, 1970).

Given the objective of this research is to *theorize how social capital influences IT-enabled innovation contest platforms*, these research articles were analysed in order to accurately portray the current state of this research stream. The following Sections provide a description of the target platforms of this study, while also investigating the state of social capital within them.

2.5.1.1 Competitive Markets

Given that Boudreau and Lakhani (2009) do not provide a concise definition of a competitive market, they are defined herein as being platforms where "***individual*** *solvers compete to attain, assimilate, and utilise knowledge in order to generate a winning solution in exchange for monetary compensation*". Here, the burden of identifying relevant knowledge is not with the innovation seeker or the competitive market platform, but rather with the problem solvers who hear of the problem. Solvers

themselves judge whether their knowledge and expertise lends itself to presenting the best solution. Those possessing information and knowledge perhaps viewed by the focal firm *a priori* as being quite unrelated to the problem, may in fact provide distant knowledge that ultimately proves to be crucial in generating breakthrough solutions (Bingham and Spradlin, 2011).

Solvers involved in these platforms do not constitute a virtual community as they seldom, if at all, interact in any significant way (Frey et al., 2011b). The resulting exchange of ideas for future innovations usually takes place in one-to-one interactions where external problem solvers disclose their innovation concepts to the innovation seeker via the platform, but not to other registered solvers. This is due to markets requiring the implementation of formal and competitive mechanisms that often discourages a community's essential qualities such as knowledge sharing. In turn, this results in pitting solvers against one another, where they will take actions to maintain their proprietary interests as they engage in their own work. When their efforts are successful, the benefits will accrue to them as individuals (Boudreau and Lakhani 2009). This provides a natural incentive to differentiate their searches for novel solutions, and to protect rather than to share their solutions. As a result, the platform controls the direction of the innovation, along with deciding who captures the value from it. In doing so, they act as a major enabler of the transformative change required for those emerging knowledge intensive organisations and networks.

Various examples of these platforms are evident, with *InnoCentive* becoming a prominent example in several studies (Billington and Davidson, 2013, Feller et al., 2012, Feller et al., 2010). *InnoCentive* allows innovation seekers to post scientific or technical problems for solvers to address. When posting a problem, the innovation seeker outlines the expected time frame for the submission of a successful solution and describes the cash prize available for the winning solution. Solvers who are interested in competing do so individually, without the collaboration or assistance of the larger solver community. As of 2013, *InnoCentive* has a network of over 365,000 solvers from 200 countries. These solvers have provided over 40,000 solutions for existing problems in the fields of biology, chemistry, physics, math, engineering, computer science among others. Due to such success, *InnoCentive* have dispensed over $40

million to winning solvers on their platform[5], with 60% of the posted challenges on the *InnoCentive* platform successfully solved (Billington and Davidson, 2013).

Similar examples include an idea competition conducted by *BMW* for telematics, online services and driver assistance systems of the future[6]. This platform provides an interactive multimedia tool to support the solver in creating new ideas for services and evaluating ideas created by others. Another example involves Peugeot initiating an internet-based design contest where nearly 2,800 design enthusiasts from 90 countries registered with their proposed car designs on the theme of "*Retrofuturism*" (Füller et al., 2006). These platforms (as evidenced further above in Table 2-8) continue to grow in popularity among both researchers and practitioners with organisations continually striving to better understand them in order to participate in them (Von Hippel and Krough, 2003).

Competitive Market	***Challenge Types***	***Focus***
Ideaken	Marketing challenges	Marketing, Sales campaign
InnoCentive	Innovation challenges, Theoretical, Brainstorming	R&D, Science, Pharmacology
Innoget	Innovation challenges, IP marketplace	Science, Engineering, Technology
NineSigma	Innovation challenges, Intermediary services	Innovation Management, Sustainability
Yet2	IP marketplace, IP challenges to find applications	R&D, Science

Table 2-8: Examples of Competitive Markets

[5] http://www.innocentive.com/about-innocentive/facts-stats

[6] (https://www.bmwgroup-cocreationlab.com/cocreation/project/customer-innovation-lab)

Competitive Markets and Social Capital

While investigating the research articles previously outlined in Section 2.2, in many cases the authors found themselves describing individual elements of social capital, yet failed to comprehend that it formed part of a larger theory towards solver participation in such platforms. For example, Bullinger et al. (2010) outline that non-monetary incentives are often mentioned in conjunction with social motivation, such as positive community feedback and self-realisation. Similarly, Adamczyk et al. (2012) detail how managers of competitive markets need to create ancillary benefits of participation, such as community identification. While though not explicitly stated, such feedback and self-realisation are vital constructs within social capital (reciprocity and self-identity) as explored previously. Furthermore, Feller et al. (2012) describe how important reciprocal relationships are within such competitive markets, further outlining the importance of reciprocity within such platforms.

In terms of social ties, Silva and Ramos (2012) believe that the social knowledge created by these competitive markets relies on the solvers' participation, experience and interactions, as well as the collaborative knowledge gathered in the markets' repository. Silva and Ramos (2012) further argue that these competitive markets must have the means to support community interaction, which can result in intensive knowledge exchange that can be used to stimulate discussions on mutual issues.

Of particular note, Bayus (2013) describes how interactions with diverse others, involving the sharing of information and ideas, has a positive effect on ideation efforts. In their study, Bayus (2013) claim that the diversity of an individual's past commenting activity is found to have a positive effect on an individual's subsequent likelihood of generating another idea the innovation seeker finds valuable enough to implement. From the point of view of social capital, it is thus argued that a potential impact of collaborative social ties within competitive markets has the potential to result in an increase of the overall submission quality of the solver.

Jeppesen and Frederiksen (2006) also argue that if competitive markets shifted the focus to the user, applications like social networks and blogs have the potential to allow for professional and personal rich peer-to-peer interactions among solvers,

collaborative value creation, and the creation of dynamic new services and business models. Similarly, Yang et al. (2011) outline that a good competitive market should take into account solver behaviour, and that it is important to understand the strategic interactions between solvers. Unfortunately however, Yang et al. (2011) note that to date not only is there scant empirical literature on such contests, but there is also a lack of understanding of how solvers compete with one another strategically.

These insights reveal rudimentary approaches to particular elements of social capital, in which various authors agree that elements of social capital have an important role to play within competitive markets. Yet even so, within the papers analysed there was no research surrounding the cognitive dimension of social capital involving a shared language and a shared vision, while there was also very little encountered in terms of investigating the construct of trust within the relational dimension. These findings further highlight the lack of research currently within this area, while presenting a research area rich in opportunity. To date, there has been no dedicated study which investigates the various constructs of social capital within the competitive market setting, something this research seeks to rectify.

2.5.1.2 Collaborative Communities

Similar to competitive markets, Boudreau and Lakhani (2009) do not provide a succinct definition for collaborative communities. Therefore they are defined herein as being: *"contests that promote a **collaborative** approach among solvers where participation is based on a common interest, a common problem or a common desire between solvers in addition to the prospect of a monetary reward."*

While traditionally innovation seekers organised their production activities by either following the directions of managers of the organisation, or by individually responding to fluctuating market signals (Benkler, 2002), these communities do not rely on either the traditional managerial hierarchies or market indicators to organise production. Rather, it represents a community based product development model where various geographically dispersed participants jointly collaborate to develop software/products (West and O'Mahony, 2008). However, while the strength of these communities is their diversity, its weakness lies ultimately in its lack of cohesiveness. As such, these

communities are naturally orientated toward solutions that depend on integrating skills, technologies and knowledge that transcend an individual contributor's capacity. Thus, if the innovation problem involves cumulative knowledge, these communities have inherent advantages for innovation seekers over competitive markets. As a result, successful communities have knowledge-sharing and dissemination mechanisms designed into them (Baldwin and Clark, 2006).

The philosophy behind this is that the transparency and access, along with the ability to develop a product outside the traditional constraints of IP law (Brabham, 2008a), will produce a product that is increasingly better developed through collective and democratic means. However, it must be reiterated that our definition of collaborative communities from the point of innovation contests, does not include open source software, nor projects, as these are separate forms of collaboration and participation (Battistella and Nonino, 2012). Similarities do exist in that both share the notion of openness and use the internet as a collaborative platform (Brabham, 2011), however beyond that, there are certain discrepancies when comparing the two:

i. Where open source models emphasize the common good (Lancashire, 2001, Bonaccorsi and Rossi, 2004) and the hobbyists' interest in the success of certain endeavours (Ghosh, 2005), crowdsourcing models add to these factors the existence of a reward.
ii. Winning these innovation contests has the potential to earn a monetary value that in some cases is relative to the potential to maximise profits from the solution (Brabham, 2008a). By its very definition, crowdsourcing involves a single firm extracting economic value from the process, and it is only when commercial exploitation takes place can the innovation process be deemed to have taken place. Open source production works precisely against this notion by liberating code and making it available to everyone.

In further contrast to competitive markets, collaborative communities are distinct in its social structures that support horizontal coordination of interdependent work processes. These collaborative communities form when solvers work together to create shared value (Adler and Heckscher, 2006). This increasingly characterises platforms

in which the generation of knowledge (often involving many solvers) has become central to the economic production. In these communities, values are not individual beliefs, but the subject of shared activity. Such communities are often heterogeneous in nature, featuring cooperative collaboration that results in frequent innovative activity. Participants of communities may compete and collaborate with each other at the same time. Participants interact with each other, jointly discuss their innovations but ultimately participants are trying to contribute the best solution to outperform the other contributors. This is in stark contrast to competitive markets where external solvers will, rather than collaborate, develop multiple competing varieties of complementary goods, components or services.

Professional tasks and expertise requirements make collaborative communities a particularly efficient organisational principle, as argued by Parsons (1968). Solvers rely on a collegial community structure to mobilise power in asserting their jurisdiction over tasks and in governing themselves in the performance of these tasks (Barber, 1963, Freidson, 1992). Many organisations have thus experimented with these collaborative communities in pursuit of leveraging enhanced knowledge flows to acquire information that was formerly unavailable (West and Lakhani, 2008). Using these communities is highly relevant when firms procure services on a non-repeating basis and under conditions of high uncertainty (Terwiesch and Xu, 2008). These contest platforms are rapidly proliferating, with a brief list outlined below in Table 2-9.

Collaborative Community	***Challenge Types***	***Focus***
100% Open	Marketing Challenges, Theoretical, Brainstorming	Innovation management, Crowdsourcing Networks
Design By Humans	Creative Design,	Fashion
IdeaConnection	Innovation Challenges, Virtual Teams, Brainstorming	Critical Science, Technology, Engineering
TopCoder	Design, Development, Data Science,	Technology, Coding
Zooppa	Creative Community, Ideas, Designs, Marketing	Technology, Science, Ad Campaigns

Table 2-9: Examples of Competitive Markets

The emergence of such communities can be explained through the work of Hayek (1945) who argues that a main issue for organisations conducting economic activity is the access to market knowledge. More recent work on such platforms by Tapscott and Williams (2008) and Feller et al. (2009) investigates the exchange of innovation skills and knowledge between organisations and the crowd leading to the development of IP. This is achieved by aggregating communities of experts and collecting their dispersed knowledge, while mitigating risks and uncertainties for participation (Feller et al., 2012). Such knowledge involves the various types of IP that have the potential for economic value.

The role of these communities is therefore not just linking the different parties, as traditionally believed, but also to search for and transform ideas, while providing solutions with new combinations that fit to individual organisations (Hossain, 2012). As a result, innovation seekers pursuing such approaches often receive a large number of solutions from domains that are typically beyond their area of expertise, exposing themselves to a broader range of interesting ideas (Pisano and Verganti, 2008). Knowledge sharing, norms, leadership and teams emerge to deal with whatever coordination or decision making is required. These communities thrive when solvers accumulate and recombine ideas through the sharing of information. However, the enforcement of IP is difficult to implement.

Existing research thus highlights a number of different challenges associated with these collaborative communities. For example, efforts have been directed toward analysing the costs associated with finding the requisite knowledge, and how to motivate solvers to share such knowledge while preventing undesirable spill-over's to competitors (Dyer and Nobeoka, 2000, Feller et al., 2012).

Collaborative Communities and Social Capital

Similar to competitive markets, there is little, if any, research attempts to investigate social capital within collaborative communities of innovation contests. This lack of research is also identified by Chen and Liu (2012). The absence of research is

surprising given that Ling and Mian (2010) argue the importance of social capital within such settings, defining the concept as "*the specific resources accumulated through the relationships among online participants*" (p. 1). This definition however fails to accurately portray the various dimensions of social capital, as outlined previously, a trait which is worryingly common in current research streams. Akin to attaining levels of expertise in a particular subject matter, Zheng et al. (2011) argue that the accumulation of social capital is also an intrinsic motivation for the participation of solvers within collaborative communities.

Within such platforms, Gebauer et al. (2013) outline that solvers derive benefits through the interaction with other like-minded peers, and the mutual assistance from other community members. These collaborative innovation activities further establish social relationships and forge a sense of community among the solvers. Collaborative communities may therefore be seen as a promising way to establish valuable relationships with peers, while increasing loyalty toward the platform (Fuller, 2010). It also represents a powerful means of encouraging solvers to participate in the first place. For example, Harsanyi (1976) argues that "*People's behaviour can largely be explained in terms of two dominant interests: economic gain and social acceptance*" (p. 127), with Morgan and Wang (2010) citing reciprocity as being one of the most common forms of expressing social acceptance. When further investigating this construct, Zhao and Zhu (2012) found that reciprocity was an important reason for participation within collaborative communities, which was argued to enhance the overall participation effort. Similarly, Lampel et al. (2012) also outline how the motivating rationale of these collaborative communities involves encouraging knowledge sharing, seed networks, and community development.

Boudreau and Lakhani (2009) futher argue that these communities require mechanisms to facilitate and encourage knowledge sharing exchange through interaction among solvers to engender a culture of sharing and learning, a sense of identity, reciprocity and personal relationships among solvers. Mo et al. (2011) similarly find that triadic structures in which a focal solver is embedded within has significant effects on the solver's chance of winning. Furthermore, literature suggests that social capital could increase the opportunity for knowledge exchange, which in

turn could increase a solver's skills rapidly. In a case study looking at the LEGO group, Andersen et al. (2013) outlined that a primary reason for the solvers' participation involved the chance to learn from fellow solvers. These acts of reciprocity faciliated interpersonal interactions among members of creative teams which increased knowledge integration.

Andersen et al. (2013) subsequently argued that more and closer interactions between solvers breeds interpersonal trust, greater openness, and a willingness to engage in a dialogue. In addition, the findings suggested that in managing teams within various solvers it is important to develop and maintain a sense of shared identity within the team. The reasoning behind this being that in creative teams, solvers may not know each other, and may not be familiar with one another's organisational backgrounds and routines, further complicating the task of integration.

Sawhney et al. (2005) agree, describing collaborative communities as a rich source of socially generated knowledge. This socially generated knowledge provides insights that complement the knowledge generated from individual solver interactions, which are difficult to gather through competitive markets. This socially generated knowledge forms the arguement presented by Chen and Liu (2012), claiming that social capital could increase the possibility of winning a crowd-rated contest. While it is argued that higher levels of social capital could increase a solver's self-marketing performance in such settings, it remains unclear however if social capital predicts future success in winning an expert-rated contest.

Again, while not explicitly stated, these various tenants form core capacities of social capital. However, similar to competitive markets there currently exists no coherent body of knowledge in terms of outlining the various dimensions of social capital from a collaborative community perspective.

2.5.2 Platform Summary

Current streams of literature within these platform categories reveal that careful design of the competition process strengthens the creativity and the quality of the submissions (Piller and Walcher, 2006). Other streams have chosen to focus on the

design on the platform itself (Bojin et al., 2011). Beyond the appearance of the platform, further research surrounding these platforms has focused on various research directions, including:

i. The value of implementing such an open innovation strategy (Gulshan, 2011, Lakhani et al., 2007, Sawhney et al., 2005)
ii. How companies motivate participation in their contests (Bengs and Wiklund-Engblom, 2012, Jeppesen and Frederiksen, 2006, Battistella and Nonino, 2013)
iii. How to design an optimal contest (Chawla et al., 2015, Che and Gale, 2003, Jouret, 2009)
iv. Case studies of such contests (Andersen et al., 2013, Brabham, 2010, Jouret, 2009)

It is worth noting that investigations into these contests also crossed the boundaries of specific industries, with Bianchi et al. (2011) choosing to research potential means of crowdsourcing for the biopharmaceutical industry. Regardless, there are several examples of authors claiming that research areas in this field have yet to be explored in greater depth (Bullinger and Moeslein, 2010, Bullinger et al., 2010, Ebner et al., 2009, Hutter et al., 2011). In the context of IT-enabled innovation contest platforms however, it seems irrational that solvers voluntarily contribute their time, knowledge and effort toward the collective benefit beyond the promise of economic compensation. Given that not everyone is guaranteed tangible rewards as a result of their efforts, theories of collective action suggest that participants forego the primary motivation of monetary compensation due to the influence of social capital (Coleman and Coleman, 1994, Putnam, 1993).

Existing research does however indicate that social capital (though misconstrued and ill-interpreted in current innovation contest literature), is regardless an important motivating factor to the solvers engaging with these platforms identified in particular by Andersen et al. (2013). However, none of the reviewed articles sought to implement, nor reference the seminal model of social capital of Nahapiet and Ghoshal (1998). This model (presented previously in Section 2.5) argues social capital consists of three

separate dimensions, each equally important in its development. This research indicated that there have been no such investigations into the influence of social capital on the overall innovation contest platform structure. In addition, while current literature primarily discusses open innovation processes from a solver point of view (Ståhlbröst and Bergvall-Kåreborn, 2013, Adamczyk et al., 2011, Archak, 2010, Brabham, 2010, Frey et al., 2011a, Zhao and Zhu, 2012), the perspective from the platform managers themselves is relatively overlooked.

Furthermore, there has been a stark absence of investigations looking at the concept of social capital within both competitive marketplaces and collaborative communities. Previous literature also fails to provide adequate research or rigor surrounding the influence of social capital as a whole within the innovation contest setting. Current research endeavours are also characterised be a lack of cross-case analyses which could lead to a stronger understanding of these contests and their role in open innovation. The majority of articles to date that present empirical evidence of participation do so only through single case studies (Mortara et al., 2013). Of the few investigations that perform a multiple case study strategy, Ogawa and Piller (2006) analysed the results side by side rather than performing a cross analysis. Similarly Sawhney et al. (2005) focused on customers as a target group and their involvement at different stages of the innovation process.

These research limitations have been noted, with the next Chapter outlining how such limitations have been avoided, and in some cases, targeted to improve the quality of the research being produced.

2.6 Chapter Conclusion

This Chapter provided several foundations to the validity of this study. Firstly, Section 2.2 presented the strategy for gathering the research articles investigated to ascertain the current state of literature investigating social capital within the innovation contest platform phenomenon. Section 2.3 compared and contrasted the traditional approach of closed innovation with the open innovation paradigm as proposed by Chesbrough (2003). Section 2.4 subsequently introduced the reader to the concept of crowdsourcing, and how this practice can be used in open innovation initiatives. In

doing so, it presents the knowledge contribution by solvers as a paramount issue in the success of innovation contests, and also the motivation as to why they want to participate in the first place.

Section 2.5 follows up by presenting social capital as being an appropriate theoretical lens for solvers engaging in innovation contest platforms based on two criteria:

i. Its suitability as a theoretical lens in similar investigations (for example knowledge exchange (Chiu et al., 2006, Yli-Renko et al., 2001, Wasko and Faraj, 2005) and virtual knowledge sharing communities (Kevin O'Neill, 2004, Ardichvili et al., 2003, Pahlke, 2012))
ii. The failure of current literature to implement this theory within the domain of IT-enabled innovation contest platforms

The concept of social capital was thus presented and discussed at length, exploring social capital as a theory, outlining its development in literature, and presenting its various dimensions and constructs. Social capital is argued by Baker (2000) as being an important element in providing "*information, ideas, leads, business opportunities, financial capital, power, emotional support, goodwill, trust, and cooperation*" (p.25). Social capital was thus presented as being comprised of three dimensions, each having distinct constructs:

i. Structural Dimension
    - Social Ties
ii. Relational Dimension
    - Trust
    - Reciprocity
    - Self-Identity
iii. Cognitive Dimension
    - Shared Language
    - Shared Vision

Section 2.6 explored the emergence of IT-enabled innovation contest platforms. In doing so, two classifications of contest platforms emerged:

i. Competitive Markets
ii. Collaborative Communities

Upon analysing the collected research papers, there emerged scant evidence of social capital being investigated within the domain of IT-enabled innovation contest platforms. Furthermore, of the research that has been conducted, the majority of it has been toward the end solver with the impacts toward the platform itself routinely overlooked. This represents a substantial knowledge gap in our understanding of how social capital influences IT-enabled innovation contest settings.

The next chapter outlines the research strategy, and describes the specific data collection and analysis methods. Examining the social capital constructs of social ties, trust, reciprocity, self-identity, shared vision and shared language is required to address the research objective and research questions. Thus, each of these concepts are applied in the research design and subsequently used to guide data collection and analysis.

CHAPTER 3: RESEARCH STRATEGY

3.1 Introduction

This chapter details the research strategy and presents the research design for this study. It begins by restating the research objective and the associated research questions (Section 3.2). The chapter then depicts the principles of IS research with a discussion on the epistemological, ontological and methodological stances guiding IS research, focusing on the various philosophical paradigms (Section 3.3). Due to the exploratory nature of this research, and the assumptions of the researcher, the epistemological stance of post-positivism is adopted in this study.

Section 3.4 outlines the chosen methodology and the reasoning behind selecting semi-structured interviews within a field study environment to gather research data. Section 3.5 outlines the data collection process, involving:

i. Phase 0-Construction and validation of interview protocol by independent researcher

ii. Phase 1-Testing of interview protocol within a pilot study of *Trend Micro*
iii. Phase 2-Implementation of interview protocol within several case studies

Section 3.6 describes the data analysis process of this research, describing the data bracketing, coding and concluding procedure implemented within this study.

Concluding this chapter, Section 3.7 summarises the overall research strategy that has been adopted for this study.

3.2 Research Objective, Questions and Approach

The identification of a suitable research objective is the most critical step involved in undertaking a research study and must be well defined, clear of any ambiguity, concise and accurate (Jenkins, 1986). Based on the review of literature conducted in Chapter 2, the objective of this research is to:

"*Theorize the relationship between social capital and IT-enabled innovation contest platforms*".

In operationalizing the research objective, two research questions were formulated:

i. What are the impacts of social capital on innovation contest platforms?
ii. What are the mechanisms used in innovation contest platforms to enable the development of social capital?

These research questions are exploratory in nature. This approach is warranted due to the lack of empirical research investigating social capital within IT-enabled innovation contest platforms. The data collection strategy pursued in this research is presented below, highlighting the interview protocol validation, and explaining the two data collection phases:

i. *Phase 0*-Interview protocol validation with independent academic researcher with previous experience and publications within the open innovation contest domain.

ii. *Phase 1*-Pilot study of *Trend Micro*. A pilot study was initially required to determine whether social capital had indeed any influence in the innovation contest setting, such was the level of exploratory research being pursued.
iii. *Phase 2*-15 field studies. This involved data gathering from several field studies in order to further accentuate and develop social capital theory.

The above phases are further developed in Section 3.5. Before the research approach is presented in more detail however, the next section positions this approach within an appropriate research paradigm discourse and identifies the epistemological stance adopted by the researcher within this study.

3.3 Discussion of Philosophical Underpinnings

Einstein believed science to be an instrument where researchers could garner systematic, deductively formulated and empirically verified concepts of reality (Northrop, 1949). These instruments depend on the basis of two different worlds that exist side by side:

i. The empirical world, where observations take place
ii. The mathematical world, where the researcher postulates mathematical constructs as representations of the empirical world

Scientists are therefore faced with the reality quandary, referring to their need to determine the ultimate nature of reality. The research strategy is therefore predetermined by the epistemological view of the researcher as to how they view reality. Epistemology refers to the theory of knowledge; primarily how is it acquired. Hirschheim (1992) outlines two vital questions which must be considered when selecting an epistemological approach for any research endeavour:

i. What is meant by knowledge?
ii. How do we subsequently obtain valid knowledge?

Epistemology is also closely related to both ontology and methodology. Ontology outlines the philosophy of reality and the nature of the world around us (Krauss, 2005,

Hirschheim, 1992, Guba, 1990). Two ontological alternative positions include realism and relativism. On one hand, realism is defined by Phillips (1987) as being "*the view that entities exist independently of being perceived or independently of our theories about them*" (p.205). For instance, the positivism paradigm embraces an ontological position of realism. In doing so, Hirschheim (1992) argues that the universe is comprised of objectively given immutable objects and structures which exist as empirical entities on their own. These structures are thus independent of the observer's appreciation of them. This view point is sharply contrasted with the relativist ontology which assumes that reality is subjective. Krauss (2005) argues that with such relativism "*there are multiple realities constructed by human beings who experience a phenomenon of interest*" (p.760).

	Positivism	***Interpretivism***	***Post-Positivism***	***Critical Theory***
Ontology	**Naive Realism** -"Real" reality but apprehendable	**Relativism** -Local and specific constructed realities	**Critical Realism** -"Real" reality but only imperfectly apprehendable	**Historical Realism** -Reality shaped by social, political, cultural, economic, ethnic and gender values
Epistemology	Dualist/Objectivist; -Findings true	Transactional/Subjectivist; -Created findings	Modified dualist/Objectivist -Critical tradition/Community findings probably true	Transactional/Subjectivist; -Value mediated findings
Methodology	Experimental/ Manipulative verification of hypotheses; -Chiefly quantitative methods	Hermeneutical/Dialectical	Modified experimental/ manipulative; -Critical multiplism -Falsification of hypotheses (May include qualitative methods)	Dialogic/Dialectical

Table 3-1: Basic assumptions of alternative inquiry paradigms (Modified from Guba and Lincoln (1994) p.109)

The philosophy of science therefore offers a diverse spectrum of views that pertain to human knowledge and action. These multiple viewpoints of epistemology and ontology ultimately influence the resulting methodology selected by the researcher. Such methodology identifies particular practices used to obtain knowledge of reality, while also being concerned with how the researcher goes about finding out this knowledge (Guba, 1990). Guba and Lincoln (1994) identify four paradigm structures that have emerged to guide social scientific inquiry:

i. Positivism
ii. Interpretivism
iii. Post-Positivism
iv. Critical Theory

These paradigms are compared above in Table 3-1, before being explored in more depth in the following sections.

3.3.1 Positivism

Under the positivist paradigm, researchers adopt a realist ontology. Fitzgerald and Howcroft (1998a) explain that such an approach embraces the belief that "*the external world consists of pre-existing, hard tangible structures which exist independently of an individual's cognition*" (p.160). This belief suggests that there is only one true reality, which embraces a four point doctrine (Kolakowski, 1972):

i. The rule of *phenomenalism*-Asserts that there is only experience and all abstractions such as "spirit" or "matter" have to be rejected.
ii. The rule of *nominalism*-Asserts that abstractions, generalisations and words etc. are merely linguistic phenomenon that does not serve to give new insight into the world.
iii. The separation of facts from values.
iv. The unity of the scientific method.

Positivism research assumes that an objective physical and social world exists independently of humans (Dubé and Pare, 2003). Positivism thus represents an

epistemological position that advocates its application to the natural sciences (biology, chemistry, physics etc.) to the study of reality and beyond (Bryman and Bell, 2015, Healy and Perry, 2000).

While assessing the different theoretical perspectives of major IS journals, Orlikowski and Baroudi (1991) identify positivism as being dominant paradigm of choice for most U.S. scholars when undertaking IS research. As a result, much has been learned about the implementation and utilisation of IS through the positivist stream of research (Jarvenpaa, 1988). Antill (1985) however rejects the notion of significant repeatability in IS as no two organisations are the same, nor do they use the same systems in similar ways.

Checkland (1999) outlines that there are three fundamental techniques of the positivist approach:

i. *Reductionism*-Problems can be better understood if they are reduced to the simplest possible elements (Crossan, 2003).
ii. *Repeatability*-Dissuades researchers from relying on the results of just one experiment. This encourages them to repeat the experiment many times over to ensure the first set of results was not a fluke.
iii. *Refutability*-Researchers refute the hypothesis if they cannot repeat an experiment and receive the same result as the original researchers (Oates, 2005).

Although the values of neutrality, rigor, measurement and quantitative observations of events can be construed as strengths of the positivist approach, since its inception it has been criticised from many positions (Hjørland, 2005). Many IS researchers (McFarlan, 1984, Weick, 1984, Mumford et al., 1985, Land, 1987, Orlikowski and Baroudi, 1991, Galliers, 1992, Hirschheim, 1992) ascertain that the positivist school of thought limits IS research. According to Orlikowski and Baroudi (1991) "*the design and use of information technology in organisations, in particular is intrinsically embedded in social contexts, marked by time, locale, politics and culture*" (p.12). Neglecting the exploration of these influences may reveal an incomplete picture of IS research. As such, Crossan (2003) argues against the positivist approach as it does

not provide the means to examine human beings along with their associated behaviour in an in-depth way. This study shall therefore not be taking a positivist approach as to assume there is one universal truth to social capital implications that can be replicated repeatedly would be foolish in the extreme as by its very nature it is dependent on social behaviour.

3.3.2 Interpretivism

Despite the dominance of the positivist stance within traditional IS, scholars have begun to address how interpretivism could be utilised for the growth of scientific knowledge (Walsham, 1995). Interpretivism has emerged as a set of beliefs that focus on the idea that knowledge of the world is constructed, with no reality to be discovered (Easton, 2010). Ontologically, if there are always many interpretations that can be made in any inquiry there is no alternative but to take the position of relativism-that there exists multiple realities in people's minds (Guba, 1990). Al-Zeera (2001) presents a fundamental epistemological distinction between the interpretivist belief and the positivist belief. Al-Zeera (2001) outlines that the latter is principally objectivist, where the observer remains detached and uninvolved from the reality being studied.

Conversely, the interpretivist belief contends that epistemologically, both the researcher and the phenomenon being studies are interlocked in such a way that the findings of the investigation are the literal creation of the inquiry process (Guba, 1990). Fitzgerald and Howcroft (1998b) describes how this school of thought adopts a relativist ontology that incorporates the "*belief that multiple realities exist as subjective constructions of the mind, (whereby) socially transmitted terms direct how reality is perceived and this will vary across different languages and cultures*" (p.10). Researchers embracing this paradigm argue that only through the subjective interpretation of reality can reality be fully understood (Klein and Myers, 1999). Therefore the interpretivist approach aims to understand the phenomena through the meaning that people assign to them (Boland Jr, 1985, Orlikowski and Baroudi, 1991, Deetz, 1996). In other words, this approach favours subjective descriptions and understanding over the explanation and prediction goals associated with the positivist

paradigm (Nissen, 1985). Interpretivism is compared with positivism below in Table 3-2.

Interpretivist Approach		***Positivist Approach***	
Purpose	*Suitability*	*Purpose*	*Suitability*
More useful for discovering	Useful in this context to understand the technical artifact and user behaviour in more detail, as well as the interactions; allows for subjective interpretations	*More useful for testing*	No measures available to test; objective ratings much be developed for research area
Provides in-depth (deeper understanding) information on a few characteristics	Useful to understand the impact of social capital as a motivating factor for solver engagement in innovation contests	*Provides summary information on many characteristics*	Less concerned about representativeness in the research context; requires exploratory analysis to provide measurable constructs to investigate numerous characteristics
Discover "hidden" motivations and values	Useful to understand how social capital and other incentives motivate solvers to engage in contests, and how the platforms facilitate this motivation	*Useful in tracking trends*	Useful to track the trends in solver behaviour; however requires previous steps in order to sample a large population and obtain objective results

Table 3-2: Approach Suitability for Research Context, Adapted from Hair et al. (2007)

The subjectivity employed through interpretivism achieves an understanding of social phenomena within a context via an inductive process (Collis and Hussey, 2013). Applying the same ontological belief of relativism and epistemological stance of subjectivity, researchers who pursue this avenue are often referred to as interpretivists, primarily in the IS field (Walsham, 1995). From a methodological

viewpoint however, the interpretivist has two aspects: hermeneutics and dialectics. This leads the interpretivist to primarily pursue qualitative research that aims to:

i. Identify the variety of constructs that exist by hermeneutically depicting individual constructions as accurately as possible
ii. Dialectically compare and contrast these individual constructions (Klein and Myers, 1999, Guba, 1990)

In doing so, the complexity of human sense-making must be focused upon (Kaplan and Maxwell, 1994). It is this extraction of meaning from an interview that separates interpretivism from general qualitative research (Silverman, 2001). Emerging from this research came the hermeneutic circle, a principle coined by Klein and Myers (1999). This term refers to the iterative approach of analysing the meaning of a particular section of an investigation, and relating it to the meaning of the whole investigation and vice-versa.

Several IS scholars (Walsham, 1993, Myers, 1995, Walsham, 1995, Myers, 1997, Shanks, 1997) highlight that the interpretivist school of thought is appropriate for studying IS. With such interpretivist research, there is a unified rejection of the positivist notions of scientific methods and causality in favour of subjective descriptions and understanding the various implications of the concept under investigation (Nissen, 1985, Smith, 2006). However, there have been criticisms directed toward its implementation, with Dupuis (1999) summarising the discomfort with how interpretative research is done: "*...our failure to recognise and account for the role that our human "selves" play throughout the research process, and how those selves subsequently shape our products; our failure to recognise and account for the role our emotions and personal experiences play in our research endeavours; and our specific data collection and writing styles*" (p.44). Due to such criticism, this paradigm has also been deemed to be inadequate when investigating the very nature of social capital and its implication on a community of solvers.

3.3.3 Post-Positivism

The various differences between positivist and interpretivist research have given cause for much debate (Fitzgerald and Howcroft, 1998a). The inherent conflict between the two paradigms can be resolved by adopting what has been termed as a post-positivism paradigm (Hirschheim, 1985). In defining this paradigm, Guba and Lincoln (1994) propose the following three prerequisites to the main conditions of post-positivism:

i. An objective reality is imperfectly knowable
ii. A subjective researcher can only know about reality to a degree of probability
iii. A modified experimental method is used including hypothesis refutation using both qualitative and quantitative methods

The post-positivist stance advocates methodological pluralism-the implication of which is that there is no one correct method of science, but rather a variety of methods (Wildemuth, 1993). This approach has been advocated by numerous IS scholars (Smith, 2006, Bygstad, 2008, Mutch, 2010). The philosophy of post-positivism is increasingly being noted as that which underpins contemporary empirical research activity (Clark, 1998, Phillips, 1990, Schumacher and Gortner, 1992). The main influences in promoting the post-positivist philosophies were the works of Popper (1959), Bronowski (1956), Hanson (1965), and Kuhn (1970). Fundamentally, a different conceptualisation of truth was suggested by these post-positivists.

Like positivism, meta-physical considerations were still deemed to be outside the sphere of science (Bronowski, 1956). However, in contrast, a realist perspective of science was advocated, with observables deemed to have existence, and the capability of explaining the functioning of observable phenomena (Bronowski, 1956, Schumacher and Gortner, 1992). Theoretical explanations therefore had greater predictive value. Like positivists, science was still deemed to require precision, logical reasoning and attention to evidence, but it was not confined to that which could be directly perceived (Clark, 1998). For example, evidence can be inferred from interviews or questionnaires (Bronowski, 1956).

Distinction drawn between empirical methods and the qualitative paradigm, as undertaken by Tesch (2013) cannot therefore be based on the nature of data (numerical or non-numerical). Post positivist research need not exclude either qualitative or quantitative data: acceptance of this is vital in rejecting the strict dichotomy often presented between the competing paradigms (Clark, 1998). This argument was pivotal in the work of Bronowski (1956), who spoke of art and science as having the same overall aim of highlighting unity in diversity: "*The scientist or the artist takes two facts or experiences which are separate; he finds in them a likeliness which had not been seen before; and he creates a unity by showing the likeliness*" (p.31).

Under post-positivistic philosophy, the perceptions of the researcher are not seen as being wholly detached from inquiry. Science is not seen as a personal opinion, or private experience, but personal processes and involvement are acknowledged as being characteristic of human inquiry. Therefore, ontologically, post-positivism employs the ontological position of critical realism, moving beyond the naïve realism embraced by the traditional positivist researcher (Klein, 2004, Vasquez, 1995). Epistemologically, post-positivism assumes that it is possible for the researcher to be outside the pale of humanness while investigating a phenomenon (Guba, 1990). According to Mingers (2004) this paradigm has distinct importance to IS research as it:

i. Allows for a realist stance whilst accepting the major criticisms of naïve realism
ii. It addresses both social and natural science thereby facilitating the appropriate domains of IS
iii. It fits well with the reality of IS being an applied discipline

This pluralism helps to build on the body of knowledge by allowing alternative approaches to research, while also reinforcing the use of post-positivism in IS research. The contextually bound nature of the research findings, consequential in the acknowledgment of researcher and theoretical biases, highlights that knowledge deemed to be truthful under post-positivistic inquiry, is not universally generalizable to all cases and all situations. Rather, the findings are viewed as contextually related

and could be inductively applied with reference to probability of the similar case holding elsewhere (Clark, 1998). This stance is in contrast to the positivists who advocated an immutable law. As advocated by Schumacher and Gortner (1992), even in the physics, true laws are most infrequent with relationships being proposed on an "all things being equal basis" (p.6). As with all research, this seldom occurs in the natural environment.

Unlike the positivists who claimed to be able to accurately know reality, and discover universal truths, recognising the futility of gaining definitive knowledge of reality leads post-positivists away from a positivist conception of truth. Little indication exists that is more trustworthy than the informed, albeit subjective, evaluations of those most likely to know the probability of a finding thereby gaining a closer approximation to the truth. As demonstrated by prominent scientific theorists such as Dolby (1996), Kuhn (1970) and Ziman (1991), entire movements of science could, in time, be shown to be far less close to truth than their proponents originally believed.

It is this concluded that the post-positivist perspective is the most appropriate approach for this research. By selecting methods that are relevant to the context of the phenomenon to be studied, this research implements a research strategy that suitably addresses the research objective and the research questions. Ryan (2006) noted the value of post-positivism is the presentation of a narrative that balances professional and personal experiences and theoretical interpretations with a compelling story. Given the lack of research on the study's phenomenon of interest, it is unrealistic to assume that objective measures can be quantitatively studied based on the existing state of knowledge for this research context. Post-positivism however enables researchers to be reflexive about their position related to a topic that they find compelling (Dupuis, 1999). Therefore, an exploratory study using the qualitative methods proposed in Section 3.4 is proposed to address the research questions, with the aim to maintain rigor by assuming the post-positive perspective. Thus, a priori theory is used to guide both data collection and analysis, more specifically, the nature of the various social capital constructs, and how they are facilitated. In addition, the findings of an inquiry should come from as many sources (data, investigators, theories, or methods) as possible in order to reduce distorted interpretations of the study (Guba,

1990). Accordingly, critical multiplism has also been applied in this study, by using two phases of data collection in order to achieve a comprehensive understanding of social capital theory.

3.3.4 Critical Theory

Under the paradigm of critical theory, researchers adopt an ontological view that assumes that there is a reality we are able to comprehend. This reality is formed by cultural, economic, ethnic, gender-based, political and social forces that have been formed over time (Guba and Lincoln, 1994). This implies that researchers choosing critical theory tend to focus on a single reality, influenced by social changes over time.

A fundamental concept of critical theory therefore is to reject the positive notion that knowledge is totally objective and free from value judgement (Habermas, 1972). If values do enter into every inquiry, then inquiry becomes a political act as the choice of a particular value system tends to empower certain persons, while disempowering others (Guba, 1990). Critical theorists therefore inherit a modified subjectivist epistemology where the researcher is unable to separate themselves from what they know, ultimately influencing the inquiry.

Methodologically critical theorists take a dialogic approach, seeking to eliminate false consciousness in order to rally participants around a common point of view. Guba (1990) describes the process of dialogue between the critical theorist and the people being studied as one where "*the participants achieve self-knowledge and self-reflection which are therapeutic and effect a cognitive, affective and practical transformation involving a movement toward autonomy and responsibility*" (p.269). Methods such as participatory action research, critical discourse analysis and critical ethnography are proposed as distinctly "critical" (Cecez-Kecmanovic et al., 2008).

The overall aim of this paradigmatic inquiry is to critique, emancipate and transform the social reality under investigation (Orlikowski and Baroudi, 1991, Klein and Myers, 1999). However, it has been suggested that the knowledge of the critical realist researcher is a result of social conditioning. As a result, the findings ultimately cannot

be presented independently of the social actors gathering the knowledge (Carlsson, 2011, Dobson, 2001). Critical realism is therefore conscious of the values of human systems and researchers (Krauss, 2005). It is therefore opposed to being value-laden as in interpretive research, or value-free as in positivist research (Lincoln and Guba, 1985).

When applied to IS research, critical theory has been described as having a "modest" impact on the domain (Lyytinen, 1992). Several authors (Ngwenyama, 1991, Lyytinen and Klein, 1985) have argued favourably for critical theory as a credible approach for conducting research on the usage of IS. Lyytinen and Klein (1985) stress critical theory can be utilised as a credible approach for conducting research on the usage of IS. Lyytinen and Klein (1985) maintain that IS should be designed not only with increased efficiency, but "*must also increase human understanding and emancipate people from undesirable social and physical constraints, distorted communication and misapplied power*" (p. 219).

However, it has also been suggested that IS critical researchers need to incorporate a much wider historical, political and social view of the IS discipline in order to observe how economic and managerial interests shape IS research (Cecez-Kecmanovic et al., 2008). Brooke (2002) also accuses critical theory as having major limitations including a lack of theorising on constraints, interests and preconditions that relate to emancipation and power.

3.3.5 Summary

Having explored the various research paradigms outlined above, this research endeavour will incorporate a post-positivist approach to present its findings. Although mixing paradigms has often been considered taboo, post-positivism offers another paradigm that can move positivism from a narrow perspective into a more encompassing way to examine real world problems (Henderson, 2011). Post-positivism emphasises meanings, not unlike interpretivism, and seeks to explicate social concerns. Furthermore, Ryan (2006) described the characteristics of post-positivism as broad, bringing together theory and practice, allowing acknowledgement and encouragement for the researchers' motivations and commitment to the topic,

while recognising that many correct techniques can be applied to collecting and analysing data.

Authors frequently use the inadequacies of positivism as a foundation for their alternative views. To equate positivism with all empirical method is erroneous, confusing a general philosophy with a particular method. Though empirical works can be shaped by positivistic philosophy, it is increasingly being recognised that empirical work can alternatively be based on a post-positivistic philosophy which avoids many of the limitations correctly associated with the positivist school of thought. Operating under a post-positivist philosophy, the empirical methods of quantitative research and those of the qualitative approaches are not as diametrically opposed as frequently portrayed (Clark, 1998).

Post-positivism does not suggest that positivism is no longer relevant, but rather contends that something exists subsequently that is also worth considering. Positivism is often linked to modernism, which emphasises valuing rationalism and empirical knowledge over other ways of knowing (Ryan, 2006). This idea of positivism remains the gold standard of modernism. Post-positivism does not negate these assumptions; rather, it suggests social sciences are fragmented, that knowledge is not neutral (and has never really been), and that all knowledge is socially constructed. Given the purpose of this research is to theorise the influence of social capital toward IT-enabled innovation contest platforms, a post-positivist approach has been selected as being the most ideal to accurately conceptualise this objective. This has been justified due to the argument of social capital having real effects that are observable, albeit imperfectly. In addition, given the exploratory nature of this study, the importance of the various social capital constructs is not known at this point, nor is it known whether each construct will be present in the model being presented at the end of this research.

3.4 Research Design

Gregor (2006) classifies theory as being an artifact that is something that would not exist in the real world without human intervention. Research therefore must begin with a problem that is to be solved, or some question of interest, with the theory that is developed depending "*on the nature of this problem, and the questions that are*

addressed" (p. 619). Four primary goals of theory are thus presented by Gregor (2006):

i. Analysis and Description
ii. Explanation
iii. Prediction
iv. Prescription

The research design implemented herein is one of analysis and description, as the development of this theory provides a description of the phenomena of interest, an analysis of the relationships among the constructs under investigation, the degree of generalizability in constructs and relationships, and the boundaries within which relationships and observations hold.

In addition to developing a theory of analysis and description, the research approach needed further verification as to how it was to be pursued. As already stated, the objective of this study is to: "*Theorize the relationship between social capital and IT-enabled innovation contest platforms*". Whetten (1989) further argues that three elements serve as the basis for a theoretical contribution, with what and how describing, and the explanation coming from the why.

This study was therefore deemed exploratory in nature due to the combination of:

i. The nature of the research problem
ii. The relative lack of understanding in the research phenomenon
iii. The theoretical lens being adopted

Purpose of the Research	***Research Questions***	***Research Strategy***	***Examples of Data Collection Techniques***
Exploratory			
		Field Studies Case Studies	• In-depth interviewing • Elite interviewing

To investigate little understood phenomena. To identify/discover important variables to generate hypotheses for future research.	What is happening in this social programme? What are the salient themes and patterns in participants meaning structures? How are these patterns linked?		
Explanatory			
To explain the forces causing the phenomenon in question. To identify plausible casual networks shaping the phenomenon.	What events, beliefs, attitudes and policies are shaping this phenomenon? How do these forces interact?	Multi-site Case Study Field Study Ethnography	• Participant observation • In-depth interviewing • Survey questionnaire • Document analysis
Descriptive			
To document the phenomenon of interest.	What are the salient behaviours, events, beliefs, attitudes and processes occurring in this phenomenon?	Field Study Case Study Ethnography	• Participant observation • In-depth interviewing • Document analysis • Unobtrusive measures • Survey questionnaire
Predictive			
To predict the outcomes of the phenomenon. To forecast the events and behaviours from the phenomenon.	What will occur as a result of this phenomenon? Who will be affected and how?	Experiment Quasi-experiment	• Survey questionnaire (large sample) • Content analysis

Table 3-3: Matching the Research Strategy with the Appropriate Methodology (Marshall and Rossman, 2014)

Patton (1990) describes how exploratory research promotes understanding and is suitable for "*new fields of study where little work has been done, few definitive hypotheses exist, and little is known about the nature of the phenomenon*" (p.31). This

study argues that the area of social capital evaluation in IT-enabled innovation contest platforms satisfies all of these criteria.

Such an exploratory approach advocates qualitative data collection and analysis (Rowlands, 2005), outlined above in Table 3-3.

In terms of methodology, Marshall and Rossman (2014) suggest that either a case study or field study research strategy is appropriate when the purpose of the research is exploratory. Given the novel aims of the study and the exploratory nature of investigating social capital within an innovation contest setting, both a pilot and secondary field study research were deemed most appropriate for empirical data gathering. The predominant reason for building theory from field studies is that they facilitate rich qualitative evidence to mainstream deductive research (Gregor, 2006, Sutton and Straw, 1995, Eisenhardt, 1989). The emphasis on developing constructs along with testable theoretical propositions makes inductive field study research consistent with the importance of testable theory within mainstream deductive research (Eisenhardt, 1989). Furthermore, given how this approach is deeply embedded in rich empirical data, building theory from evidence gathered in the field produces theory that is accurate, honest, interesting and testable (Eisenhardt and Graebner, 2007).

The use of multiple field studies also enables a deeper understanding of a particular problem or area (Yin, 1994). The field study methodology outlined herein is also consistent with the approach of Eisenhardt (1989) and Benbasat et al. (1987) in that the researcher applied *a-priori* theory to aid the research design. It is worth noting however that Eisenhardt (1989) argues that while early identification of constructs is useful, the researcher should remember that they are ultimately speculative in theory-building research. According to Eisenhardt (1989), it is important to remember that "*no construct is guaranteed a place in the resultant theory, no matter how well it is measured*" (p.536).

Pursuing qualitative interview research within a field study environment is further justified as a suitable research method in the following sections.

3.4.1 Field Studies

Field studies are conducted in a natural setting with human subjects (Jenkins, 1986), where the researcher does not manipulate any independent variables, but the dependent variables are systematically measured through a cross sectional analysis (Kaplan, 1985). Field studies thus require the researcher to have prior definitions of the constructs in the field and the relationships between them (Benbasat et al. 1987).

There have been numerous scholars that have played an important role in the adaptation and application of the field study methodology, for example Malinowski (1926) who was instrumental in establishing the usefulness of field-work in research. Malinowski (1926) proposed the appropriate way of studying and understanding society was by analyzing the various parts and their roles within a culture. Similarly, Radcliffe-Brown et al. (1952) argued the need to conceptualise society as a network of relations between its parts, which were termed social structures. Blau (1955) also attempted to link together the micro and macro levels of social analysis through field study investigations while examining the processes governing human associations.

In pursuing a field study methodology, Jenkins (1985) outlines two distinct advantages inherent to its implementation:

i. The researcher is capable of conducting research in the natural setting, which provides a richer understanding of the phenomenon under investigation
ii. By taking advantage of background knowledge, results may be reported in a shorter timeframe, while providing information that may not have been achieved otherwise

The following sections justify the choice of using a semi-structured interview process within the field study research design.

3.4.2 Interviews

There are many established forms of interview methods used to gather insights into a variety of phenomenon, such as focus groups and in-depth interviewing (Gubrium and Holstein, 2002). The family of qualitative interviews encompass ways of questioning

that according to Rubin and Rubin (2012) "*differ in the degree of emphasis on culture, in the choice of arena or boundaries of the study, and in the specific forms of information that are sought*" (p. 19). While quantitative measures are succinct, parsimonious and easily aggregated for analysis, qualitative findings are more detailed, as open-ended questions allow the researcher to understand the world as seen by the respondent. The purpose of gathering responses to open-ended questions is to enable the researcher to understand and capture the points of view of other people, without predetermining those points of view through prior selection of questionnaire categories.

Given the wide application of interviews in research, there exists an extensive literature on the interview method focusing on a broad range of topics. Such research streams include the different types of interviews (Goldman and McDonald, 1987), strengths and limitations of the method (Symon and Cassell, 1998), along with various techniques in conducting effective interviews (Douglas, 1985). Philosophers and social theorists however have several critiques for using interviews as data collection tools (Denzin and Lincoln, 2000, Qu and Dumay, 2011):

i. Problems of representation
ii. The nature of the language
iii. The inseparability of researcher and knowledge
iv. The problems of writing
v. The empirical data produced is unrealistic, impressionistic and not objective

Regardless, interviews have been widely used in conducting both field studies and ethnographic research (Qu and Dumay, 2011). To these researchers, interviews are regarded as nothing more than casual everyday conversations. However, the research interview can be characterised by an asymmetry of power in which the researcher is in charge of questioning a voluntary interviewee. Although it may seem that everyone can simply ask questions, interviews conducted in a casual manner with little preparation could lead to disappointing results, such as a wasted opportunity (Hannabuss, 1996).

Qualitative research interviews therefore require not only the use of various skills, such as intensive listening and note taking, but also careful planning and sufficient

preparation (Yin, 1984). In order to collect interview data that is useful for research purposes, it is necessary for the researchers to develop as much expertise in relevant topic areas as possible so informed questions are asked (Qu and Dumay, 2011). Thus, interviewing requires a respect and a curiosity for what people say and a systemic effort to really understand what people tell you (Rubin and Rubin, 2012).

The quality of qualitative data therefore depends to a great extent on the methodological skill, sensitivity and integrity of the researcher as interviews primarily yield direct quotations from people about their experiences, opinions, feelings and knowledge (Yin, 2008). Direct quotations are a basic source of raw data in qualitative inquiry, revealing respondents' depth of emotion, the ways they have organised their world, their thoughts as to what is happening, their experiences and their basic perceptions (Patton, 2005).

Whatever the focus of the study, the basic research question needs to be succinctly focused so that a relatively homogenous group will have shared experiences about the topic (Miller and Crabtree, 2004). The basic research question can serve as the first interview question, but between 5 and 10 more specific questions are usually developed to delve more deeply into the different aspects of the literature. The iterative nature of the qualitative research process in which preliminary data analysis coincides with data collection often results in altering questions as the investigators learn more about the subject. Questions that are not effective at eliciting the necessary information can be dropped and new ones added (Yin, 1994). Furthermore, the interviewer can depart from the planned itinerary during the interview because digressions can be very productive as they follow the interviewee's interest and knowledge (Johnson, 2002).

Qualitative interviews have been categorised in a variety of ways, with many contemporary texts loosely differentiating them as being either structured or un-structured (Bernard, 1988). For the purposes of this research, the use of semi-structured interviews were chosen, the reasons for which are outlined below.

3.4.2.1 Semi-Structured Interviews

This research approach incorporated the use of semi-structured interviews, which involves prepared questioning guided by identifying themes in a consistent and systematic manner interposed with probes to elicit more elaborate responses (Qu and Dumay, 2011). The interview is focused on incorporating a series of broad themes during the interview to direct the conversation toward the topics and issues about what the interviewers want to learn. Interview guides range from highly structured to relatively loose, yet ensure the same thematic approach is applied during the interview.

Whereas unstructured interviews are conducted in conjunction with the collection of observational data, semi-structured interviews are often the sole data source, and are usually scheduled in advance at a designated time and location (DiCicco-Bloom and Crabtree, 2006). They are organised around a set of pre-determined open ended questions, and other questions emerging from the dialogue between the interviewer and the interviewee(s). Semi-structured in-depth interviews are the most widely used interviewing format for qualitative research and can occur either with an individual or within groups (Yin, 2008). Individual interviews allow the interviewer to delve deeply into social and personal matters, whereas the group interview allows interviews to get a wider range of experience but, because of the public nature of the process, prevents delving as deeply into the individual (Chirban, 1996).

Because it has its basis in human conversation, it allows the skilful interview to modify the style, pace and ordering of questions to evoke the fullest responses in their own terms. It proves to be especially valuable if the researchers are to understand the way the interviewees perceive the social world under study (Qu and Dumay, 2011). Utilising an ethnographic approach to questioning, researchers can learn about organisational culture from different individuals' points of view, thereby bringing into the open an often hidden environment.

The adoption of a semi-structured interview was further deemed appropriate given the post-positivist approach previously outlined. As this research was deemed to be exploratory in nature, fixed interviews would not have been desirable given their inherent limitation of asking fixed and structured questions. This approach would not

have allowed the researcher to explore emergent themes within the interview setting as they arose, nor would it have allowed the researcher to pursue additional lines of questioning towards social capital constructs that the interviewees had evident experience of.

3.4.3 Secondary Data Sources

Secondary data sources were also consulted during the data analysis process in order to obtain a heightened understanding and appreciation of how the platforms operate. In some cases this warranted setting up a solver account to explore the platform layout in depth, and using the mechanisms further outlined in Chapter 6. For example, Figure 3-1 represents a randomly selected contest solver profile from *InnoCentive* taken as a secondary source of research data, which serves to provide the community with a brief description of the solver's background and previous experience. Solvers have the option of including a contact email should other members of the community wish to contact them directly.

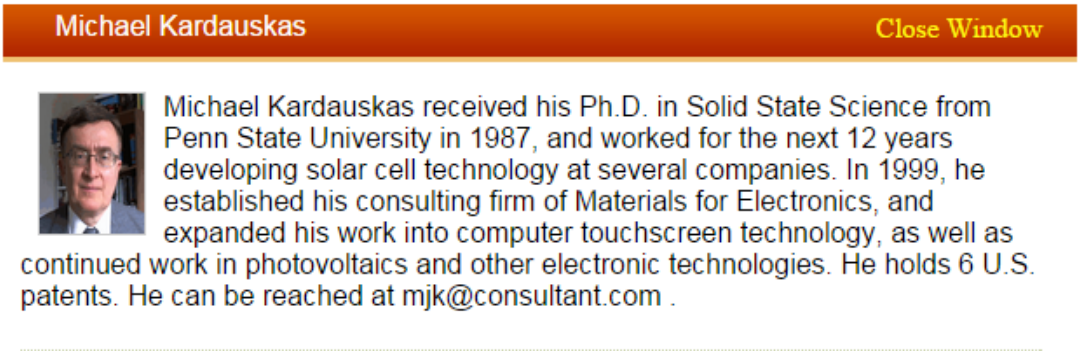


Figure 3-1: Solver Profile from *InnoCentive*

Similarly, Figure 3-2 below showcases the typical solver profile for the collaborative community of *TopCoder*. In addition to the information provided by the other platforms, the solver profile for *TopCoder* also represents an opportunity to showcase a solvers reputation by presenting the solvers success rate, percentile, and awards received from winning various contests.

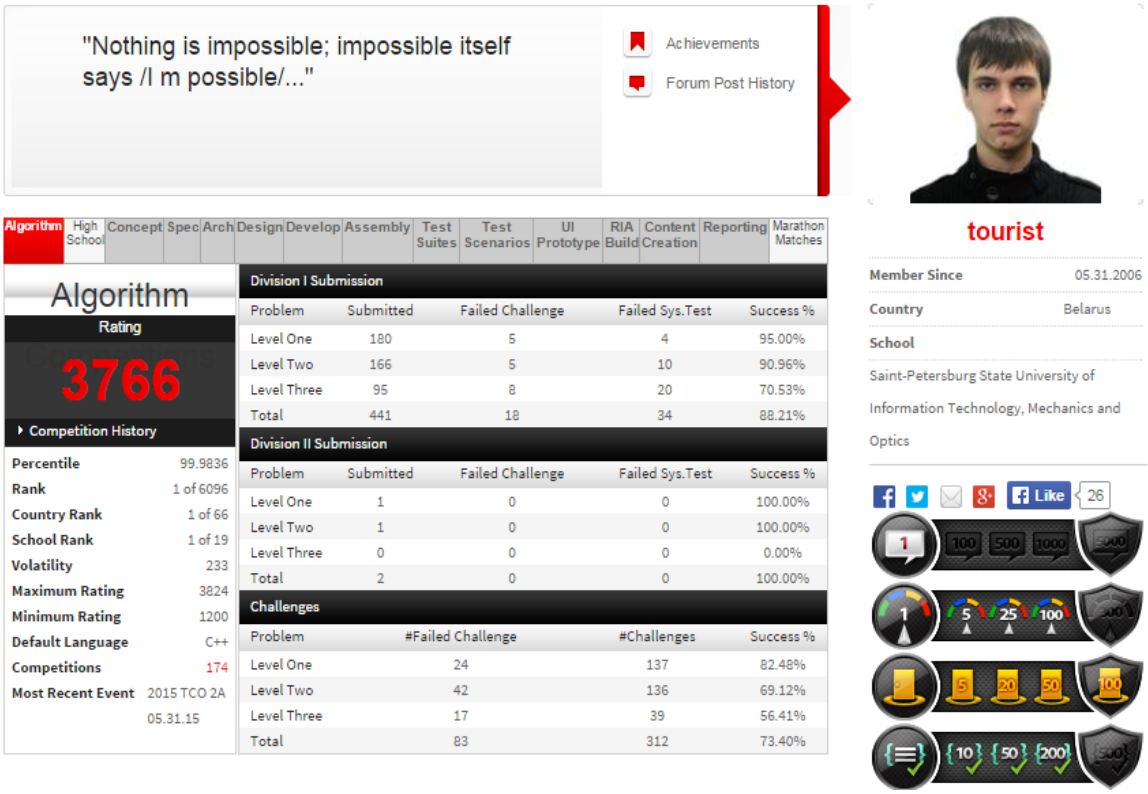


Figure 3-2: Solver Profile from *TopCoder*

The main advantage of using these secondary data sources is that they already exist, while other advantages include the size of the sample, its representativeness, and the reduced likelihood of bias (Sorensen et al., 1996).

3.5 Data Collection

The process of data collection encompassed three distinct phases, each of which will be outlined in depth within this Section:

i. Phase 0-Interview Protocol Validation
ii. Phase 1-Pilot Study
iii. Phase 2-Multiple Field Studies

Data collection was over a 10-month period from July 2014 to March 2015. Both the pilot study and the field studies involved gathering data using semi-structured interviews with KDMs in each of the innovation contest platforms investigated. The selection of appropriate KDMs was the result of a rigorous sampling strategy which is

further outlined in Sections 3.5.2 and 3.5.3. The interviews began with general open questions regarding experience of partaking or implementing innovation contests. This enabled the researcher to gather background information on both the company/platform being investigated and the interviewee. Subsequently, the interviewees were asked more specific and direct questions based on each construct of social capital.

Convergent interviewing was the technique implemented during data collection. It is a technique used for collecting, analysing and interpreting qualitative information about people's attitudes, beliefs, experiences, knowledge and opinions through the use of interviews that converge on important research issues (Nair and Riege, 1995). The process is useful to develop and refine a research problem and due to its exploratory nature, it is more rigorous than other qualitative methodologies (Dick, 1990).

The following sections outline the validation phase of the interview protocol implemented in the study, along with the pilot and field studies identified for the data collection. (See Appendix 3 for finalised interview protocol).

3.5.1 Phase 0-Interview Protocol Validation

Information systems research is a dynamic and ever changing field. Novel technologies and management trends have emerged, evolved and departed over the years since the discipline first formed in the late 1960's. The very scientific basis of the profession however depends on solid validation of the instruments that are used to gather the data upon which findings and interpretations are based (Boudreau et al., 2001). The best social science methodologists (Cook and Campbell, 1979, Cronbach, 1949, Stone, 1978) allow a great deal of latitude in the choice of validation method, but make it clear that the ideal study will use a variety of pre-tests to ensure that the research instrument is reliable and valid.

Criticism	***Strategic Response***
Results in overly complex theories	Develop prior theories and specific research questions

External validity	Use theoretical replication logic
Difficult to conduct	Use field study protocol
No single approach sufficient for sound theory development	Treat the research effort as only part of the process of theory development
Researcher bias and lack of rigor	Discussions with supervisors and other academic researchers to allow validity checks. Discuss data analysis with other researchers

Table 3-4: Limitations of Field Study Research (Developed from (Eisenhardt, 1989, Riege, 2009, Yin, 1994)

Given the well documented criticisms of field study research design outlined below, the validation phase of the research strategy sought to achieve an interview protocol with established rigor and reliability prior to embarking on the pilot study. Failure to do so would have otherwise suggested a sense of flexibility and absence of rigid experimental control. The lack of such control might also suggest doubt to the ability of producing reliable findings (Sykes, 1990).

During this phase, several criticisms directed toward field study research were identified and addressed (outlined above in Table 3-4):

i. Field study research has been accused of generating overly complex theories (Eisenhardt, 1989). This concern was addressed by examining prior theories, and developing specific research issues in Chapter 2. The additional theories that were explored are presented in the Appendix.
ii. Field study research has been criticised for lacking external validity (Yin, 2008). These criticisms have been addressed in this research by adopting the recommendations of Yin (1994):
    - Construct Validity: Multiple sources of evidence were gathered and a chain of evidence was established.
    - Reliability: Use of a field study protocol and developing a study database (data collection and analysis).
iii. Criticisms have been levelled at field study research in terms of being difficult to conduct due to logistic and operational elements (Eisenhardt, 1989, Parkhe, 1993). This was overcome through the development and implementation of a

study protocol (Yin, 1994) through consultation with an independent research academic to validate the protocol's rigor and relevance.

iv. Field study methodology has been labelled as being insufficient for sound theory development. However, this same accusation could be re-directed at alternative research methods, as any research is unlikely to satisfy the demands of construct validity, internal validity, external validity and reliability simultaneously (Parkhe, 1993). The purpose of this research is to develop a theory, on which later endeavours can be based, not to provide a conclusive theory (Eisenhardt, 1985).

v. The field study approach has been accused of researcher bias due to the subjectivity of the researcher and the respondents on whom the researcher relies to get an understanding of the research problem (Hamel et al., 1993). This limitation was overcome through discussion with academic supervisors and other researchers on research design, data analysis and the findings to ensure that consistencies of interpretation provided a deeper understanding of the nature of the phenomena. In doing so, this avoided any possible bias that could be introduced by the researcher's interpretations (Hirschman, 1986).

To further avoid these limitations, the primary task was to achieve a comprehensive, yet understandable interview protocol. A preliminary interview protocol was constructed after an in depth analysis of both IT-enabled innovation contest platforms and social capital theory literature. This interview protocol was tested with an independent academic with prior experience in the discipline of open innovation. Several issues were highlighted through this phase which subsequently resulted in further refinement of the interview protocol, examples of which include:

i. Improved context specific vocabulary based on experience-*Shared vision needed further clarification*
ii. Identified ambiguity around constructs which were later refined
iii. Cut irrelevant questions from protocol-e.g. "*What do you feel are the challenges associated with these contests*?"

Once the interview protocol was amended to reflect these changes, it was then used within both the pilot study and the resulting field studies.

3.5.2 Phase 1-Pilot Study

Once an established interview protocol was validated and refined, the next phase of the research strategy sought to explore the constructs in a practical setting. Given that the exploration of social capital within the innovation contest setting has previously been unexplored in this level of detail, a pilot study was necessary to ascertain its prevalence (if any). When the research is highly exploratory, Benbasat et al. (1987) argue that a single case may be useful as a pilot study.

Yin (1984) suggests that single case-studies are appropriate if:

i. It is a *revelatory* case i.e. it is a situation previously inaccessible to scientific investigation
ii. It represents a *critical* case for testing a well-formulated theory[7]
iii. It is an *extreme* or *unique* case

Pilot studies are most useful at the outset of theory generation and late in theory testing. According to Benbasat et al. (1987), "*a single case used for exploration may be followed by a multiple case study*" (p.373). Within such settings, the researcher learns first-hand the relevant jargon and context in which the phenomenon will be studied. *Trend Micro* was used as the first empirical study in which the influences of social capital within an innovation contest setting were investigated. The selection of *Trend Micro* was due to several factors, making it an ideal candidate for a pilot study:

i. *Pragmatic*-the basis of geographic proximity and accessibility
ii. *Representative*-their status of having previously implemented two in-house innovation contests

[7] According to Yin (1984) "*To confirm, challenge, or extend a theory, there may exist a single case, meeting all the conditions for testing the theory*" (p.42).

iii. *Revelatory*-being able to interview both KDMs and the contest solvers to ascertain the importance and nature of social capital within the contests previously held

3.5.2.1 Trend Micro

In 2013 the Cork office of *Trend Micro* in Ireland set a priority: to accelerate the development of high potential business ideas. Although *Trend Micro* implements state of the art management practices, as a global organisation the company continually faces the challenge of speeding up new product development to meet fierce time-based competition. In addition, the Cork office wanted to mark their ten year anniversary by becoming recognised as a European innovation hub of excellence. *Trend Micro* recognised that an internal idea competition could offer a mechanism to increase both the quantity and quality of ideas, encouraging staff to develop brand new ideas and to cross-pollinate their ideas with insights from their colleagues. This strategy benefited not only from new scientific and technological advancements based on their employees' insights, but also from the ability of the company to recombine its existing knowledge.

The Cork office has approximately 250 members of staff, with the main population being in sales. The remaining employees are involved in various support functions such as IT, Human Resources, legal, finance and customer operations. *Trend Micro* designed their idea competition initiative to allow for the participation of internal experts across their various functional departments.

In doing so, they sought to promote the following goals:

i. To awaken dormant ideas
ii. To stimulate idea generation from their workforce
iii. To offer feedback to their staff beyond what traditional appraisals would permit

As a direct result of the unprecedented success the idea competition experienced during its first year, the decision was made to implement another competition for the following year. The decision makers responsible for doing so hoped that such an

initiative would develop and accentuate a culture of collaborative innovation within the office. The contest process evolved through the two iterations in terms of the reward on offer, and also the quality of submissions. In its first year, there was a prize fund of €2,000 allocated to the winning idea(s); however for the second version of the initiative, this monetary allocation was replaced with a "developmental trip". The destination of this trip at the time of the data gathering was left open as it was to be the choice of the winning solver. The aim of such developmental trips was for the solvers to go somewhere to develop their ideas further while also developing personal growth. This arguably works out better for *Trend Micro* also as it scatters the costs of the prize allocation throughout different departments, without having to budget out one substantial lump sum.

In terms of the sampling strategy for the interviewees, two criteria for selecting participants were identified at the outset:

i. They should occupy roles that make them knowledgeable about the issues being researched
ii. The study participants should be a combination of contest solvers (to validate the influence of social capital), and KDMs of the innovation contest holding managerial positions

The resulting participants are outlined below in Table 3-5:

Interviewee	***Job Description***
Solver 1 (S1)	Technical Account Manager
Solver 2 (S2)	Renewal and Up Sell Account Manager
Key Decision Maker (KDM)	Senior Manager in charge of organisation effectiveness and operational excellence

Table 3-5: List of Participants Interviewed at *Trend Micro*

Both solvers interviewed were contest winners through the different iterations of the contest initiative, and subsequently have reaped significant rewards from participating in the initiative. The KDM holds a senior position within *Trend Micro* and was one of the key figure heads in the formation and implementation of the innovation contest initiative. Each interviewee was interviewed separately, and the interviews began by asking the interviewee's their own background in the company and the experience they have gathered as a result in order to put them at ease.

Choosing *Trend Micro* as a pilot case study has a significant role in further assessing the validity, reliability and usefulness of the pre-identified interview questions. Pilot studies however are not merely a pre-test of the interview protocol (Yin, 1984). It also allowed the researcher a further opportunity to review data collection procedures before Phase 2 of case study data gathering was undertaken (Eisenhardt, 1989, Yin, 1994). While investigating the perceived importance of social capital constructs was confined to the pilot study, these questions generated a rich narrative for the subsequent data analysis. The answers stimulated discussion around the very nature of social capital, and as a result, it was decided that these questions would remain in the interview protocol going forward for the case studies. Therefore in contrast to the Phase 0, there were no amendments to the interview protocol needed to be made subsequent to the pilot study.

The analysis of the pilot study revealed innovation contests focus on a variety of characteristics and dynamics within the phenomena, ranging from concrete technical architectures, to socio-cultural processes. Through this analysis three critical measurement variables were analysed as illustrated below in Figure 3-3. While these three measurement variables formed the coding structure for the pilot study, once the importance of social capital was confirmed in this setting the coding schema was subsequently refined to only investigate research questions one and two (nature and mechanisms).

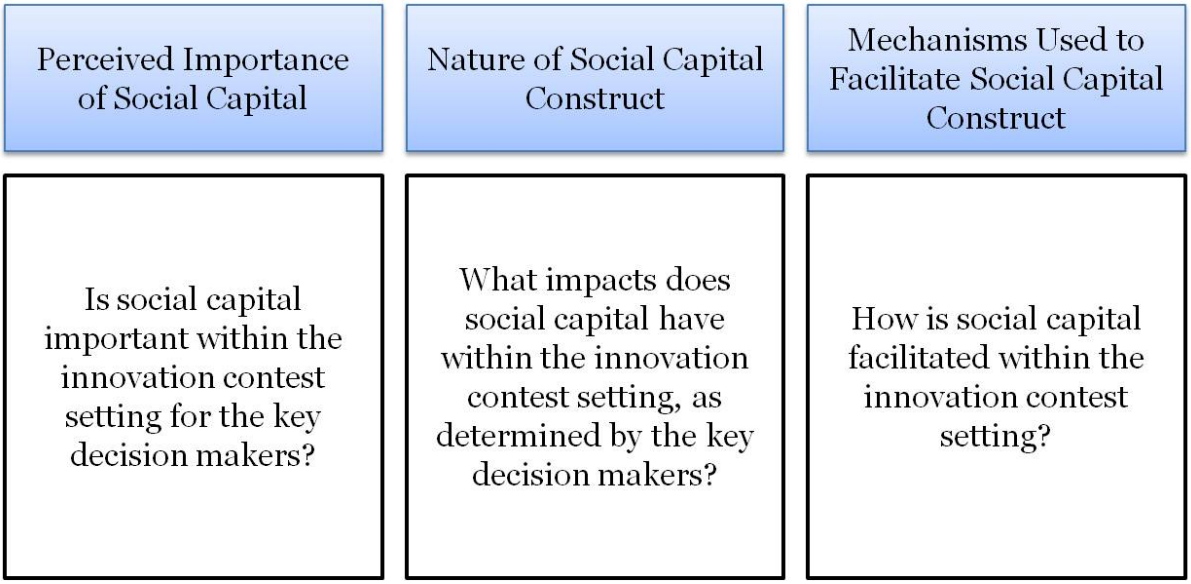


Figure 3-3: Coding schema for pilot study

The researcher believes this coding approach is the most appropriate way to capture the complex, idiosyncratic nature of personal experience when it comes to measuring social capital.

3.5.3 Phase 2-Multiple Field Studies

Having explored the influence of social capital through the pilot study of *Trend Micro*, the next step involved building a theory of social capital through the exploration of multiple field-studies. According to Benbasat et al. (1987) this approach is "*desirable when the intent of the research is description, theory building or theory testing"* while they *" allow for cross-case analysis and extension of theory*" (p.373). It is quite useful to consider a multiple-field project as analogous to the replication that is possible with multiple traditional experiments. Taking this point of view, Yin (1984) proposes two criteria for selecting potential sites:

i. Sites where similar results are predicted may be used as "literal" replications
ii. Sites may be chosen such that contradictory results are predicted

The identification of both competitive markets and collaborative communities facilitated these criteria, allowing individual investigations while also providing a cross case comparison analysis. Field selection however should be carefully thought out rather than being opportunistic. The platforms selected for analysis (described in Table 3-6) are therefore argued to give the requisite theoretical saturation, encompassing five competitive markets and nine collaborative communities. Similar to the pilot study, two criteria for selecting study participants for the field studies were identified at the outset:

i. They should occupy roles that make them knowledgeable about the issues being researched
ii. The study participants should either hold a managerial position, or be involved in decisions around the contest strategy

Platform	*Founded*	*Ceased Trading*	*URL*	*Sample Subset*	*Role of Interviewee*	*Contest Example*	*Challenge Description*	*Winning Prize*
Appirio [TopCoder]	2001	Still Active	www.topcoder.com	Collaborative Community	Director: Solutions Marketing	Living Progress-World Wildlife Fund-Trading Data Comparison Web Application	This challenge built a foundational audit process to identify, using the Trade Data compiled by the UN, country submissions that might indicate that illegal trade is going on.	$2,500
Battle of Concepts	2007	Still Active	www.battleofconcepts.nl	Collaborative Community	Innovation Manager	Innovate Online Patient Portals for GPs	The functionality of existing portals allow patients to make appointments, order repeat prescriptions and view a summary of their file. This challenge sought improvements for what the patient is really looking for in terms of time savings, improved understanding of health, removing uncertainty etc...	$1,500
Chaordix	2009	Still Active	www.chaordix.com	Collaborative Community	Founder	Customer Market Insights Community	Marketing stakeholders of the American Airlines (AA) brand wanted to form a highly-engaging market insights community to more deeply understand the AA customer experience and travel journey. The goal was to gain insight into how AA can better serve the needs and wants of specific high-value customer segments.	Not disclosed
Crowd-ANALYTIX	2012	Still Active	www.crowdanalytix.com	Competitive Market	Founder and CEO	Customer Analytics Exploration	Challenges involved the development of: promotional recommendations to upsell and cross sell; market based analysis for targeted offerings, and; predicting churn based on transactional events.	Not disclosed

Platform	*Founded*	*Ceased Trading*	*URL*	*Sample Subset*	*Role of Interviewee*	*Contest Example*	*Challenge Description*	*Winning Prize*
Crowding	2012	2015	www.gocrowding.com	Competitive Market	Founder and CEO	Mediates Innovation Challenges	Challenges involved organisational and product development.	Not disclosed
F6S	2012	Still Active	www.f6s.com	Collaborative Community	CEO	DevAppLB Ultralight	12 hour Hackathon, where apps were developed to a live beta version at the end of the challenge before delivering a pitch/presentation. The app was then scored based on the: - Faithfulness to the brief - technical status and readiness of the app/game - design, user experience, and user interface of the app/game - marketing strategy - pitch+presentation, powerpoint, etc	Not disclosed
IdeaConnection	2007	Still Active	www.ideaconnection.com	Competitive Market	CEO	Solar Shelter Harvest Energy and Goodwill	The innovative Solar Shelter challenge was designed to house refugees while also providing clean energy to the local area.	€10,000
InnoCentive	2001	Still Active	www.innocentive.com	Collaborative Community	Innovation Program Manager	The MasterCard Foundation Clients at the Centre Prize 2016	This challenge sought the world's most impactful and sustainable financial services provider that puts "clients at the centre" of its thinking and operations for the benefit of poor people in developing countries.	$150,000

Platform	*Founded*	*Ceased Trading*	*URL*	*Sample Subset*	*Role of Interviewee*	*Contest Example*	*Challenge Description*	*Winning Prize*
Innoget	2007	Still Active	www.innoget.com	Competitive Market	CEO	Seeking Digital or Video Image Processing Solutions	This challenge aims at creating a software that can process the videos captured through the eyepiece of an improved Cerenkov viewing device, and turn them into a single composite image with a better resolving power, thus improving the confidence of item counting.	$5,000-$12,000
Munktell Science Park	2012	Still Active	www.munktellsciencepark.se	Collaborative Community	Open Innovation Manager	Smart Living Challenge	Munktell Science Park, together with the Swedish Institute initiated the Smart Living Challenge, an open, international innovation competition designed to generate business opportunities and ideas to foster more sustainable lifestyles in cities.	Innovation week to Sweden
NASA Tournament Lab	2011	Still Active	www.nasa.gov/coeci/ntl	Collaborative Community	Senior Scientific Advisor	Astronaut Email Challenge	Develop extensions to MS Outlook/Exchange Server for International Space Station (ISS) that utilizes delay tolerant networking to exchange email files between ISS and Mission Control Center.	$41,314
NineSigma	2000	Still Active	www.ninesigma.com	Competitive Market	Business Development Manager	Cool Ship Technologies	The Hershey Company sought to develop a lightweight, affordable shipping system that will keep chocolate close to the temperature at which it was packed, 75°F or below, for at least 48 hours. The ultimate goal was to develop a system that would be inexpensive enough to use year round, as part of the standard packaging for small parcel shipments.	$25,000

Platform	*Founded*	*Ceased Trading*	*URL*	*Sample Subset*	*Role of Interviewee*	*Contest Example*	*Challenge Description*	*Winning Prize*
Phantominds	2014	Still Active	www.phantominds.com	Collaborative Community	Founder	International Sales Strategy Development	A start up from Hamburg called Masunt tasked solvers with developing new international sales strategies for their product "KeyBox key safe".	€ 1,200
Presans	2008	Still Active	www.presans.com	Competitive Market	Operations Manager	Evaluating the potential of ultra-high performance concrete for the fabrication of marine structures	The objective of this project was twofold: to obtain an overview of the properties, modes of implementation and fields of application of ultra-high performance concrete, and; to obtain a forecast of what the properties and modes of implementation will be within a 10-15 years term.	€10,000
Skild	2002	Still Active	www.skild.com	Collaborative Community	Founder	Ford Motor Co. Connected Health App Challenge	This challenge invited solvers to submit concepts that utilize the automobile and wearable devices as components providing an effective health and wellbeing program for customers and patients of all ages and conditions. The concepts made use of emerging wearable, mobile and web technologies, and envisioned new in-vehicle use-cases of the data recorded by these technologies through mobile applications and websites or other types of user interfaces.	$10,000

Table 3-6: Platform details used for field studies, including their description, the role of the interviewees, and previous contest examples

All of the interviewees were considered to be KDMs in their respective platforms; with their roles ranging from CEO's and founders, to platform managers and solution directors. As such, they were highly knowledgeable, and were in a position to not only witness the varying effects of social capital constructs on their platforms, but also had authority to implement guidelines and practices that (retrospectively for them) promoted them. All interviews were pre-organised and required confirmation of Skype handles and time only. The platforms that were targeted, their description, along with the suitability of the interviewee are illustrated in Table 3-6 above. Interviews on average lasted 60 minutes, which were recorded and subsequently transcribed.

The analysis of these field studies followed a similar structure to the strategy implemented for the pilot study, with the exception of coding for the perceived importance of the construct (as later described in Section 3.6). This was due to the confirmation in the pilot study that social capital was important in these settings. Further classifications were required however for the field studies, which are further outlined below.

Classification of Platforms

As outlined previously in Chapter 2, IT-enabled innovation contest platforms can be classified depending on common traits exhibited by either platform design or solver interaction. As such, open innovation reflects not so much a dichotomy between open versus closed innovation, rather than a continuum with varying degrees of openness (Dahlander and Gann, 2010). Two categories of open innovation contest platforms were thus selected using the purposive sampling approach, as per Boudreau and Lakhani (2009).

i. Competitive Markets

The first classification involved six IT-enabled innovation contest platforms that exhibited traits of being more directed toward individual solvers working for themselves rather than as part of a collective. Solvers within such platforms have primarily competitive relationships among one another. The platforms analysed in this section, along with the roles of the interviewees are outlined in Table 3-7 below.

Platform	*Role of Interviewee*
CrowdANALYTIX	Founder and CEO
Crowding	Founder and CEO
InnoCentive	Innovation Program Manager
Innoget	CEO
NineSigma	Business Development Manager
Presans	Operations Manager

Table 3-7: Competitive Markets and their Interviewees

ii. Collaborative Communities

The second platform classification to emerge from our analysis involved nine platforms. These platforms exhibited traits of the platform being more directed toward collaborative solvers working as part of a community, rather than from an individualistic point of view. IT-enabled innovation contest platforms analysed in this section, along with the roles of the interviewees are outlined below in Table 3-8.

Platform	*Role of Interviewee*
Appirio [TopCoder]	Director: Solutions Marketing
Battle of Concepts	Innovation Manager
Chaordix	Founder
F6S	CEO
IdeaConnection	CEO
Munktell Science Park	Open Innovation Manager
NASA Tournament Lab	Senior Scientific Advisor
PhantoMinds	Founder
Skild	Founder

Table 3-8: Collaborative Communities and their Interviewees

3.6 Data Analysis

This section describes how the data analysis was undertaken. This process consists of examining, categorising and tabulating the evidence to address the original research

issues (Yin, 1994). Such strategies can include content analysis, pattern matching and explanation building. Miles and Huberman (1984) contend that qualitative analysis is a continuous iterative enterprise, in which data reduction, data display and drawing conclusions are part of the analytical process.

3.6.1 Data Bracketing, Coding and Concluding

Subsequent to the cleaning and editing of data and summarising each field study, data bracketing and coding were the initial steps in analysing the data in order to reduce and organise the mass of information to a manageable level. The first step in this phenomenological analysis is referred to as being the *epoche* (Patton, 1990). According to Moustakas (1994), "*Epoche is a Greek word meaning to refrain from judgement, to abstain or stay away from the everyday, ordinary way of perceiving things. In a natural attitude we hold knowledge judgementally; we presuppose that what we perceive in nature is actually there and remains there as we perceive it. In contrast, Epoche requires a new way of looking at things, a way that requires that we learn to see what stands before our eyes, what we can distinguish and describe... In the Epoche, the everyday understandings, judgements, and knowings are set aside, and then phenomena are revisited, visually, naively, in a wide-open sense, from the vantage point of a pure or transcendental ego*" (p.33).

In taking this perspective of *epoche,* the researcher looks inside to become aware of personal bias, to eliminate personal involvement with the subject material by eliminating preconceptions. Rigor is reinforced by a phenomenological attitude shift achieved through *epoche*. As explained by Katz (1987); "*Epoche is a process that the researcher engages in to remove, or at least become aware of the prejudices, viewpoints, or assumptions regarding the phenomenon under investigation. Epoche helps enables the researcher to investigate the phenomenon from a fresh and open viewpoint without prejudgement or imposing meaning too soon. This suspension of judgement is critical in phenomenological investigation and requires the setting aside of the researcher's personal viewpoint in order to see the experience for itself*" (p.36-37).

Epoche requires that looking precede judgement and that judgement of what is real, or most real be suspended until all the evidence (or at least sufficient evidence is in) (Ihde, 1986). Following *epoche*, the second step is phenomenological reduction. In this analytical process, the researcher brackets out the world and presuppositions to identify the data in pure form, uncontaminated by extraneous intrusions (Patton, 1990). In bracketing, the researcher holds the phenomenon up for serious inspection. It is removed from the world where it occurs and is taken apart and dissected (Husserl, 2012). Its elements and essential structures are uncovered, defined, and analysed. It is not interpreted in terms of the standard meanings given to it by the existing literature. Preconceptions are suspended and put aside during bracketing, where the subject matter is confronted as much as possible on its own terms (Patton, 1990). According to Denzin (2001) bracketing involves several steps including:

i. Locate within the story key phrases and statements that speak directly to the phenomenon in question
ii. Interpret the meanings of these phrases as an informed researcher
iii. Obtain the subject's interpretations of these phrases, if possible
iv. Inspect these meanings for what they reveal about the essential, recurring features of the phenomenon being studied
v. Offer a tentative statement, or definition, of the phenomenon in terms of the essential recurring features

Examples of how data bracketing was achieved during Phase 1 and Phase 2 are outlined below in Tables 3-9, 3-10 and 3-11.

3.6.1.1 Perceived Importance of Social Capital

In contrast to the field studies, the pilot study additionally sought to explore the perceived importance of the social capital constructs in order to validate this research. This measurement used place units of data that told the researcher how the subjects define the settings or particular topics, in essence displaying the subjects' world view (Bogdan and Bilken, 1982). This is important, as what constitutes an individual's perceived worth/desirability/utility to engage with a platform depends on various factors. These factors are not formed in isolation, but may be a composite of factors (Bird and Lehrman, 1993, Cronk and Fitzgerald, 1999, Symons, 1991), including:

i. Preconceived ideas that influence value expectations
ii. The role of the individual to the organisation
iii. Personal value system/ethics
iv. Factors relating to the organisation, for example the IS culture

Perceived importance is therefore subjective, described by the interviewees based on their perceptions of the efficiency, innovativeness and effectiveness of the contest setting thus increasing differentiation (Bowman and Ambrosini, 2000). Several possibilities have been investigated to explain similarities and differences in values held by individuals (Meglino and Elizabeth, 1998). The primary reason is the influence of personal experiences and exposure to more formal socialisation forces (Bem, 1970, Jones and Gerard, 1967). This makes the sole use of traditional financial measures to fully account for evidence of potential benefits inept (Brynjolfsson, 1993).

This should be expected as most theorists see value as products of a culture or a social system (Cao, 2010). However, unlike constructs that would be considered to be more peripheral to a user (e.g. attitudes, opinions etc.), perceived value is relatively permanent although capable of being changed under certain conditions (Meglino and Elizabeth, 1998). An example of the perceived importance coding for social capital within the pilot study is presented below in Table 3-9.

Perceived Importance of Social Ties within "Trend Micro"		
KDM	*Solver 1*	*Solver 2*
(Social ties) ended up being huge.	So, for me, it is not only the money, its just to say that yeah, I had an idea, all the people are saying "its great, why don't and how do you do it?"	(On being asked about how important solver interaction is) That is vital.
I think it's definitely (important for) that whole developmental angle.	The other guy that I am working on with this project is in Munich... So we were talking in December I think, so when we finished the contest, and then you say "ok, lets start collaborating".	(Having a previous relationship helps), that is why it is easy for me to pull them out, which is something we I think this year are trying to push as well. Even if I don't work in this area, talk to them and learn from them.
(An employee) would have been very much under the radar. Like even some of the individuals of the final ten this year, you know that are in my function, everyone knows them, but they would never potentially have expected them to have been in the last ten.	Even if I don't win the contest, I'm in touch with people that are interested in how it works	We were able to work with some guys in the Philippines, guys in Taiwan, guys in South America, guys in Dublin here.
For (another KDM), she didn't care if the ideas ever went anywhere. Her driver though, we call it collaboration really I guess. It's one of her values. I think definitely it was a driver in launching this. I mean it was really about innovation and collaboration I would say.		I didn't have to bring all these people in a project because for the last six years I am talking to them on the floor everyday.
I think for individuals, I don't think we had necessarily thought through what would happen over in that corner, and the positivity of (social ties).		So that's what I mean, all this social stuff that I have built up for the last six years, I am now reaping the rewards.
(Social ties) just created a huge buzz for people who didn't even know each other necessarily previous to then, were actually having really lively, animated conversations, about not just improving things that bothered them, about actually completely redesigning.		
We were mainly trying to accelerate (social ties) becoming more of a culture.		

Table 3-9: Example of the Perceived Importance of Social Ties Coding within Trend Micro

The perceived importance of the social capital construct was further classified under one of three categories as outlined below:

i. High Importance-All interviewees agree with the construct's importance.
ii. Medium Importance-Interviewees disagree about the construct's importance.
iii. Low Importance-All interviewees agree that the construct is not important.

3.6.1.2 Impacts of Social Capital

This level of analysis explored the impact of the social capital constructs, thus addressing research question one. As argued previously, social capital seems likely to play an important role in eliciting knowledge sharing behaviour from individuals within a community. Previous studies of social capital focus on its impact on community-level outcomes (Putnam, 1993). It is natural for studies of social capital and its consequences to focus on community or regional-level analysis because most definitions of social capital are based on networks (Inkpen and Tsang, 2005, Kavanaugh et al., 2005). However, there is significant heterogeneity among individuals in both the extent of their embeddedness in innovation communities, and in their levels of knowledge sharing. As such, there is much to be learned by examining the impact of social capital on knowledge sharing behaviour at the level of the individual.

These codes are therefore directed at regularly occurring kinds of behaviour (Bogdan and Bilken, 1982) between solvers as a direct result of the respective dimension of social capital being investigated. Examples of these codes can be viewed below in Table 3-10, where impacts of social ties within competitive markets presented.

	Impacts of Social Ties within Competitive Markets					
	CrowdANALYTIX	*Crowding*	*InnoCentive*	*Innoget*	*NineSigma*	*Presans*
Quote	This is an interesting place for not only networking, but also making a bunch of money as well.	I think it is important that you have some kind of co-creation because our point of view is that the co-creation creates better results.	InnoCentive solvers are solo, and InnoCentive has struggled for years to create this in a team challenge, they struggled to allow people to work in teams.	We facilitate connections and promotions and building the crowd.	They can do it alone, but more often maybe in a team and if its an innovation contest which means they get afterwards shortlisted and they have to develop something, to provide a prototype, then it would be in a team.	If the need is not too complex, you really don't need to have a team of experts because it means that you need to manage more, invest more time by managing more people etc.
Code	Collaboration	Collaboration	Competition	Collaboration	Competition/Collaboration	Competition
Quote	What is common across, apart from just the fact that they enjoy the challenges, is that they are competing, and competitions are always a great motivator of yielding better results.	There could be a group of 5 that are a team on a platform that are announced as the winner, and then they will get less, like for example 10,000 euro for the first prize reward, but the problem is if the company will start implementing and all five people want to be a part of that in some way and have discussions, I think there could be big problems in the long term prospect.	It is really an individual effort.	We have more than 100,000 members worldwide, covering various disciplines from life science, chemistry, physical science, engineering technology etc...	In principle, yes great, cooperation is the best. But in practice, a little bit challenging.	It depends how much the work is correlated, but the work depends on the other ones, so if they cannot advance before somebody else who finishes something.
Code	Competition	Competition	Competition	Collaboration	Collaboration	
Quote	On our platform, every project is held as a data competition, where 150+ people compete against each other to deliver the best solutions.		The whole design of InnoCentive platform and business model, and again I would say the same for Idea Connection and NineSigma, is actually, does not really encourage social interaction among the solvers.	Some of these companies might be start ups and spin off companies, but also public sector related to research universities, research centers and also a big crowd of individuals, let's say inventors, scientists, whoever is active on sharing technology and innovation and willing to connect with new partners and do collaborative projects for innovation.	So we are thinking how we can bring in these kind of (social ties) activities in the future, but of course we have to think through all the little aspects of this, under what conditions, what they present themselves, what they present the organisation, when do we sign the next deal with them, if they work on some kind of solution together and they create something great, how can we divide the result between them and our client.	We are not really talking about the community in our case because the experts, they do not know each other, there is no building of communities, except those in the groups, but very often we have more projects that are individuals.
Code	Competition		Competition	Collaboration	Collaboration	Competition
Quote	Individual or team, but they work independently. They have of course the freedom to form teams.			We provide the engineers opportunities for collaboration which is rather different		That sense of community, we don't need it.
Code	Competition/Collaboration			Collaboration		Competition

Table 3-10: Example of Social Ties Impact Coding (Competitive Markets)

3.6.1.3 Mechanisms of Social Capital Facilitation

This level of analysis explored the mechanisms used to facilitate the social capital constructs, addressing research question two. Most organizations engage in an ongoing process of evaluating their challenges-questioning, verifying and redefining the manner of interaction with their environments. Organizations also constantly modify and refine the mechanisms by which they achieve their purposes-rearranging their structure of roles and relationships and their managerial processes (Moore, 2003). Efficient contests establish mechanisms that complement their strategy, but inefficient contests struggle with these structural and process mechanisms (Miles et al., 1978).

These mechanisms refer to the tactics, methods, ways, techniques, manoeuvres, ploys and other conscious ways the various dimensions of social capital are facilitated (Bogdan and Bilken, 1982). An example of the coding structure for this analysis is presented below in Table 3-11.

	Mechanisms of Social Ties within Collaborative Communities								
	Appirio [TopCoder]	*Battle of Concepts*	*Chaordix*	*F6S*	*IdeaConnection*	*NASA Tournament Lab*	*Munktell Science Park*	*Phantominds*	*Skild*
Quote	Top Coder Open, and what this is, is a yearlong competition... Basically it takes the best coders in the world based on the ratings and the performance in different contests and it brings them together.	On the platform itself, there was not real interaction, it was more outside that they saw each other face to face, or through their own digital connection, and then it came to the platform.	We also have what is called the private work spaces in our community which means once the experts in the crowd see the top contributors across the community, they can form a private work space where an idea might go through some additional evolution, or whatever.	F6S works more or less like Facebook, so you create your personal account to identify you as a real person, and then you can create teams, or companies.	After we do a challenge, at the end of each one they get an email to ask them to rate their fellow team members, there are four members in each team and there are four teams in each challenge. Rate their fellow team members, and rate the facilitator and make comments.	Top Coder for example are doing some interesting things, for example, trying to keep them in Top Coder, the users reasonably close and they run like at least once a year they try to invite them all to meet by choosing someplace in America and running some Top Coder program recognition event.	But when it comes the motivation of the participants in workshops, they say that it has been really valuable just to be part of the actual process. So, collaborating with people with other backgrounds has been one valuable thing for them.	There will be user or community member profiles, they can write private messages, they can also, we are testing a kind of a chat option or feature.	I mean you need some sort of proof points now if you have won a whole lot of competitions then maybe people are like "Hey this person is a great collaborator!"
Code	Offline Events	Offline Events	Workshop	Solver Profile	Moderators	Offline Events	Workshop	Solver Profile	Solver Profile
Quote	When you watch the video (the solvers) just love being rock stars. And the video is outstanding, you can feel the tension building, and building and building and they show these guys and women celebrating, and you think that they have just won a million dollars.	How we try to (develop social ties) was really with offline meetings, so that they really meet each other over drinks, sometimes we organize training where you could learn how to pitch ideas in real life, how they can dress if they have an important business meeting, how you breathe and speak if you are on stage, these kind of things.	We are working with some pretty rudimentary functionality in our platform, so it could be like, let's just call it "Find a Friend", so based on my actions, my contributions, what I am doing, we can either make a match in the community automatically, or we can provide functionality that says "I want to find people, maybe not like me, but people who might be interested in my idea".	It works like a forum... it is just a discussion board where they can write recommendations...	Some will say "I never want to work with that idiot again!" and some will say "The next team I am doing please put me on with so and so" and we keep that so next time the challenge comes up.	They can write messages to each other but as far as I understand they are not doing that too often.	When it comes to the actual website and the community there, I am convinced that if you want to have a website that is more of a community in the feeling, you need to have someone there who is the moderator, or actually more people there that sort of facilitate that sort of dialogue	And we are also thinking about using an app, like for your smartphone that they can use it everywhere and they can interact with that.	
Code	Offline Events	Offline Events	Solver Match Making	Discussion Forum	Solver Match Making	Solver Profile	Moderators	Social Network	
Quote	Working with other members of the community as well, becoming that rock star, they can't lose that within the community. They won the Top Coder open, or this element of Top Coder open, and they love that.		They can form teams, they private messaging, they can do public messaging, we always have the coder community cafe where the community can start their own discussions.	There can be emails, it can be groups formed in whatever tools people might want to use, either Facebook groups, or meet up groups or whatever else.	We facilitate that interaction with trained facilitators or you know, one facilitator for each group of four.	We were studying how they were writing messages to each other, what were the timing, who managed to get the successful etc...	By implementing more digital tools while you have the workshop, so actually not using post-its, but maybe using computers so you are in the system from the beginning, so that is actually part of the process, that will be a very important next step for us.	We would try and kind of make proposals or match making..	
Code	Offline Events		Discussion Forum	Solver Profile	Moderators	Discussion Forum	Workshop	Solver Match Making	

Table 3-11: Example of Mechanisms of Developing Social Ties Coding (Collaborative Communities)

Miles and Huberman (1994) refer to these codes as "*tags, or labels for assigning units of meaning to the descriptive or inferential information compiled during a study*" (p.56). By implementing a coding strategy, the researcher undertook a delimitation process whereby irrelevant, repetitive or overlapping data were eliminated. Bogdan and Bilken (1982) outline a coding category development approach which encompasses several steps. As mentioned, usually the data is searched for regularities and patterns, as well as for the topics that the data covers, with the researcher then writing down words and phrases to represent these topics and patterns. Miles and Huberman (1984) and Neuman (1997) suggest the following steps which were incorporated into this study:

i. Classifying/Coding the provided information into different arrays to facilitate the search and retrieval of data and identify emerging themes and patterns
ii. Summarising and paraphrasing
iii. Subsuming specific instances into larger patterns
iv. Quantifying instances into numbers and ranks

The next step undertaken in the data analysis phase was to draw meaning from displayed data. In addition to effective coding, Miles and Huberman (1984) argue that a valid analysis is immensely aided by data displays that are focused enough to permit viewing of a full data set on one location, while also simultaneously and systematically arranged to answer the research questions at hand and to help see patterns. Drawing and verifying conclusions requires data to be condensed, clustered, sorted and linked in this manner.

Regularities and patterns, drawing explanations, re-checking data, and reviewing findings amongst third persons also formed part of this process as per Yin (1994). Content analysis was thus used to identify core themes within each interview, as it is a means of illustrating consistency and regularity. Miles and Huberman (1984) suggest the following steps outlined in Table 3-12 to be used in content analysis, which were implemented within this study.

Content Analysis Steps	*Action Taken*
Putting information into different arrays	The content analysis was compiled by accumulating various quotes in a structured layout
Noting reflections or other remarks in the margins	Each quote was labelled as being either: "Perceived Importance" ”Impact of", or "Mechanisms of" social capital
Identifying similar phrases, relationships between variables, patterns, themes, common sequences, and distinct differences between subgroups	The content analysis was further investigated by comparing between both competitive markets and collaborative communities and searching for emergent themes For example, competitive markets revealed the emergent theme of increased competition as a result of social ties, while collaborative communities revealed both increased competition and increased collaboration due to social ties
Making matrix of categories and placing the evidence within such categories	The content analysis matrix comprised of the six social capital constructs, within which quotes from various contest platforms were placed
Creating data displays for examining the data	Colour coding to distinguish the importance, impacts, and mechanisms of social capital

Table 3-12: Content analysis approach

The data from Phase 1 and Phase 2 was coded and tabulated before a matrix of categories was developed and evidence placed within each matrix. An example of how these clusters were achieved and visualised within this study is outlined below in Table 3-13. Displaying the data in this method allowed the researcher to combine, compare and contrast data, and report findings visually. This allowed a clear display of the data, while also facilitating an initial high-level analysis. The data was thus spread out, with all elements and perspectives having equal weight. The data was then organised into meaningful clusters through the process of coding, a central approach to data reduction (O'Flaherty and Whalley, 2004).

	Ties	*Trust*	*Reciprocity*	*Self-identity*	*Shared Vision*	*Shared Language*
Quote	So, both ideas were touching areas which I knew I knew a few guys, I know myself from home and whatever way I am, but not in my daily work.	And as well it was the first time something like that happened in Cork, so my main motivation was "I'm not doing if it was going to be a funny recording involving politics, I have my ethics. So if I wanted to get somewhere, it's a discussion I had with my previous boss, I would rather take two more years to get there where I can look at myself in the mirror, than go the politics and be there two years earlier but hate myself.	No, I didn't care. We were two on the project, happy enough to share, with the other project no one picked it up but it was for an association, like a charity project, I was happy to give my 1k away.	I am getting really bored easily. If I can't do anything else, if I am stuck in the same routine.. I was at the point after four years in sales I was close to looking for somewhere else.	I waited until the last minute to send all my propositions, and to make sure I got it right	So the more we went into the competition, the more it was getting your stuff right, getting the urgency right because we have technical, financial, where different people that were winning and wanted to hear different stuff
Comment	*Impact of Social Capital*	*Percieved Importance of solver's Point of View*	*Impact of Social Capital*	*Percieved Importance of solver's Point of View*	*Percieved Importance of solver's Point of View*	*Percieved Importance of solver's Point of View*
Quote	(On being asked about how important solver interaction is) That is vital.	So for me it was a good opportunity to see if TrendMicro do that, if you are just on a project, no politics, purely on whatever ideas are coming from it.	So that is why I am a kind of unofficial point of contact, like sure that guys is, even if it's not in my scope, they know I know about it so they will come to me.	I told Norma I was close to looking somewhere else, company wise as well because I couldn't see anywhere to go from where I was back then.	everyone had a template they could follow with your structure, your proposal, your impacts on stakeholders and so on and so forth.	So the good thing was to find a good approach for all of them, tell the same story but put a bit of technical for this guy, put a bit of finance for this one, and so on and so on.
Comment	*Percieved Importance of solver's Point of View*	*Percieved Importance of solver's Point of View*	*Impact of Social Capital*	*Percieved Importance of solver's Point of View*	*Mechanisms Used*	*Mechanisms Used*
Quote	I didn't have to meet many people for my ideas, I had a few technical guys here, I had a few who were out of my scope I needed them, I gave them responsibilities for a few tasks, because I need to gather the data from them.	So one of my ideas was me alone.	(When asked about sharing his ideas) No, no problem for that.	And roughly around the same time this thing came up and I was like, I didn't want to do it first, then I thought I had nothing to lose, you might as well put your ideas and in all fairness, the ideas that I had were those that came to my mind in the past year and never worked on them. I just recalled them, put them on paper, tried to articulate a bit and that was it.	One of the ideas was more difficult to articulate around that, because we are building everything from scratch, that was a gaming one so we are trying to go to a new way, while trying to leverage whatever we have existing internally as well.	So, all the topics, all the systems, all the terminology, all this kind of stuff was new.
Comment	*Impact of Social Capital*	*Impact of Social Capital*	*Impact of Social Capital*	*Impact of Social Capital*	*Mechanisms Used*	*Impact of Social Capital*
Quote	So what I mean is I didn't mean to use them, but I didn't have to bring all these people in a project because for the last six years I am talking to them on the floor everyday...	The second one was with someone else. It was alone my submission as well but they grouped us together, it was a bit different but the same area, different ideas. I still drew up this one, I mean she did help me the person, but we both agreed... Anyway, so yeah, I did the most of this one as it was my area in gaming and stuff, but.. the people I picked for myself, there was no trust issues, there was trust.	(Did others have an issue sharing?) I would say not at the beginning but then depending, if you are touching a project that is already running, in another region on a bigger scale that is where you have to adapt to it, get your data, you can shadow these projects for example. no, I was not made aware of it.	I wanted to challenge myself, see if I could do something else within the company.	And for me, it was a lot of learning because few of the stuff are case proposals, so if you have never done one before and if you worked on a project and brought some ideas, it was not following the structure, so it took a bit of touch and go to get it right at the beginning.	For me it is fine, I've been here a few years now so I'm better at my writing and my grammar is pretty ok so people can understand me. I was working on my projects with someone German, with someone from Eastern Europe, with someone from Spain, at the end of the day even if we all have our flaws in the languages; we know what we want to put across, the message and stuff that is fine as long as we do that.
Comment	*Impact of Social Capital*	*Impact of Social Capital*	*Impact of Social Capital*	*Percieved Importance of solver's Point of View*	*Percieved Importance of solver's Point of View*	*Impact of Social Capital*

Table 3-13: Content Analysis Example for the Pilot Study Data

The final step was to build theoretical coherence through comparisons with the literature, which is further outlined in Chapter 7.

Further data reduction occurred by eliminating an impact or mechanism when only encountered once within the platforms investigated. Only impacts and mechanisms that were encountered multiple times formed the basis of the chapters' findings. This level of analysis is implemented in order to construe deeper meanings from the findings, while also allowing the researcher to perform cross case analysis between platforms. Examples of data reduction included:

i. The impact of *platform exposure* within competitive markets due to social ties
ii. The emergence of *governance issues* within competitive markets due to reciprocity
iii. The impact of *affinity* within collaborative communities due to self-identity
iv. The impact of *platform efficiency* within collaborative communities due to shared language

3.7 Chapter Conclusion

This chapter details how the research investigation was conducted and justifies the suitability of the approach in the context of the research objective and the research questions. Comparisons of several philosophical and research approaches were highlighted, and the degree of rigor necessary to ensure external and internal validity and generalizability were illustrated. After arguing the merits and drawbacks of positivism, interpretivism, and critical theory, a post-positive approach was deemed to be the most appropriate in successfully achieving the research objective. The study design of incorporating semi-structured interviews was also presented within a field study environment, and argued as being the most suitable approach for answering the research questions.

The research approach described within this chapter adopted three distinct phases to ensure the data required was of an acceptable standard in terms of richness and rigor. Phase 0 created a preliminary interview protocol which was further refined after an interview with an independent academic with previous publications within the open

innovation discipline. Phase 1 sought to implement this refined interview protocol within a pilot study of an organisation that had previously organised various internal innovation contests. This represented the first investigation of social capital theory within an innovation contest setting, and therefore required its importance to be validated prior to embarking on subsequent data gathering. Once the importance of social capital was verified, Phase 2 identified 15 suitable field studies of online innovation contest platforms (comprised of both competitive markets and collaborative communities), which were investigated in order to answer the two research questions of this study.

This approach was also essential towards the theory building process and to gain richer insights into the influences of social capital within the innovation contest setting. Having identified the appropriate methodology employed by the researcher in this study, the following Chapters (4, 5 and 6) present the findings from the pilot and the field studies investigated.

CHAPTER 4: PILOT STUDY FINDINGS

4.1 Introduction

This chapter presents the findings of the study's primary research design, the pilot study of *Trend Micro*. As identified in Chapter 3, when compared to previous studies of social capital which focus upon salient features, this study takes a broader, more comprehensive perspective to include:

i. The perceived importance of the social capital construct
ii. The impact of the social capital construct
iii. The mechanisms used to facilitate the social capital construct

Section 4.2 therefore explores whether social capital is firstly of importance in the innovation contest setting. Section 4.3 explores the overall impact of each social capital construct within the innovation contest setting. Section 4.4 then illustrates the various mechanisms used to develop the social capital constructs within *Trend Micro*. Section 4.5 presents the key outcomes of the pilot study, while Section 4.6 finishes the chapter by providing an overall summary of the chapter.

4.2 Perceived Importance of Social Capital Constructs

This section outlines the perceived importance of the various social capital constructs as described by the interviewees.

	Social Ties	***Trust***	***Reciprocity***	***Self-Identity***	***Shared Vision***	***Shared Language***
Trend Micro	High	High	Medium	High	High	Medium

Table 4-1: Perceived Importance of Social Capital within *Trend Micro*

Through the data gathered from the three interviews (2 solvers and one KDM), the resulting levels of importance per social capital construct are illustrated above in Table 4-1.

4.2.1 Social Ties

The opportunity to develop social ties throughout the idea generation phase of the innovation contest was described as "*vital*" by all interviewees. When asked whether social ties was a factor in the decision for solvers to engage in the contest the KDM described the effect it had as being "*huge*", to the extent that *Trend Micro* had not fully anticipated the overall positive impact it would bring about. The interviewees argued that due to solvers being directly involved in the development of various ideas, it leads to a greater involvement, thereby increasing networks both socially and professionally. S1 outlined that: "*If (my colleagues) are people who are interested in creating the project, then I prefer to work in groups, because in teams, we are human, we make mistakes, and we don't have everything*."

Trend Micro has good communication channels in place to facilitate the development of social ties, and ultimately commitment to the initiative. S2 described how existing social ties were important in the development of his solution, outlining "*that is why it is easy for me to pull (collaborators) out, which is something we, I think this year, are trying to push. Even if I don't work in this area, talk to them, and learn from them*." The KDM believed the social ties developed during the contest to be the reason why certain solvers took senior management by surprise, providing ideas they might not have been thought capable of prior. As the KDM explained "*I think it is definitely that whole developmental angle... Even some of the individuals of the final ten this year that would be in my function, everyone knows them, but they would never potentially have expected them to have been in the last ten*." These ties generated from:

i. The daily interaction with peers working through a project.
ii. Outside the work setting where solvers would engage on a more personal level while discussing the projects being pursued.

Interviewees believed that projects were better developed by solvers working collaboratively in teams, rather than as competing individuals. The findings also showed that engaging in the innovation contest to develop social ties also trumped the potential for monetary compensation. As S1 stated, "*So, for me, it not only the money,*

it's just to say that yeah, I had an idea. Maybe I don't have the knowledge or whatever to implement it... Even if I don't win the contest, I'm now in touch with people that are interested in how it works". The solvers interviewed argued that the main reason they engaged in this initiative was to become better acquainted with colleagues that share similar interests and ideas.

4.2.2 Trust

The competitive nature of an innovation contest might suggest that trust would be a rare commodity within the setting. On the contrary, trust is a huge component of the *Trend Micro* culture they promote. *Trend Micro* implements a framework of 3 C's, I and T, (Customer, Change, Collaboration, Innovation and Trustworthiness). As such the degree to which trust is established within the contest settings was intrinsically inherent to the *Trend Micro* fabric. Trust exists between the employees themselves, as well as being evident between the employee and the organisation. For both iterations of the contest, trust was vital in ensuring the success of the initiative.

The KDM argued that there is always going to be a level of healthy competition throughout the contest due to the various incentives on offer. In terms of developing this level of trust between how the solvers engage and ultimately compete against each other, the KDM admitted that the element of competition will also be present in such settings, and it is important that employees remain focused on the core principles on which the contest is built upon. The KDM explained that this was crucial in developing the culture of innovation they aim to achieve, and that while it is a contest at the end of the day, *Trend Micro* take any breach of trust in the processes they have created very seriously: "*If anyone is operating in a non-trust worthy way, they would be very quickly picked up and told that this is not the way we work... if you aren't working in the Trend way, it is very clear and won't be tolerated either*." The KDM maintained that so long as solvers do not engage in these contests in an overly egotistical manner then the contest should run smoothly as there is inherent trust that exists within the community of *Trend Micro*.

4.2.3 Reciprocity

In contrast to the previous constructs, the perceived importance of reciprocity was not as influential. The KDM did outline how important reciprocity was between the solvers, and noted his surprise that in terms of engagement, the environment generated by the contest setting was non-self-focused: "*This might go against your research, but I was not expecting this place to be as not kind of self-focused first*". This was made evident when solvers from various teams were willing to help each other through several workshops organised by *Trend Micro* (further explored in Section 4.5). S1 outlined that: "*I mean, I am doing this every day with work. So what I am doing is offering my knowledge, like I can do it*."

However outside these workshops, reciprocity did not seem to feature as much, with interviewees describing how they would prefer to work on their own proposals before either sharing their concepts, or opening themselves up further for questions regarding their approach.

4.2.4 Self-Identity

As outlined previously, the contest setting affords solvers the platform to address issues that have been on their minds for quite some time. As the KDM explained: "*Some people had worked here for 10 years, and they never really had a vehicle to say* "For God's sake, why can't we switch off all the lights at night?" *An awful lot of green stuff came through actually last year. So I think it was an opportunity for everyone to get it out of their system*". S2 agreed with this point, revealing that "*We don't have any tool to assess who is good with what. So if you don't know politics, you might spend three years in the shadows until your project comes up, if it ever comes up.*" S1 also outlined that "*I was thinking about this (idea) in 2009. I presented it here in 2014 as it was the best environment to apply it*".

While some of these offerings missed the mark in terms of the overall potential this opportunity provided them, other solvers used it to develop composite ideas that had been on their mind for quite a while. S2 emphasised that self-identifying with the contest initiative made him stay with *Trend Micro* as prior to the contest, he was not being intellectually stimulated or driven by his role: "*I was getting really bored*

easily... I was at the point after four years in sales; I was close to looking for somewhere else... I couldn't see anywhere to go from where I was back then." Once the contest was announced to the department, S2 immediately viewed it as a way of not only challenging himself to push his ideas further to senior management, but also to see to what extent his ideas could progress to: "*I wanted to challenge myself, see if I could do something else within the company*".

Self-identifying with the innovation contest allowed the solvers to pursue their own project ambitions in a setting where internal political influences would be a minimal. Self-identifying with the concept also superseded the potential for monetary compensation in some cases. As S2 states, "*I really, as I said before, wanted to see that for me to progress within the company and see one idea. Purely working on that idea, and different angles, no politics, how far could it go. Money wise? Pssssh, I don't care to be honest*." By developing the idea, delivering the submission and winning the contest in its first year, S2 achieved what he set out to do in the first place which was to gain visibility from senior staff: "*You don't go there for the money... That's not the point. That is not me lying, to make a point about money; it is purely about you, and what you can do.*"

S2 revealed his self-identity to be driven by three primary motivations:

i. Professionally

To achieve a career, reputation and recognition from his superiors he would have otherwise been unable to obtain: "*Career, show yourself, show what you can do, just following your ethics working on the project.*"

ii. Personally

To achieve the recognition among his peers to showcase his talents and skill sets. S2 made specific reference to the fact that although he may have been working with these people for years and they know him on a personal level, they had no idea what he was valuable for or his conviction when dealing with such projects: "*People started to know me. I mean years after they know me, they didn't know what I was valuable for. On a personal level that was pretty much what I used it for.*"

iii. *Trend Micro*

The innovation contest was the first time something like this had been attempted and S2 wanted it to succeed: "*That was the first time we did that as an office here, I had been here five years, it was worth winning. So I wanted to show that this thing could work. I didn't know if it was going to work, but I wanted to see the two hundred other people who weren't shortlisted, that next year want to go because of what happened (to the winners).*" S2 believed it was worth winning and wanted to show that the concept could work, going so far as to say "*on an employee level, it gave me faith again in the company*." As a result of winning, S2 now often talks to senior management within the office on a weekly basis: "*Talking to the big guys from the office, which I can do now on a weekly basis for whatever I want for projects*."

4.2.5 Shared Language

Along with the construct of reciprocity, shared language was not one that was perceived to be wholly important, though the interviewees did regard it as being necessary. The KDM outlined that "*we have almost 250 people here (in Trend Micro)... We have lots of different nationalities, languages. Our main population is sales. We also have a lot of technical support, and then we have support functions like IS, HR, legal, finance, customer operations etc...*" Given that certain teams during the idea generation phase were grouped together with senior management based on their initial idea suggestions, it was not uncommon for solvers based in different functional areas to be working together within the contest setting. This resulted in teams being subsequently formed with different systems, terminologies, national languages etc. where confusion often occurred. S2 outlined that "*the more we went into the competition, the more it was getting your stuff right, getting the urgency right because we have technical, financial, where different people that were winning and wanted to hear different stuff*".

S2 argued that this diversity is actually the strength of such competitions, outlining that "*for me, different languages as we see every day here in Trend... I think something like 38 nationalities, that is something that makes the company stronger...*

it's not a flaw, it's something you can take more out of, you can learn from that... different languages mean different cultures and perspectives on things as well, so it's always good to share that together." S2 believed that as long as the solvers are capable of putting their requirements forward in a structured and detailed manner, shared language can be achieved: "*As long as you can move forward and get the message across, and know who is doing what, you know they know their place, and what is on their task list, as long as you put that across you can work on your project and get more out of it*."

4.2.6 Shared Vision

S2 stated that before submitting his ideas, he waited until the last minute of the deadline revising his propositions, making sure they were correct and what he wanted to convey. This was necessary as the vision solvers present to senior management need to be able to sell the potential for the idea. In doing so, there is a lot of learning required for the solvers, as the material they present are quite often case proposals. If a solver had never completed one previously, coming from different projects with new ideas, the structure was difficult to follow which required "*a bit of touch and go to get it right*" according to S2. S1 outlined his preference towards an open submission format, one where solvers have more time to expand their ideas and are capable of relaxing their thinking before submitting something to the judging panel in writing. S1 argued that "*First of all it was more like if you managed to get your story across and your big potential, that's enough. There is still a lot to do, but it's a start*".

On developing his idea, S2 identified a departmental subset of colleagues he wished to share his vision with. Once he had received and implemented the feedback from his colleagues, he identified that the next step in progressing his idea was in sharing it with the board for further feedback and direction. Upon winning the contest, S2 was invited to Taiwan and the U.S. S2 stated "*I would prefer to have that than the 2k (prize)*".

4.3 Impacts of Social Capital Constructs

This section outlines the impacts of the various social capital constructs as described by the interviewees.

4.3.1 Social Ties

The overall impact of developing and utilising social ties during the innovation contest was deemed to be significantly positive from all interviewees. Once ideas were submitted to senior management, the ideas that showed significant promise were identified and management allocated solvers that exhibited equal interests into teams. For the second year of the contest, of the ten submissions entered eight were from teams and the remaining two were individual.

The KDM outlined that social ties "*ended up being huge*" for *Trend Micro's* desire to foster a culture that promoted collaborative innovation within the organisation. The KDM argued that the solvers who embraced the innovation contest fully and ran with it were the ones who rose socially within the company. This viewpoint was embraced by both solvers interviewed. The contests were viewed as a means of promoting themselves within the company, both by what they could offer, as well as being able to develop relationships they would otherwise have not have been able to forge.

S1 explained how he was able to develop a relationship with a co-worker from Munich for his project, a point mirrored by S2 who outlined that through engaging in the contest, he was able to develop social ties with peers from the "*Philippines, guys in Taiwan, guys in South America, guys in Dublin here*". Developing these relationships highlighted certain issues during the idea generation process, however. For example, S1 was the sole representative of his project from the Cork office of *Trend Micro* and revealed to be under particular stress when it came to idea formulation and presentation. In contrast, S2 had members of his team within the office. This allowed him to develop precise deliverables on what was required to develop his idea, who he needed to approach and how to go about getting the assistance he required. S2 described how his existing social ties were beneficial when identifying who he needed to collaborate with: "*For the last six years I am talking to them on the floor every day.*"

S2 had entered two ideas in the first year of the contest setting. The first idea was a concept that was a result of his formation alone, with the second idea facilitating the input of another solver. However, for both the two ideas that were developed, he

sought assistance and guidance from both internal and external sources of social ties that he had fostered both personally and professionally. As such, having a previous relationship with the solvers was of an additional advantage in terms of the social capital he had already developed during his time in *Trend Micro*. As S2 described: "*So that's what I mean, all this social stuff that I have built up for the last six years, I am now reaping the rewards.*"

4.3.2 Trust

The element of trust also played an important deciding factor for the solvers' decision to engage in the contest. Interviewees noted that not only was trust required between solvers throughout the idea generation phase, but solvers also needed to develop their trust towards the overall purpose of the contest being developed by *Trend Micro*.

The solvers revealed that they viewed the innovation contest as a means of realising ideas that were borne of personal frustrations. Often these frustrations were towards particular work processes or procedures experienced during their time working for *Trend Micro*. This was acknowledged by the KDM: "*So we're not perfect from a process, and from an information perspective. Often the ideas will come from such deep, personal frustrations as to how we operate, that we are not as slick or scientific to a certain extent as we should be.*" As a result of such personal investment into an idea, interviewees stressed that they needed to trust, and buy into what the ultimate goal for the winning ideas was to be. The solvers revealed the necessity of trusting management so they are not worried about their winning idea being shelved a few days after the contest ends. S1 explained that "*So, one other question is what happened with the idea? So what happened? You win the contest and where has it gone? As I said, I was thinking about this idea in 2009, I presented it here... I don't really know how these terms and conditions work internally...*"

Another concern raised was the issue of office politics. S2 stated the reason he chose to submit his idea, was that he wanted to avoid such politics, to develop an idea that was purely his own and to see how far he could develop it through this setting. S2 explained that: "*It was the first time something like this happened in Cork, so my main motivation was "I'm not doing it if was going to involve politics, I have my*

ethics". So if I wanted to get somewhere, I would rather take two more years to get there where I can look at myself in the mirror, than go the politics route, be there two years earlier, but hate myself." The idea in question was ultimately successful and the solver in question has since used it to promote himself to his peers and more importantly to him, to higher management. As a result, the trust the solver placed in the process was more important than the prize on offer.

S2 further described how he had entered two submissions to the contest, one being an individual effort, the second where he worked with colleagues. For the individual submission, the interviewee stressed that he would not share his ideas, not even with the mentors that *Trend Micro* provided, until he had completed his own due diligence on its feasibility and concept. S2 argued strongly that "*Before I had anything really, there was no way I was going to talk to someone, or show anything*."

Trust also played a role when solvers are choosing their teams to further develop their concepts. Interviewees suggest such trust can be born of social ties currently in existence. For example, S2 described how within a project he had developed by himself, he identified and picked people he knew were capable of delivering what he required, as he had previously known them, and as a result, trusted the standard of work they would deliver: "*I picked up these guys because I knew they were good at this area or this area, so I delegate work to them, work with them, I trusted them no problem*." This proposal proceeded to win the innovation contest, suggesting that trust serves to heighten the quality of the overall submitted proposal.

4.3.3 Reciprocity

The levels of reciprocity exhibited during the innovation contest held by *Trend Micro* were quite strong. This indicated that solvers had no issue in sharing their ideas, or sourcing others within the office in the hopes they might develop their ideas further. Indeed after winning the first contest, S2 welcomed the role of offering advice to his peers who were competing the following year. S2 outlined how other solvers often approach his desk when they have ideas that require a technical point of view they might not necessarily have to discuss its development: "*No, no problem for that (sharing ideas).. So that is why I am a kind of unofficial point of contact... even if it's*

not in my scope, they know I know about it so they will come to me." S1 also stated that he would like his colleagues to know that he was successful in submitting a winning idea so that if they want something for their future contest ideas, they could turn to him for help.

The KDM suggested that the level of reciprocity depends on the actual reward that is available to the solvers. As mentioned previously, at the time of data gathering *Trend Micro* was in its second year of the innovation contest initiative. For the first year, there was a prize fund of €2,000 available to the winning entries. For the second year of the initiative however, the decision was made to change from a monetary prize, to a developmental trip which was to be left to the decision of the solvers. The KDM suggested potential locations such as the United States or Asia given *Trend Micro* have centres in those locations. The change of reward available put "*a different spin*" on things, increasing the amount of reciprocity experienced. The KDM suggested that if there was a defined location on offer, then the solvers' natural competition would come out a lot more. However, due to the solvers' ability to drive their own prize, they didn't know what they were ultimately competing for which increased the reciprocity.

As a side effect however, this change in prize also saw a drastic change to the amount of entries into the second round of the contest. The KDM highlighted that in the first year of the contests' implementation there was a functional aspect to the process, with entries from the sales department being quite high due to the monetary reward on offer. When that was changed in the second year, the number of entries from their sales department fell significantly. The KDM believed that this was due to the competitive nature of the people in sales, who are always more focused with monetary commission and prizes.

Another possible reason for the enhanced reciprocity in the second year might have been adopting the mechanism of the lean start up work shop (described further in Section 4.5.3). The impact of reciprocity in this setting encouraged solvers to share and discuss their ideas more freely, exposing them to critical and stimulating thinking they would not have achieved otherwise. As the KDM recalled: "*I think that was what was emotional for everyone who was in it, genuinely, because they couldn't believe there*

was such a lack of protection and there was so much reciprocity going on in the room."

S1 described this contest evolution over the two years, outlining that in the first iteration the levels of reciprocity were not as high due to the belief that this was "*more my project, my idea, my money, win.*" In the second year of the contest, *Trend Micro* facilitated more trainings and meetings with all the solvers through several workshops where the main purpose of the sessions was to focus on sharing ideas. S1 described how reciprocity impacted the evolution of one of his ideas from one year to the other.

Initially, the solver sought to create a tool to streamline processes, but though collaboration with others, he soon saw increased potential by changing the architecture from a project to a framework. S1 realised he did not have the required knowledge to see this through to completion, so he reached out to colleagues he knew would be able to accentuate his vision with their own skill sets: "*That means we are creating a framework and other people can contribute with their own mini problems. So then, maybe I don't have the knowledge, but if (someone else) knows how to program, please do it and it will improve*!"

This strategy was followed by the different teams working in the innovation contest by *Trend Micro*. The advantage to this, according to S1, is that you are then contacting people from different back grounds and experiences who are able to approach challenges from their own respective points of view. As S1 described: "*More points of view always with more people... So every time I did it, I was talking to people about the idea to say "What do you think?" from technical people that know and not technically minded people.*"

By engaging in reciprocal activities, S1 revealed that it gave the community a sense of being "*solution consultants*" when helping their peers: "*And that is the key. I know it is possible, let's search for someone that can help us.... That's important*." Due to this heightened reciprocity, successful solvers also achieved a heightened reputation among their peers. S1 reflected: "*Now that I won the previous contest, there are people coming to my desk when they have ideas... I would like people to know that I did it. If they want something, they can come to me*".

These findings revealed reciprocity to be a main element of interest to *Trend Micro,* by both management and the solvers. The KDM outlined that management sought to promote reciprocity of ideas within the contest, to the point where it becomes embedded in the organisational culture. The KDM was optimistic, saying that he does not view many challenges per se to evolving the structure of what they have created, more so he is looking forward to the opportunities that are achievable.

4.3.4 Self-Identity

There were various impacts of self-identification experienced by the solvers interviewed, with all being in agreement that the personal development experienced throughout the contest was of huge benefit. As the KDM reflected: "*the perception of them will never be the same again actually afterwards. So I think it is that rising up, or stepping up, stepping out is probably the key benefit.*"

The prospect of recognition was perceived to be important to solvers during the idea generation phase, however pride was also a powerful method of self-identification. S1 revealed that he did not necessarily embrace the attention of the recognition that came with winning the contest. S1 outlined he would have preferred a smaller gesture from the contest organisers instead of the outdoor event ceremony where the winners are unveiled in front of their peers: "O*n the other hand I don't like recognition. In one way, yes, it's nice for the managers to say "That's awesome", but these public outdoor events...*"

S1 outlined how he self-identified with the innovation contest as he enjoyed feeling challenged: "*I like to think, I need data*". S1 explained how he saw this contest as an opportunity to showcase his creative thinking. Solvers became personally and intrinsically involved with the structure of the contest *Trend Micro* chose to implement as they were given complete autonomy regarding the areas they wished to pursue. S1 viewed the opportunity to develop his idea as the primary reward, and it was this sense of self accomplishment of having your idea selected that ultimately drove him: "*If you want my idea I would be proud that this is going farther. If you have recognition like* "Oh, well done"*, yeah, it's nice, but if you can say* "Yeah, I did this" *every time you are going to sleep (its better).*"

Similarly, S2 also self-identified with the contest as it provided a means of voicing concerns or ideas employees may have been privately working on previously. S2 recalls that: "*I didn't want to do it first, then I thought I had nothing to lose, you might as well put your ideas and in all fairness, the ideas that I had were those that came to my mind in the past year and never worked on them. I just recalled them, put them on paper and tried to articulate a bit.*"

4.3.5 Shared Language

Shared language, while deemed to be initially important given the diversity present in *Trend Micro*, did not have an overall impact on the contest. The KDM explained the layout of the offices at *Trend Micro* and how shared language is developed internally: "*...so all this side is sales and all the latter are technical support, and the support functions are around the side. So I think each function will have its own terminology*." Each functional unit was kept independent of each other, where they each developed their own form of language pursuant to the processes being undertaken. S2 explained that when he was collaborating with his peers, "*all the topics, all the systems, all the terminology, all this kind of stuff was new*."

Developing a shared language requires solvers to bring a heightened level of clarity and understanding to what they are attempting to develop. Once this is achieved, it should not have too great an impact on the overall process, according to S2:"*I was working on my projects with someone German, with someone from Eastern Europe, with someone from Spain, at the end of the day even if we all have our flaws in the languages; we know what we want to put across, the message and stuff that is fine as long as we do that*."

Shared language therefore did not seem to have a large impact between solvers as the interviewees felt that their ideas and conceptualisations could be understood regardless.

4.3.6 Shared Vision

The KDM revealed that once solvers developed a shared vision, the quality of ideas being submitted increased. For the second year of the contest, the KDM admitted the

quantity of idea submissions were much lower, with 45 entries, while the quality was "*tremendously higher*". The KDM highlighted that the amount of "*Weed*" ideas (further described in Section 4.5.6) submitted in the second year were completely reduced, while conversely, the amount of high quality "*Seeds*" and "*Blue Skies*" ideas increased. Once the standard of ideas required had been identified by the solvers, the levels of engagement in the workshops increased to the point where solvers were "*almost self-censoring to an extent as they knew the bar was high*" according to the KDM.

This is echoed by S1, who argued that such self-censorship was evidenced when solvers from different functional areas addressed issues that existed for some time in separate departments. S1 explained his approach to a solution being developed: "*No one was thinking in twenty five years of technical support about this kind of automation. Even though we have programmers, we have everything, but they are not working in technical support. So, I am working in technical support, I know how to program, so I say "*Ok, why don't we apply these kinds of things here that we need*"... I think that is why people can be involved in this kind of idea, because they know something can be done in a different way*."

The interviewees agreed that achieving a shared vision between all the parties involved would ultimately serve to enhance the standard and the overall quality of the proposal being submitted. S2 explained that "*as long as you can move forward and get the message across and make sure who is doing what, you know they know their place, and what is on their task list, as long as you put that across you can work on your project and get more out of it.*" S2 also believed that having a shared vision makes the process more interesting. S2 reflected that in order to ensure a shared vision during the contest, it necessitated several phases including:

i. Gathering the requirements needed
ii. Identifying and collaborating with peers to make the submission stronger
iii. Articulating their proposals to several C level executives

Once the business case was accepted by the C levels, the vision was then able to progress and be developed further. These finding suggest that once solvers develop a

clear and defined vision for what they want to achieve together as a group, it maximises the overall potential of the project.

4.4 Mechanisms Used to Facilitate Social Capital Constructs

This section outlines the mechanisms used to facilitate the various social capital constructs as described by the interviewees.

4.4.1 Social Ties

The initial mechanism implemented for the innovation contest involved the setting up of designated areas for solvers to congregate, voice suggestions, share ideas, and provide feedback to one another. The first initiative to develop social ties involved setting up various whiteboards near the workers' canteen. Senior management would challenge workers by writing various questions on these whiteboards, such as "*Does it bother anyone that you can't find information on legacy products*?" The KDM reflected on how the process developed both strong and weak ties between solvers who would not have known each other previously and how it generated positive results: "*It just created a huge buzz. People who didn't even know each other necessarily previous to then were actually having really lively, animated conversations, about not just improving things that bothered them, about actually completely redesigning.*"

Once solvers established who was interested in their ideas, or the ideas themselves that were to be conceptualised, they would then approach the other solvers directly, creating social relations and ties. This process proved successful, with S2 outlining how he identified other solvers he wanted to help develop his idea, and how contact was subsequently made with them: "*That's what I did back then.*"Ok, this guy is responsible for that, let's get in touch with him*" and you can, if you find a good person... you can deal with him straight away".* This inter-departmental transparency increased to the point where employees were suddenly comfortable reaching out to colleagues in different branches to promote their ideas and get feedback on how to make it a success going forward.

Trend Micro also created what was affectionately known as "*The Greenhouse*". This was an area primarily for the development of innovative ideas that was located away from the main working area. This area consisted of various creative thinking areas far removed from a typical work environment, each of which were partitioned from each other. The Greenhouse area also had various whiteboards on hand for employees to expand and discuss their concepts in more detail. Solvers were often encouraged to visit the Greenhouse by senior management in further attempts to nurture the culture of collaboration and innovation they sought. Solvers would begin to flesh out their ideas on the whiteboards located near the canteen. Once groups of employees emerged with similar shared visions to the problems or the ideas being addressed, they then relocated themselves towards the Greenhouse to discuss the concepts further in more detail. As the KDM explained: "*So for that time period, it started over here (by the whiteboards) and when people wanted to get together and thrash things out, they went upstairs.*"

During the first contest, there were hundreds of ideas being submitted to the whiteboards. As a result, for the second year of the contest, the decision was taken to remove the whiteboards from their previous location near the canteen. It is worth noting again that in the second year of the contest implementation, solver submissions were significantly lower. The second iteration of the contest also saw Greenhouse being halved with additional chairs being relocated to the work floor in the hopes that it might promote further engagement for the development of social ties. This was not to be the case, with the KDM admitting the failings of the Greenhouse relocation scheme: "*We halved Greenhouse, so what you are seeing up there right now is half the number of plants, and half the number of chairs. We kind of moved them around, so we have some chairs here over in the far corner there. That didn't work.*" There are various reasons as to why the Greenhouse initiative failed in its second year. Firstly, the creative workspace had already been established away from the work environment, and attempting to bring that element back to the work floor might not have been well received by the solvers. Secondly, the newly established area was created outside the office of the Technical Support Director, which perhaps made solvers uncomfortable when trying to collaborate on ideas.

To counteract the innovation Greenhouse being scaled back, *Trend Micro* also implemented various lean start-up session workshops, where teams developing ideas were able to pitch their ideas to others looking for feedback, advice and creative suggestions (further described in Section 4.1.3).

4.4.2 Trust

Trend Micro implements various frameworks for the personal and professional development of their staff. The KDM described one in particular as being the "*3C's, I and T* (*Customer, Change, Collaboration, Innovation, and Trustworthiness*) *model*". As a result, according to the KDM, many aspects involving the question of trust are "*intrinsically part of the Trend Micro fabric*".

An important mechanism used for trust was not only the social ties developed among the solvers (outlined previously), but also the relationship that existed between the solvers and senior management. As this was the first time an initiative like this had been operationalised in the Cork offices, the solvers interviewed state that they depended on their guidance and advice for achieving success. S2 described how during the process it was his first time speaking to major stakeholders working in the office in all his previous years working there. The relationship was described by S2 as being a "*help me help you*" process: senior management wished to develop projects of superior quality to showcase the innovation potential for the Cork office, while also getting the best out of the solvers.

The KDM described how he helped S1 with his idea through this process by putting him into contact with the CIO: "*Collaboration becomes more either around the centre, or even external. So I would have put for instance one of them in touch with our CIO, (S1) actually*." The KDM described that in doing so, it inspired S1 with further confidence to pursue potential avenues for idea generation outside of the traditional *Trend Micro* setting. This represented a synergistic relationship based on mutual gain. The senior staff members invested in making the project a success, while the solvers competed for the prize allocation at stake. S2 outlined that "*they have to help me, or redirect me to someone that can help me. So for me it's a win-win for everyone. I need*

to show off what I can do, I need to show off to the higher guys what they can do here as a big office."

S1 also described how simple acts like sharing ideas thr0ugh email, or how solvers responded to invitations to collaborate as examples of how trust develops between solvers. S1 revealed that while such acts could be used to identify potential collaborators, it could also be used to identify peers acting egotistically. S1 explained that when discussing ideas prior to their development, observing how your peers behave and how they subsequently present collaborated material may ultimately impact the decision of whether you intend to work with them at all in the future.

4.4.3 Reciprocity

The main mechanism for reciprocity employed by *Trend Micro* during the innovation contests was the lean start up workshops. These workshops allowed the different groups who were competing in the contest to showcase their progress, while also asking for suggestions for further development. As the KDM noted "*in that lean start up session, I mean some people were saying* "I am actually really struggling with this"*, so then that would have been when (S1) or someone else from a completely different part of the Trend world was giving them real nuggets of stuff to think about*."

According to the KDM, the reciprocal environment created by the workshops genuinely surprised him due to the lack of protection of ideas being developed and how there was no competition going on in the room. The KDM attributed this to the culture they are trying to develop, believing that the solvers are primarily driven by the success of *Trend Micro*, with their own success coming shortly thereafter. These work shops were positively received by the solvers, with the KDM explaining that "*anyone that went through it raved about it. What amazed me the most was the spirit of collaboration in there... I think that was what was emotional for everyone who was in it, genuinely, because they couldn't believe there was such a lack of protection and there was so much reciprocity going on in the room. I mean people were just stunned that there was no competition going on in the room*."

As outlined previously, in the first year of the innovation contest, solvers were also encouraged to draw up and develop ideas in the open spaces where whiteboards were

placed. As such, the idea generation phase was considerably more open than the second version given the decision to remove the whiteboards and halve the innovation greenhouse facility. However, the KDM noted that there was a distinct drop in reciprocity when the presentation dates were approaching in the first year. Again, the main difference between the two contests was for the first year, the prize was a lump sum of €2,000, whereas the prize for the second concert was to an extent vaguer in that it selected by the winning solver. The prospect of monetary reward may have impacted the levels of reciprocity in the first year, as during the same stage for the second contest, there was no shortage of reciprocity.

4.4.4 Self-Identity

The KDM believed a main mechanism self-identification is the opportunity for solvers to engage with top management and effectively put themselves on their radar. Besides the reward for winning the contest (which in some cases was not viewed as being the primary driver), the providing the opportunity to change roles was another mechanism to emerge that increased the levels of solver self-identity. This was realised by solvers having to submit and present their ideas to an executive committee. Being able to present a winning solution to senior management through such a mechanism was described as being "*a defining moment*" by the KDM. The KDM highlighted the case of S2 who, after winning the previous contest, is now viewed as an important resource by staff: "*Three finalists got to move roles, they got to present in front of the executive committee, everyone knows them now, they are viewed as being resources to go and ask stuff, and they are attending off site events like IT in Cork.*"

From such exposure, the second method for solvers to achieve a level of self-identification involved the development of their own reputation within the setting. The KDM described how their increased reputation was a result of "*the qualities they exhibited, the confidence they grew in themselves, the doors that were opened by them*" throughout the process.

Another mechanism of how solvers self-identify involved the prospect of autonomy. In pursuing a proposal to be submitted, solvers were free to draw upon whatever they wanted as the basis for their idea. Submissions ranged from various corporate social

responsibility initiatives, to charities and gaming. The KDM also reflected on how solvers achieved such self-identification: "*there is a genuine desire to put forward stuff, like I genuinely, I can say this hand on heart, I think anyone who is in Greenhouse, has got company first, and themselves are a very close second*."

4.4.5 Shared Language

Achieving a shared language involved senior management providing clarity as to what was expected throughout the contest phase to ensure solvers remained on course for their objectives. The importance of this resulted in solvers having a much clearer understanding as to what *Trend Micro* were ultimately looking for, as well as how they could go about and achieve it. As the KDM explains "*I think that is my role to drive leadership teams to distil it down and down and down so people are really clear, as are we, as to functionally what we are after to build up then to a centre of excellence*."

Beyond this, the interviewees felt that the concept of shared language did not seem to necessitate dedicated mechanisms in order to increase the knowledge exchange between solvers as the interviewees felt that their ideas and conceptualisations could be understood regardless.

4.4.6 Shared Vision

A shared vision between the solvers was firstly facilitated during the idea generation phase within both the whiteboard and the Greenhouse area, while a shared vision between the solvers and *Trend Micro* was achieved through the first round submission of the proposal. The ideas submitted to *Trend Micro* were divided by the KDM into three distinct categories. These ideas were based on the overall potential of the ideas being submitted.

i. *Weeds*-Ideas that were mundane, generic, and overall, unimportant trivial suggestions that workers put forward merely in the hopes of improving working conditions. These ideas were mainly personal issues employees had with the day to day operations of the office and saw the contest as a platform to voice their opinions on subjects such as new vending machines, turning the lights off at night etc...

ii. *Seeds*-Ideas showed signs of potential that could be further developed. However, these ideas ultimately lacked a proof of concept validation required to implement the initiative.
iii. *Blue Skies*-Ideas were the strongest and, in essence, game changers. The ideas that were deemed to fall into this category were considered to be highly innovative that could be realistically implemented by *Trend Micro*.

Another mechanism of achieving a shared vision involved senior management creating teams of solvers. Solvers were placed in teams if they had exhibited similar ideas on the whiteboards, or if they were pursuing ideas in the same areas as one another. Groups that were formed as a result of this approach brought solvers from different functional areas within *Trend Micro* together facilitating a more in depth analysis to their proof of concept analysis. The KDM explained "*we combined for instance a person from tech support with a person from finance.*" S2 noted how such an approach had an impact on the overall quality of their proposal "t*he good thing was to find a good approach for all of them, tell the same story but put a bit of technical for this guy, put a bit of finance for this one, and so on.*"

In terms of developing the idea, S2 explained how groups of solvers were also given a template they could follow to describe their structure, their proposal, the eventual impact on stakeholders etc... Such a template was advantageous to projects that involved processes or ideas *Trend Micro* were already pursuing. S2 described that the main task for the idea was to ultimately show how it could become bigger by articulating the details clearly, while illustrating the scalability of the project. Once this was achieved, the solvers were required to develop further business cases to argue the merits of their proposal incorporating various technical and economic impacts in order to give a complete picture for what was being submitted.

Initially, for the first submission, S2 felt like the proposal he was describing to the C level board members was more akin to that of a story, pointing toward the overall potential to what was being conceptualised. S2 describes that "*I felt like the story I told to the C level was more about showing them potential. I couldn't show them a proper split, like "*If we do that, if we put that much money, we will get this... our cost will be x." *That was not tangible yet because of the idea. The potential was selling the story.*"

S2 revealed that he knew the C level members were the jury; however he was uncertain as to what exactly they were looking for in the proposals to be submitted. Senior management thus mentored him in the formulation of his proposal and advised him to adapt his story accordingly. Solvers also were required to deliver a primary presentation to an executive committee. This served to ensure the vision being pursued by the solvers was one that was shared by *Trend Micro*.

4.5 Key Outcomes from Pilot Study

The purpose of this pilot study had several mandates:

i. To validate the importance of social capital within an innovation contest, and therein, the need to pursue this thesis
ii. To validate social capital theory as an appropriate theoretical lens to collect data for this thesis
iii. To further refine the interview protocol before its implementation in targeted case studies outlined in Chapters 5 and 6
iv. To provisionally test the coding validity of social capital
    - Impacts of Social Capital
    - Mechanisms of Social Capital
v. To determine whether the research questions were being successfully answered through this line of inquiry

Firstly, this investigation was the first to explore the nature of social capital influence within an innovation contest setting, which therefore demanded the importance of this concept be firstly validated. *Trend Micro* provided an opportune setting with which to test the importance of social capital. As illustrated in Table 4-1, there was no social capital construct deemed to be unimportant by the three participants interviewed. On the contrary, each interviewee agreed that four of the six social capital constructs were considered to be of particular importance (social ties, trust, self-identity and shared vision). The remaining two social capital constructs (reciprocity and shared language) bore disagreement between the interviewees of its overall importance. While no interviewee labelled these constructs as being un-important, these constructs were deemed to be more of a necessity rather than playing a focal role in the implementation

of an innovation contest. These findings also serve to justify the need for this investigation, given that it was the first exploration of social capital within this setting. Furthermore, due to this revelation of social capital having an important role within innovation contests, the subsequent coding strategy for the case studies was amended to focus solely on the impacts and the mechanisms of social capital. The questions regarding social capital importance however remained within the interview protocol for the case studies as they invoked a rich narrative around these constructs.

Secondly, social capital was also validated as being an appropriate mechanism by which to explore the innovation contest domain. By exploring the six distinct social capital constructs from the perspectives of the interviewees, each construct revealed a compelling story as to how it bears influence on the overall process. The data gathered successfully revealed relationships (winning solvers making themselves available for their peers to provide guidance on their submissions), dependencies (solvers on the KDMs) and correlations (eliminating the financial reward resulting in a lower amount of submission entries) that would otherwise not have been found by consulting existing literature. These key insights further bear weight for the justification of selecting social capital.

Thirdly, in terms of needing to refine the interview protocol, the interviewees answered each question thoughtfully, with a clarity that demonstrated immediate recognition as to what was being asked of them. The interviewees did not seek clarification nor an expanded explanation for any of the questions posed. While some of the emerging data did not end up being coded within the confines of the importance, impacts or mechanisms used to facilitate the social capital constructs, it nevertheless bore crucial insights into the contest process. As a result, the entirety of the data collected was used in some fashion to develop a deeper understanding of the innovation contest process within *Trend Micro*, how it was implemented and the overall outcomes. Therefore in contrast to Phase 0 (described in Chapter 3), Phase 1 resulted in no changes being made to the interview protocol.

Fourthly, this investigation sought to provide further rigor surrounding the coding strategy to be implemented within the subsequent case studies. The coding scheme (outlined in Chapter 3) produced descriptive, structured and concise insights into the

overall nature of social capital, along with its subsequent impacts and mechanisms. This provided the researcher with an in-depth appreciation to the roles the various social capital constructs play within the innovation contest setting. In particular, it revealed several key impacts, such as:

i. Allowing the solver to identify who best to consult with on developing their submission based on existing social ties
ii. Increasing the levels of solver self-promotion based on the trust that they will be recognised for their efforts by the contest organisers
iii. Increasing the levels of collaboration due to the presence of reciprocity
iv. Increasing the levels of solver satisfaction through self-identity
v. Heightening the levels of clarity by ensuring a shared language
vi. Increasing the quality of submissions due to ensuring shared vision

It also revealed a myriad of mechanisms used to facilitate social capital, such as:

i. The creation of designated innovation spaces to build social ties within projects
ii. Providing workshops to the solvers in order to promote reciprocity
iii. Exposure to various KDMs including the CIO to increase trust
iv. The potential of career progression to facilitate self-identity
v. Having KDMs promote and convey what is being expected of the solvers to develop a shared language
vi. Classifying ideas based on their potential (weeds, seeds and blue skies) to ensure a shared vision

This also serves to answer the fifth mandate listed above, which was to determine whether the research questions were being successfully answered during this investigation. The evidence collected verified that the research questions were extremely successful in stimulating engaging discussions, which provided detailed insights into the very nature of each social capital construct.

4.6 Chapter Conclusion

To investigate the linkage between innovation contest platforms and social capital, the core constructs of social capital were identified through an in depth literature review.

Previous research outlined in Chapter 2 indicated that the social capital dimensions bore equal importance in facilitating knowledge exchange; however social capital had not been previously explored in an innovation contest setting. This pilot study of *Trend Micro* was therefore an important step in the validation of the overall research objective in ascertaining whether social capital actually influences innovation contests in the first place. In doing so, the perspectives from both contest solvers and KDMs were investigated, with the findings revealing that both target groups acknowledged the influence of social capital in the innovation contest setting. In addition, by testing the interview protocol within a pilot study of Trend Micro, the research strategy sought to achieve an interview protocol with established rigor and reliability prior to embarking on the case study.

The findings further confirm that social capital does indeed influence how solvers engage and share information within such settings, however, not at the previously hypothesised abstract level. The interviewees argued that while some constructs of social capital such as self-identification and trust are of vital importance to the successful implementation of an innovation contest, other constructs such as reciprocity and shared language are not as important.

This chapter also served as a preliminary investigation into the viability of the three coding dimensions articulated previously in Chapter 3:

i. Perceived importance of social capital constructs
ii. The impacts of social capital constructs
iii. The mechanisms used to facilitate social capital constructs

Exploring the data through these focal points successfully created a rich narrative through which the understanding of social capital was increased significantly. Furthermore, this analysis served to provide enhanced validation to the interview protocol before collecting the case study data which will be further explored and addressed in Chapters 5 and 6.

With this confirmation of social capital importance, the next chapter builds on this research, investigating the role of social capital within various IT-enabled innovation contest platforms, while addressing the first research question of this study.

CHAPTER 5: FINDINGS PART 1- IMPACTS OF SOCIAL CAPITAL

5.1 Introduction

This chapter describes the first set of results from the case studies. As described previously in Chapter 3, the analysis identifies two types of IT-enabled innovation contest platforms (competitive markets and collaborative communities). One resembles an independently motivated solver community, while the other represents a high density network of collaborative solvers. As illustrated in the below sections, the impacts attributable to the various constructs of social capital can differ significantly.

Having validated the importance of social capital from Chapter 4, this chapter will outline the emergent themes from each social capital construct, and their resulting overall impact in both sets of platforms that have been identified. In doing so, this chapter will address research question one as outlined below:

"What are the impacts of social capital on innovation contest platforms?"

Section 5.2 addresses the impacts of the various social capital constructs within the competitive market platforms investigated, while Section 5.3 does likewise for the collaborative communities. Section 5.4 presents the comparative findings of both sets of platforms analysed, before Section 5.5 provides a chapter conclusion.

A summary of the findings in this chapter are illustrated below in Figures 5-1, 5-2, and 5-3.

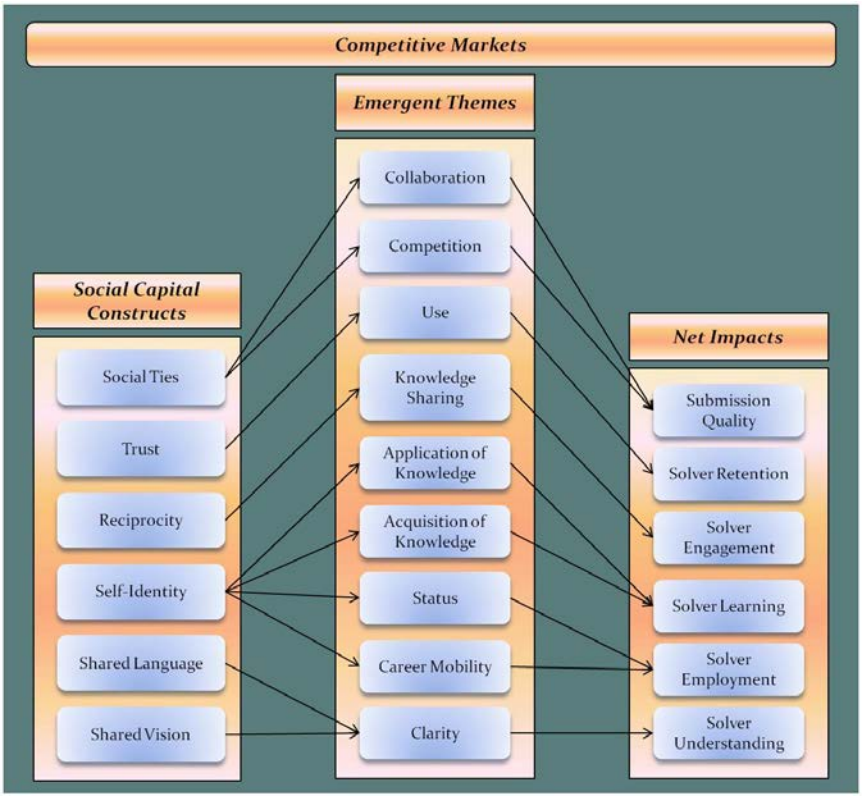


Figure 5-1: Social Capital Preliminary Model for Competitive Markets

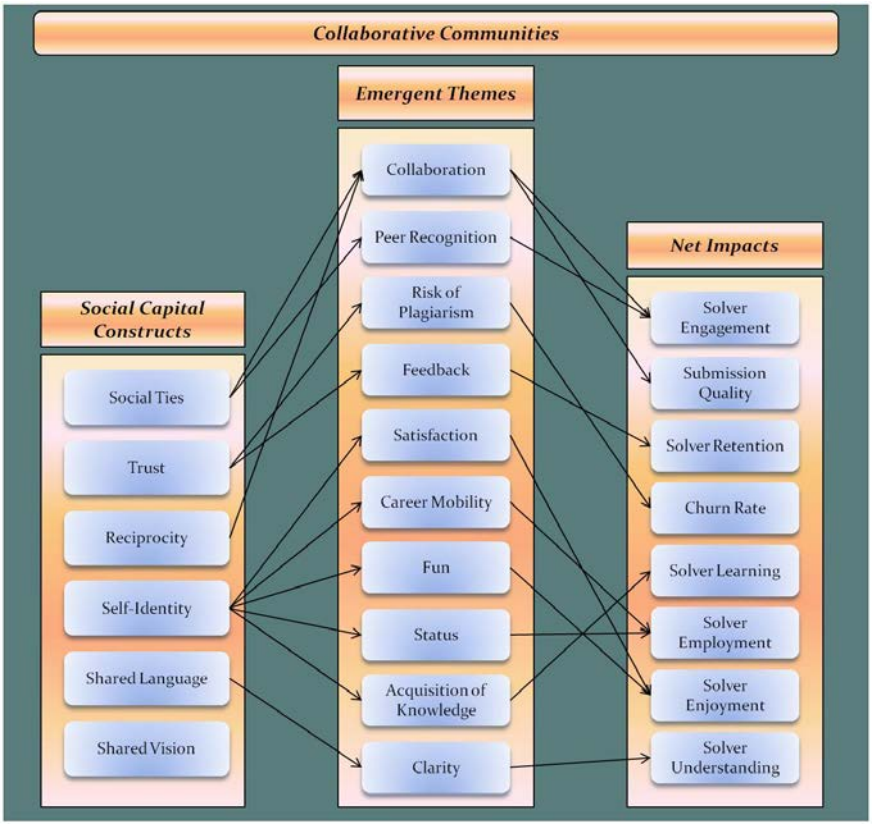


Figure 5-2: Social Capital Preliminary Model for Collaborative Communities

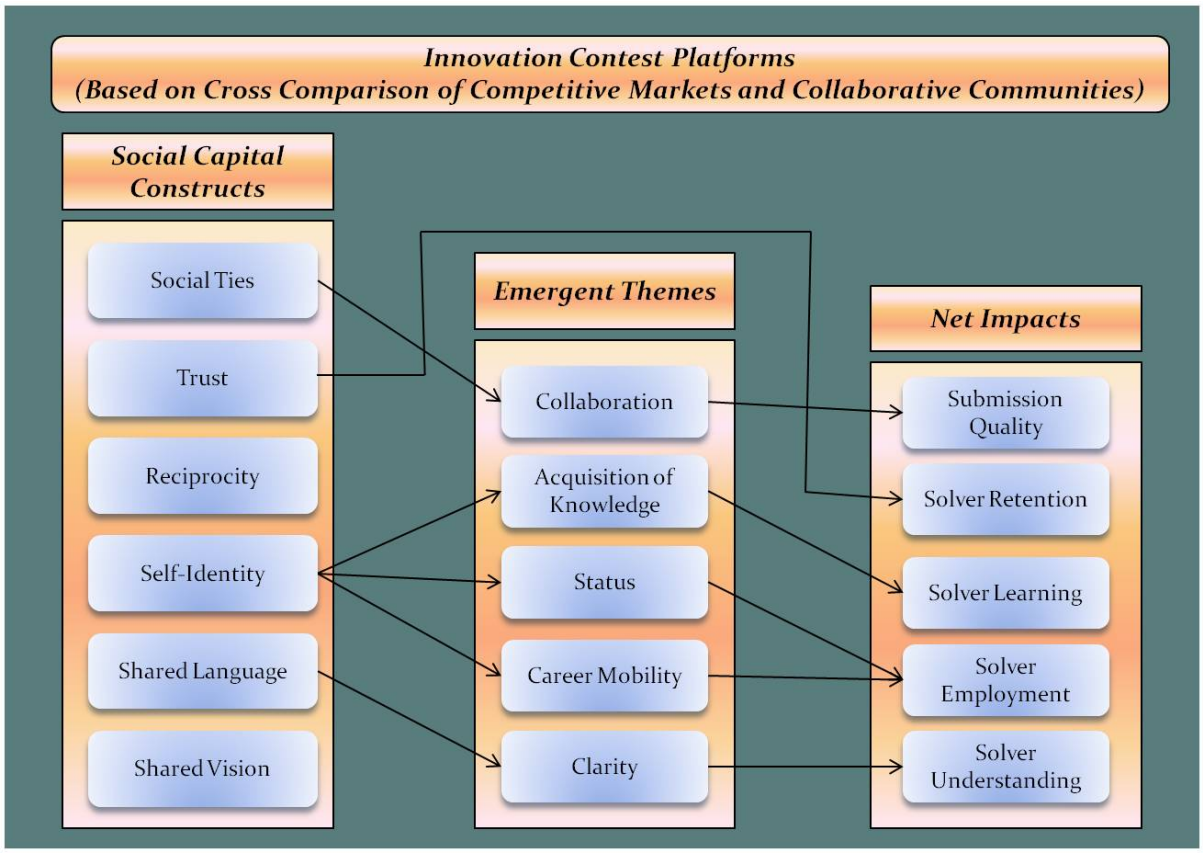


Figure 5-3: Social Capital Preliminary Model for Innovation Contest Platforms

5.2 Competitive Markets

This section explores the impacts of social capital experienced by competitive markets based on the analysis of the case study findings.

5.2.1 Social Ties

Social ties have previously been defined in Chapter 2 by Granovetter (1973) as being "*a combination of the amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services which characterise that tie*" (p.1361). This section will analyse the emergent themes of social ties from the data as evidenced throughout the six different competitive markets investigated in this study, before subsequently describing their net impact.

5.2.1.1 Emergent Themes

Two primary themes of social tie development emerged from the data, those being "*increased collaboration"* and "*increased competition*", as outlined below in Table 5-1. These themes argue the claim that "*social ties influence the submission quality generated by the solvers*", which will be further outlined subsequently.

Interestingly, these themes both represent the dichotomy of social tie formation in current literature, with strong social ties being synonymous with collaboration, and weak social ties being indicative of competition. It is surprising however that a desire for increased collaboration was encountered within the competitive market platforms investigated.

Increased Collaboration

Increasing the collaboration between solvers within competitive markets, and in turn developing the strength of the social ties between solvers was a surprising theme to emerge from the data. *Crowding*, *Innoget* and *Presans* highlighted the importance of facilitating a degree of collaborative co-creation between the solvers, which in turn was argued to promote social interactions within their communities. *Crowding* believed that it was important there should be some level of social tie development within the platforms as such relationships would serve to provide better results in the long term: "*I think it is important that you have some kind of co-creation because our point of view is that the co-creation creates better results.*"

This level of co-creation and development of strong social ties was also seen from *Innoget*, who described their community of having approximately 100,000 members. This community comprises of various disciplines, including the life sciences, chemistry, engineering and technology etc., with the members of each community "*willing to connect with new partners and do collaborative projects for innovation.*" This vast network of solvers willing to collaborate over various disciplines was argued by *Innoget* as being a primary component to how they increase the standard of submissions from their solvers. This level of collaboration is further achieved through the *Innoget* cloud they sell as a software-as-a-service tool. As *Innoget* explained: "*It is software we provide that is under licensing agreement... we connect this tool with*

our main marketplace which is Innoget.com and we facilitate connections and promotions and building the crowd." This cloud is a closed environment to real communities that are focused on different brands, being controlled by specific organisations. By using this service, it "*provides opportunities for collaboration*", which was argued to lead to a better quality of submissions.

Impact of Social Ties		
Theme	*Evidence from Study Participants*	*Claim*
Increased Collaboration	Crowding: "*I think it is important that you have some kind of co-creation because our point of view is that* ***co-creation creates better results***."	*Social ties influence the* ***submission quality of solutions*** *provided by the solvers.*
	Innoget: "*Today at Innoget,* ***we have more than 100,000 members worldwide****, covering various disciplines from the life science, chemistry, physical science, engineering technology etc...* ***willing to connect with new partners and do collaborative projects for innovation***."	
	Presans: (When discussing submission quality)"*If there is a group of experts... One of the motivations for them is that* ***they are going to get to know somebody else****, so sometimes...* ***it is necessary to have experts from different fields that are going to work together***."	
Increased Competition	CrowdANALYTIX: "*They are competing, and* ***competitors are always a great motivator of yielding better results***."	
	CrowdANALYTIX: "*It is purely competition driven... On our platform, every project is a data competition where* ***150 plus people compete against each other to deliver the best solutions***."	
	CrowdANALYTIX: *"(Solvers) get exposed to real life problems... And* ***they can do it competing with the best in the industry*** *on each of these competitions*."	
	InnoCentive: "*I would say that the ability for the particular solvers to solve a problem, for me, would be more important than if you are a solver to engage other people, so this is a very pragmatic thing.*"	

Table 5-1: Chain of Evidence for Social Ties Impacting Submission Quality within Competitive Markets

While both *Crowding* and *Innoget* explicitly indicated the impact of strong social ties on the submission quality, several interviewees including *InnoCentive*, *CrowdANALYTIX* and *NineSigma* revealed either previous attempts or future efforts to develop social ties into their platforms. For example, *InnoCentive* revealed that "*InnoCentive have struggled for years to create this in a team challenge, they struggled to allow people to work in teams... for InnoCentive it just hasn't worked*." The interviewee did not wish to discuss why it was that InnoCentive have failed to implement a successful approach to developing social ties among their solver community. *CrowdANALYTIX* also highlighted that developing these levels of social ties is very important to both the success and the growth of their platform, arguing that it is "*very important for the levels of success of a platform like this that there are connections between the people on the platform, beyond what we can just orchestrate*".

Similarly, *Presans* also describe strong social ties as being rudimentary to the wellbeing of the contest platform, specifically identifying them as a strong motivator as to why solvers look to compete in the first instance. *Presans* argue that: *"One of the motivations for (the solvers) is that they are going to get to know somebody else. Sometimes... it is necessary to have experts from different fields that are going to work together*." With this level of collaboration among selected experts in the industry under consideration, *Presans* also argue that the net benefit involves an enhanced submission quality being provided by the community.

These findings suggest that competitive markets should try supporting voluntary collaboration, such as making others' ideas visible, giving credit for contributions, and showing people how their contributions matter.

Increased Competition

The findings also reveal that weak social ties promote competition between the solvers of a platform. As previously explored in Chapter 2, weak social ties imply solvers to be less likely to be socially involved with one another in comparison to their counterparts who exhibit strong social ties. Weak social ties were identified to be prevalent in several platforms including *Crowding*, *InnoCentive*, *Presans* and *InnoGet*.

CrowdANALYTIX in particular however argued that weak social ties resulted in a heightened level of submission quality. *CrowdANALYTIX* believed that weak social ties result in increased competition between solvers, which ultimately serves to provide the best solutions: "*150 plus people compete against each other to deliver the best solutions... they are competing, and competitors are always a great motivator of yielding better results*". This heightened standard of submission for the most part was the by-product of their community of solvers being able to "*compete with the best in the industry*".

This level of competition is an important element to the competitive market model, with *InnoCentive* revealing that "*The whole design of the platform business model... does not really encourage social interaction among the solvers... It is really an individual effort*". This is slightly ironic given *InnoCentive's* previous admission of failing to create a collaborative environment within their platform. Regardless, this could be for a majority of reasons, primarily of which being the implications of IP ownership among groups of solvers. Furthermore, *InnoCentive* outline their belief that "*...the ability for the particular problem, for me, would be more important than if you are a solver to engage other people*", highlighting the competitive nature existing within their platform.

5.2.1.2 Impact of Social Ties

Based on the themes identified previously, it is argued that social ties have one key impact towards competitive markets, manifesting itself in the overall submission quality of the solutions being presented by the community. This impact is further outlined below.

Submission Quality

Given the very nature of competitive markets, one would have assumed that the presence of weak social ties among their solvers would be the sole focus of the interviewees. Therefore, perhaps the most interesting finding to emerge from this set of analysis is the revelation that competitive markets use both sets of social ties (strong and weak) in order to augment the submission quality from their solver communities.

KDMs that were interviewed described how both sets of ties served to enhance the overall offerings by their community, though independently of each other.

In terms of weak social ties, the increased competition between solvers was identified as being fundamental to the increase of submission quality, with several platforms outlining how such competition serves to galvanise the community, challenging individual solvers to best their peers. This was summarised by *CrowdANALYTIX*, stating that "*competitors are always a great motivator of yielding better results*". However, the platforms must take ownership themselves of creating this competitive environment and to place an increased focus on the competition between the solvers in order to reap the rewards. Merely awaiting submissions will not increase their quality. Platforms need to take the pre-emptive step of addressing and promoting this level of competition among their community, which will be further addressed in Chapter 6 which outlines the mechanisms that can be implemented to achieve this.

It was the revelation of some competitive markets seeking to develop strong social ties that was the most surprising, with *Crowding* arguing that "*co-creation creates better results*". While admittedly the presence of such ties was encountered in a minority of platforms, the fact that further KDMs expressed their desire to promote such ties speaks volumes. Furthermore, as previously indicated there have also been several attempts from competitive markets including *InnoCentive* and *CrowdANALYTIX* to incorporate this level of heightened interactivity within their platforms. These findings reveal that competitive markets are capable of adopting both strong and weak social ties in order to improve the offerings of their community.

The question emerges however as to whether the one competitive market can seek to implement both sets of social ties in their search of greater quality. Preliminary evidence from the data would suggest not, that the social ties themselves are by products to the structure of the platform. For example, while *Crowding* advocated increased collaboration to achieve better results, the platform itself remains primarily fixed on developing solutions through solvers working individually. When pushed as to why this was, *Crowding* explained that the concept of team work in contest platforms is very compelling, citing the developments being made by *OpenIdeo* (a collaborative market). *Crowding* admitted that "*(OpenIdeo) have a very good*

technical option that you can create teams. So I think that works very good, but I think if you just copy how that works and go to the commercial area, I think there would be big problems".

The implications of IP ownership and issues of reward allocation between collaborative team members may have been areas which *Crowding* wish to avoid being embroiled in. For example, *Crowding* presented a scenario where a group of solvers that are a team might be announced as the winner. A primary issue for *Crowding* would be the allocation of the overall prize fund. Subsequently, should the company wish to implement the solution and each solver wants to become part of it in some way, the interviewee envisions "*big problems in the long term prospect...*" as to how this could be addressed.

While the proposed approach of increasing the collaboration might go against the very ethos of the competitive market, some might argue that this diminishes their appropriation of being just that, a competitive market. However, when the mechanisms of both are outlined further in Chapter 6, the disparities of how the two platform sets develop social ties reaffirm this dichotomy.

5.2.2 Trust

Trust has previously been defined in Chapter 2 by Rotter (1980) as being "*a generalised expectancy held by an individual that the word, promise, oral or written statement of another individual or group can be relied upon*" (p.1). This section will analyse the emergent themes of trust from the data as evidenced throughout the six different competitive markets investigated in this study, before subsequently describing their net impact.

5.2.2.1 Emergent Theme

One primary theme of trust emerged from the data: "*increased use*", as outlined below in Table 5-2. This theme argues the claim that "*trust impacts the levels of solver retention experienced by the platform*", which will be further outlined subsequently.

Impact of Trust		
Theme	*Evidence from Study Participants*	*Claim*
Increased Use	CrowdANALYTIX: "*In fact, we want to grow that (trust) aspect of the platform... **The chances that they will become more engaged and remain on the platform longer will go up,** so that is where we want to evolve going forward.*"	Trust impacts the levels of **solver retention** experienced by the platform.
	CrowdANALYTIX: "***They will remain on the platform** as long as we can keep remunerating them*."	
	InnoCentive: "***People trust, otherwise, well, they won't come next time***."	
	Innoget: "*We motivate people to keep taking part in the community, and **not abandon it** in any way.*"	

Table 5-2: Chain of Evidence for Trust Impacting Solver Retention within Competitive Markets

Increased Use

The amount of platform use was shown to be a vital theme of trust by several platforms including *CrowdANALYTIX*, *InnoCentive and Innoget*. *InnoCentive* in particular cited trust to be the main reason why solvers return to the platform after engaging it in the first instance: "*People trust, otherwise, well, they won't come next time.*" Developing trust within their solver community was also stressed by *CrowdANALYTIX* as being crucial in reaching their objectives in terms of growth and success, and is an area they have marked for continued focus. *CrowdANALYTIX* described that while the primary activity of their platform is competition based, they would like to see solvers exhibiting indications of trust amongst themselves by enabling increased collaboration, as outlined previously. In doing so, *CrowdANALYTIX* revealed that "*the chances that they will become more engaged and remain on the platform longer will go up, so that is where we want to evolve to going forward*". *CrowdANALYTIX* argued that this level of trust can be developed between the platform and the solvers by providing the winning solvers with the appropriate rewards that were offered in the challenge description: "*(The solvers) will remain on the platform as long as we can keep remunerating them*."

A similar approach was pursued by *Innoget,* which involved directly motivating their solvers to continually engage with the platform. This was facilitated through several means, including offering the solvers an avenue to publish their solutions, contact potential partners, and being able to detect key innovation and industry needs, worldwide, and in real time: "*So that is another way we build trust, and we motivate people to keep taking part in the community and not abandon it in any way... We have contact with almost all of our customers within the website, we know them.*"

5.2.2.2 Impact of Trust

Based on the theme identified above, it is argued that trust has one key impact towards competitive markets, manifesting itself in the levels of solver retention experienced by the platform. This impact is further outlined below.

Solver Retention

The findings reveal that the social capital construct of trust is a vital component in maintaining and increasing the levels of solver retention within competitive markets. Several interviewees revealed this correlation, arguing that when the solvers develop trust, not only towards the platform itself, but also within the community that they operate within; it increases the likelihood of returning for future contests.

The data reveals however that developing trust among the community of solvers is difficult to achieve. As mentioned previously, the social ties in occurrence within competitive markets are predominately of a weak nature, which inevitably results in a lower rate of trust being developed among the communities. This difficulty is compounded when one considers the levels of solver engagement in conjunction with the diversity of challenges being issued, as outlined by *NineSigma*. *NineSigma* argued that establishing trust among their community of solvers can be quite difficult to develop because "*we have such a huge database (of solvers), and the topics we have there are very different. For example, they range from how to have a better fertiliser for agriculture, to how to solve some energy storage issue in a nuclear station*". *NineSigma* argued that such diversity proves problematic when attempting to develop trust and familiarity among their solvers, due primarily in part to the limited exposure they may have with one another.

This suggests that trust towards the platform itself is of primary concern for competitive markets, superseding the trust between the solvers themselves. The findings reveal the primary means of achieving this level of trust, with both *CrowdANALYTIX* and *Innoget* arguing that platforms need to ensure their solver communities trust the processes in place that exchange IP for the potential reward. For example, the data reveals several examples of solvers being worried their work would get either stolen or copied by other solvers, due to ineffective processes implemented by the platform. *InnoCentive* for example outlined that when you work with a large number of people, "*there are always people who complain that they were cheated; they've been treated unfairly etc...*" *NineSigma* also illustrated how trust can be a deciding factor for solvers to engage with their platform to begin with as there have been instances of solvers being worried that their solution or technology being submitted might be copied or stolen by other solvers, or even the organization posting the challenge: "*They are very worried that someone will steal their idea*."

The levels of transparency present on the platform therefore play an important role in the successful retention of solvers on the platform. This involves providing solvers with an environment that is forthcoming in the steps involved in the overall contest process, while also exhibiting a degree of openness toward their solver communities.

5.2.3 Reciprocity

Reciprocity has previously been defined in Chapter 2 by Blau (1964) as being "*actions that are contingent on rewarding reactions from others, and that cease when these expected reactions are not forthcoming*" (p.6). This section will analyse the emergent themes of reciprocity from the data as evidenced throughout the six different competitive markets investigated in this study, before subsequently describing their net impact.

5.2.3.1 Emergent Theme

One key theme of reciprocity emerged from the data: "*increased knowledge sharing*", as outlined below in Table 5-3. This theme argues that "*reciprocity impacts the levels of solver engagement*", which will be further outlined subsequently.

Impact of Reciprocity		
Theme	*Evidence from Study Participants*	*Claim*
Increased Knowledge Sharing	CrowdANALYTIX: "*Absolutely, I think these guys, you see a lot of discussions on the forums. So yes without a doubt,* ***it is a community that wants to learn from each other*** *and that is the reason why it's working.*"	Reciprocity impacts the levels of **solver engagement**.
	CrowdANALYTIX: "***We want them to help us create knowledge, create and write white papers, talk about their approach when they won****, give them more visibility as well and get them engaged more.*"	
	InnoCentive: "*I suspect that in situations when money is not the whole motivation,* ***people would be more willing to communicate*** *with each other.*"	
	InnoCentive: "*InnoCentive posts a lot of challenges where basically they ask for solving some direct technical problem solving social problems in some sub-African countries. Usually these challenges are posted by an employer that doesn't have the ability to pay people...* ***People would come and do that (share knowledge) because they know this is the goal. People really do want to make an impact to society****.*"	
	NineSigma: "*What we want to see as a result of not just somebody doing a job to a solution, but there is real cooperation that happens afterwards.*"	

Table 5-3: Chain of Evidence for Reciprocity Impacting Solver Engagement within Competitive Markets

Increased Knowledge Sharing

Reciprocity was shown to increase the levels of knowledge sharing among the community of solvers both during, and outside of the contest setting by several platforms including *CrowdANALYTIX*, *InnoCentive* and *NineSigma*. *CrowdANALYTIX* in particular described how reciprocity resulted in increased knowledge sharing on their platform: "*Absolutely, I think these guys; you see a lot of discussions on the forums. So yes, without a doubt, it is a community that wants to learn from each other and that is why it's working.*" Solvers use the discussion forums present on the platform (further described in Chapter 6) to engage with one another,

and by doing so, exchange knowledge about their solutions, or the approaches they took to develop those solutions. *CrowdANALYTIX* made a concentrated effort to promote this aspect of reciprocity, explaining that "*We want them to help us create knowledge, create and write white papers, talk about their approach when they won, give them more visibility as well and get them engaged more*."

This is an area in particular *CrowdANALYTIX* wish to target as they progress, as they feel the levels of reciprocity can enhance long term sustainability of their platform: "*For them (solvers) to remain engaged, we have a very small team in house, its just 12 people, so we cannot be orchestrating and keeping the momentum and energy going. So our goal as a platform would be to make sure we keep adding the pieces that they can engage better with each other*." *CrowdANALYTIX* regarded reciprocity to be an area which, if developed correctly, could provide the foundations for both increased social ties and trust amongst solvers within their community

InnoCentive however argued that knowledge sharing, and by extension reciprocity, does not occur instantly, but is merely a product of the type of challenge being issued, the reward being offered, and the target solver demographic: "*You really have to look at the breakdown of InnoCentive cases and breakdown of the solvers because they have a very diverse group of people working for them*." *InnoCentive* outlined that knowledge sharing increases when money is not the primary motivator of their solvers: "*I suspect that in situations when money is not the whole motivation, people would be more willing to communicate with each other... people would just do it because they want an impact*". When their solvers are motivated more by the social impact, or the social good they are trying to create, *InnoCentive* noted that the levels of knowledge sharing would increase because "*people really do want to make an impact to society*."

For example, *InnoCentive* described how their platform often posts challenges involving sub-African countries by an innovation seeker who might not necessarily "*have the ability to pay people*". *InnoCentive* revealed their solvers would "*come and do that (share knowledge) because they know that this (social good) is the goal. People really do want to make an impact to society*." *InnoCentive* subsequently outlined that should the contest revolve around producing a solution that could be sold

on the open market, solvers would be less inclined to share their efforts with their peers as their emphasis would be focused on the monetary reward on offer by the innovation seeker, thus limiting the reciprocity.

5.2.3.2 Impact of Reciprocity

Based on the theme identified above, it is argued that reciprocity has one key impact towards competitive markets, manifesting itself in the levels of solver engagement experienced by the platform. This impact is further outlined below.

Solver Engagement

The findings show that the social capital construct of reciprocity impacts on competitive markets by way of increasing the levels of solver engagement within the platform. This was evident in several platforms, including *CrowdANALYTIX*, *InnoCentive* and *NineSigma* who attributed the sharing of knowledge with increased engagement on their respective platforms.

Again, this finding was quite surprising at the outset given how the nature of the competitive market is geared primarily toward the individual solver acting on their own self-interests, as opposed to the good of the collective. However, the data also revealed alternative motives that support this theory. The first explanation as to why solvers would be inclined to increase their knowledge sharing within competitive markets involved their own self-promotion. By showcasing their knowledge, solvers highlight to their peers their own proficiencies in their subject area. The findings show that some solvers did so in the hopes of gaining recognition from their peers, while others sought to take advantage of the reciprocal environment to further better their own ideas.

Crowding for example believed reciprocity to be an important motivator for their solvers to remain engaged with their platform, as it provided them an opportunity to express their creative solutions and receive critical feedback from their peers as to how they might adapt their approaches going forward: "*You want people to look at (a solution) and hopefully they like it and vote for you, and they comment on your idea, and that is an important motivation. That you can pitch into the crowd and you can*

get feedback." Such reciprocal actions among the community add another layer of engagement to these platforms, with solvers being able to present their submissions for external review by their peers.

Another explanation was identified by *InnoCentive* to explain the prominence of reciprocity within competitive markets, revealing that solvers were also motivated to share their knowledge depending on what the contest sought to achieve. *InnoCentive* explained that if the solvers deemed a challenge to have a profound societal impact, then the prospect of a monetary reward would become of secondary importance to them. This is turn served to further increase the knowledge sharing between solvers in order to find a solution for the common good.

Each of these explanations however is dependent on the willingness of solvers to exchange knowledge with their peers, and in doing so to partake in reciprocal relationships within the competitive markets.

5.2.4 Self-Identity

Self-identity has been previously defined in Chapter 2 by Nahapiet and Ghoshal (1998) as how "*individuals see themselves as one with another person, or group of people*" (p.256). This section will analyse the impacts of self-identity as evidenced throughout the six different competitive markets investigated in this study.

5.2.4.1 Emergent Themes

Four key themes of self-identity emerged from the data, as outlined below in Table 5-4.

Impact of Self-Identity		
Theme	*Evidence from Study Participants*	*Claim*
Enhanced Career Mobility	Innoget: "*I would say more the possibility to get in contact, or* ***get more projects in their area of expertise***."	Self-identity provides the solver with

	Innoget: "*That often allows people to keep track on what is going on in other sectors, or technology areas where* ***they can find the opportunities that they couldn't find elsewhere****, or in their current industry*."	enhanced **employment prospects**.
	Innoget: "*The community itself, it is both a global one in that we have members from all over the world, but also that* ***you can find opportunities from many various business sectors*** *and industry sectors.*"	
	NineSigma: "*There is a* ***real business opportunity for them***."	
	NineSigma: "*We want to be sure that the companies that are doing it,* ***they really offer opportunities for the solvers afterwards***."	
	Presans: "*(The solvers) find the concept interesting, so* ***some of them would like to be... contacted for future projects***."	
	Presans: "***The client afterwards can contact non-selected experts, or selected experts to work on another project****, or to continue working on the project they were contracted initially to so.*"	
Increased Status	Crowding: "***To be a part of something, participation and influence.*** *For example, if you do a meet up or a physical event, I think that is a good impact. People will join because there are other people that are interested in the brand or in the subject.*"	
	Crowding: "***They could have an influence in that they could speak to higher level people in the company and give ideas***."	
	Presans: "*There is also a motivation that* ***the client will have all the contact details of the expert, even those that aren't selected***."	
	Presans: "***They want to be recognised*** *by some of the huge companies they know about.*"	

Impact of Self-Identity		
Theme	*Evidence from Study Participants*	*Claim*

Acquisition of Knowledge	NineSigma: "W*hat we have heard from some of our most active solvers, is that when they follow what kind of topics, or questions we post,* ***it helps them to actually better their own product development activity***."	Self-identity provides the solver with increased **learning** opportunities.
	Presans: "*If there is a group of experts... One of the motivations for them is that they are going to get to know somebody else, so sometimes it can be like a need that it is necessary to have experts from different fields that are going to work together*."	
	Presans: "*It was always motivating for them, that's for sure, because* ***they are going to work with somebody qualified. So they are absolutely going to learn something.***"	
	Presans: "***They are going to learn something new*** *from another field*."	
Application of Knowledge	CrowdANALYTIX: "*There are basically three segments of people on the platform. One are the independent consultants who actually want to make a living out of this... This allows them to remain independent... The second category is the students, who* ***want to apply their skills to real life problems****... The third is a bunch of people who are already employed... They probably have a passion for mathematics, but now do something totally different*."	
	CrowdANALYTIX: "*What is common I think ... (solvers)* ***get exposed to real life problems, they get to test their skills and they want to know if they are good enough and show they can do it*** *without the fear of failure. And they can do it competing with the best in the industry*."	

Table 5-4: Chain of Evidence for Self-Identity Impacting the Solvers' Career Development and Learning within Competitive Markets

These themes support two claims, both of which will be outlined subsequently:

i. Self-identity provides the solver with enhanced employment prospects opportunities.
ii. Self-identity provides the solver with increased learning opportunities.

Enhanced Career Mobility

Participation in competitive markets is shown to have important employment benefits that may offset the need for significant pecuniary rewards. Contest solvers may appropriate value by signalling their abilities and, thereby position themselves to capture value, for example, by obtaining better jobs. It is clear from the data that self-identifying with either the challenge, or indeed the competitive market itself provides the solver with enhanced career mobility, as outlined by several platforms investigated. Career mobility refers to the prospective hiring, or job relocation as a result of engaging with the innovation challenge. For example, *Presans* described how their solvers often self-identify with the challenges being posted on their platform as "*(The solvers) would like to be... contacted for future projects*." *Presans* further explained that even if their solvers' submissions are unsuccessful, *Presans* provide their clients with the contact details of the experts. This allows their clients to contact non-selected solvers to work on future projects: "*The client afterwards can contact non-selected experts, or selected experts to work on another project, or to continue working on the project they were contracted initially to so.*"

This exposure to the innovation seeking organisation was also experienced by *NineSigma,* who identified the close working nature between the platform and the companies seeking solutions as a main reason for solvers engaging with them. *NineSigma* explained how their platform strives to keep business opportunities for their solvers active: "*We want to be sure that the companies that are doing it, they really offer opportunities for the solvers afterwards*" and in doing so, that "*there is a real business opportunity for them*."

The prospect of career mobility is also reiterated by *Innoget* who agree that it is a strong indicator of how solvers self-identify with competitive markets. *Innoget* argued that due to their global community of high quality experts, their solvers can find opportunities from many various business sectors and industry sectors they might not find elsewhere. *Innoget* believed this aspect allows their solvers to "*keep track on what is going on in other sectors or technology areas where they can find the opportunities that they couldn't find elsewhere, or in their current industry*". *Innoget* also outlined

how their solvers engage with their platform for "*more the possibility to get in contact, or get more projects in their area of expertise*".

Increased Status

The opportunity to promote one's status among a large community of peers emerged as another theme as to why solvers self-identify with the challenge being issued, or the hosting contest platform itself. The enhancement of a solver's status results from the prowess the solvers exhibit while competing, and range from increased visibility of their worth, to being exposed to KDMs within the challenging organisations.

The findings reveal that both *Crowding* and *Presans* believe the opportunity of increasing a solvers' status is a primary reason for their self-identification towards the platform. *Crowding* argued that by self-identifying with the platform, it affords the solver the opportunity to be "*a part of something, while experiencing a level of participation and influence*". Solvers can easily signal their abilities to a large number of peers and may easily gain status enhancement this way.

Similarly, *Presans* argued that solvers self-identify with their contest platform primarily because it provides potential opportunities for solvers to be contacted again when future projects emerge: "*There is also a motivation that the client will have all the contact details of the expert, even those that aren't selected*". It also provides the solvers with an increased likelihood of getting the attention of the companies they are presenting their submissions to, according to *Presans*: "*They want to be recognised by some of the huge companies they know about.*"

Both *Crowding* and *Innoget* agreed that solvers wish to make an impression with the companies they are doing the work for. For example, *Crowding* outlined how their solvers approach the challenges with a mind-set of contacting the challenging organisation directly, to promote their ideas and talents: "*They could have an influence in that they could speak to higher level people in the company and give ideas.*" Similarly, *Innoget* revealed that they also allow their solvers to upload their solution to promote themselves.

Acquisition of Knowledge

Acquisition of knowledge involves solvers self-identifying with the contest platform in order to develop new skill levels or expand their existing repertoire of tacit knowledge. This acquisition of knowledge was highlighted by *NineSigma* as being an important feature of self-identification based on feedback from their most active solvers. This feedback indicated that an important benefit of self-identification for the solvers involved the exposure to world issues and topics by the platform. Such exposure allowed their solvers to better understand how to approach various challenges, not of all which would be platform related: "*An important benefit (of self-identity), and what we have heard from some of our most active solvers, is that when they follow what kind of topics, or questions we post, it helps them to actually better their own product development activity*."*Presans* similarly outlined that solvers self-identify with their platform as it provided them an opportunity to "*learn something new from another field*."

Application of Knowledge

In addition to acquiring new dimensions of knowledge, innovation contests also provide the solvers a unique environment with which to showcase their existing skill sets and knowledge base. *CrowdANALYTIX* in particular believed the application of knowledge to be a main reason why solvers self-identify with their platform. In addition to independent consultants, *CrowdANALYTIX* revealed how two of their three target demographics self-identify with their platform in such a manner:

i. Students-*CrowdANALYTIX* argued that there are various solvers currently doing PhDs and Masters Degrees on their platform who enjoy the opportunity of being exposed to real life problems. This demographic self-identifies with *CrowdANALYTIX* because they want to apply the skills they are learning in their courses to real life problems. *CrowdANALYTIX* also revealed how they have targeted their student demographic, outlining their strategy to provide data competitions to interested universities in the hopes that when graduated, the students will return to the platform: "F*or the learning student category*...

We are in talks with a bunch of professors who say they want to have competitions in their data science classes."

ii. Employed Professionals-These solvers self-identify by having a passion for problem solving. The interviewee provided the example of a senior marketing manager in Amazon who was always passionate about math and statistics. By engaging with *CrowdANALYTIX*, it "*gives him a way of almost, like a hobby, to express his own interest which he would not be allowed to do in his current career... nobody is going to accept a transition from a senior marketing manager to a statistician, but here he gets to do it*".

Both these target demographics self-identify with the environment *CrowdANALYTIX* provides to apply their knowledge to real world issues. In doing so, solvers get to test their skills and challenge themselves in the process without the fear of failure: "*(Solvers) get exposed to real life problems, they get to test their skills and they want to know if they are good enough and show they can do it without the fear of failure. And they can do it competing with the best in the industry*."

5.2.4.2 Impacts of Self-Identity

Based on the themes identified above, it is argued that self-identity has two key impacts towards solvers competing in competitive markets. These impacts are:

i. Employment
ii. Learning

These impacts are further outlined below.

Solver Employment

The first impact of self-identification to emerge from the data analysis was that of the enhanced employments prospects offered to the solvers. Solvers are able to realise this impact through obtaining enhanced career mobility and increasing their own status as evidenced previously. This was seen in several platforms investigated, who agreed that solvers often use these innovation contests to further their own professional ambitions, whether that be by showcasing their talents to the companies seeking the

solutions, or alternatively by delivering a successful solution they could present on their résumé for future job applications. The employment prospects encountered in the data ranged from inviting solvers to partake in various projects (some being related to what the challenge sought to achieve) to offering solvers designated job roles inside the challenging organisation.

Solver Learning

The second impact of self-identification to emerge from the data analysis was the increased learning opportunities afforded to the solvers. The findings again show that competitive market facilitates and encourages knowledge exchange through interaction among solvers, engendering a culture of learning and sense of affiliation and identity.

This was highlighted by *CrowdANALYTIX* who described the learning opportunities afforded to their community through use of their platform as a vital reason as to why their community self-identifies in the first place. Competitive markets subject solvers to current industrial trends, illustrate specific problems being encountered and challenge their community to develop sufficient solutions. The solvers then approach these challenges from their own unique perspectives, and apply their own repertoires of tacit knowledge in the formulation of a solution. As discussed previously, this presents the solvers with an opportunity to both acquire knowledge, based on the goal of the challenge, and to apply their tacit knowledge to real world problems.

In doing so, solvers self-identify to a larger degree as they are getting value from the experience, beyond the potential for a monetary reward. Indeed, while this monetary reward is only bestowed on the winning solutions, reflecting a minority of the contestants, every solver is able to increase their individual knowledge base, making it an attractive proposition for them to self-identify with.

5.2.5 Shared Language

Shared language has previously been defined in Chapter 2 by Lesser and Storck (2001) as being "*the acronyms, subtleties and underlying assumptions that are the staples of day-to-day interactions*" (p.836). This section will analyse the impacts of self-identity as evidenced throughout the six different competitive markets investigated in this study.

5.2.5.1 Emergent Theme

One key theme of shared language emerged from the data: "*increased clarity*" as outlined below in Table 5-5. This theme argues that "*shared language impacts the solver understanding of a challenge*", which will be further outlined subsequently.

Increased Clarity

The clarity of the challenge emerged as a theme for shared language. By ensuring a shared language between the community of solvers, and also between the community and the platforms themselves, the findings illustrate how it presents the solver with a deeper understanding of what the contest objective is, while also avoiding potential ambiguity.

NineSigma illustrated this need for clarity, outlining how, as a platform, they place an increased focus on the topic formulation before it is send out to their solvers: "*Yeah, I think we recognise (shared language) as being a very important dilemma that is why we put so much effort into the topic formulation that would have all these details laid out in our technology brief.*" *NineSigma* revealed that they often take a retrospective look at the language they used to describe their various challenges in order to better present future contests: "*Although sometimes with some topics, we come back and say* "Actually, we should have better articulated it this way, not that way."" *CrowdANALYTIX* agrees with this point, arguing that "*If your output expectations are not absolutely clear, that is an issue*". *NineSigma* argued that by doing so, it allows them to better articulate the challenges going forward for the solvers which *NineSigma* argued would result in better submissions.

Impact of Shared Language		
Theme	*Evidence from Study Participants*	*Claim*
Increased Clarity	CrowdANALYTIX: "***If you are clear about the output expectations... Now they know what to do****, it doesn't matter what country they are from*."	Shared Language impacts the **solver understanding** of a challenge.
	CrowdANALYTIX: "*The biggest challenge from our perspective as a business has been,* ***how do you take a business challenge*** *which the client has,* ***and figure out the best way of turning that into very well defined data problems****? If you can't do that, you don't get a lot of opportunity*."	
	InnoCentive: "*I think that some type of* ***consideration (for shared language) is very important to define your problem and then how to present your solution****, because when you put ideas in bullet points, then we judge your solution by the extent your solution meets the call*."	
	NineSigma: "***We put so much effort into the topic formulation*** *that would have all these details laid out in our technology brief*."	
	NineSigma: "*Sometimes, with some topics we come back and say* "Actually, **we should have better articulated it this way**, not this way."	
	Presans: "*In order to make it more understandable,* ***they are going to reformulate the need so it can be more understandable to different experts***."	
	Presans: "*There is always a tendency to use your vocabulary that you are used to, but there is also the work of the fellows that they are going to make it understandable afterwards to the client...* ***It is the importance of being understandable to different people***."	

Table 5-5: Chain of Evidence for Shared Language Impacting the Solvers' Understanding within Competitive Markets

Presans also outlined that establishing a shared language is vital in providing clarity to the various solvers on a platform: "*It is the importance of being understandable to different people.*" *Presans* described how such shared language is often difficult to achieve in their platform given how their clients use a particular vocabulary dependent

on their specific industry when explaining the challenges being issued: "*When (Presans employees) are speaking to engineers of the clients, they are going to use the vocabulary specific to their domain*." Once the appropriate information is expressed by the client, *Presans* then retrofits the challenge description so their solvers are absolutely clear as to what is being expected of them: "*In order to make it more understandable, they are going to reformulate the need so it can be more understandable to different experts*." This process is also repeated when the solution is presented back to the clients: "*There is always a tendency to use your vocabulary that you are used to, but there is also the work of the fellows that they are going to make it understandable afterwards to the client*."

Crowding also acknowledged the difficulty in presenting a clear challenge description in a global contest where the solvers are subject to various languages and practices, describing it as "*a very big issue*." *CrowdANALYTIX* further illustrated that developing such clarity was "*A very clear challenge, the biggest one*" within their platform. *CrowdANALYTIX* described how challenging the formulation of accurate contest descriptions has been for their platform: "*The biggest challenge from our perspective as a business has been,* "How do you take a business challenge which the client has, and figure out the best way of turning that into very well defined data problems?" *If you can't do that, you don't get a lot of opportunity*." While other types platforms have the ability for communication to take place in an environment that affords solvers the opportunity to have "*several back and forth interactions on a one to one basis to deem the problem statement, and then work on other aspects and so on*", *CrowdANALYTIX* bemoaned the fact that competitive markets do not have that luxury due to the type of contests being held. *CrowdANALYTIX* referred to issuing the challenges as more of a "*broadcast message*" that they struggled with initially to describe accurately to their competing solvers: "*If you can't do that, you don't get a lot of opportunity*". In order to address this issue, *CrowdANALYTIX* have begun to divide the business challenges issued by their clients, reducing their deliverables into very well defined data problems. This mechanism is further outlined in Chapter 6.

5.2.5.2 Impact of Shared Language

Based on the theme identified above, it is argued that shared language has one key impact towards solvers competing in competitive markets: the solver understanding of the challenge being posted.

This impact is further outlined below.

Solver Understanding

As argued previously, the increased clarity afforded to solvers through the development of a shared language subsequently impacts the solvers' overall understanding of the contest objective. This was perhaps to be expected, as shared language (along with shared vision) accounts for the cognitive dimension of social capital. As explored in Chapter 2, the cognitive dimension facilitates shared representations, interpretations and systems of meaning within a virtual collective (Wasko and Faraj, 2005). These findings validate this expectation of how shared language impacts solvers within an IT-enabled innovation contest setting.

Solvers that develop a higher level of understanding are subsequently in a better position to deliver a successful submission, as was noted by *InnoCentive*. *InnoCentive* outlined that the provision of successful submissions can be hindered when the solvers fail to possess a common understanding as to what is required of them when initiating the contest: "*I think that some type of consideration is very important to define your problem and then how to present your solution*." *InnoCentive* described this lack of a shared language as being: "*a huge problem*", reflecting that this failure has often led to potentially successful submissions being discarded.

5.2.6 Shared Vision

Shared vision has previously been defined in Chapter 2 by Tsai and Ghoshal (1998) as "*embodying the collective goals and aspirations of the members of an organisation*" (p.467). This section will analyse the impact of shared vision as evidenced throughout the six different competitive markets investigated in this study.

5.2.6.1 Emergent Theme

One key theme of shared language emerged from the data: "*increased clarity*" as outlined below in Table 5-6. This theme argues that "*shared vision enhances the overall solver understanding*", which will be further outlined subsequently.

Impact of Shared Vision		
Theme	*Evidence from Study Participants*	*Claim*
Increased Clarity	CrowdANALYTIX: "*So* ***if your output expectations are not absolutely clear, that is an issue***."	Shared Vision enhances the overall **solver understanding**.
	Crowding: "*That is one of the arguments why you should have like a physical event at the beginning because at the event,* ***the company can go deep in the brief, and give more information***."	
	InnoCentive: "*The challenge lasts for no more than three months, mostly. So* ***if you post a problem wrong, then forget it. No question about it***."	
	InnoCentive: "*Obviously, when you pose the question,* ***you really have to define the scope. If you don't do that, there is really no point in discussing anything else***."	
	InnoCentive: "*You really have to make sure that your solvers understand everything...* ***make sure they understand the requirements, and the scope***."	

Table 5-6: Chain of Evidence for Self-Identity Impacting the Solvers' Career Development and Learning within Competitive Markets

Increased Clarity

The shared vision data also outlines that the clarity of contest requirements issued by the challenging platform impacts on the levels of solver understanding by the community.

The data reveals that the success of a solver's solution is related to the shared vision developed based on the amount of detail revealed in the contest briefing as formulated by the respective platforms. The importance of achieving such a unified vision for engagement is illustrated through the point made by *InnoCentive,* stating categorically that: "*If you post a problem wrong, then forget it. No question about it... Obviously when you pose the question, you really have to define the scope. If you don't do that, there is really no point in discussing anything else.*" Developing a shared vision through the contest requirements is important as it outlines to the solver community what the contest is trying to achieve, how the solvers are to set about addressing the issue, and for what in return they should expect to receive if their solution is successful: "*You really have to make sure that your solvers understand everything. So to make sure they understand the requirements, the scope, yes, you must do that (achieve a shared vision).*"

CrowdANALYTIX mirrored these arguments, stating that the accurate presentation of what the contest seeks to address is fundamental to its success. Failure to do so can lead to deep rooted problems as the contest progresses due to the solvers being unsure of the overall objective: "*if your output expectations are not absolutely clear, that is an issue.*" *Crowding* highlighted this issue whereby the challenging organisations would have a lot of details on hand that they would be able to provide to the solver, however questioned whether divulging all the information was a prudent means of achieving this shared vision: "*If it is a technical challenge, the company will have a lot of information, but they can't give that out to the crowd. There are two arguments for that. Both a legal issue that they can't open up the whole company so they can see all their secrets, but also even if they do that I don't think that the crowd will read all the information.*" *NineSigma* outlined that by providing solvers with too much information, it would ultimately dissuade them from competing as it would make them feel overloaded with the scope of the task. This reflects the challenge that *Crowding*

identified when dealing with a shared vision: "*So you have a really big challenge, what kind of information should you give to the crowd to make a good impact?*"

InnoCentive also pointed to the to the short time periods available to solvers to submit their entries. *InnoCentive* outlined that because of such time frames, should the initial vision be ambiguous the likelihood of receiving the target amount of submissions would be reduced: "*They create quite narrow times for entry. So the challenge lasts for no more than three months, mostly. So, if you post a problem wrong, then forget it. No question about it.*" This is one of the arguments used by *Crowding* to organise a physical event at the beginning of a challenge with the company that is posting the challenge also in attendance as it gives solvers the opportunity to have a deeper understanding as to what is being asked of them, along with any questions or issues that might arise. Obviously there are various logistical issues associated with such an approach, but other platforms, particularly those of a collaborative community nature, also pursue such a strategy (As further explored in Chapter 6).

5.2.6.2 Impact of Shared Vision

Based on the theme identified above, it is argued that shared vision has one key impact towards solvers competing in competitive markets: successfully completing a solution. This impact is further outlined below.

Solver Understanding

Much like it's counterpart of shared language, shared vision also provides the net impact of solver understanding, as a result of providing increased clarity. As previously outlined, both shared vision and shared language comprises of the cognitive dimension of social capital. The findings reveal that the degree of a shared vision existing between the platform issuing the challenge, and the solvers that partake in it affects the overall understanding of the contest objective. When formulating the contest brief, competitive markets must ensure what they are describing to their solvers is realistic, attainable, and it is able to resonate with the community being challenged. This shared vision serves as the contest's foundation, and must in that respect be appreciated and bought into by the community. Once a clear outline of the

challenge has been presented to the solvers, the community will thereafter be more likely to develop a solution better suited to the needs of the challenging organisation.

5.2.7 Competitive Market Summary

The findings reveal that social capital is responsible for six significant impacts, for both the platforms issuing the challenge, and the solvers that engage:

i. Solver Employment
ii. Solver Learning
iii. Solver Engagement
iv. Solver Retention
v. Solver Understanding
vi. Submission Quality

In addition to these impacts, this figure also outlines the social capital constructs responsible for their influence, along with their emergent themes as described by the interviewees. The findings presented above reveal that while social capital research toward IT-enabled innovation contest platforms is quite shortcoming, their implications for the platform operators are far reaching. The findings reveal that the three relational dimension constructs of social capital (trust, reciprocity and self-identity) primarily affect the behaviour of solvers towards the platform. While trust was shown to directly impact the levels of solver retention within competitive markets, reciprocity was shown to impact the levels of solver engagement. Self-identity was also shown to have a more direct impact toward the solvers themselves, providing the opportunity for both employment and learning.

Both the cognitive constructs of social capital (shared language and shared vision) meanwhile were illustrated to impact the overall understanding of the solver community towards the challenges being issued. Interestingly, the structural dimension of social capital (social ties) was shown to increase the levels of submission quality by facilitating both increased competition and increased collaboration among solvers.

The next section will investigate the social capital impacts within collaborative communities.

5.3 Collaborative Communities

This section explores the impacts of social capital experienced by collaborative communities based on the analysis of the case study findings.

5.3.1 Social Ties

This section will analyse the emergent themes of social ties from the data as evidenced throughout the nine different collaborative communities investigated in this study, before subsequently describing their net impact.

5.3.1.1 Emergent Themes

Two primary themes of social tie development emerged from the data, those being "*increased collaboration*" and "*increased peer recognition*", as outlined below in Table 5-7.

Impact of Social Ties		
Theme	*Evidence from Study Participants*	*Claim*
Increased Collaboration	Battle of Concepts: "***You saw that more teams were going to participate****, but it was more among friends. So they had already found the group, and then they entered the community to participate as a group*."	Social ties influence the overall **solver engagement** generated by the solvers.
	Chaordix: *"So the power of crowdsourcing is that I make some form of contribution, and my peers and the community can help me improve that contribution...* ***We would look at collaboration as being a key characteristic of the community*** *design."*	
	Chaordix: "We define 3-5 pillars of behaviour that we want from the community. We want the community to build community, we want the community to build connections, and we want them to contribute."	
	Munktell Science Park: "*For us, finding the right people and matching them together, making winners come together is something that is really important, but also* ***for the all the participants as a whole to come together is really important for us***."	
	Munktell Science Park: "*In one example, we had ten groups with three people per group, and quite often they didn't know each other from before. But just* ***being part of this, and by combining their knowledge, they meet these people and understand the heart of the idea***."	
	Munktell Science Park: "*The participants say it has been really valuable just to be part of the actual process,* ***collaborating with people*** *with other backgrounds*."	
	Munktell Science Park: "*We have said from the beginning that* ***(collaboration) is about building engagement on all levels.***"	
	NASA Tournament Lab: "There is a ***lot of collaboration between the contests****."*	
	Skild: "*For students it was a good group activity, so* ***it was another way of meeting new people and work in a group activity***."	

Impact of Social Ties		
Theme	*Evidence from Study Participants*	*Claim*
Increased Peer Recognition	Appirio: "*It's just this level of achievement and **recognition that they crave**... If they are working with other members of the community as well, becoming the rock star, they can't lose that within the community*."	Social ties influence the overall **solver engagement** generated by the solvers.
	*Battle of Concepts: "The social ties, and **feeling part of this community, being proud of being part of the community, and also the interaction with the different participants**, that was highly valuable for them (the solvers)."*	
	IdeaConnection: "***The peer stuff is really important, the friendship and the being challenged...** I think they want to feel stimulated and talk to brilliant people, I think that is really exciting for them. They get excited when they can give a very complex idea solution and a member of the team can take it to the next step, and then they can take it to the next level after that. So **they are building together.***"	
	Munktell Science Park: "*One of the reasons why we do things like the Smart Living Challenge is actually building networks. We try to build structures so people can also connect and have **the feeling of being involved in the community***."	
	NASA Tournament Lab: "*It is a competition plus community... Yes **they race against each other, but after they celebrate together***."	

Impact of Social Ties		
Theme	*Evidence from Study Participants*	*Claim*
Increased Collaboration	Battle of Concepts: "*In this concept, people were allowed to work individually or in teams.* ***We saw that the teams had better performances****, especially when it was a multi-disciplinary team.*"	Social ties influence the overall **submission quality** generated by the solvers.
	Battle of Concepts: "***They found (the groups) themselves because they noticed (teams) had better results***."	
	Chaordix: "*That is a key piece of research that we are working on in our lab right now, the connections between participants.* ***If we can be good at building those connection****s, or identifying those connections,* ***does that increase the overall quality of participants and the overall quality of contributions?***"	
	IdeaConnection: "*So yeah,* ***we definitely put together a diverse group in each team because we know diversity can solve problems***."	
	IdeaConnection: "*What can we do to make the team more likely to win, more likely to solve the problem? So* ***diversity is the answer there***."	
	NASA Tournament Lab: "*In order for the crowd to compete in it, you have to educate the crowd, and education,* ***that would require a lot of collaboration***."	
	Phantominds: "***For us, it is really important they interact with each other*** *because we want them to work together.*"	
	Phantominds: "*In our mind, we would say it is more like a collaborative contest. So* ***for us, they are not winning individually, they are winning in teams***."	

Table 5-7: Chain of Evidence for Social Ties Impacting Solver Engagement and Submission Quality within Collaborative Communities

These themes argue that "*social ties increase the levels of solver engagement*" and "*social ties increase the levels of submission quality*" which will be further outlined subsequently.

Increased Collaboration (For Solver Engagement)

Social ties were shown to increase the levels of collaboration among the community, impacting the overall levels of solver engagement with the platforms.

When describing collaboration as a result of social ties within their platform, *Chaordix* reflected on the nature of crowdsourcing, describing its premise as being "*I make some form of contribution, and my peers and the community can help me improve that contribution*." *Chaordix* argued that "*if you design for collaboration, collaboration will happen. If you don't, it won't*." In describing the importance of social ties within their own platform, *Chaordix* highlighted that collaboration is "*a key characteristic of the community design*". *NASA Tournament Lab* reiterated this point also, describing how their platform experiences increased levels of collaboration between solvers both during and outside of the contest setting, which further leads to increased solver engagement: "*There is a lot of collaboration between the contests."*

This sense of collaboration is necessary not only for the creation of strong social ties within the community, but it also facilitates increased engagement between the solvers as exhibited by *Munktell Science Park*, *Phantominds* and *Appirio*. *Munktell Science Park* for example highlighted that their vision from the beginning was that it was very much about "*building engagement on all levels*". *Munktell Science Park* stated the main reason they host challenges was actually to build networks among the solvers, providing an example of the Smart Living Challenge they had previously developed. During this challenge, *Munktell Science Park* developed various approaches for their solvers to connect and feel as though they were involved in a community. This was evidenced in the workshops held, where the solvers said that it was really valuable just to be part of the actual process. *Munktell Science Park* subsequently revealed that "*collaborating with people with other backgrounds has been one valuable thing for them*." This view is shared also by *Phantominds* who argued that "*For us, it is really important they interact with each other because we want them to work together*."

The importance of social ties for solver engagement was echoed further by *Appirio: "I would say that it is extremely, extremely important." Appirio* argued that these social ties provide the solvers with increased fun and enjoyment, which encouraged solvers

to collaborate on challenges. *Appirio* argued it should represent best practice within the industry: "*why not collaborate, why not integrate the ethos into the work experience and just take it a level further*?" *Skild* agrees with this point, believing that by increasing collaboration, it is more about solvers understanding themselves, and how they can work with other solvers as part of a team.

In terms of being platform driven, *Chaordix* outlined their promotion of collaboration through social ties, arguing that such an approach allows the solvers within a community to build a currency through their actions together. This belief resulted in the platform creating an "*Achievement Framework*". This framework defines four pillars of behaviour that *Chaordix* are trying to generate from their community of solvers:

i. *Chaordix* want the community to build their community
ii. *Chaordix* want the community to build connections
iii. *Chaordix* want the community to contribute
iv. *Chaordix* want the community to recruit

Based on these high level objectives, *Chaordix* implemented this framework by outlining to their solvers that: "*If you want to be on the top of the crowd, we are going to measure your contribution across these pillars, we are going to put certain weight against those forms of contribution across these pillars*". This framework then gives the solvers of *Chaordix* "*signal strength*" to the inside of their community, a proprietary concept they have worked on for several years. *Skild* also exhibited a similar approach when encouraging solver engagement within their platform. *Skild* provides their target demographic (students) a method of networking, allowing them to engage in group activities. *Skild* argued that this empowered and encouraged their solvers to engage further with the platform and their communities.

Phantominds also outlined that this sense of collaboration exists within their platform, supporting the development of social ties between their solvers: "*I think the platform of the community makes it really fun for people.*" Similarly, *Munktell Science Park* described how their solvers develop strong social ties through various workshops, and exposure to other solvers from different backgrounds: "*The participants in*

workshops, they say it has been really valuable to be part of the actual process, collaborating with people with other backgrounds". The data revealed that such an approach encouraged solvers to form their own teams when engaging in the various challenges, with *Battle of Concepts* describing that: "*more teams were going to participate, but it was more among friends. So they had already found the group, and then they entered the community to participate as a group*."

Increased Collaboration (For Submission Quality)

Along with the levels of solver engagement, increased collaboration was also shown to increase the submission quality within collaborative communities. The interviewees were all in agreement that increased social ties led to a drastic increase in the overall standard of the solution being submitted. For example, *Battle of Concepts* stated that while solvers are allowed to work both individually or in teams on their platform, teams had better performances especially when it was a multi-disciplinary team: "*We saw that teams had better performances, especially when it was a multi-disciplinary team*." The solvers soon too became aware of this fact to the point that there was an increase in the amount of teams entering the challenges through the platform: "*They found (the groups) themselves because they noticed they had better results*." *Battle of Concepts* believed that the best solutions were achieved when their solvers collaborated, though suggested that organising such an approach can sometimes be difficult due to the element of competition also present.

Similarly, *Munktell Science Park* illustrated an example of solvers collaborating in one of their challenges who did not know each other previously. *Munktell Science Park* argued that by engaging with their peers and combining their knowledge, these solvers were able to develop a better understanding as to the heart of the idea than they would have achieved working alone. This resulted in the solvers delivering solutions that were technically and conceptually superior to their individual counterparts: "*In one example, we had ten groups with three people per group, and quite often they didn't know each other from before. But just being part of this, and by combining their knowledge, they meet these people and understand the heart of the idea*." By focusing on the community rather than the idea, *Munktell Science Park* places increased importance on their solvers collective problem solving capabilities. This is in contrast,

according to *Munktell Science Park* to the strategy pursued by various competitive markets, including *InnoCentive*: *"One thing that differentiates our model from InnoCentive... We are more interested in the actual people than their ideas because an idea is just an idea. InnoCentive is more about the actual idea, they don't care who it comes from... For us, finding the right people and matching them together, making winners come together is something that is really important, but also for the all the participants as a whole to come together is really important for us.*"

This approach further outlines the importance of developing strong social ties within collaborative communities, with *IdeaConnection* outlining how such social ties make teams of solvers more effective due to the inherent value of diversity: "*What can we do to make the team more likely to win, more likely to solve the problem? So diversity is the answer there... we know diversity can solve problems.*" *IdeaConnection* believed that it is through diversity that teams of solvers will solve the problems being challenged, which is why arguably the platform does not allow team to self-form.

This finding supports current research being performed by *Chaordix*, who are exploring the strength of social connections between their solvers to determine whether it increases not only the resulting quality of contributions, but also the overall quality of solver: "*That is a key piece of research that we are working on in our lab right now, the connections between participants. If we can be good at building those connections, or identifying those connections, does that increase the overall quality of participants and the overall quality of contributions?*"

Peer Recognition

In addition to increased collaboration, the theme of peer recognition also emerged from the findings of several platforms when investigating the levels of solver engagement. *Appirio* for example argued that the social ties developed among their solvers provided them with the opportunity to further promote themselves among their peers. *Appirio* outlined how such solvers work with their peers in the challenge setting and develop the recognition of their peers as a result, a status that their solvers strive to obtain: "*It is this level of achievement and recognition that they crave... If they are working with other members of the community as well, becoming the rock*

star, they can't lose that within the community." *NASA Tournament Lab* similarly described their platform as being "*a competition plus community*", outlining while the solvers compete against each other during the contests, after its completion they celebrate together which leads to increased peer recognition between contests on the platform.

This team ethos within the collaborative community is identified by numerous platforms. *IdeaConnection* for example believed social ties to be "*really important*", along with the feelings of "*friendship, and being challenged*". *IdeaConnection* argued that solvers want to "*feel stimulated and talk to brilliant people*", and that is what gets them excited to engage. *IdeaConnection* outlined that solvers get "e*xcited when they can give a very complex idea a solution and a member of the team can take it to the next step, and then they can take it to the next level after that*."

This was further mirrored by *Battle of Concepts*, who revealed their solvers described how the peer recognition of "*the social ties and feeling part of this community, being proud of the community, and also the interaction with the different participants*" was "*highly valuable*" to them, which in turn increased their overall engagement with the platform.

5.3.1.2 Impacts of Social Ties

Based on the themes identified previously, it is argued that social ties have two key impacts towards collaborative communities: solver engagement, and submission quality. These impacts are further outlined below.

Solver Engagement

The findings show that social ties serve to increase the levels of solver engagement with the platform within collaborative communities. Interestingly, this impact was not encountered within the competitive markets investigated, and further highlights the dichotomy between the two platform sets. The increase of collaboration between solvers results in solvers becoming familiar and comfortable within the community, especially in relation to whom it is they are engaging with. Ultimately, such actions are the foundation of strengthened social ties.

In addition to collaboration serving to increase the levels of solver engagement, the findings also reveal engagement can be achieved through the theme of peer recognition. The more solvers are recognised for their efforts and contributions by the community, and indeed, the platform itself, the more likely they are to engage with the platform. Being recognised by their peers also serves to strengthen the social ties between solvers, as it allows them to communicate directly with one another to provide feedback, advice, or simply to provide an avenue of networking within the community.

Several platforms outlined how such engagement can come to pass based on the structure of the platform, along with describing how their platforms are tailored to facilitate and develop such engagement. The mechanisms by which to do so are further outlined in Chapter 6.

Submission Quality

The second impact of social ties within collaborative communities involved the heightened levels of submission quality being presented by the solvers. This correlation had also previously been revealed within competitive markets, further strengthening this claim. These findings reveal that a higher submission quality is the by-product of increased collaboration between the solvers within a community, outlined by several platforms investigated. Such findings present collaborative communities with increased opportunities to further enhance the strength of their communities' overall offerings. The communities who focus their attentions towards developing strong social ties within their platforms will also be the platforms to provide their clients with a higher level of quality.

5.3.2 Trust

This section will analyse the emergent themes of trust from the data as evidenced throughout the nine different collaborative communities investigated in this study, before subsequently describing their net impact.

5.3.2.1 Emergent Themes

Two primary themes of trust emerged from the data, those being "*risk of plagiarism*" and "*increased feedback*", as outlined below in Table 5-8. These themes argue that "*trust influences the overall churn rate of the platform*" and "*trust influences the overall solver retention of the platform*" which will be further outlined subsequently.

Impact of Trust		
Theme	*Evidence from Study Participants*	*Claim*
Risk of Plagiarism	Appirio: "*I think that* ***if the trust is gone, the relationship is gone****, and I think there is a level of social sanction where you know, if someone is red flagged,* ***that's it, they are done****.*"	Trust influences the overall **solver churn rate** of the platform.
	NASA Tournament Lab: "*I would say that if there is a breach of trust...* ***You would see just a huge drop in participation****.*"	
	Phantominds: "*They have* ***lost a lot of members*** *due to the duplication of ideas.*"	
	Skild: "***You make it fairer so you don't lose people****, because people like that are like "*Well I'm never going to compete in that again!*" because someone just took their idea.*"	

Impact of Trust		
Theme	*Evidence from Study Participants*	*Claim*
Increased Feedback	Battle of Concepts: "***If you want a sustainable community, you want them to join more often, then appreciation and trust*** *that you communicate fairly so that they know what they are into, that* ***you respond to them on time, you explain why they get good results, or not selected results,*** *all these kind of things are really important for the appreciation and trust in a platform.*"	Trust influences the overall **solver retention** experienced in the platform.

	Phantominds: "*I think trust and the feeling of being treated fairly in the community is really important.* ***They trust us for example that the evaluation of the winners is fair and transparent***."	
	Phantominds: "*The company will evaluate the ideas and says which are the winners acting as a kind of jury. But* ***for this process, you have to be really open and if you use these juries from the company, you have to be really open and transparent and explain how the winners were evaluated*** *and how we come to the winners. So I think there is a really big trust issue in it*."	
	Skild: "*Your ideas are going to be heard, and here is the process. It is a level playing field, and* ***being very transparent about the process and all these things earn trust and get people to do it***."	

Table 5-8: Chain of Evidence for Trust Impacting Solver Retention within Collaborative Communities

Risk of Plagiarism

The first key theme to emerge from the trust analysis was the risk of plagiarism within solver community. Risk of plagiarism relates to the behaviour of solvers that are concerned about the security of their IP once shared on such collaborative platforms. Several platforms including *Munktell Science Park*, *NASA Tournament Lab* and *Battle of Concepts* explained how solvers would simply walk away from the platform should they feel vulnerable about whom they are sharing their ideas with, illustrating how vital a sense of trust was within the setting. *Munktell Science Park* for example outlined how "*Trust is a key word for things like this (solvers returning) to happen*" for successfully maintaining a healthy and sustainable solver community.

F6S also shared this view, arguing that solvers need to feel confident there is no exposure to risk in interacting with the community, further highlighting that trust was one of the main reasons for the continued use of their platform: *"Trust is extremely important... It's what keeps them at F6S after they come here."* This level of trust is extremely fragile however according to *Appirio*, to the extent where once it is compromised, it is very difficult to recover in the eyes of both peers and the platform

community: "*I think that if the trust is gone, the relationship is gone, and I think there is a level of social sanction where you know, if someone is red flagged, that's it, they are done.*" Once solvers feel as though there is a risk in interacting, that level of trust is very difficult to repair, and impacts on the numbers of solvers who remain committed to the platform.

Indeed, this lack of trust between solvers was also highlighted as being detrimental by several platforms. *Phantominds* acknowledged risk aversion as being "*a very important point*", before revealing trust to be a huge challenge to develop. A lack of trust within platforms can emerge from solvers duplicating or stealing the ideas of others only to embed them in their own projects, as experienced by *Phantominds*. *Phantominds* revealed how they had discussed this issue with a competitor of theirs who had previously lost a lot of their members as a result of such plagiarism: "*We discussed (trust) with a competitor of ours in Switzerland, and they have discussions about it in their community as well. They have lost a lot of members due to the duplication of ideas... I think this is a challenge of the platform.*" *Skild* mirrored this concern of solvers having their IP replicated and duplicated within platforms, however argued that to counter this behaviour it depends on how the platform themselves structure the contest: "*It is really hard to control collaboration and people's individual motivations. It boils down to how you structure that collaboration and how you make it fairer so you don't lose people, because people like that are like* "Well, I'm never going to compete in that again!" *because someone just took their idea.*" Appirio further outlined that should a lack of trust exist between solvers, they would not "*expose their top level thinking*", which "*has a negative effect on everyone*" including the platform.

The implications of losing trust within collaborative communities were further outlined by both *Phantominds* and *NASA Tournament Lab*. Both platforms described how their communities would experience a loss of participation should there be an absence of the construct. For example, *NASA Tournament Lab* argued that: "*I would say that if there is a breach of trust... You would see just a huge drop in participation.*"

Increased Feedback

The levels of feedback were also identified by several platforms investigated as being an important theme of trust. *Appirio* argued that increased feedback to solvers within the platform leads to the sharing of personal information at a higher level, which not only makes the process "*more robust*", but also "*raises the level of the quality of work*". Unfortunately *Appirio* was the only platform to illustrate a relationship between the levels of feedback returned to the solvers and the resulting impact on submission quality. As such, this claim was not entered into the final model.

Battle of Concepts further explained how important it was for platforms to provide feedback in order for solvers to remain active within the community. This process involved communicating with the various solvers, responding to queries and suggestions, while also revealing how the submissions were being judged: "*If you want a sustainable community, you want them to join more often... You communicate fairly so they know what they are into, that you respond to them on time, you explain why they get good results, or not selected results.*"

If the solvers do not trust in the feedback they are receiving, and adopt their methodology appropriately, their future submissions will most likely also result in failure. *NASA Tournament Lab* for example outlined that for contests, the evaluation of submissions can be quite subjective. *NASA Tournament Lab* acknowledged that solvers can often receive negative feedback, which leads them to sometimes argue that their solution was subjectively undervalued: "*You can actually get a lot of negative feedback. So people complained sometimes quite a lot, saying their solution was subjectively under-valued and there were a lot of recommendations based on early feedback on why the solution was scored subjectively and validated this way.*" However, *NASA Tournament Lab* believed that solvers who trust the received feedback often use it to further develop and improve their initial offerings. *Skild* also outlined this strategy, calling for an increase of transparency as to how the submissions were judged. *Skild* believed that by doing so, it would further develop trust within their solvers, ensuring solver retention: "*You make it fairer so you don't lose people.*" *Skild also* stressed that trust can be developed between solvers once the proper processes are put in place, and when the solvers are ensured that: "*Your ideas*

are going to be heard... It is a level playing field, and being very transparent about the process and all these things earn trust and get people to do it."

5.3.2.2 Impacts of Trust

Based on the themes identified previously, it is argued that trust has two key impacts towards collaborative communities: churn rate and solver retention. This impact is further outlined below.

Solver Churn Rate

The churn rate describes the numbers of solvers leaving a platform during a given period, providing a possible indicator of dissatisfaction. The findings show that the threat of IP plagiarism is heavily associated with the churn rate of solvers within the collaborative community. Once solvers become worried their efforts are being either exploited or plagiarised they will immediately leave the community and may not return. Actions of plagiarism are obviously against the very ethos of a collaborative community; however the findings show that there is still a tendency for them to occur, which only serves to create discord and ill-will towards the platform itself. The platforms must therefore be aware of the risks involved in neglecting to monitor solver interactions. The social capital construct of trust is therefore vital in this sense, as a lack of it will see the numbers within the community drop to an unsustainable level. This makes it imperative for the platform to implement strict mechanisms by which to avoid this outcome, which will be further explored in the following chapter.

Solver Retention

While a lack of trust leads to increased solver churn, generating trust by providing increased levels of feedback was shown to increase the levels of solver retention within the collaborative communities. These findings mirror those already discussed within their competitive market counterparts. However, while the net impact was similar, the emergent themes as to how solver retention was created differed. In this case,

providing feedback to the solvers as to how their submissions were evaluated emerged as the primary theme of developing trust.

This serves to eliminate solver uncertainty as to why their submission did not win the challenge, with several platforms admitting their solvers in some cases express dissatisfaction to what they perceived to be subjective methods of evaluation. When provided with feedback explaining why the submissions were unsuccessful, the findings show that it serves to increase the levels of trust within the community toward the platform, which consequently serves to increase the levels of solver retention.

5.3.3 Reciprocity

This section will analyse the emergent themes of reciprocity from the data as evidenced throughout the nine different collaborative communities investigated in this study, before subsequently describing their net impact.

5.3.3.1 Emergent Themes

One key theme of reciprocity emerged from the data: "*increased collaboration*" as outlined below in Table 5-9. This theme argues that "*reciprocity influences the overall submission quality generated by the solvers*" which will be further outlined subsequently.

Impact of Reciprocity		
Theme	*Evidence from Study Participants*	*Claim*
Increased Collaboration	Appirio: "*My sense is that there is a really **strong sense of sharing**... They like to **raise the standard of work**.*"	Reciprocity influences the overall **submission quality** generated by the solvers.
	Appirio: "*Ultimately the collaboration raises the chance that each has to win.... I think **that probably raises the quality** of the final solution.*"	

	Battle of Concepts: "*I also see real appreciation between people who are high on the ranking, they appreciate each other... Sometimes* ***they give each other feedback on their concepts*** *before they hand it in.*"	
	Chaordix: "In all of our communities, that would be a default setting, that we would want to encourage our community to ***accept forms of collaboration on their solution, but also contribute to other potential solutions****."*	
	F6S: "*I would say (reciprocity) is extremely big... It's more about collaboration right? I mean* ***the hackathons and events at the end of the day are more about collaborative spirit...*** *A social collaborative action is very welcomed in these hackathons.*"	
	NASA Tournament Lab: "*It is quite often when the challenges are interesting, after they* ***go into the same forum and share their winning strategy****, and congratulate each other.*"	
	Phantominds: "*I think* ***the quality of the ideas is better*** *so the chance of winning I would assume is better for any individual when they work together.*"	
	Phantominds: "*We use a collaborative approach so* ***we want our participants or community members to work collaboratively*** *on ideas and solutions.*"	

Table 5-9: Chain of Evidence for Reciprocity Impacting Solver Engagement and Submission Quality within Collaborative Communities

Increased Collaboration

The emergent theme of reciprocity within collaborative communities was that of increased collaboration. This was evidenced by several platforms including *Appirio, Battle of Concepts, Chaordix* and *Phantominds*. *Phantominds* believed that this increase of collaboration ensures that the "*quality of the ideas is better, so the chance of winning... is better*", a view also shared by *Battle of Concepts*. In *Battle of Concepts,* solvers often develop strong social ties that subsequently lead to an increased level of collaboration between solvers. This relationship results in the development of "*real appreciation between people who are high on the ranking.*" *Battle of Concepts* further explained that this level of collaboration extends to the point where often these solvers

will provide each other with detailed feedback on their respective concepts before the submission deadline.

Chaordix revealed similar manifestations of collaboration, pointing to the example of the *NetFlix* prize as a great case study. In this challenge, the contest started with individual solvers competing against each other, but through its progression: "*these individuals joined up to form teams to find the solution.*" Such reciprocity led to a higher standard of work than would have been individually produced. As *Chaordix* described: "*That would be a default setting: that we would want to encourage our community to accept forms of collaboration on their solution, but also to contribute to other solutions*".

This display of collaboration was also experienced by *Appirio. Appirio* believed that at a certain point solvers collaborate with each other based on the reciprocal ethos of the community within the platform. *Appirio* provided the example of two solvers experiencing problems within a software development challenge: "*I am working on this algorithm, same contest you are, and I have reached point G. Have you reached point G and are you dealing with the same problem that I am*?" *Appirio* compared this degree of reciprocity to solvers running a marathon. *Appirio* described the marathon as being akin to two solvers helping each other through the contest: "*You line up and there is a big crowd, and the second it starts, some guys just take off and they are out to win. Everyone else is there because... they want to find that person that runs the same pace that they do, with whom they can speak and lend motivation to.*" *Appirio* argued that solvers need that reciprocity which both "*raises the chance that each has to win*" and "*raises the standard of the work.*"

The community *Phantominds* is developing is also based on a collaborative approach for the solvers to work together on both ideas and solutions. *Phantominds* outlined that it is firstly "*really important*" that their solvers have the options to interact, as the platform wishes them to work together. *Phantominds* outlined why they chose to pursue a collaborative approach as they "*want our participants or community members to work collaboratively on ideas and solutions.*" *Phantominds* argued that this ultimately serves to enhance the overall solution offerings: "*I think the quality of the ideas is better so the chance of winning I would assume is better for any*

individual when they work together." *NASA Tournament Lab* also described how similar increased collaboration serves to increase the quality of work being produced by their solvers. *NASA Tournament Lab* explained how collaboration transpires among their solvers, outlining how they often reveal their winning strategies among one another, which increases the quality of their subsequent submissions: "*It is quite often when the challenges are interesting, after they go into the same forum and share their winning strategy*."

5.3.3.2 Impact of Reciprocity

Based on the theme identified above, it is argued that reciprocity has one key impact towards collaborative communities: submission quality. This impact is further outlined below.

Submission Quality

Based on the sole impact to emerge from the findings in terms of reciprocity, the data reveals once more that the theme of increased collaboration serves to raise the submission quality of the platform community. In this instance, the submission quality increases as a result of the collaboration between solvers, and the willingness by each to further develop their own ideas by sharing it amongst their peers. This correlation was encountered in several platforms during the analysis. These findings illustrate the advantages of providing an open environment, allowing solvers to share their ideas. However, as the previously explored construct of trust outlines, platforms must ensure this openness is not abused by the community, or they risk the likelihood of solvers abandoning the platform entirely.

5.3.4 Self-Identity

This section will analyse the emergent themes of self-identity from the data as evidenced throughout the nine different collaborative communities investigated in this study, before subsequently describing their net impact.

5.3.4.1 Emergent Themes

Five key themes of self-identity emerged from the data: enhanced career mobility, increased solver status, acquisition of knowledge, increased fun and enhanced satisfaction, as outlined below in Table 5-10.

Impact of Self-Identity		
Theme	*Evidence from Study Participants*	*Claim*
Enhanced Career Mobility	Battle of Concepts: "*They also use (the contest) for example after they finish their studies to* ***get a job****. You can say "*Well, ok, in this competition I won, I had the best idea, so that shows that I have potential"."	Self-identity provides the solver with enhanced **career development** opportunities.
	IdeaConnection: "*It could* ***lead to a job***."	
	Skild: "***We have had many people hired*** *through these competitions*."	
	Skild: "*We went out to large, global corporations like Hilton Hotels, American Express, and Chrysler...* ***(solvers) would to it to eventually get noticed by the companies for a job***."	
Increased Solver Status	F6S: *"****First and foremost is the benefit for themselves****. So they engage in the platform first of all for their own benefit."*	
	Munktell Science Park: "*I know several (solvers) have mentioned they have used a platform like Smart Living Challenge, as a way of* ***getting recognition for their idea.***"	
	NASA Tournament Lab: "***You want to get your rating higher****, you want to beat everyone, and you also want to get the prize*."	
	Skild: "***(Solvers) use it as a résumé builder****, something to talk about in an interview, something they did and the skills they picked up and how they really differentiated themselves among other candidates*."	

Impact of Self-Identity		
Theme	*Evidence from Study Participants*	*Claim*

Acquisition of Knowledge	Appirio: "*For the overwhelming majority, the reality is that they can't achieve it. But they can learn how. Or they can* ***learn the skills that will be applied to the next challenge***."	Self-identity provides the solver with enhanced **learning** opportunities.
	Appirio: "*I think* ***learning and skills development is extremely high***... They learn a great deal from one another."	
	Battle of Concepts: "*They found that* ***this was a nice way to learn more from the real world,*** *so to speak*."	
	Munktell Science Park: "*We want to make sure from the beginning that it is a really hot topic where* ***people can grow their network and knowledge***."	
	NASA Tournament Lab: "*We also have a lot of incentives with people coming to try and solve a massive problem because* ***they are curious as to how it works***."	
	Skild: "*I think that people who win end up doing it for a higher purpose... I think from what I have seen is that it is not really necessarily for the money,* ***it is more about... picking up new skills****, breaking into a new industry, that has been a theme.*"	
	Skild: "*If you were able to put in classes, and bring in some training for new skills to learn a particular part of the problem that increases collaboration, because* ***everyone is learning together***."	

Impact of Self-Identity		
Theme	*Evidence from Study Participants*	*Claim*
Increased Fun	Appirio: "***Fun and enjoyment I think are certainly good motivators***."	Self-identity provides

	Appirio: "*I would say that self-identification is extremely, extremely important. In terms of the feeling of belonging,* ***in terms of having fun and enjoying yourself.***"	enhanced **solver enjoyment.**
	NASA Tournament Lab: "*There are* ***a lot of people who only participate in competitions for fun.***"	
	NASA Tournament Lab: "*They run also competitions for fun. And* ***those competitions surprisingly have much stronger participation than commercial competitions***."	
	Phantominds: "*I think the platform of* ***the community makes it really fun for the people***."	
	Skild: "***Students would do it for the fun*** *of doing it*."	
Enhanced Satisfaction	Appirio: "*I thought of running a marathon as an example. You line up and there is a big crowd, and the second it starts, some guys just take off and they are out to win. Everyone else is there because* ***it's a sense of satisfaction****. They want to finish, they want to get their t-shirt, they want to find that person that runs the same pace that they do, with whom they can speak and lend motivation to.*"	
	Appirio: "*If you are able to solve, you know, find out at the end that you really made a difference for a client,* ***we have seen that is extremely satisfying***."	
	Appirio: "*The ability for a coder to work for himself, rather than work for Microsoft for example.* ***He can set his own hours.***"	
	IdeaConnection: "*The big reason is working with really intelligent people... R&D, engineering, or biochem challenges, genetics, mathematical modelling, they get to work with some really great people so* ***that is a pleasure for them***."	
	IdeaConnection: "*You can divide (satisfaction) into two: why they do it in the first place for the first time they do it, and why they continue to do it.*"	

Table 5-10: Chain of Evidence for Self-Identity Impacting Career Development, Learning and Solver Enjoyment within Collaborative Communities

These themes argue the following claims:

i. Self-identity provides the solver with enhanced career development opportunities
ii. Self-identity provides the solver with enhanced learning opportunities
iii. Self-identity provides enhanced solver enjoyment

These will be further outlined subsequently.

Enhanced Career Mobility

The first theme to emerge from the data surrounding the self-identification of solvers involved the enhanced career mobility afforded to them through competing in the platforms. Several platforms expressed this point of view, with *Battle of Concepts*, *IdeaConnection* and *Skild* explaining how solvers self-identify with their platforms with the intent of achieving a job offer through their efforts. *Battle of Concepts* described that their target demographic (students) use the contests hosted on their platform as a means to get a job after they finish their studies: "*They also use (the contest) for example after they finish their studies to get a job. You can say* "Well, ok, in this competition I won, I had the best idea, so that shows that I have potential"".

IdeaConnection and *Skild* also outline how competing in such challenges could ultimately "*lead to a job*", with *Skild* revealing they have successfully seen many solvers being "*hired through these competitions*." *Skild* identified numerous clients that approached them to host a challenge on their behalf, reiterating that a primary reason of why solvers self-identified with the challenge was the potential of subsequently gaining employment with the challenging company: "*We went out to large, global corporations like Hilton Hotels, American Express, and Chrysler... (solvers) would to it to eventually get noticed by the companies for a job*."

Increased Status

The second theme to emerge from the self-identification data involved solvers achieving an increased status, which would be used to promote themselves on a professional level. Several platforms revealed how their solvers outline their experience of winning various challenges on their résumés, along with the rewards that may have subsequently been achieved as a result. For example, *Skild* outlined how they

give the winning solver teams the title of "*Most Innovative MBA Team in the World*". *Skild* revealed that "*even today if you go back and look at the winners, they have it on their résumés, like 10 years later... They think it is pretty prestigious*". *Skild* also described solvers use "*it as a résumé builder, something to talk about in an interview, something that they did and these skills they picked up, and how they really differentiated themselves among other candidates when they interview a lot of people*".

A*ppirio* further explained that solvers often self-identify with the ratings they receive from *TopCoder* in order to use them during job interviews. A*ppirio* explained that for example the interview process of *Google* is "*very, very difficult... and if you already have a* TopCoder *rating, they let you skip a number of steps*". Similarly, A*ppirio* also described how other companies often request job candidates to receive a *TopCoder* rating before they can be further considered for the post being sought.

Munktell Science Park and *NASA Tournament Lab* also explained how a solvers status was a powerful means of establishing self-identification with the platform itself. *NASA Tournament Lab* for example described how their solvers continually strive to better their status within the community which in turn puts them in a better position to successful compete and win the contests they are engaged in: "*you want to get your rating higher, you want to beat everyone, and you also want to get the prize*". *Munktell Science Park* also outlined how their solvers compete in their challenges in order to promote their own work in the hopes that something may emerge from doing so: "*Several (solvers) have mentioned they have used a platform like Smart Living Challenge as a way of getting recognition for their idea*". By promoting their ideas in such a fashion, *Munktell Science Park* described how various solvers had been contacted in order to collaborate further by combining various ideas into one cohesive product beyond the platform: ""*To give you one example, there was one contest who posted an idea about having solar panels... There was another winner who posted sketches of a boat driven by solar energy. And the guy behind the idea for solar panels on the roof... posted on the other guys challenge page and said "*we should collaborate*!*""

Acquisition of Knowledge

The third theme to emerge from the self-identification data involved solvers acquiring knowledge through their efforts of competing in the various challenges. The data reveals that similar to competitive markets, solvers self-identify with these platforms in order to further develop new skills and talents while testing them against the best in the industry. It affords them the opportunity to express their creativity they might otherwise by unable to do so within a professional setting. Whether the solvers in question end up winning the problem is often considered irrelevant by some platforms. These platforms indicated that the solvers would implement their learning's to the next challenge they compete in to heighten their offerings. *Appirio* in particular believed the intellectual challenge for solvers to be "*extremely*" important in their self-identification, arguing that "*for the overwhelming majority, the reality is that they can't (win it). But they can learn how, or that they can learn skills that will apply to the next challenge*". *NASA Tournament Lab* agreed with this point, arguing that the prospect of learning is the strongest incentive of self-identification.

This is also exhibited by both *Skild* and *Battle of Concepts*. *Skild* for example outlined how their solvers self-identify with their platform to tap into and further develop their creative skills. *Skild* went further to explain how ""*I think that people who win end up doing it for a higher purpose... I think from what I have seen is that it is not really necessarily for the money, it is more about... picking up new skills, breaking into a new industry, that has been a theme.*" Indeed, this was also mirrored by NASA Tournament Lab who explained that a subset of their solver base are drawn to the challenges posted out of sheer curiosity in what the challenge aims to achieve, and how it means to do so: "*We also have a lot of incentives with people coming to try and solve a massive problem because they are curious as to how it works.*"

Skild further outlined that "*I think people will identify themselves and say "*Hey, I'm creative, I can do this and I am going to show it to you and prove it to you through this opportunity""*.* To further highlight the importance of acquiring knowledge, *Skild* suggested that dedicated classes should be implemented on the platforms in question to provide solvers with new skills which would ultimately serve to "*increase collaboration, because everyone is learning together. Everyone is reading that*

material together, practicing it, maybe doing an exercise, and then they are tackling the challenge".

Battle of Concepts revealed a similar approach, describing how their solvers receive personalised feedback to their submitted solutions. This is an important driver for the solvers according to the platform as they are able to learn how their ideas fit into the professional market, and adapt them accordingly: "*They found that this was a nice way to learn more from the real world.*"

Increased Fun

The fourth theme to emerge from the self-identification data involved solvers having increased levels of fun. This theme was evident in several platforms, including *Appirio, NASA Tournament Lab, Skild* and *Phatominds*. *Appirio* for example outlined that "*fun and enjoyment I think are certainly good motivators... I would say that (fun) is extremely, extremely important in terms of the feeling of belonging, in terms of having fun and enjoying yourself.*" Indeed, *NASA Tournament Lab* revealed that "*there are a lot of people who only participate in competitions for fun*", a finding also expressed by *Skild*: "*students would do it for the fun of doing it*."

The allure of increased fun and the resulting effect of it were also made evident by NASA Tournament Lab, who outlined that in some cases, the prospect of a reward is superseded by the desire for enjoyment completely. *NASA Tournament Lab* outlined how contests designed for the solvers enjoyment have a higher participation rate than those contests with the prospect of monetary reward: "*those (fun) competitions surprisingly have much stronger participation than commercial competitions*". *NASA Tournament Lab* argued this to be case as solvers can enjoy engaging in innovation contests in two ways: "*You enjoy solving the problem, or you also enjoy sort of the spirit of the competition*".

Enhanced Satisfaction

The fifth theme to emerge from the self-identification data involved solvers attaining enhanced levels of satisfaction through their engagement with the contests being posted and the overall community of the platforms. Achieving this satisfaction was

described by *Appirio* as being almost akin to running in a marathon: "*You line up and there is a big crowd, and the second it starts, some guys just take off and they are out to win. Everyone else is there because it's a sense of satisfaction*." *Chaordix* echoed this sentiment, explaining how their solvers self-identify by being "*amongst peers, they are amateur creators, or designers, or inventors and are getting together to do this, meaning* "I have found my people"*, so therefore (the solvers are) motivated by those around (them)*".

IdeaConnection agreed with this point, highlighting how such satisfaction can be broken down into two components: "*You can divide (satisfaction) into two: why they do it in the first place for the first time they do it, and why they continue to do it.*" The primary reason solvers remain satisfied according to *IdeaConnection,* mirrors the views previously outlined by both *Appirio* and *Chaordix*: "The big *reason is working with really intelligent people... R&D, engineering, or biochem challenges, genetics, mathematical modelling, they get to work with some really great people so that is a pleasure for them*." *Appirio* also outlined how the process of problem solving was also a source of satisfaction, citing that their solvers, who successfully meet the need of the client posting the challenge, have found the experience "*tremendously satisfying*".

5.3.4.2 Impacts of Self-Identity

Based on the themes identified above, it is argued that self-identity has three key impacts towards collaborative communities: career development, learning and solver enjoyment. These impacts are further outlined below.

Solver Employment

Similar to competitive markets, solvers that self-identify with collaborative communities do so in the hopes of gaining employment opportunities. They compete in the challenges in order to show case their skills and talents to the challenging organisation, in the hopes of working directly for that organisation after the challenge finishes. Alternatively, solvers are also capable of taking the recognition they receive for competing and using it to further their career prospects by embellishing their

résumés, as was evident from several platforms. This recognition was shown to come in various forms, ranging from directly ranking the solvers as was the case with *TopCoder* (further discussed in Chapter 6), to awarding titles upon the winning solvers as illustrated by *Skild*.

Solver Learning

Another impact that was encountered within competitive markets, solvers within collaborative communities also self-identified with the platform for the potential of acquiring new information or knowledge. Interestingly however, it was only the prospect of gaining knowledge that made the solvers self-identify with collaborative communities, as opposed to both gaining and applying knowledge as was previously outlined in competitive markets. This reveals that solvers partake in collaborative communities as a means of exploring new areas of interest to gain fresh levels of knowledge, rather than applying and testing their existing repertoires of tacit knowledge. This indicates a more intrinsic approach as solvers seek to directly gain a personal reward in return for engaging.

Solver Enjoyment

The findings also reveal that self-identity results in increased levels of solver enjoyment through the emergent themes of fun and satisfaction. This finding is especially relevant as this impact was not encountered in any of the previously explored social capital constructs within competitive markets. This further implies that solvers are drawn to collaborative communities more so on an intrinsic level rather than anything of an extrinsic nature. The fun and satisfaction experienced herein arguably also serves to encourage increased collaboration which has previously been shown to increase the overall standard of submission quality. While this relationship was not expressly investigated within this study, it certainly represents an area in need of further clarification.

5.3.5 Shared Language

This section will analyse the emergent themes of shared language from the data as evidenced throughout the nine different collaborative communities investigated in this study, before subsequently describing their net impact.

5.3.5.1 Emergent Themes

One key theme of shared language emerged from the data: increased clarity, as outlined below in Table 5-11. This theme argues that "*shared language impacts the solver understanding of a challenge*", which will be further outlined subsequently.

Impact of Shared Language		
Theme	*Evidence from Study Participants*	*Claim*
Increased Clarity	F6S: "*English is more or less the business language worldwide, and being as unified as possible, having this community* ***allows you to overcome these barriers of different languages*** *and different cultures.*"	Shared Language enhances the overall **solver understanding**.
	F6S: "We found it ***extremely important to be as unified as possible*** *within the different cultures, the different languages, different backgrounds... When you communicate in this one language... It* ***eliminates the barriers of people coming from different backgrounds*** *and not knowing how to deal with it.*"	
	NASA Tournament Lab: "*There* ***has to be a good understanding*** *if you are a crowd member.*"	
	NASA Tournament Lab: "***There has to be not only clarity for the crowd, but also understanding*** *(when discussing shared language).*"	

Table 5-11: Chain of Evidence for Shared Language Impacting Solver Understanding within Collaborative Communities

Increased Clarity

The core theme to emerge from the shared language data within collaborative communities was that it afforded the solvers an increased sense of clarity as to what was expected of them, and how they were to go about delivering a successful

submission. These findings mirror those previously revealed within competitive markets.

Phantominds for example highlighted that ensuring clarity between their solvers is important to their understanding of each other, outlining that "*if you have a software engineer or a marketing expert, I hope they might understand each other, but they would use different terminologies and I think a shared language would be important*". *Phantominds* noted that solvers not understanding each other due to shared language barriers, could negatively impact the clarity they have towards a challenge and thus "*could be an issue*". *F6S* agrees with this point, arguing the need for clarity between solvers, recommending English as a shared language as it is "*more or less the business language worldwide.*" Having this shared language within their solver community allows the *F6S* community to "*overcome these barriers of different languages and different cultures... When you communicate in this one language... It eliminates the barriers of people coming from different backgrounds and not knowing how to deal with it*."

Developing this culture however depends on "*multiple things*" according to *Skild*, and in order to address the problem sufficiently, it requires an increased understanding between both the platforms, and the solvers. As *Skild* described: "*It is about understanding who you are dealing with, understanding the initial task, how do you design the initial task and are you getting appropriate content, mentorship or feedback. These are the types of features that need to be built into the platform to make it truly effective*".

NASA Tournament Lab outlined however that a shared language is very hard to measure, both between the solvers, and between the solvers and the platform. *NASA Tournament Lab* stated that "*definitely we experience that a lot... what you get from the crowd is what you actually set as a question. So, in order to get something back you have to understand the whole thing. So you have to understand what have you actually asked, not what you think you asked, but what can you actually set or request for the submission*".

Due to this inherent difficulty, *Battle of Concepts* stated that the development of a shared language is arguably the most important construct of social capital because it is an important factor on a solvers decision to compete in the challenge. *Battle of Concepts* stated that the language the platform chooses to present the challenge in has implications to not only how the solvers interpret the contest requirements, but also how it motivates them to take part in the first place: "*knowing what kind of words you have to use... what would motivate them to think about this topic, to gain their interest, that is really I think a communication aspect that is very important*".

5.3.5.2 Impact of Shared Language

Based on the theme identified above, it is argued that shared language has one primary impact towards collaborative communities: solver understanding. This impact is further outlined below.

Solver Understanding

As outlined previously, shared language (along with shared vision) represents the cognitive dimension of social capital. These findings therefore verify the previously theorised impact of shared language within the setting of an IT-enabled innovation contest. This impact also mirrors both the emergent theme and the overall impact previously investigated within the competitive markets. By providing increased levels of clarity to the solver community, the provision of a shared language allow the solvers to better understand what the objective of the contest is, and how best they should approach the challenge in the hopes of delivering a successful submission. This was evidenced through several platforms that directly associated the levels of clarity achieved through a shared language with an increase of solver understanding.

5.3.6 Shared Vision

There were no shared themes to emerge from the collaborative communities based on shared vision, thus no net impacts were recorded either. Preliminary investigations revealed an early correlation between shared vision and submission quality; however

this was only outlined by one platform. As it was not revealed in any other of the platform investigated, it was thus cut from the findings. It is worth reiterating from Chapter 2 that according to Eisenhardt (1989) "*no construct is guaranteed a place in the resultant theory, no matter how well it is measured*" (p. 536). Therefore, the exclusion of this particular construct does not diminish the offerings of the overall theoretical model being presented herein.

5.3.7 Collaborative Community Summary

The findings reveal that social capital is responsible for eight significant impacts, for both the platforms issuing the challenge, and the solvers that engage:

i. Churn Rate
ii. Solver Learning
iii. Solver Employment
iv. Solver Engagement
v. Solver Enjoyment
vi. Solver Retention
vii. Solver Understanding
viii. Submission Quality

The findings reveal that increasing the collaboration among solvers directly increases the overall submission quality, as experienced within both social ties and reciprocity. This also mirrors the previously outlined correlation between collaboration and submission quality found within the competitive markets. In addition however, the analysis shows that increased collaboration, together with peer recognition also results in increased levels of solver engagement due to social ties.

The construct of trust was shown to affect the levels of solvers present on the platform, with a lack of trust due to risk of plagiarism resulting in an increased rate of solver churn for the platform. Alternatively, platforms that provided increased levels of feedback to their solvers were shown to increase the levels of trust present, which in turn increased the rates of solver retention experienced by the platform.

Self-Identity was shown to impact the solvers directly by providing them the means of furthering their professional careers, to learn new skills and knowledge, and also to simply enjoy themselves through the process (a feature that was not present within the competitive markets). Finally, the findings of the cognitive dimension of social capital were also interesting. While the provision of a shared language also ensured increased levels of solver understanding (mirroring competitive markets), the findings did not reveal any emergent themes, nor overall impacts for the shared vision construct. Due to the constraints involved in this research, it was not feasible to return to the platforms interviewed in order to ascertain why this was, however it certainly represents an area of future interest for research.

5.4 Comparative Findings

This section conceptualises and compares the findings of the two previously identified IT-enabled innovation contest platforms, competitive markets and collaborative communities. In doing so, this section outlines the key impacts of social capital prevalent in both sets of platforms, while indicating the social capital constructs responsible for the impacts in question. Table 5-12 presents the comparative findings between competitive markets and collaborative communities.

	Themes		Impacts	
	Competitive Market	***Collaborative Community***	***Competitive Market***	***Collaborative Community***
Social Ties	Increased Collaboration	Increased Collaboration	Submission Quality	Submission Quality
	Increased Competition	Increased Peer Recognition		Solver Engagement
Trust	Increased Use	Risk of Plagiarism	Solver Retention	Solver Churn Rate
		Increased Feedback		Solver Retention
Reciprocity	Increased Knowledge Sharing	Increased Collaboration	Solver Engagement	Submission Quality
Self-Identity	Acquisition of Knowledge	Acquisition of Knowledge	Solver Learning	Solver Learning
	Application of Knowledge			
	Enhanced Career Mobility	Enhanced Career Mobility	Solver Employment	Solver Employment
	Increased Status	Increased Status		
		Increased Fun		Solver Enjoyment
		Enhanced Satisfaction		
Shared Language	Increased Clarity	Increased Clarity	Solver Understanding	Solver Understanding
Shared Vision	Increased Clarity	N/A	Solver Understanding	N/A

Table 5-12: Comparative Findings of Competitive Markets and Collaborative Communities (Highlighting the overlaps between platforms)

The above table highlights the common themes and impacts of the various social capital constructs investigated. These commonalities shall be discussed further in the below sections.

5.4.1 Social Ties

Both platform sets identified increased collaboration as an important social ties theme within their respective communities. This was surprising for the competitive markets as their very business model is aimed toward the individual solver, and not towards the provision of a collaborative environment between their solvers. While although competitive markets are less inclined to promote collaborative behaviour due to a combination of issues as previously discussed (IP ownership, reward allocation etc...), it was also revealed they believe their competitive nature also serves to enhance the overall submission quality of solutions. This argument was presented by several platforms, outlining how the competition between solvers serves to heighten the standard of what is being produced. This was summarised by *CrowdANALYTIX* who argued that the increased competition that exists between solvers when they compete ultimately achieves the best solutions: "*they are competing, and competitors are always a great motivator of yielding better results*".

Collaborative communities also identified increased collaboration as a vital theme for increasing the quality of submissions from their solvers. Collaborative communities believe that social ties are the key advantage they possess. Such social ties are exhibited in the communal willingness for solvers to collaborate and engage with one another through the communities present. For example, *IdeaConnection* stated that social ties make teams of solvers more effective due to the inherent value of diversity present in the solver groups. Similarly, *Battle of Concepts* found that groups of solvers had better levels of performances, especially when it was a multi-disciplinary team. *Chaordix* also illustrated the importance of social ties in the quality of submissions, as it is currently a key piece of research they are undertaking. Collaborative communities therefore believe that this collaboration serves to heighten not only the standard of submissions being produced, but also the levels of engagement for the solvers themselves within the platform.

In addition to this, rather than having an increased focus on competition like their competitive market counterparts, the collaborative communities revealed how the theme of increased peer recognition also served to increase the levels of solver engagement within their platforms. Arguably, the impact of solver engagement is the most important impact attributable to the concept of social capital. For example, *InnoCentive* outlined that it was not a secret that many solvers stop engaging with *InnoCentive* after a while out of pure frustration that they never win.

These contest platforms are designed in general for contribution and/or collaboration between the solver communities present on the platforms. By engaging in such contests, it represents a new model of socio-organisational production for the solvers involved. This model involves a large number of people being coordinated into large projects without the traditional hierarchical organisation due initially to their interest in the challenges being issued, along with the topics of discussion and ideas to which they post and comment. These open innovation platforms are therefore strongly dependent on the commitment of solvers who are enthusiastic and are self-motivated by the challenge being issued, and driven to do so by their voluntary choice.

5.4.2 Trust

In terms of trust, the prominent impact to emerge from both sets of platforms was the increased levels of solver retention as a result of trust being developed within the platforms. The findings show however that different themes were accountable for its facilitation. For competitive markets, the findings show these platforms believe trust increases with the amount of use solvers dedicate to the platform, impacting on their decision to remain on the platform. Conversely however, collaborative communities believe that providing their solvers with detailed feedback to their submissions increases the levels of trust towards the platform, which in turn serves to influence the levels of solver retention. Such solver retention exists when the solver community has confidence in the reliability and integrity of their peers, and of the innovation contest platform itself. In general, such trust develops when a history of favourable past interactions leads to expectations about positive future interactions. Developing such trust however, is a difficult proposition as outlined by both *NineSigma* and *Skild* as it

is a complex phenomenon, involving various dimensions existing within multiple levels.

Solvers remain in innovation contest platforms as they trust that the sites are reliable, and are able to provide more customised offerings. Solvers who remain active in the solver communities do so as they are pleased with the service that is being provided, and as a result are likely to spread positive word-of-mouth experiences to their peers. The termination of trust, and ultimately the relationships generated therein however, is viewed as being a considerable loss to both parties, evidenced from *InnoCentive* claiming that "*people trust, otherwise, well they won't come the next time. And again you know that every organisation strives to preserve their reputation*".

If there is a lack of trust between solvers, *Appirio* believes solvers will not expose their top level thinking, which "*has a negative effect on everyone, including* TopCoder". Negative consequences such as platform reputation and solver disharmony clearly illustrate the importance of trust in such settings, both from an economical and a social point of view. As *NASA Tournament Lab* argued, should there be a breach of trust, "*you would see a huge drop in participation*" of solvers within the platform. This was particularly evident within collaborative communities, where the risk of plagiarism emerged as a theme within several platforms. This lack of trust towards the platform ultimately resulted in increased rates of solver churn. This impact is an inherent difficulty in hosting a collaborative community, as there is always the risk a select few solvers might act in an opportunistic fashion, much to the annoyance of their peers.

5.4.3 Reciprocity

Within competitive markets, the primary theme of reciprocity was revealed to be increased knowledge sharing among the solvers. Again, much like the social ties theme of increased collaboration, this finding was quite surprising given the individualistic nature of solvers present on these types of platforms. Regardless, this theme was found to be responsible for the levels of solver engagement within the platform. The findings reveal that the competitive market environment produces a system of social credit, in that solvers can draw upon the contributions of their peers without needing to immediately reciprocate. The design of such a platform has various potential benefits,

primary of which impacts the levels of solver engagement within the communities present on the platforms. With such increased engagement, the participants argued that if each solver freely shares and contributes their knowledge to the collective, the community as a whole is better off as it has access to a repertoire of information and experience that no single person might match.

For collaborative communities, there was also only the one emergent theme identified from the data in terms of reciprocity, which was shown to be increased collaboration. Similar to social ties, increased collaboration was again seen to provide the net impact of enhanced submission quality by collaborative communities. By presenting this correlation through two separate social capital constructs, it solidifies the relationship between the levels of collaboration present on platforms with the overall standard of the final submission quality; a finding which is relevant to competitive markets.

5.4.4 Self-Identity

The social capital construct of self-identity was the most similar in terms of emergent themes and overall net impact for both competitive markets and collaborative communities. Three similar emergent themes were found in both sets of platforms:

i. Enhanced Career Mobility
ii. Increased Status
iii. Acquisition of Knowledge

In terms of career mobility and solver status, the findings reveal that both sets of innovation contest platforms investigated believe these themes lead to solver employment. The findings highlight that a solvers reputation is viewed as an important asset to them, one which they can leverage to achieve and maintain status. Realising this, more and more solvers are recognising the potential of using these innovation contest platforms as a means of establishing heightened credibility within their respective disciplines.

For the majority of solvers however, working on an open innovation contest incurs a variety of benefits and costs. For example, the three categories of solvers identified by *CrowdANALYTIX* include students, professionals and consultants:

i. The students may incur an opportunity cost of their time, as while they are working on the challenge they are limited with respect to further projects they may be interested in pursuing
ii. The consultants forgo the monetary compensation they would receive if they were working for a commercial firm in the hopes of providing a winning solution to these challenges
iii. Professionals with an affiliation to a commercial company, university or research lab might incur the opportunity cost of not being able to focus solely on their primary tasks

The students' progression toward their qualification might slow down, the consultants' income might be affected, and the professionals' job performance output might be impacted. Regardless, these solvers dedicate themselves to the outcome of the challenges being issued, further stressing the importance of self-identity within the innovation contest domain.

By increasing their reputational capital within such platforms, it ultimately acts as a means of enhancing their future job prospects or potentially receiving job offerings with the company that posted the innovation challenge initially. Solver profiles (a key mechanism further explored in Chapter 6) are implemented in the various innovation contest platforms investigated. This mechanism allows solvers to create professional profiles about themselves and their contributions are reflected therein. The participants of this study outlined how solvers in their communities use such mechanisms to indicate to potential employers their superior skill sets and experience, which they build by contributing to successful projects. Their achievements on the platform can be subsequently outlined on their résumés or solver profiles hosted within the community, providing them with enhanced career mobility.

The second impact encountered from the findings of both sets of platforms involved solver learning. Competitive markets identified both the acquisition and the application of knowledge as emergent themes of self-identity, which ultimately provided such avenues of learning. By self-identifying with an innovation contest challenge or platform, solvers address the properties of the problem statement that are relevant to their own existing knowledge repertoire. In doing so, they identify

approaches that would best provide an outlet for developing a solution. It also provides the solvers with an opportunity to develop their skill sets further, testing them in areas they would not have been previously exposed to, according to the participants. *InnoCentive* for example outlined that the ability for solvers to solve the problem would be more important to them than engaging with their peers. Participants argued that solvers generally have a strong inclination to make use of existing methods in their own fields of expertise when confronted with fresh problems or innovative challenges.

Solvers that continue to learn, and develop a broader pool of knowledge through exposure of such innovation challenges are therefore able to identify more problem specific approaches. This increases the likelihood of developing future successful solutions for the contest platforms. Solvers can also improve their problem solving skills and techniques in some platforms through a peer review process that opens up their approach to heightened levels of feedback such as the proposed approach by *CrowdANALYTIX*. *CrowdANALYTIX* outlined plans to "*grab hold of the top guys who won the competition and get them to kind of train these guys (new solvers), or take them through step by step on how the problem can be solved and how it can be done well.*" This self-identification is evident whenever the solvers' natural curiosity and interest energise their learning. When an innovation contest platform provides optimal challenges, rich sources of stimulation and a sense of autonomy, the solver's self-identification toward that particular platform increases substantially.

Interestingly however, only the acquisition of knowledge was identified within the collaborative communities investigated as being a learning theme of self-identity. IT-enabled innovation contest platforms have an unparalleled ability to facilitate the collective action of knowledge contribution, as evidenced within each of the platforms investigated within this study. There are many opportunities available to solvers who wish to expand their knowledge by learning from experts in the various disciplines. This transference and sharing of knowledge within the solver communities allows the solvers to develop various problem solving skills and methods that, once learned, can be applied to a wide variety of approaches as the contests are often generic in their nature.

Finally, collaborative communities exhibited one additional emergent theme, and by extension, net impact than those outlined by the competitive markets. Tellingly, this theme involved the increased levels of fun experienced by the solvers on the platform, a sentiment not provided by any of the participants for competitive markets within this study. Whether or not competitive markets view fun to be conducive to their model, the findings show that it results in increased solver enjoyment for collaborative communities.

5.4.5 Shared Language

Shared language, as part of the cognitive dimension of social capital offered both competitive markets and collaborative communities the theme of increasing the contest clarity with what the objective of the challenge being issued was. This theme resulted in increased levels of solver understanding as to how best they should approach the contest.

5.4.6 Shared Vision

Only competitive markets revealed an underlying theme of increased clarity within their platforms, with the resulting net impact of increased solver understanding. Collaborative communities did not reveal any themes or net impacts in contrast.

5.5 Chapter Conclusion

This chapter addressed research question one:

"What are the impacts of social capital on innovation contest platforms?"

Two sets of IT-enabled innovation contest platforms were selected for the data gathering: competitive markets and collaborative communities. As previously noted, prior to this study the categorisation of social capital implemented herein had not been investigated in innovation contest platforms, making this work novel and exploratory from the outset. This identified the impacts of the various social capital constructs within an innovation contest platform setting.

Section 5.2 investigated the emergent themes of the various social capital constructs, along with their subsequent net impacts, as identified by the competitive markets. These impacts included:

i. Solver employment
ii. Solver engagement
iii. Solver learning
iv. Solver retention
v. Solver understanding
vi. Submission quality

Section 5.3 did likewise for the collaborative communities, which included the following impacts:

i. Solver churn rate
ii. Solver employment
iii. Solver engagement
iv. Solver enjoyment
v. Solver learning
vi. Submission quality
vii. Solver retention
viii. Solver understanding

Of the various impacts recorded by both competitive markets and collaborative communities, Section 5.4 provides the comparative findings of both. This section outlined the five key impacts that were shown to be prevalent by both sets of platforms, by the same social capital construct. The five key impacts of social capital were identified as being;

i. Solver employment
ii. Solver learning
iii. Solver retention
iv. Solver understanding
v. Submission quality

The next Chapter will address this study's second research question, which aims to investigate the mechanisms by which these constructs of social capital can be facilitated within the respective contest platforms.

CHAPTER 6: FINDINGS PART 2-MECHANISMS OF SOCIAL CAPITAL FACILITATION

6.1 Introduction

This chapter describes the second set of results of from the case studies. While the previous chapter explored the impacts of the various social capital constructs within the IT-enabled innovation contest platforms investigated, this chapter shall present the mechanisms by which they are facilitated. In doing so, this section will also address research question two as outlined below:

"What are the mechanisms used in innovation contest platforms to enable the development of social capital?"

This chapter describes how the identified platforms are structured by their KDMs to facilitate social capital among their community of solvers.

Section 6.2 begins by presenting the mechanisms used to facilitate the various social capital constructs within the competitive markets analysed. Section 6.3 subsequently presents the social capital mechanisms as outlined by the collaborative communities explored, while Section 6.4 provides a conclusion of the chapter.

It is important to note that in some instances a particular mechanism might be present for two separate social capital constructs within the platform group being investigated. For example the findings reveal that for competitive markets, the mechanism of discussion forums is used to facilitate both trust and reciprocity among the solvers within the community. Similarly for collaborative communities, the mechanism of solver profiles is used to facilitate both social ties as well as trust. It is worth highlighting that some mechanisms can be used to enhance multiple constructs.

The summary of this chapters' findings are illustrated below in Figures 6-1, 6-2 and 6-3.

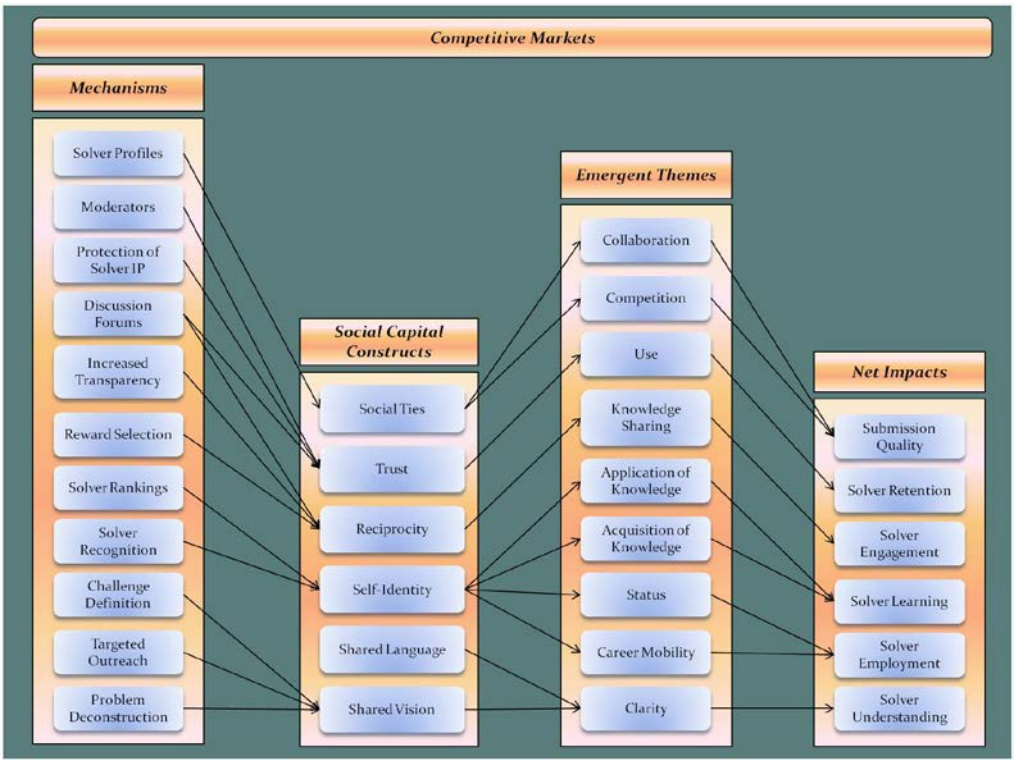


Figure 6-1: An Extended Preliminary Model of Social Capital for Competitive Markets

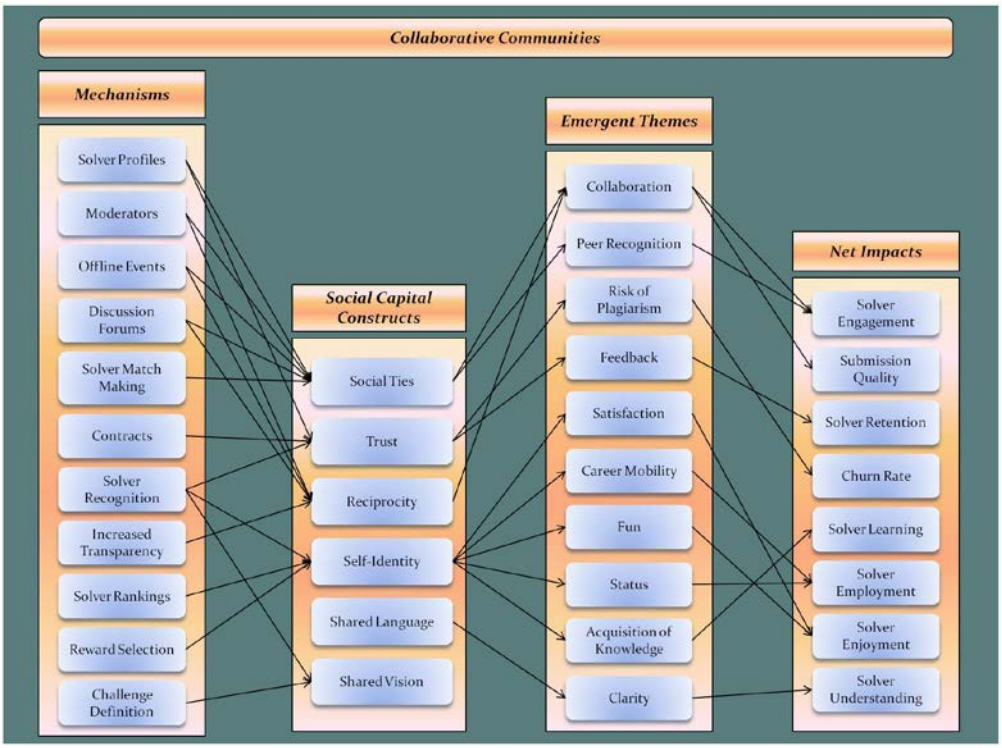


Figure 6-2: An Extended Preliminary Model of Social Capital for Collaborative Communities

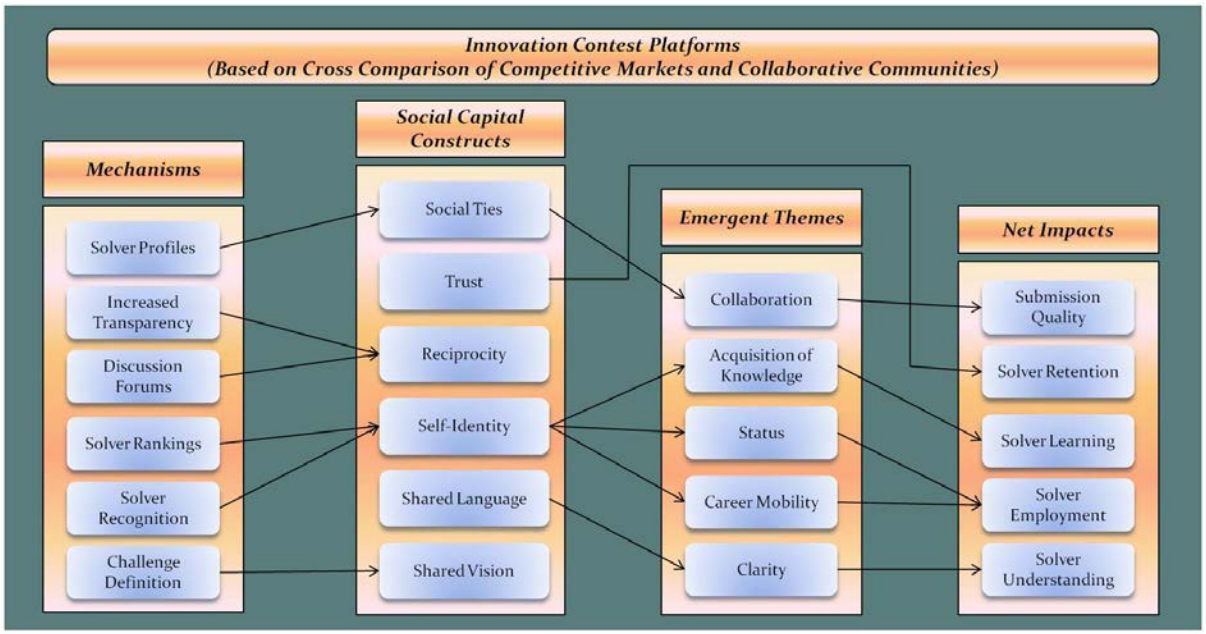


Figure 6-3: An Extended Preliminary Model of Social Capital for Innovation Contest Platforms

6.2 Competitive Markets

This section will explore the mechanisms used to facilitate social capital within competitive markets based on the analysis of the case study findings.

6.2.1 Social Ties

This section will analyse the mechanism used to facilitate social ties as evidenced throughout the six different competitive markets investigated in this study, as outlined below in Table 6-1.

The mechanisms used facilitate this construct were somewhat limited in comparison to those of the collaborative communities, arguably due to the very nature of competitive markets. However, as highlighted in the previous chapter, there is also evidence of solver profiles increasing the collaboration between the solvers within such competitive environments.

Mechanism of Social Ties	
	Evidence from Study Participants
<u>*Solver Profiles*</u>	CrowdANALYTIX: *"Even on our platform* ***you can see their profiles****."*
	CrowdANALYTIX: *"They select who they want to partner with themselves, and* ***they do that based on the profile****, as well as the details on how that person has done in the past, how many competitions he has participated in, how many he has won etc..."*
	Crowding: "*I think* ***the best way is to develop your profile****, and make it possible that you should... gain your reputation*."
	Crowding: *"They have individual accounts, so if they want to work as a group, they have to work with one leader,* ***then they will work under that profile****."*
	Innoget: *"Today at Innoget we have more than 100,000 members worldwide, covering various disciplines from life sciences, chemistry, physical science, engineering technology etc... And* ***we have different kinds of profiles within the community****.*

Table 6-1: Chain of Evidence for Mechanisms of Social Ties within Competitive Platforms

<u>Solver Profiles</u>

The primary mechanism to facilitate social ties within competitive markets involved the use of solver profiles, as outlined by *CrowdANALYTIX*, *Crowding* and *Innoget*. Solver profiles allow the individual solvers to showcase their previous contest experiences, while also outlining the areas of interest to the solver in question. The findings show that these profiles allow solvers within a community to identify and interact with like-minded peers, which can lead to either increased competition or collaboration, depending on the challenge being issued. For example, the use of such platforms is evident within *CrowdANALYTIX*, who outlined that although the solvers work independently, they have the freedom to form teams should they so wish, with the solvers capable of creating their personal profiles to showcase their talents. In doing so, solvers are able to judge who they want to partner with based on details such as how well the solver has performed in the past, how many competitions they have participated in, how many times they have won etc... *CrowdANALYTIX* described the process to being akin to that of a *"social network come contest management*

platform", where solvers can become friends with one another, follow each other's work, while also having the capability of privately messaging each other through the platform.

Similarly, *Crowding* revealed that their solvers also have their own individual accounts, however should they wish to work as a group, they have to work with one leader and subsequently work under that profile. *Crowding* argued that these profiles are quite important for the facilitation of social ties among solvers as it is the primary method for their reputation to increase. In terms of solvers contacting each other through the platform, while the solvers can visit each other's profiles, the platform does not have a messaging function. *Crowding* stated that those options will become realised in the near future, especially in different challenges. *Innoget* also described how their platform has more than 100,000 members worldwide that covers various disciplines, ranging from life sciences and chemistry, to physical science and engineering technology, with *Innoget* having different profiles within the communities of solvers.

The functionality of the different solver profiles varies however. For example, *InnoCentive* allows solvers to provide a brief description of themselves and offers the addition of a contact email should the solvers wish to communicate externally from the platform. CrowdANALYTIX on the other hand provides the solvers with dedicated sections not only to provide a summary of who they are, but also for their education, skills, previous work undertaken, interests etc. all the while allowing solvers to communicate directly with each other via private messaging.

6.2.2 Trust

This section will analyse the three mechanisms used to facilitate trust as evidenced throughout the six different competitive markets investigated in this study. These mechanisms are outlined below in Table 6-2, and include:

i. Discussion Forums
ii. Moderators
iii. Protection of Solver IP

Discussion Forums

Discussion forums were identified by various platforms as being able to promote levels of trust both among solvers and between the solvers and the platform itself. These discussion forums allow the platform or the solvers themselves to post questions or opinions to the community, stimulating discussion around certain areas of interest. Through participating with these forums, solvers are able to develop increased trust to solvers interested in similar areas to themselves. Furthermore, the findings also reveal the solvers develop increased trust towards the platform for hosting such an environment, especially if the platform engages with the community also.

For example, *NineSigma* outlined that their most active solvers believe trust can be developed from the questions and topics that are posted on their forum pages. The solvers argued that this helps them to better their own product development activity by developing an increased insight to the market they are targeting. This was especially evident within B2B businesses, which is where most of *NineSigma*'s operations are. For B2B businesses, "*it is not so easy just to have a test pilot group. If you are developing some mobile app you give to your friends to play it, and then you have customer feedback. But if you are developing something complicated for the manufacture of something else, it is a bit harder*." These discussion forums help solvers to better refine their development strategies by receiving enhanced exposure to other initiatives being developed.

This was also seen from the data collected from both *CrowdANALYTIX* and *Innoget*. *CrowdANALYTIX* in particular outlined how the discussion forums enabled "*more collaboration between these folks*" and served to increase the levels of trust within the community.

Mechanisms of Trust	
	Evidence from Study Participants
Discussion Forums	CrowdANALYTIX: "*We enable more collaboration between these folks and **general discussions**.*"
	Innoget*: "We post things, and different members within the community. We have contact with almost all our customers within the website, we know them. **We would say that most postings that you would find in our marketplace are not available in others, they are quite unique. That is something of value to the crowd**."*
	NineSigma*: "What we have heard from some of our most active solvers is that when **they follow what kind of topics or questions we post there,** it helps them to actually better their own product development activity."*
Moderators	InnoCentive*: "People must be certain that they don't cheat. And if you work with a large crowd of people, there are always people who complain that they were cheated and they've been treated unfairly etc. So **your role as a moderator is to minimize this kind of dissent**."*
	Presans*: "You can have a conference call, and there is always like a project manager, such as myself in Presans, and also we have fellows who are the ones that interface between the client and the expert, so they are competitive enough to understand the work of the experts. So **they are going to be kind of like moderators that analyse the work**."*
Protection of Solver IP	Innoget*: "What the platform recommends, and Innoget and the process itself tasks innovators to really **focus on revealing data that is not really confidential and is not giving away any intellectual property**."*
	NineSigma*: "I think this is one of the dangers... **If we see that they have submitted some proposal information that is confidential, we write them back and ask them to change it**."*
	NineSigma: "*The solvers don't really interact with each other, so **we evaluate them one by one**. They don't know what the others have participated*."
	NineSigma*: "**We also protect them** and I think they respect that as well."*
	NineSigma*: "We don't send (a proposal) to a client like General Electric until **we make sure there is no confidential information**."*

Table 6-2: Chain of Evidence for Mechanisms of Trust within Competitive Platforms

Moderators

The second mechanism used by competitive markets to facilitate trust within the community involved the use of moderators. These moderators act essentially as project managers to the various contests being held, providing a point of contact between the group of solvers competing for the prize and the platform itself or alternatively directly to the challenging organisation. These moderators allow the platform to ensure a productive environment, free from disquiet and distractions, as outlined by *InnoCentive*: "*People must be certain that they don't cheat. And if you work with a large crowd of people, there are always people who complain that they were cheated, that they've been treated unfairly etc. So your role as moderator is to minimise this kind of dissent*."

The use of moderators is also implemented within *Presans*, providing their solvers with essentially an interface to communicate with the client while they compete for a winning solution. The moderators in this case analyse the work being presented by the solver groups and ensure it meets the required standard of what is being asked: "*We have fellows who are the ones that interface between the client and the expert... So they are going to be kind of like moderators that analyse the work*." Such an approach facilitates trust between the solver groups and the platforms in question as they have someone directly on hand should any problems arise that need quick resolutions.

Protection of Solver IP

An interesting mechanism used to facilitate trust within the solver communities as outlined by various platforms involved the protection of the solvers' IP. *NineSigma* and *Innoget* in particular outlined such an approach to facilitating trust among their solvers. By protecting the IP being offered, the platforms believe that solvers will not only trust the platforms to a higher degree, but also that the respect they have for the platform will grow also. For example, *NineSigma* protects the transfer of IP by limiting the interaction between the solvers. No solver group is informed as to how many groups, or indeed what solvers are actually competing in the challenge to limit the contamination of IP. *NineSigma* evaluates the submissions entered one by one and does not inform the community who has participated in the challenge: "*we protect*

them, and I think they respect that as well." Furthermore, when the platform receives the submissions, *NineSigma* ensures there is no confidential IP being included: "*If we see that they have submitted some proposal information that is confidential, we write them back and ask them to change it*." By providing the solvers with this element of security to their submissions, the platforms argued that it promotes increased trust among the solvers.

This point is also echoed also by *Innoget* who argued that the solvers need to "*take care of your intellectual property, and know that you are not giving away confidential information during the process once you are meeting your proposal*".

6.2.3 Reciprocity

This section will analyse the three mechanisms used to facilitate trust as evidenced throughout the six different competitive markets investigated in this study. These three mechanisms are outlined below in Table 6-3, and include:

i. Discussion Forums
ii. Increased Transparency
iii. Reward Mechanism

Discussion Forums

Previously identified as a mechanism of facilitating trust among solvers, the use of various discussion forums were also highlighted as being a mechanism of facilitating reciprocity. These discussion forums allow solvers to relay their opinions and offer suggestions to one another regarding how the contest is structured while also serving as a means to outline the approaches implemented when solving the challenge. *CrowdANALYTIX* in particular described how they are encouraging the contest winners to engage in various discussion forums, and also to partake in a blog that will help the platform to "*create knowledge, create and write white papers, talk about their approach when they won, give them more visibility as well and hopefully get them engaged more*". This increased engagement is argued by *CrowdANALYTIX* to ultimately manifest itself through heightened reciprocity among the solvers within the

forums. Similarly, *NineSigma* also described their implementation of forums, which solvers also use to communicate and reciprocate with each other, though not to the same extent of *CrowdANALYTIX*.

Mechanisms of Reciprocity	
	Evidence from Study Participants
Discussion Forums	CrowdANALYTIX: "*We want (the solvers) to write a blog for us let's say, **they do (reciprocate) already on various forums** and you will find blogs about us in different languages... Hopefully get them engaged more.*"
	CrowdANALYTIX*: "Absolutely, **you see a lot of discussions on the forums**... It is a community that wants to learn from each other."*
	NineSigma*: **"There is a forum where they can discuss with each other** and communicate with each other."*
Increased Transparency	CrowdANALYTIX*: "**We want them to help us create knowledge**, create and write white papers, talk about their approach when they won, give them more visibility."*
	CrowdANALYTIX*: "One thing we are enabling is **we are opening up all of our past competitions and the data around them**... We grab hold of one of the top guys who won the competition and get them to train these guys, or take them through step by step on how the problem can be solved, and how it can be done well."*
	Crowding*: "We have found one model that works really good, and it is the one that works with iterations. So we have like different steps and the entire **crowd can publish ideas in each step**, and between the steps we will announce winners **and people can build upon each other's ideas**."*
Reward Mechanism	InnoCentive*: "**When money is not the whole motivation, people would be willing to communicate** with each other."*
	InnoCentive*: "**To suspect that (some solvers) are driven by money would be very difficult**."*
	Innoget: "***We do not encourage our community members or crowd to connect just because there is some money exchange** at the very beginning.*"

Table 6-3: Chain of Evidence for Mechanisms of Reciprocity within Competitive Platforms

Increased Transparency

Another mechanism used to facilitate reciprocity was to increase the levels of transparency present on the platforms. Platforms exhibited various means of achieving this, with *CrowdANALTIX* in particular revealing how their platform is aiming to increase a culture of reciprocity among their solver community by opening up previous contests, data and evaluation methodologies to them. In addition to this, *CrowdANALYTIX* also outlined how they are aiming to have previous contest winners available to train new solvers, taking the community step by step on how the problem can be solved, and how it can be solved well: "*One thing we are enabling is we are opening up all of our past competitions and the data around them… We grab hold of one of the top guys who won the competition and get them to train these guys, or take them through step by step on how the problem can be solved, and how it can be done well.*" By adopting such an approach, levels of engagement within the solver community are expected to increase sharply as the platform continues to pursue a culture of reciprocity.

NineSigma expressed a similar vision for their platform, outlining how "*we are all the time trying to invent and try things and become open*". Some early initiatives they have developed include the ability for solvers to meet together as part of an open innovation meet up which is aimed primarily at nurturing this culture of reciprocity being sought.

Reward Selection

The third mechanism used to facilitate reciprocity among a solver community involved the actual reward being offered to the winners. Several platforms outlined that a solvers propensity to engage and even reciprocate with their peers was dependent on the reward on offer, with *InnoCentive, Innoget* and *Presans* in particular outlining this correlation.

InnoCentive argued that the levels of reciprocity experienced within a contest platform can vary as a direct result of the reward being offered. *InnoCentive* suggested that in situations where money is not the whole motivation for a successful solution, then

solvers would be more willing to reciprocate with each other. Platforms are able to convey the reward on offer by clearly defining the rules of engagement from the very beginning in terms of what the contest is aiming to address, along with what the reward is.

If the solvers are submitting something that can be sold on an open market, then *InnoCentive* argued that the platforms' emphasis should be more of a monetary reward. However, if the contest was directed toward a cause that brings with it a social impact rather than a commercial one, then levels of reciprocity would increase. *InnoCentive* illustrated the example of challenges asking for help in solving technical-social problems in sub-African countries. Often these challenges are posted by clients that do not have the ability to pay the solvers. Solvers would be asked to provide very complicated and technical submissions, and regardless of the lack of reward, they do so as they want to make an impact to society. In contrast, if the same challenge was to be issued by a client with the resources available to provide a substantial reward, *InnoCentive* argued the demand for a reward would be higher, with the levels of reciprocity lower. The presence of a reward impacting the levels of reciprocity was also experienced within *Innoget* who provide their solvers with a monetary incentive at the beginning of the process. As a result of this exchange, the solvers do not engage in acts of reciprocity with their peers: "*we do not encourage our community members or crowd to connect because there is some money exchange at the very beginning*".

In a similar vein, the findings reveal that the levels of reciprocity can also be affected by the reward being offered to the target solver demographic. For instance, *InnoCentive* outlined the breakdown of solver categories present on their platform. On one hand, there is a very distinct community including retired people who once held very high positions at companies. *InnoCentive* argued that "*to suspect these people are driven by money would be very difficult, they have enough money*", and are more open to acts of reciprocity. On the other hand, *InnoCentive* argued that the demographic of students do not lack challenges. In that case, *InnoCentive* argued that money would be more important for them, resulting in lower levels of reciprocal acts. *Presans* also argued this point, outlining that "*sometimes in the group of experts it is*

clear that not all of them are going to earn the same amount of money because they are not going to do the same job".

6.2.4 Self-Identity

This section will analyse the two mechanisms used to facilitate self-identity as evidenced throughout the six different competitive markets investigated in this study. These mechanisms are outlined below in Table 6-4, and involve:

i. Solver Rankings
ii. Solver Recognition

Solver Rankings

The first mechanism encountered to facilitate self-identity within the solver communities involved the provision of a ranking system for the solvers within the various platforms. Such a system typically involves illustrating how the respective solvers are performing, and can ranked through several means such as the type of challenge being entered, solver breakdown based on geographic location, all-time top scoring solvers etc... This level of self-identification enhances the solvers reputation which they can subsequently display on their solver profiles or résumés going forward. It also provides the solvers with a sense of pride to their accomplishments should they fall short of winning the overall reward on offer. This is evidenced through *CrowdANALYTIX* who described a typical example of such ranking systems. *CrowdANALYTIX* has a community of solvers spread over 50 different countries. Should for example a solver in the U.S. after submitting the best response, beating every other score on the leader board, wake up the following morning to find his positioning lower due to a new entry, their self-identification will increase. There will also be an increased motivation on them to get back to the top, to the point where solvers in the process do not care about the amount of money on offer: "*We have people from 50 different countries, so imagine being in the US, you submit your best response, it beats every other score on the leader board, you go to sleep, and when you wake up the next morning someone in India or China has beaten your score. The*

motivation here is to get back on the board. Who cares how much you are getting paid at this point?"

Mechanisms of Self-Identity	
	Evidence from Study Participants
Solver Rankings	CrowdANALYTIX: "***If the score didn't exist****, if there was no leader board...* ***I don't think we would have had the kind of energy*** *while the competitions were going on*."
	CrowdANALYTIX: "*They are competitive. These guys, they want to be better at solving a problem better than anybody else.* ***If you end up at being number 4 just because somebody else did better, you will do everything in your power to try and get back on top***."
	CrowdANALYTIX: "*We have people from 50 different countries, so imagine being in the US, you submit your best response, it beats every other score on the leader board, you go to sleep, and when you wake up the next morning someone in India or China has beaten your score.* ***The motivation here is to get back on the board. Who cares how much you are getting paid at this point?***"
	Crowding: "*We have built in a points system and* ***you can translate or convert points into whatever you want***."
Solver Recognition	CrowdANALYTIX*: "Instead of just rewarding you for winning a competition, there should be* ***smaller rewards for various activities that you do on the platform****."*
	Crowding*: "In the end of the challenge, the points will be transferred to your profile so* ***you get like a reputation system for the whole platform****."*
	Presans*: "People, when they receive the email, t****hey know that they are pre-selected by somebody*** *because their needs are personalised. They know it is not spam."*
	Presans*: "They are contacted by email or phone, so* ***they are identified as an expert in the subject.*** *They are asked would they like to participate in the project etc."*

Table 6-4: Chain of Evidence for Mechanisms of Reciprocity within Competitive Platforms

CrowdANALYTIX outlined that the solvers in their community are extremely competitive, to the point whereby they want to be a better problem solver than any of their peers. If a solver ends up being ranked fourth, just because others did marginally better, *CrowdANALYTIX* argued that solver will do everything in their power to try

and reclaim the top position, and at this point "*it doesn't matter what the prize money is*".

These ranking systems bring with them the means to promote not only self-engagement, but also to increase overall engagement with the platform, fostering a heightened sense of competition among the community. *CrowdANALYTIX* stated, "*If the score didn't exist, if there was no leader board... I don't think we would have had the kind of energy while the competitions were going on... That gets them all focused*." *Crowding* also agreed with such an approach, describing how their platform has already built in a points system that can then be translated or converted into gifts or real money.

Solver Recognition

The second mechanism to facilitate the self-identity of their solvers revealed by the platforms investigated involved the conscious effort to recognise the solver community for their efforts, whether or not they were eventually chosen as winners of the challenge posted. Such recognition taps into the previously mentioned intrinsic motivational spectrum of self-determination theory as it provides the solvers with a sense of community and a feel good factor that in some cases is more prevalent than the desire of monetary rewards.

This recognition was evidenced in various instances, with *Presans* for example recognising their solvers at the beginning of the process. Each solver for *Presans* is contacted directly via email or phone call by the platform. These solvers have been preselected by the platform based on their experience and skill sets so when they are approached, the solvers know that they have been pre-selected and specifically chosen for the challenge which increases their self-identity to the process: "*People, when they receive the email, they know that they are pre-selected by somebody because their needs are personalised.*" These solvers have been identified as being experts in their respective fields, and this level of recognition further encourages solvers to compete in the challenge.

Levels of recognition can also take place within the platforms, challenges notwithstanding as evidenced by *CrowdANALYTIX*. *CrowdANALYTIX* also believed solver recognition to be an important feature within innovation contest platforms, and described how their platform is developing various gamification approaches. *CrowdANALYTIX* believe that solvers should not only be recognised for the winning of challenges, but also for certain acts undertaken within the platform that promotes the platform and the community internally that would result in solvers getting engaged further: "*instead of just rewarding you for winning a competition, there should be smaller rewards for various activities you do on the platform, and that will hopefully get more people engaged and want to do more*". *CrowdANALYTIX* reflected that identification will only happen once the solvers become engaged more in the first place, "*and once that engagement goes up, they will identify*".

6.2.5 Shared Language

There were no mechanisms within the competitive markets investigated that facilitated a shared language among their solver community. This finding in and of itself is expanded in the competitive market summary subsequently.

6.2.6 Shared Vision

This section will analyse the three mechanisms used to facilitate self-identity as evidenced throughout the six different competitive markets investigated in this study. These mechanisms are outlined below in Table 6-5, and involve:

i. Challenge Definition
ii. Problem Deconstruction
iii. Targeted Outreach

Challenge Definition

The first mechanism to emerge from the findings highlights the importance of the initial challenge definition presented to the solver community in order to ensure a shared vision. This challenge definition presents a clear and concise outline to the solvers as to what is expected in their submissions, along with recommendations as to

how to approach the challenge. The formulation of this definition is often the first step in the contest process, as it ensures the solvers community are familiar with the expectations of the problem seeker. Due to the importance of this mechanism, the findings indicate that the contest platforms apply extreme due diligence when constructing the challenge definition.

This is exemplified through several platforms investigated, with *Presans* for example outlining that the first step in hosting an innovation contest is to specify everything in the beginning with the client regarding what is involved. Similarly, *InnoCentive* believed that "*first of all, you need the problem definition... I personally believe the question is more important than the crowd*." This statement argues that the challenge definition takes precedent over the overall crowd in the first instance, highlighting the importance of such an artfact. The importance of this mechanism is also echoed by *NineSigma* who revealed that they "*spend a lot of time on the formulation of the technology brief of what we want. And if you look at the needs of the contests, sometimes they are very detailed, they can even say out of which material it should be done, and what exactly it should measure*."

Mechanisms of Shared Vision	
	Evidence from Study Participants
Challenge Definition	InnoCentive: "*First of all **you need the problem definition**... I personally believe that the question is more important than the crowd*."
	InnoCentive: "*When you pose the question, **you really have to define the scope**. If you don't do that, there is really no point in discussing anything else*."
	NineSigma: "*Actually, **we spend a lot of time on the formulation of the technology brief** of what we want. And if you look at the needs of the contests, sometimes they are very detailed, they can even say out of which material it should be done, and what exactly it should measure... Many, many technical details*."
	NineSigma: "***We spend a lot of time together with our clients to formulate (the challenge definition)**, and then also for the technical people that do it together, so that they understand actually what we are looking for*."
	Presans: "***Everything is specified in the beginning**, we have a discussion with the client*."

Mechanisms of Shared Vision	
	Evidence from Study Participants
Problem Deconstruction	CrowdANALYTIX: "*Our solution to (shared vision) is **we are learning how to break down the problem into smaller work packages**.*"
	CrowdANALYTIX: "*Facebook wanted to understand how to get from 1 billion to 3 billion users. Now, the issue is that you don't even have 3 billion internet users, so what you need to do is make infrastructure investments in developing countries, so they came to us asking which countries would be the ideal for making this happen. **We translated that into figuring out the top drivers of surges in smart phone demand in these countries**... The assumption is that they will need a smart phone in order to be active users of Facebook, which the client agreed with. This seemed like an interesting way to translate the question.*"
	CrowdANALYTIX: "***Because the client didn't give us any data, we split this into three activities**, or even four types of competitions. The first type of competition is figuring out the data we need to extract from those data sources.*"
	CrowdANALYTIX: "*So **the outcome of the first competition is consolidated and shared with everyone else** for the second competition where the modelling needs to be done. And any modelling exercise of course requires very good structured data sets and that gets addressed through the first competition.*"
	CrowdANALYTIX: "*So I mean **we are still learning how to break these things down** in a way that the clients' abstract problems can be solved through this mechanism, and we are still evolving this.*"
	Crowding: "*The competitions have also some options; **you can do it in many iterations**.*"
Targeted Outreach	CrowdANALYTIX*: "**We filter the top 10 or 15 people** to the next round, where we can have a much more engaged discussion, with a much smaller set of people."*
	Innoget*: "It is an automatic process where **we can really reach out to the relevant community for each particular posting**."*
	Innoget*: "**We make sure for instance that one guy who is an expert in IT for instance, does not receive something that is related to physics**. So we take care of it."*
	NineSigma*: "**We always do a targeted outreach**."*
	Presans*: **"(The solvers) are contacted by email and they are asked to submit a short proposal**... They are going to explain briefly what are the approaches that they are going to use if they are selected."*

Table 6-5: Chain of Evidence for Mechanisms of Shared Vision within Competitive Platforms

Problem Deconstruction

The second mechanism to ensure a shared vision among the solvers was the deconstruction of complex problems into a composite set of more realistic, manageable deliverables. This ensures a shared vision throughout the process, while also avoiding the risk of solvers going too far off course from where they should be pursuing. This mechanism is still in its early stages of refinement in various platforms, as it depends on the complexity, time scope and number of solvers involved in the challenge, with *CrowdANALYTIX* revealing how they are "*still evolving this*".

Once the challenge has been broken down, the data indicates that it subsequently creates a synergistic effect, making the sum of the individual challenges greater than what would be achieved had it been left as the single challenge. An example of how certain projects can be deconstructed was presented by *CrowdANALYTIX*, outlining a challenge Facebook had set for them. Facebook wanted to understand how to grow from one billion to three billion users. *CrowdANALYTIX* realised this number surpassed the amount of individuals capable of internet connection so the problem was adapted to address infrastructure investments in developing countries. The challenge then addressed which countries would be ideal for making this happen. *CrowdANALYTIX* translated that into figuring out the top drivers of surges in smart phone demand in these countries, the assumption being they will need a smart phone in order to be active users of Facebook, which the client agreed with. This approach seemed to be an interesting way to address to initial question according to *CrowdANALYTIX*. Once *CrowdANALTIX* were able to translate the challenge into a question that says "*figure out the top drivers of demand*", it then became a predictive model that solvers could build upon, allowing them to predict demand.

Once that was achieved, the challenge was subsequently split further into several types of competitions. The first competition sought to figure out the data required from the necessary data sources, which involved having the solvers submit ideas as to where and what the credible data sources were, what factors could be extracted from them etc. The outcome of this first competition was subsequently consolidated and shared with everyone else for the later stages where data modelling is required.

CrowdANALYTIX reflected that they are still learning how to break their contests down in a way that their clients' abstract problems can be solved through this mechanism, highlighting that they are "*still evolving this, this is our biggest challenge*".

Crowding similarly argued that implementation of dividing challenges up into various iterations "*works really well*" for their platform. Mirroring the previous example, various contests are broken down into several steps with the crowd being able to publish their ideas openly: "*The competitions have also some options; you can do it in many iterations.*" Between each step, *Crowding* announces the winners, with the solvers thereafter building upon each other's ideas. *Crowding* stressed that such a model works really well in commercial competitions.

Targeted Outreach

The third mechanism that was emerged from the data to facilitate shared vision was implementing a targeted outreach for solvers whom the platforms deemed capable of delivering a successful solution. By pre-selecting the correct demographic in terms of skill sets and experience, platforms are able to identify solvers with an increased likelihood of submitting a winning solution of a higher quality.

This mechanism was outlined by various platforms, through approached somewhat differently by each. *Innoget* for example described how they ensure a shared vision by pre-identifying the community of solvers they require. They achieve this by breaking down the both the expertise sought, along with industry required down to three separate areas based on a classification of the industries and the technology area. This provides a very "*automatic process*" for *Innoget* to reach out to the relevant solver communities required for each particular challenge. As *Innoget* outlined: "*We make sure that one guy who is an expert in IT for instance does not receive something that is related to physics: so we do take care of it.*"

NineSigma on the other hand highlighted that while their platform has approximately 3 million names of solvers, when they open up a specific topic, they also undergo a targeted outreach to somewhere between 10-15,000 solvers. *NineSigma* uses a

professional search team to identify solvers of interest, subsequently contacting them directly via email. The solvers are invited to participate as *NineSigma* believe based on their technology and knowledge description that they are the right people to compete. The solvers then write a short proposal detailing how they intend to address the challenge. After this phase, *NineSigma* shortlist between three and five candidates who are then paid to develop a prototype based on their proposal. NineSigma reviews the received proposals and summarizes them to present to the clients who then give their opinions regarding which proposal they want further continuation. This approach was also implemented by *Presans* who initiate contact with the solvers they deem to be experts in the field being sought. *Presans* send their experts an email informing them of the solution being sought. The solvers then submit a short proposal, explaining briefly what approaches they would take if they are selected. Based on the proposal submitted, *Presans* and the problem seeker analyse the applications submitted before selecting the solvers they feel best understand what is being asked, thereby ensuring the shared vision between both sets of parties.

6.2.7 Competitive Market Summary

To present the mechanisms used to facilitate social capital within competitive markets, the previously outlined social capital impact preliminary model for competitive markets was extended.

The findings reveal that competitive markets primarily focus their efforts on developing mechanisms to increase the shared vision and reciprocity within their platforms, with three distinct mechanisms being identified for each construct. As noted previously, both shared vision and trust have one impact each toward competitive markets, coming in the form of solver understanding and solver engagement respectively. In order to facilitate solver understanding through a shared vision, competitive markets utilise various mechanisms including deconstructing the problem into achievable targets, constructing an accurate challenge description, and conducting a targeted outreach of potential solvers. For the construct of reciprocity on the other hand, the impact of solver engagement is realised through the use of

discussion forums, providing solvers with increased transparency and tailoring the reward selection for the challenge in question.

The social capital constructs of self-identity and trust have two distinct mechanisms each also, the only difference being that self-identity provides two overall net impacts through solver employment and solver learning, with trust providing solver retention. The mechanisms revealed through the findings for self-identity include solver rankings and solver recognition, while the data also shows that trust is facilitated through the use of discussion forums and moderators within the platforms.

There was only one mechanism encountered for the facilitation of social ties within the competitive market findings, which came in the form of solver profiles. Again, by their very nature competitive markets historically do not place an onus on promoting this social capital construct, yet the findings herein argue a change of this mind-set, with evidence outlined previously in Chapter 5 revealing how some platforms have already attempted to increase its presence. This is especially of importance given the net impact of social ties has been shown to be an increase in the overall submission quality for their clients.

Finally, there were no mechanisms identified for facilitating a shared language within the competitive markets data. This is an interesting finding in that previously the competitive markets revealed that shared language promotes an increased understanding for their solvers, however they are unaware as to how this is facilitated. This is certainly an area for future attention, however due to the constraints involved within the scope of this research; it was beyond the achievable remit of this project.

6.3 Collaborative Communities

This section will explore the mechanisms used to facilitate social capital that were revealed to be subject to collaborative communities only based on the analysis of the case study findings.

6.3.1 Social Ties

This section will analyse the five mechanisms used to facilitate social ties as evidenced throughout the nine different collaborative communities investigated in this study. . These mechanisms are outlined below in Table 6-6, and include:

i. Discussion Forums
ii. Moderators
iii. Offline Events
iv. Solver Match Making
v. Solver Profiles

Discussion Forums

The findings reveal that the various discussion forums present within the collaborative communities are viewed as being mechanisms to facilitate the social ties among solvers. These forums offer the solvers an outlet to engage with the community by posting their opinions and insights to the various topics emerging from the challenges being posted. Through increased engagement, solvers are capable of developing familiarity and subsequent relationships with like-minded solvers interested in similar disciplines or industries, with *Chaordix*, *F6S* and *Phantominds* outlining their use of such. Once an opinion is posted to the forum, solvers are can see who submitted it via their solver profiles and can reply to stimulate discussion while strengthening their social ties. This process is described by F6S: "*"The other basic example of individuals communicating is a discussion board where people can just post whatever message they want, tag the message according to the relevancy, and then other people can reply to it."*

Mechanisms of Social Ties	
	Evidence from Study Participants
Discussion Forums	Chaordix: "*We always have **the "Coder Community Café" where the community can start their own discussions**.*"
	F6S*: "**The other basic example of individuals communicating is a discussion board** where people can just post whatever message they want, tag the message according to the relevancy, and then other people can reply to it."*
	Phantominds*: "But we hope that they will more interact with each other directly like that is why we want to try this chat option, that they will use it when working on ideas, where they directly communicate, rather than **posting something in the forum**."*
Moderators	IdeaConnection*: "After we do a challenge, at the end of each one they get an email to ask them to rate their fellow team members, (there are four members in each team and there are four teams in each challenge)... **rate the facilitator** and make comments."*
	IdeaConnection: "*So that (social ties) is what our whole business is based on, is that **we facilitate that interaction with trained facilitators** or you know, one facilitator for each group of four*."
	Munktell Science Park*: "I am convinced that if you want to have a website that is more of a community in the feeling, **you need to have someone there who is the moderator**, or actually more people there that sort of facilitate that sort of dialogue."*

Mechanisms of Social Ties	
	Evidence from Study Participants
Offline Events	*Appirio: "TopCoder Open... basically i**t takes the best coders in the world** based on the ratings and the performance in different contests **and it brings them together**. This year it will be in San Francisco."*
	Battle of Concepts: "*How we try to (develop social ties) was really with **offline meetings**, so that they really meet each other over drinks."*
	*NASA Tournament Lab: "Top Coder for example are doing some interesting things, for example, trying to keep them in Top Coder, the users reasonably close and they run like at least once a year they try to i**nvite them all to meet by choosing someplace in America and running some Top Coder program recognition event**."*
Solver Match Making	*Chaordix: "we are working with some pretty rudimentary functionality in our platform, so it could be like, let's just call it "**Find a Friend**", so based on my actions, my contributions, what I am doing, **we can either make a match in the community automatically, or we can provide functionality** that says "I want to find people, maybe not like me, but people who might be interested in my idea."*
	*IdeaConnection: "**So software does it (match solvers together) in part**, but we have skilled people who help form the teams."*
	IdeaConnection: "*Some will say "*I never want to work with that idiot again!*" and **some will say "**The next team I am doing please put me on with so and so**" and we keep that so next time the challenge comes up**."*
	*Phantominds: "We would try and kind of make proposals or **match making**."*
Solver Profiles	*F6S: "Basically F6S works more or less like Facebook, **so you create your personal account** to identify you as a real person, and then you can create teams, or companies."*
	*Phantominds: "**There will be user or community member profiles**, they can write private messages, they can also, we are testing a kind of a chat option or feature."*

Table 6-6: Chain of Evidence for Mechanisms of Social Ties within Collaborative Communities

Moderators

The second mechanism to emerge from the findings to facilitate social ties involved the use of moderators. As explored previously within competitive markets, the role of

a moderator within contest platforms is to ensure the challenges are running smoothly, keep the solvers on track with regards to deliverables and prevent discord within the solver community. The findings reveal that collaborative communities also use the moderators in order to promote social ties within their solver communities.

Both *Munktell Science Park* and *IdeaConnection* outlined their use of moderators and how they view the role to be an important step in facilitating the social ties between individual solvers. *Munktell Science Park* highlighted that moderators are vital should the contest platform wish to develop a community, as they are responsible for facilitating the dialogue and the processes needed for the community development to happen: "*I am convinced that if you want to have a website that is more of a community in the feeling, you need to have someone there who is the moderator, or actually more people there that sort of facilitate that sort of dialogue.*"

IdeaConnection also agreed with the need for a moderator: "*So that is what our whole business is based on, is that we facilitate that interaction with trained facilitators.*" *IdeaConnection* explained how after the completion of a challenge, each solver is sent an email to rate not only their fellow team members, but also to rate their facilitators and make comments. *IdeaConnection* described how some might say "*I never want to work with that idiot again*!" while others might say "*The next team I am doing, please put me on with so and so*!" *IdeaConnection* uses the preferences of solvers to develop teams for the next round of challenges, thereby strengthening the social ties between the members.

Offline Events

Collaborative communities also host various offline events in order to promote social ties among their solvers. These offline events afford the solvers an opportunity to network face to face. An example of such an event is TopCoder Open, as described by *Appirio*. TopCoder Open is the result of a yearlong competition organised by TopCoder, where best solvers of the platform in the world (based on the ratings and the performances in different contests) are brought together. In 2014, it was held in San Francisco, and *Appirio* reflected that when these solvers are brought together, "*you can just tell that these guys and women, they just love being rock stars... you*

can feel the tension building and building, and (when the winners celebrate) you think that they have just won a million dollars." *NASA Tournament Lab* also referenced this recognition event as a means of strengthening the social ties within the TopCoder community.

The data shows that these solvers not only enjoy promoting themselves among their peers, but also enjoy the exposure to their peers. It offers them the means to personally meet their collaborators and competitors in an environment that seeks to congratulate them on their accomplishments to date. Similar events can also be held prior and during a challenge, as *Phantominds* outlined how their platform organises offline events with the start-up community in Hamburg, allowing their solvers to meet and discuss challenges. Similarly, *Battle of Concepts* described how their platform also organises events for allowing solvers to develop strong social ties. Often the platform will use these meetings to organise training and networking opportunities for their solvers.

Solver Match Making

The data also reveals strategies pursued by several platforms to match solvers of similar interests together. The platforms distinguish a subset of solvers who are attracted to contests within a particular industry or disciple, and identify solvers whose experiences and skill sets complement each other. These solvers are subsequently placed into teams for the duration of the contest.

This methodology is outlined by *Chaordix, IdeaConnection* and *Phantominds* who argued that groups of solvers with similar interests and experiences will be more likely to develop stronger social ties. *Chaordix* for example reflected how their platform is currently implementing a "*Find a Friend*" functionality: *"So based on my actions, my contributions, what I am doing, we can either make a match in the community automatically, or we can provide functionality that says "*I want to find people, maybe not like me, but people who might be interested in my idea*"."* Once in contact, these solvers will subsequently form collaborative teams. *Phantominds* revealed their platform to be investigating a similar approach, where they would try to make proposals of match making for their community members. *IdeaConnection* also

outlined how they implement both software and highly skilled people who help form the teams of solvers for the requisite challenges: "*So software does it in part, but we have skilled people who help form the teams.*"

Solver Profiles

Solver profiles were also outlined in the findings as being an important mechanism through which solvers within the various communities develop their social ties. These solver profiles offer the community an insight into who the respective solvers are, their interests and experiences, and in some cases the means with which to contact each other directly through the platform via private messaging. For example, *F6S* described their platforms use as akin to that of Facebook: "*Basically F6S works more or less like Facebook, so you create your personal account to identify you as a real person, and then you can create teams, or companies." F6S* allows solvers to form a company out of individuals where they can either communicate through the platform, or alternatively, allows individuals to explore the platform and communicate with other solvers throughout the platform. The same strategy is also pursued by *Chaordix* and *NASA Tournament Lab*, where their solvers are also allowed the options both private and public messaging each other.

Phantominds also outlined how their platform will have community member profiles, allowing their solvers to write private messages to each other. Building on their solver profiles, *Phantominds* are also testing chat functionality within their platform, which they hope will facilitate increased engagement among solvers when working on ideas, allowing them to communicate directly rather than posting on their forum.

6.3.2 Trust

This section will analyse the three mechanisms used to facilitate trust as evidenced throughout the nine different collaborative communities investigated in this study. These mechanisms are outlined below in Table 6-7, and include:

i. Contracts
ii. Solver Profiles

iii. Solver Recognition

Contracts

While not a predominant mechanism, the findings reveal two particular platforms to implement contracts with their solvers as a means of facilitating trust. These contracts provide security to the solvers, clearly outlining what the rules of engagement with the challenge are, as well as what the solvers should expect to receive in return. Two examples of such contracts emerged from the findings, implemented by *Battle of Concepts* and *IdeaConnection*.

Mechanisms of Trust	
	Evidence from Study Participants
Contracts	Battle of Concepts*: "I think it is really important to make the rules of the game clear... **They really know that "Ok, I sign" and it is a CC0 licence** so you can share an idea. All these kind of regulations are clear on the website."*
	IdeaConnection: "***They have all signed NDA's (non-disclosure agreements) beforehand***."
Solver Profiles	Appirio*: "You can pose a question and have it answered. **You can always see who answered them (by their profiles), and the care they put into the answer**... It probably means that if I am clueless about what I am doing, I might reach out to that person first, just based on that signal."*
	F6S: "*The credibility of the profile of the solver, whether it is an event, hackathon or accelerator, **the credibility of the profile will go up***."
	Phantominds: "*It is like **if you have a photo or a real name, or for example your LinkedIn profile or your Twitter profile, and in our community level that is quite important** as it is kind of an identification*."
	Phantominds: "***We will have these profiles of the community members and you can see their skills, their previous successes** in the innovation projects, maybe the expertise and also their performance*."

Mechanisms of Trust	
	Evidence from Study Participants

Solver Recognition	Chaordix: "*We typically identify different participant types in our communities so again, based on the behaviour that we are trying to drive, there could be some form of badge that identifies me as a type of contributor... **what we try to do is identify different types of contributions and behaviour by those participants, reward them, label them, recognise them, and perhaps gamify them.***"
	F6S: "***This trustworthiness can come in the form of recommendations**... They can always provide instantaneous feedback, either recommendations or ratings which again builds the trustworthiness of the solver.*"
	IdeaConnection: ""*They might have heard of each other through academic papers or something, because **they can list all the papers they have written**.*"
	Munktell Science Park*: "One of the first things we do is that we build trust within the people that are part of the group... **We ask people what they bring to the table, and what is the reason they are there**"*
	Phantominds: "*(You must) **explain how the winners were evaluated and how we come to the winners**, so I think there is a really big trust in it.*"

Table 6-7: Chain of Evidence for Mechanisms of Trust within Competitive Platforms

In the first instance, *Battle of Concepts* outlined how they incorporate a CC0 licence, making their ideas accessible to others, while also detailing the prize allocation for group work. This type of contract ensures that the ideas being submitted to the platform can be adapted and developed further at a later stage with solvers consent: "*I think it is really important to make the rules of the game clear... it is a CC0 licence so you can share an idea. All these kind of regulations are clear on the website.*" This level of transparency develops the trust present within the community according to *Battle of Concepts*. Similarly, *IdeaConnection* also described how their solvers sign non-disclosure agreements prior to commencing work on the challenges being issued: "*They have all signed NDA's beforehand.*" Such an approach ensures the IP being developed is protected, an approach which also generates an increased level of trust within the solver community.

Solver Profiles

In addition to facilitating social ties, solver profiles were also identified as a means of facilitating trust within the solver community. The participants outlined that these profiles present the overall credibility of the solver in terms of experience and levels of success. When presented with such information, the solvers will be in a better position to select who they feel is most trustworthy. For example, *Appirio* argued that the solver profiles act as a means of signalling the individual's level of trustworthiness, while also providing a means to contact the solvers directly. *Appirio* described how solvers are able to see who responded to their questions on the various discussion forums by means of the solver profiles. In doing so, it provides the solvers with an indication as to which members of the community are trustworthy, and who they should contact if they are looking to collaborate: "*You can pose a question and have it answered. You can always see who answered them (by their profiles), and the care they put into the answer... It probably means that if I am clueless about what I am doing, I might reach out to that person first, just based on that signal."* By seeing who responded to their questions, the solvers were able to develop trust towards each other based on the level of detail to their answer, and the amount of information on their solver profile.

Phantominds similarly outlined how each solver will have their own profile on their platform where other members can see their skills, previous successes in innovation projects, expertise and performance: "*We will have these profiles of the community members and you can see their skills, their previous successes in the innovation projects, maybe the expertise and also their performance*." *Phantominds* believed that in order to develop trust, it is quite important for solvers to provide their real name, LinkedIn profile or Twitter profile as it provides another layer of verification that the solver is who they are claiming to be: "*If you have a photo or a real name, or for example your LinkedIn profile or your Twitter profile, in our community level that is quite important as it is kind of an identification*." This level of credibility is echoed by *F6S* who also view solver profiles as a mechanism of promoting trust within their platform: "*The credibility of the profile of the solver, whether it is an event, hackathon or accelerator, the credibility of the profile will go up*."

Solver Recognition

Several platforms outlined how the recognition of solver efforts also facilitates levels of trust within the community. The findings reveal that solvers who are directly recognised by the platforms for their contributions develop increased levels of trust. This recognition informs solvers that they are not being taken for granted, and that the work they are producing is being viewed and in some cases judged by the platform. Such recognition can in some cases be viewed as a reward in and of itself.

For example, *Phantominds* outlined how solvers wish to be treated fairly and by directly recognising the efforts of solvers it allows them to develop a reputation for what they are doing on the platform. A main part of this is providing detailed feedback to the solvers submissions: "*(You must) explain how the winners were evaluated and how we come to the winners, so I think there is a really big trust in it*." Similarly, *Chaordix* described how their platform recognises solvers who promote trust by collaborating with peers. *Chaordix* gamifies that type of role by rewarding it within the community. *Chaordix* recognise these solvers by offering distinct badges for the solver profiles that can be accredited with certain behaviours. These badges are branded and labelled in such a way that is meaningful to the solver: "*Based on the behaviour that we are trying to drive, there could be some form of badge that identifies me as a type of contributor... What we try to do is identify different types of contributions and behaviour by those participants, reward them, label them, recognise them, and perhaps gamify them*."

Such recognition can also be promoted from the solvers themselves rather than being addressed by the platform. For example, within F6S the solvers are capable of leaving recommendations which F6S argued also helps to build the trustworthiness of their community: "*This trustworthiness cam come in the form of recommendations... They can always provide instantaneous feedback, either recommendations or ratings which again builds the trustworthiness of the solver*." Once solvers develop multiple recommendations, it signals to their peers that they are trustworthy as they can view what projects they have worked on previously and how they have been recognised for their efforts. *IdeaConnection* also outlined that such recognition can be promoted by

the solvers themselves, for example: "*They might have heard of each other through academic papers or something, because they can list all the papers they have written*." *IdeaConnection* allow their solvers to list their published academic papers on their profiles, further highlighting their capabilities to their peers in order to develop trust.

6.3.3 Reciprocity

This section will analyse the four mechanisms used to facilitate reciprocity as evidenced throughout the nine different collaborative communities investigated in this study. These mechanisms are outlined below in Table 6-8, and include:

i. Discussion Forums
ii. Increased Transparency
iii. Moderators
iv. Offline Events

Discussion Forums

The use of discussion forums were again identified by the platforms as a means of facilitating reciprocity among the solver community. This mechanism was implemented by several platforms including *Battle of Concepts, Phantominds, F6S* and *NASA Tournament Lab*.

NASA Tournament Lab for example outlined how solvers can go on such forums to give very detailed feedback to each other. *NASA Tournament Lab* reveals that this is something they would want to stimulate on certain projects to add an educational collaboration that would stimulate solvers further, and increase the levels of reciprocity: ""*They can go on a forum and give very detailed feedback, especially after the contest; there are a lot of discussions usually on the forum*." The platform also has a technical forum where solvers can discuss their approaches, along with their methods which provides potential access to a lot of data. However the winners do not usually share their code as the top submitted solutions have been bought with the rights and ownership of the IP transferred to the organisation posting the challenge.

Similarly, *IdeaConnection* described how solvers on their platform are also able to list their methods of problem solving or thinking: "*They can list methods of problem solving, or thinking (on forums).*" However due to the NDA's signed by the solvers discussed previously, they do not share the winning solutions with other teams.

Phantominds also described how their platform is aiming to achieve a forum for each innovation project where solvers can detail the themes experienced while engaging, along with various discussions of topics relevant to the project: *"We want a kind of forum for each innovation project where (the solvers) can put their themes and their discussions."*

Mechanisms of Reciprocity	
<u>*Discussion Forums*</u>	*Evidence from Study Participants*
	Battle of Concepts: "*For example, one person wanted to join battle X, and the other person wanted to join battle Y, so they weren't in the same competition. They said "Ok, I will help you with feedback on your content for this challenge. Another time another solver will help me with feedback on a different challenge."* ***I know some of the community members did that (over the forums)***."
	IdeaConnection: "***They can list methods of problem solving, or thinking*** *(on forums)."*
	NASA Tournament Lab: "*They also have a free technical forum where they just talk a lot about certain types of problems and* ***it is also pretty easy to share their solutions***."
	NASA Tournament Lab: "***They can go on a forum and give very detailed feedback****, especially after the contest; there are a lot of discussions usually on the forum*."
	Phantominds*: "We want a kind of forum for each innovation project where* ***(the solvers) can put their themes and their discussions****."*

Mechanisms of Reciprocity

	Evidence from Study Participants
Increased Transparency	Battle of Concepts: "*What also helps is that we really put back the results, like "*Ok, so these were the best ideas*" if we can make them open. That is not always the case of course with IP, but if* ***we can put back the feedback back, and also like a few months later what the organisation did with it***."
	Chaordix*: "Sometimes we would start a community or start a challenge community... we would take the participants through a process where we would say "***We want some insights around this problem and potential solutions***, so don't give us the solutions yet!" And what that does is that* ***it generates and fosters discussion and collaboration across a group of these activities****."*
	NASA Tournament Lab*: "That is something where* ***we would want to stimulate certain things on some projects, like to add educational collaboration.*** *That would stimulate people, or make people compete in some interesting games."*
Moderators	F6S*: "****(The solvers) engage with the mentors most of the time****, or the mentors that are helping... On the voluntary basis, just giving back to the community."*
	IdeaConnection*: "They want to show how smart they are. So they want to solve the problem, some will be shy; they don't want to be seen as being silly. But* ***that is where the facilitator comes in and encourages them****."*
Offline Events	*Battle of Concepts: "In between (working on the project) with having drinks together, for example, if they had won a battle, they were invited to come and pitch it for the direction of the company board.* ***Then they see each other's ideas, and they can learn from each other****."*
	*Battle of Concepts: "****Sometimes we had offline session and they could build on ideas.*** *So first, everything in our company was online individually, and then sometimes we had a second round and that was like making a new product together, sort of like the best of the different ideas."*
	*Munktell Science Park: "****I still really love the idea of having physical workshops with people coming together****. I think it is really valuable and hard to beat... One of the reasons of having workshops is to form groups, so they find each other and start groups."*
	*Skild: "****What we have done in an offline setting is presentations, and everyone presents, and everyone gets to see each other's presentations****... You could see how the judges react and their kind of likings so people sort of borrow from each other."*

Table 6-8: Chain of Evidence for Mechanisms of Reciprocity within Collaborative Communities

Increased Transparency

Increasing the levels of transparency on the platform was again outlined by collaborative communities to facilitate levels of reciprocity within their respective platforms. Such transparency can involve revealing core information to the solvers with regards to the challenge itself, how the submissions have been evaluated, what the client did with the winning solution etc., as evidenced from several platforms. For example, *Chaordix* argued that reciprocity can be achieved through the design of the challenge and implementing an open process initially that promotes collaboration between solvers. *Chaordix* illustrated the example of starting a challenge where they do not immediately seek for solutions: "*Sometimes we would start a community or start a challenge community that doesn't go "Here is the problem, submit solutions!" What we would do is we would take the participants through a process where we would say "*We want some insights around this problem and potential solutions, so don't give us the solutions yet*!""* According to *Chaordix*, this approach "*generates and fosters discussion and collaboration across a group through these activities*".

Battle of Concepts also believed that a transparent approach to be important, advocating to publish the best of the submitted ideas (IP dependant), and show the community of solvers what the feedback toward the solutions were, as well as what the organisations did with the winning solutions: "*What also helps is that we really put back the results, like "*Ok, so these were the best ideas*" if we can make them open. That is not always the case of course with IP, but if we can put back the feedback back, and also like a few months later what the organisation did with it." Battle of Concepts* explained that this strategy allows the winning solvers to identify each other in order to "*organise brainstorming sessions with themselves, what did they learn, what was the feedback, how did you experience the process of solving this problem etc... these kind of questions*".

Moderator

Several platforms outlined how the use of a moderator within their communities impacted the levels of reciprocity among solvers. These moderators promote engagement within teams and encourage solvers to share information with each other.

For instance, *IdeaConnection* outlined how once their solvers engage in teams, they also provide a moderator to ensure solvers collaborate effectively: "(*The solvers) want to show how smart they are. So they want to solve the problem, some will be shy; they don't want to be seen as being silly. But that is where the facilitator comes in and encourages them.*"

Munktell Science Park also described the importance of having a moderator for the solver community: "*I am convinced that if you want to have a website that is more of a community in the feeling, you need to have someone there who is the moderator, or actually more people there that sort of facilitate that sort of dialogue, and processes need to be developed for that to happen*". *Chaordix* outlines their implementation of this mechanism, stating how the solvers within their communities can perform two roles, one of which involves being a moderator whereby they are "*actively participating in discussions with the crowd*".

Offline Events

In addition offline events being used to facilitate social ties among the solvers, the participants revealed that offline events were also utilised in order to facilitate levels of reciprocity among their respective solvers also. One of the main reasons of having these workshops is for solvers to come together, find equally minded solvers and form their own groups to collaborate together *Skild* for example described how offline sessions were organised so the solvers could build on each other's ideas: "*What we have done in an offline setting is presentations, and everyone presents, and everyone gets to see each other's presentations... You could see how the judges react and their kind of likings so people sort of borrow from each other.*" *Battle of Concepts* advocated a similar approach, providing an example of one group who, having won the contest, were invited to pitch their idea to the company posting the challenge and their peers: "*If they had won a battle, they were invited to come and pitch it for the direction of the company board. Then they see each other's ideas, and they can learn from each other."* By doing so, these solvers were exposed to what each of their peers were doing while also learning new approaches to develop their ideas further.

Munktell Science Park also strongly advocated the use of physical workshops with solvers coming together, citing that "*it is really valuable and hard to beat*". *Munktell Science Park* explained that once the workshops have been set up, the solvers discuss issues in groups relating to the challenge itself, their understanding of the problem and the issues that might emerge from its development. *Munktell Science Park* described further how the solvers are capable of using visual methods such as "*story boarding their ideas*" which is attributed to how the solvers "*come together quite fast so they can move forward*". *Munktell Science Park* admitted that such approaches are difficult to achieve in a digital environment, which is why "*we think it is still very much important to physically be involved*".

6.3.4 Self-Identity

This section will analyse the three mechanisms used to facilitate self-identity as evidenced throughout the nine different collaborative communities investigated in this study. These mechanisms are outlined below in Table 6-9, and include:

i. Reward Selection
ii. Solver Ranking
iii. Solver Recognition

Reward Selection

The first mechanism to emerge from the data that facilitated a solvers' self-identity was selecting the correct reward to encourage them to engage in the first instance. While the majority of open innovation contests provide monetary reward to varying degrees, depending on the complexities of the problems being addressed, some contest platforms offer more compelling rewards that solvers take personal interest to. For example, *Skild* described how one of their more recent challenges provided the winning solver the opportunity to ring the bell at the New York Stock Exchange. *Skild* outlined that while the challenge also presented the solvers an opportunity to receive a financial reward, solvers were drawn primarily to the chance of achieving something novel: "*Another time we had that you could ring the bell at the New York Stock Exchange... It wasn't really about the money so much... It was more about being able*

to say that you were an innovative team and you get to ring the bell and meeting all these sponsors and potentially using it to get a job." *Skild* explained that "*it wasn't really about the money, but it was being able to say that you were an innovative team and you get to ring the bell and meeting all these sponsors*".

Mechanisms of Self-Identity	
	Evidence from Study Participants
Reward Selection	Battle of Concepts: "***They could earn money, but the prize money differed per question.*** *So if we asked more of them, for example working out a concept in five pages as part of the research, the prize money they could earn was higher than when we asked to just pitch your idea on one page.*"
	Munktell Science Park: "***There is of course the possibility to win the trip to Sweden****, and I know that has been a driving force for a lot of them to participate.*"
	Skild: "***Another time we had that you could ring the bell at the New York Stock Exchange****... It wasn't really about the money so much... It was more about being able to say that you were an innovative team and you get to ring the bell and meeting all these sponsors and potentially using it to get a job.*"

Mechanisms of Self-Identity	
	Evidence from Study Participants

Solver Rankings	Appirio*: "If you have a very high TopCoder rating for example, and if you interview with Google, Google has a very, very difficult interview process... **If you already have a TopCoder rating, they let you skip a number of steps**."*
	Appirio*: "At the same time there are other companies where you may interview and they might say "*Look, you have a fantastic background, but **if you want us to take a look at you, you will need a TopCoder rating**" so they will get one."*
	Appirio*: "**I think one thing they do is try to get top ratings**, because the higher the ratings, the more likely when it comes to choosing a winning solution, if they have a top rating then the customer will feel safer with that person."*
	Appirio*: "**The other thing that is extremely important from what we have seen is ratings**, internal peer reviewed ratings. All code that is submitted is reviewed by peers."*
	Battle of Concepts*: "**Because it was a competition, everyone was on a ranking**, so you could be the most creative of this year, or of this month, or in total, as long as the platform existed."*
	Battle of Concepts*: "So what you saw also was that the students and the young professionals were **really battling with other to gain a higher spot in this ranking**."*
	NASA Tournament Lab*: "They are actually getting addicted, because **we see a lot of people making their ratings a reliable measure of their experience**."*
	NASA Tournament Lab*: "**They see the provisional scores of everyone, so they can see who is working on the solution and who has submitted a solution**... So you can see who is competing against whom... You can see for example the number of people participating, the rating of people who are participating, their distribution, the countries they are from etc..."*
	Skild*: "It is important for those people, they need an outlet, they'll self-identify because they want to tap into that part of themselves... After they do it, **they want to know where they stand so they can use that experience to get to the next step**, or the next ladder, the next opportunity."*
	Skild*: "The more they collect to see where they rank, and **ranking is very important**, like how they rank even though they didn't win. We published rankings and we had people who took those rankings and stuck them on their resume, or on their profile."*

Mechanisms of Self-Identity

	Evidence from Study Participants
Solver Recognition	Battle of Concepts*: "And then **we really said like "Thank you, and we appreciate and we value your knowledge**." I think that is really important, and that makes them proud."*
	Chaordix*: "We typically identify different participant types in our communities so again, **based on the behaviour that we are trying to drive, there could be some form of badging that identifies me as a contributor**."*
	F6S*: "We feel as a platform that **it is extremely important when the person signs up with F6S to help him find his place** in the platform as soon as possible."*
	F6S*: "We need to kind of as soon as possible and as easy as possible as well, **help him find how he can start building or playing with the platform**."*
	F6S*: "When the solver basically creates a profile on F6S, most of the time we get notifications and we contact the people. **We try to organise a Skype call so that we can talk**, know what he is doing, and then we are figuring out how we can personally help him as a platform."*
	Munktell Science Park*: "**They feel very selected when they are invited**."*
	Skild*: "**They think it is pretty prestigious**. If they are problem solvers and they take pride in owning the title and being called one of the most innovative teams in the world at that time is pretty prestigious."*
	Skild*: "We have done surveys and asked solvers why they are doing it and in the innovation challenges, a lot of times it was like when you are giving someone a title after they win it. So our title was "Most Innovative MBA Team in the World". So **having that title, even today if you look back at the winners, they have it on their résumé, like 10 years later**."*

Table 6-9: Chain of Evidence for Mechanisms of Self-Identity within Collaborative Communities

This effect of the reward on the levels of self-identity is also argued by *Appirio,* who outlined that the monetary incentive for solvers to engage in innovation contest platforms can be "*very low*". By setting the prize for a particular contest lower than what would normally be expected, *Appirio* revealed that solvers are attracted to engage in the contest due to their genuine passion for the subject area, rather than what the resulting financial benefits might be available. *Appirio* illustrated an example of hosting a contest for the International Space Station which might have "*8,000 people*

that submit challenges, with (only) two getting paid." *Appirio* outlined that due to the high levels of interest in the project, the solvers are aware that the chances of being paid for the work undertaken is quite low: "*chances are you are one of those two people are negligible*." Regardless, these solvers are more interested in participating in an area they have a personal interest in, as it might provide them with the opportunity to learn about the project in a more practical setting, and how they may be of further assistance to it going forward: "*You are participating in something that is very cool, learning a lot that you can take forward. If I was a coder, and I could take part in that contest, I would just for the sake of being part of it*."

NASA Tournament Lab also agreed with this belief, arguing that contests that run competitions for fun rather than monetary reward "*surprisingly have much stronger participation than commercial competitions*".

Solver Rankings

Solver rankings emerged as an important mechanism through which collaborative communities facilitated self-identity among their community of solvers. Similar to competitive markets as outlined previously, these rankings provide the solver with an indication to their overall performance and standing within the solver community, based on their levels of success toward the various challenges the solvers enter.

This mechanism was implemented by several of the platforms explored, including *Appirio*, *Skild*, *NASA Tournament Lab* and *Battle of Concepts*. *Appirio* for example outlined the ability for solvers to achieve high *TopCoder* ratings as a means of self-identifying with the platform. *TopCoder* promotes internal peer reviewed ratings, where all code that is submitted is reviewed by the solvers' peers. *Appirio* believed this process to be "*extremely important*", describing the process as being akin to "*being in an advanced class. You don't have to have your paper graded, but you do and it helps you*". *Appirio* also argued that when solvers obtain top ratings, it can also represent a "*signalling function*" to the platform customers, making them feel safer with the solution submitted. *Chaordix* outlined a similar approach where they interact with their solvers, explaining to their solvers that "*Here is what we are trying to do, and here are series of activities that we believe if we take you through, we could generate*

contributions, we could improve those contributions and we could rank those contributions".

Skild agreed with the use of such a mechanism, suggesting that platforms need to develop a proof points system where if solvers have won various competitions, their peers can take note of their progress: *"The more they collect to see where they rank, and ranking is very important, like how they rank even though they didn't win. We published rankings and we had people who took those rankings and stuck them on their resume, or on their profile." Skild* described how they receive surveys from their solvers after being asked why they engage with the platform and the feedback was positive when the solvers were given a ranking or a title after winning the contest. The interviewee describes solver ranking as "*always really important*" even for the solvers who were unsuccessful in the contest. As the interviewee states, "*it is important for those people, they need an outlet, they'll self-identify because they want to tap into that part of themselves and they just need more opportunities to do it*".

Battle of Concepts also described how the solver ranking on their platform can be identified monthly, yearly or in total. *Battle of Concepts* explained the result of such an approach by stating, "*What you saw also was that the students and young professionals were really battling with each other to gain a higher spot in this ranking*". *NASA Tournament Lab* also described their solvers as "*actually getting addicted because... (they) really make their ratings a reliable measure of their experience*".

Solver Recognition

Platforms can also facilitate solver self-identity by recognising their community directly. For example, *F6S* believed it to be vital when a solver signs up with the platform to help them find their place as soon as possible, encouraging their solvers directly to engage: "*We feel as a platform that it is extremely important when the person signs up with F6S to help him find his place in the platform as soon as possible*." *F6S* described that the program managers "*as soon as possible, and as easy as possible as well, help (the solver) to find how they can start building or playing with the platform to get visible to the community*". When the solver creates their

profile on the platform, a notification is sent which allows the platform to make immediate contact with the new solver. The platform will subsequently attempt to organise a Skype call "*so that we can talk, know what he is doing, what he is about, and then figure out how we can personally help him as a platform*". From here, the solver can explore the platform, invite other solvers to his team and the self-identification builds up from there according to the interviewee.

Battle of Concepts also described how they contact the solvers directly after each contest, "*we really said like "*Thank you, and we appreciate and we value your knowledge.*" I think that is really important, and that makes them proud, like "*Hey! The guys in the community realize this and its now on the market and how cool is that that I am part of that community?*"" Similarly, *Munktell Science Park* stated that when it comes to organising workshops, the solvers not only take part in them due to the enjoyment they receive, but also because "*they feel very selected when they are invited, it is a very important thing for why they actually should participate in it*". The platform also asks their solvers directly what their reasons for engaging in the contest are, to which the solvers then further self-identify with. *Munktell Science Park* highlighted the difference between their operating model and that of InnoCentive stating that "*we are more interested in the people that their ideas... InnoCentive is more about the actual idea, they don't care who it comes from*."

NASA Tournament Lab also contrasted the different approaches between competitive markets and collaborative communities. *NASA Tournament Lab* again used *InnoCentive* as an example, arguing that "*they don't really care who competes, it can be a person, or it can be a whole institution... so every challenge is separate, whereas on TopCoder they concentrate on individuals in every challenge but they want to support the community overall*." *NASA Tournament Lab* thus described *TopCoder* as being "*a competition plus community*", citing that they are all about fair sport, and while the solvers race against each other during the contests, after its completion they celebrate together which leads to increased collaboration between contests on the platform. *Appirio* argued that it is this level of achievement and recognition that the solvers crave, arguing that regardless of how solvers perform during the contests, they can't lose this within their community.

6.3.5 Shared Language

Similar to their competitive market counterparts, there was a lack of mechanisms identified that were used to facilitate a shared language among the solvers within the platforms investigated. This too shall also be subsequently addressed in the collaborative community summary.

6.3.6 Shared Vision

This section will analyse the two mechanisms used to facilitate shared vision as evidenced throughout the nine different collaborative communities investigated in this study. These mechanisms are outlined below in Table 6-10, and include:

i. Challenge Definition
ii. Solver Recognition

Challenge Definition

The use of a challenge definition was revealed by the collaborative communities to be the primary mechanism used to facilitate a shared vision among their solvers. Both *Phantominds* and *Battle of Concepts* for example revealed how their platforms present the challenge to their solvers in the form of a briefing. *Battle of Concepts* outlined how their briefings evolve from the initial meeting with the client seeking the solution: "*So we had an intake with the client,* "Ok, what are you looking for? What is the background? What are the criteria? What are the go or the no go areas in the solution directions? What fits your strategy?" *All these kind of things we analysed beforehand, and based on these conversations with the client, we helped to make a briefing that is attractive for the people so that people get like the momentum of action. Also that it is clear about what it is we search for and how will we judge*".

Mechanisms of Shared Vision	
Challenge Definition	*Evidence from Study Participants*
	Battle of Concepts*: "We had a* ***briefing per challenge****."*

	Battle of Concepts: ""*So we had an intake with the client, "*Ok, what are you looking for, what is the background, what is the criteria, what are the go or the no go areas in the solution directions, what fits your strategy...*?" All these kind of things we analysed beforehand, and based on these conversations with the client, we* ***helped to make a briefing that is attractive for the people so that people get like the momentum of action****. Also that it is clear about what it is we search for and how will we judge*".
	Chaordix*: "They* ***write a brief*** *to the community."*
	F6S*: "We are* ***trying to develop this common, unified structure of describing the initiative****... And by this, this common vision is basically being clarified."*
	Munktell Science Park*: "The idea generation process has several parts. One of them is that* ***together within the group****, they talk about future trends and* ***understanding the problem*** *and issues... That is the way they can come together quite fast so they can move forward."*
	NASA Tournament Lab*: "****All those rules and regulations, you write at the beginning.*** *It may take a long time to solve a problem, but the outcome depends on the actions that you do very clearly when you start the whole thing."*
	Phantominds*: "For sure,* ***we present the challenge in a kind of briefing****."*
Solver Recognition	F6S*: "The short listed teams;* ***they receive the first kind of interaction from the program managers and then the connection starts.*** *So they might by invited for a Skype interview, they might be invited to a real interview, face-to-face interview etc..."*
	Munktell Science Park*: "****A very active dialogue with those that are part of the challenge on all levels****, and there are more than 1,000 participants that we have this dialogue with"*
	Skild*: "The more things that make it humanizing.* ***I always like to tell people to do a conference call.*** *A lot of people don't do a live conference call when everything is online. If you just get on the phone for an hour and talk about the challenge and why you are doing it, why it is important to your company or non-profit.* ***People can hear each other's voices, then they feel like it is really real and they are able to ask questions****."*

Table 6-10: Chain of Evidence for Mechanisms of Shared Vision within Collaborative Communities

NASA Tournament Lab also described the importance of developing a comprehensive, yet concise challenge briefing, outlining that: "*All those rules and conditions that you*

write from the beginning. It may take a long time to solve a problem but the outcome depends a lot on the actions that you do very clearly when you start the whole thing". *NASA Tournament Lab* revealed there are dangers associated with removing certain barriers to invite the community of solvers to "*think outside the box*", outlining that "*the broader you set (the contest), the broader your responses get and the higher fraction then will be crap*". *Appirio* argued against this point however, outlining that if solvers are going to win, they have to demonstrate a certain skill which very few people have. *Appirio* revealed that often, the winning submissions "*come from nowhere*" describing a contest ran by the ISS that was won by "*an engineer... (that) had nothing to do with space, but he could write code, he could write algorithms*".

In terms of creating a challenge definition for their solvers, *F6S* outlined how their platform is "*trying to develop this common, unified structure of describing the initiative. So when they are being created they are asked the very same information that we would ask any other program. And by this, as you say this common vision basically is being clarified*".

Solver Recognition

Collaborative communities also argued the importance of directly recognising the solvers who are competing in their contests throughout the process in order to maintain a shared vision with them. *Skild* for example believed that the best way to develop solutions is to "*really understand the audience*" advocating approaches to "*make it more humanising*". *Skild* outlined how they encourage their community to engage in conference calls to "*talk about the challenge and why you are doing it, why it is important to your company, or non-profit, people can hear each other's voices. Then they feel like it is really real, and they are able to ask questions*". *Skild* argued that "*these are the kind of things that make people stay engaged throughout the process*". *Munktell Science Park* agreed with this approach, stating that to achieve a shared vision with their solvers, they have "*a very active dialogue with those that are part of the challenge on all levels, and there are more than 1,000 participants that we have this dialogue with*". *F6S* also described how their platform initially proposes an open call, with interested teams then sending their application. Once this occurs, a

specific evaluation occurs surrounding the applications and a short list of teams is selected. These teams then interact with the program managers on the platform through either Skype interviews, or real face-to-face interviews: *"The short listed teams; they receive the first kind of interaction from the program managers and then the connection starts. So they might by invited for a Skype interview, they might be invited to a real interview, face-to-face interview etc..."*

Phantominds admitted their platform struggles in achieving a shared vision amongst their solvers, describing solvers having previously contacted them stating "*we don't know how to begin*". *Phantominds* would like to see the development of certain tools, though revealed "*I don't know if they have to be rich like on the community, or give them some hints, or some advice how they can be creative... At the moment it is more like text based features, but we are thinking about creative tools*". *Phantominds* described an approach currently in use by *OpenIDEO* who have developed an "*inspiration phase*" to make the solving process more akin to that of mind mapping where the solvers are able to post comments to share their approaches and findings. However, *Phantominds* also highlighted the challenges involved in such an approach: "*It is really tough to look at each comment of each user because it is such a big mind map... That is also a problem if you have a lot of users it can be very hard for a new user or a new community member to see what is the interesting stuff in the project*".

6.3.7 Collaborative Community Summary

To present the mechanisms used to facilitate social capital within collaborative communities, the previously outlined social capital impact model for collaborative communities was extended.

The findings immediately reveal an increased amount of mechanisms directed toward the development of social capital within collaborative communities when compared to competitive markets.

The findings indicate that collaborative communities primarily focus their efforts on developing mechanisms to increase the social ties and reciprocity. Social ties have been previously proven to play an important role in the overall submission quality and the

levels of solver engagement, while reciprocity has been shown to increase the overall submission quality. Five separate mechanisms were identified to facilitate social ties (solver profiles, discussion forums, moderators, offline events, and solver match making), while reciprocity commanded four mechanisms (discussion forums, increasing the levels of transparency, moderators, and offline events). As noted previously, some mechanisms may be present for multiple constructs, as is the case herein where discussion forums were shown to facilitate both social ties and reciprocity. This serves to further highlight the importance of the mechanism in question and underlines why platforms need a strategic, focused effort in considering their adoption or implementation.

Trust and self-identity displayed three mechanisms by which to facilitate both constructs. As previously outlined, trust has been proven to increase the levels of solver retention within the platform, whereas a lack of the construct only serves to increase the levels of solver churn. Self-identity meanwhile was shown to impact on the levels of solver employment, solver learning and solver enjoyment. For trust, the mechanisms of solver profiles, use of contracts and solver recognition were identified as being vital for its development, while for self-identity the data revealed that collaborative communities utilised solver rankings, solver recognition and reward selection.

Interestingly, the data also shows that while the collaborative communities failed to identify a net impact of shared vision, they did however illustrate two distinct mechanisms by which to achieve this construct. Essentially, they promote the construct, without knowing the overall impact it has on their platform. Conversely for the construct of shared language, the collaborative community platforms did not identify any mechanism by which to achieve the impact of solver understanding. It seems that for the cognitive dimension of social capital, there is much still to be revealed. As mentioned previously, these areas should be subject to further investigation.

6.4 Comparative Findings

This section conceptualises and compares the findings of the previously analysed competitive markets and collaborative communities. In doing so, this section builds upon the previous social capital model for innovation contests outlined in Chapter 5 by illustrating the shared mechanisms by which these platforms facilitate social capital. Figure 6-6 below presents the extended theory of social capital for innovation contest platforms, while Table 6-11 presents the comparative findings between competitive markets and collaborative communities.

Our findings show that there are six shared mechanisms used by IT-enabled innovation contest platforms in the facilitation of social capital:

i. Challenge Definition
ii. Discussion Forums
iii. Increased Transparency
iv. Solver Profiles
v. Solver Rankings
vi. Solver Recognition

However, given that reciprocity was previously revealed to share no similar emergent themes, nor net impacts, the shared mechanisms for this construct (discussion forums and increased transparency) were ultimately cut from the final model presented herein.

	Competitive Market	***Collaborative Community***
Social Ties	Solver Profiles	Solver Profiles
		Discussion Forums
		Moderators
		Offline Events
		Solver Match Making
Trust	Discussion Forums	Contracts
	Moderators	Solver Profiles
	Protection of Solver IP	Solver Recognition
Reciprocity	Discussion Forums	Discussion Forums
	Increased Transparency	Increased Transparency
	Reward Selection	Moderators
		Offline Events
Self-Identity	Solver Rankings	Reward Selection
		Solver Rankings
	Solver Recognition	Solver Recognition
Shared Language	No Mechanisms Revealed	No Mechanisms Revealed
Shared Vision	Challenge Definition	Challenge Definition
	Problem Deconstruction	Solver Recognition
	Targeted Outreach	

Table 6-11: Comparative Findings of Competitive Markets and Collaborative Communities Social Capital Mechanisms

These are considered to be key mechanisms for innovation contest platforms as both competitive markets and collaborative communities identified them to facilitate similar social capital constructs. It is worth noting however that both competitive markets and collaborative communities identified several mechanisms that facilitate one or more social capital constructs. These instances are outlined below:

i. While solver profiles are considered as being a key mechanism in the facilitation of social ties; collaborative communities identified this mechanism to facilitate trust also.

ii. Both platform sets identified discussion forums as being a key mechanism for the facilitation of reciprocity, yet competitive markets additionally viewed it as being important for the facilitation of trust, while collaborative communities identified it as a means of facilitating social ties among their solvers.
iii. While both platform sets identified solver recognition as being a key mechanism for the facilitation of self-identity, collaborative communities also identified it as being important in the facilitation of a shared vision and trust.
iv. While not considered a key mechanism as neither platform set identified its presence in similar social capital constructs, the use of moderators as a mechanism was outlined by both platform sets to facilitate different constructs. For competitive markets, moderators were used to facilitate the levels of trust within the platforms, while for collaborative communities moderators were used to facilitate the social ties among solvers.

6.4.1 Social Ties

The findings reveal that both platform implement solver profiles to facilitate the building of social ties within their respective communities. However, while this was the sole mechanism outlined by the competitive markets, collaborative communities meanwhile implemented four separate mechanisms to facilitate these ties:

i. Discussion forums
ii. Moderators
iii. Offline events
iv. Solver match making

This comparison further strengthens the disparity between the two platforms, highlighting the effort collaborative communities go to in promoting strong social ties. As previously discussed in Chapter 5, the net impact of social ties was the increase in submission quality from the solver community. The findings therefore indicate that the provision and utilisation of these mechanisms play a key role in delivering this promise.

6.4.2 Trust

There was disagreement between the two sets of platforms when revealing how trust is facilitated within their respective platforms. While competitive markets revealed their pursuance of discussion forums and moderators to ensure this construct, collaborative communities on the other hand described their use of contracts, solver profiles and solver recognition to achieve the same. This disagreement was also illustrated in Chapter 5, where these platforms also disagreed on the emergent themes of the construct, before agreeing the overall impact to be solver retention. As a result there are no shared mechanisms that can be included in the extended theory of social capital for innovation contest platforms.

6.4.3 Reciprocity

This construct also represents an area of disparity between competitive markets and collaborative communities. While an absence of shared themes and impacts were previously highlighted in Chapter 5, the findings reveal two shared mechanisms being utilised to facilitate this construct among the two platforms. These mechanisms involved the use of discussion forums and increased transparency, and were thus included in the extended theoretical model of social capital for innovation contest platforms.

In addition to these two shared mechanisms, both platforms revealed the additional use of separate mechanisms also. For competitive markets, the choice of reward on offer to the winning solver was illustrated to have a significant impact on the levels of reciprocity within the community. Conversely, for collaborative communities the implementation of both moderators and offline events were described as having important roles in the facilitation of this construct also.

6.4.4 Self-Identity

Both competitive markets and collaborative communities revealed similar use of two distinct mechanisms by which to facilitate the self-identity of their solver communities:

i. Solver rankings
ii. Solver recognition

These mechanisms were utilised by the platforms to deliver the impacts of self-identity previously described (solver employment and solver learning). However while these mechanisms were the only two revealed by competitive markets to facilitate this construct, collaborative communities described the importance of offering an appropriate reward to their solver communities also.

6.4.5 Shared Language

Shared language represented the only social capital construct not to exhibit a shared mechanism by the two platform sets investigated. This is an interesting finding in and of itself however, in that while both competitive markets and collaborative communities argue that this construct impacts on heightened levels of solver understanding by delivering an increased level of clarity (as described in Chapter 5), these platforms do not know how this is achieved. As such this represents a rich area of future research opportunity.

6.4.6 Shared Vision

Both competitive markets and collaborative communities reveal the importance of having a well-researched, concise, and accurate challenge definition for when they launch various innovation contests in order to achieve a shared vision. Competitive markets further described how they deconstructed the problem being asked of their community to ensure a shared vision between their clients and the solvers, while also outlining their strategy of pursuing a targeted outreach for particular solvers. Conversely, beyond solver recognition collaborative communities described their use of solver recognition to promote a shared vision between the platform and their respective communities.

However, this social capital construct mirrors reciprocity, in that neither platform was shown to exhibit similar themes or impacts for shared vision. Much like its cognitive dimension counterpart of shared language, shared vision also represents an exciting

area for future research as this investigation has revealed a significant lack of understanding in how this construct shapes these innovation contest platforms.

6.5 Chapter Conclusion

This chapter identified and explored the mechanisms used to facilitate each social capital construct within both the competitive market and the collaborative community platforms. In doing so, this chapter addressed research question two:

"*What are the mechanisms used in innovation contest platforms to enable the development of social capital*?"

Similar to the social capital impacts described in the previous chapter, there were various mechanisms used to facilitate social capital that were identified throughout the data analysis. Section 6.2 outlines the mechanisms used to facilitate social capital within the competitive markets investigated. The mechanisms that were identified therein were subsequently embedded onto the model of competitive market social capital impacts as presented in Chapter 5, which included the use of:

i. Challenge definition
ii. Discussion forums
iii. Increased transparency
iv. Moderators
v. Problem deconstruction
vi. Reward selection
vii. Solver profiles
viii. Solver rankings
ix. Solver recognition
x. Targeted outreach

Similarly, Section 6.3 investigated the mechanisms exhibited by the collaborative communities. These mechanisms were also embedded onto the social capital impact model illustrated previously in Chapter 5 for collaborative communities, and included the use of:

i. Challenge definition
ii. Contracts
iii. Discussion forums
iv. Increased transparency
v. Moderators
vi. Offline events
vii. Reward selection
viii. Solver match making
ix. Solver profiles
x. Solver ranking
xi. Solver recognition

Section 6.4 provided a comparative analysis between the two platforms investigated, outlining the shared mechanisms that were exhibited to facilitate similar constructs of social capital. Examples of these mechanisms included:

i. Challenge definition-Shared Vision
ii. Discussion forums-Reciprocity
iii. Increased transparency-Reciprocity
iv. Solver profiles-Social ties
v. Solver rankings-Self identity
vi. Solver recognition-Self identity

Further discussion regarding the contributions of these research models, along with their theoretical and practical implications follows in Chapter 7.

CHAPTER 7: SUMMARY OF RESEARCH FINDINGS

7.1 Introduction

This Chapter synthesizes the study's findings by presenting the theoretical models that have emerged from the findings, while also discussing these models via-à-vis prior research. In doing so, this answers the two research questions put forth in the study:

Research Question 1:

"*What are the impacts of social capital on innovation contest platforms*?"

Research Question 2:

"*What are the mechanisms used in innovation contest platforms to enable the development of social capital*?"

Section 7.2 will present a summary of findings, before Section 7.3 will outline the discussion of findings surrounding research questions one and two, and validate these findings where applicable through prior literature. Section 7.4 provides a brief chapter conclusion before introducing Chapter 8, the study's overall conclusions.

7.2 Summary of Findings

This section presents the three preliminary theoretical models that emerged from Chapter 6, illustrating:

i. A preliminary theory of social capital for innovation contest platforms
ii. A preliminary theory of social capital for competitive markets
iii. A preliminary theory of social capital for collaborative communities

7.2.1 A Preliminary Theory of Social Capital for Innovation Contest Platforms

In addition to providing two distinct theoretical models for social capital influence within competitive markets and collaborative communities, the findings also present

a shared theory of social capital for innovation contest platforms based on shared themes, impacts and mechanisms, outlined below in Figure 7-1.

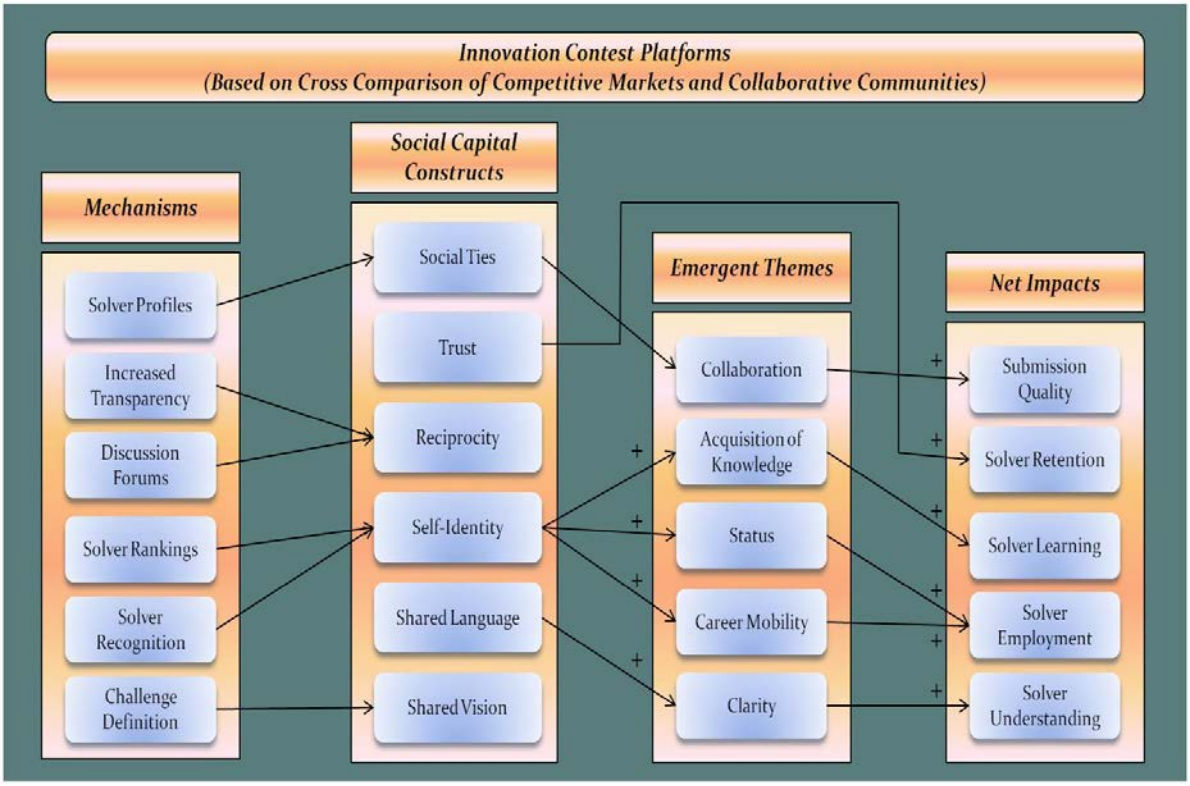


Figure 7-1: A Preliminary Theory of Social Capital for Innovation Contest Platforms

For the structural dimension of social capital, the findings reveal that social ties increase the submission quality as a result of having increased collaboration. This construct is facilitated through the use of solver profiles.

Secondly for the relational dimension of social capital, trust was revealed to impact on the overall levels of solver retention. However, no shared themes or mechanisms emerged from the findings. Similarly for reciprocity, no shared themes or impacts emerged, however the shared mechanisms of discussion forums and increased transparency were revealed. For self-identity however, the shared impacts of solver employment and solver learning were outlined through the themes of enhanced career mobility, increased solver status, and the acquisition of knowledge. This construct was facilitated through the mechanisms of solver rankings and solver recognition.

Lastly, for the cognitive dimension of social capital the findings reveal that shared language results in solver understanding through increased levels of clarity. However the findings reveal no shared mechanisms to facilitate this construct. Conversely for shared vision, the findings show no shared themes, nor shared impact, but reveal the construct to be facilitated through the provision of a challenge definition.

7.2.2 A Preliminary Theory of Social Capital for Competitive Markets

This section presents a newly formulated theoretical model for social capital within competitive markets, outlined in Figure 7-2.

Firstly, the findings reveal that the structural dimension of social capital, which involves the social ties present between solvers, provides an increase in the overall submission quality by the solver community. This was outlined through the emergent themes of both increased collaboration and increased collaboration, and was facilitated through the use of solver profiles within the platform.

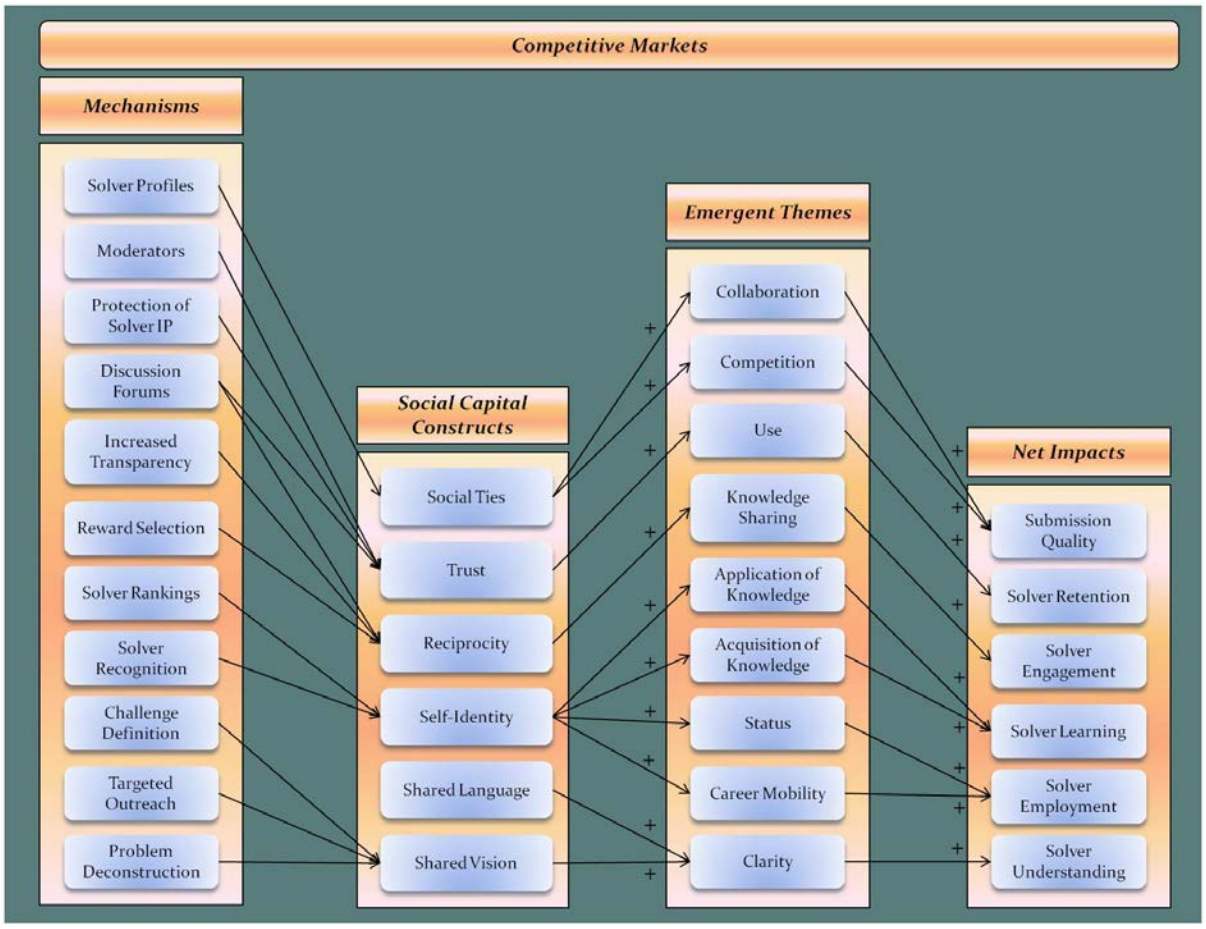


Figure 7-2: A Preliminary Theory of Social Capital for Competitive Markets

Secondly, for the relational dimension of social capital the findings outline that trust, reciprocity and self-identity have a profound influence on both the contest platform itself, as well as the solver community. For example, it was shown that the impact of trust resulted in increased levels of solver retention. This was evident through the emergent theme of increased solver use, and was shown to be facilitated through the use of discussion forums and moderators. Similarly, reciprocity impacts on competitive markets by increasing the levels of solver engagement. Increased levels of knowledge sharing was revealed to be an emergent theme of this construct, which was facilitated through the use of discussion forums, increasing the levels of transparency and selecting an appropriate reward for the solvers. The last construct of the relational dimension (self-identity) was shown to impact on the levels of solver employment and solver learning. This was experienced through increased levels of career mobility,

solver status, and acquisition and application of knowledge, and was facilitated through solver rankings and solver recognition.

Finally, for the cognitive dimension of social capital, both shared language and shared vision were shown to impact on the overall levels of solver understanding by increasing the levels of clarity to the solvers. However, while this was facilitated for shared vision through problem deconstruction, challenge definitions, and targeted outreaches, for shared language the findings revealed no mechanisms being implemented to facilitate the construct.

7.2.3 A Preliminary Theory of Social Capital for Collaborative Communities

This section presents a newly formulated theoretical model for social capital within collaborative communities, outlined in Figure 7-3.

Firstly, for the structural dimension of social capital, the findings reveal that social ties increase the levels of solver engagement and submission quality through the increase of collaboration and peer recognition. In contrast to competitive markets, collaborative communities outlined five distinct mechanisms as to how social ties are facilitated, including solver profiles, discussion forums, moderators, offline events and solver match making.

Secondly, for the relational dimension of social capital, the findings also reveal an increase in the amount of themes, impacts and mechanisms for trust, reciprocity and self-identity. The findings reveal that trust increases the levels of solver retention, while a lack of trust results in an increased churn rate of solvers. This was revealed through the provision of feedback and the emergence of plagiarism respectively, while the findings also described how trust was facilitated through solver profiles, contracts and solver recognition within such platforms.

For reciprocity, the findings show this construct results in an increased level of submission quality through an increase of solver collaboration. The construct itself is facilitated through discussion forums, increased levels of transparency, moderators

and offline events. The last construct of the relational dimension, self-identity, resulted in increased levels of solver employment, learning and enjoyment. This was evident through enhanced levels of career mobility, solver status, fun, satisfaction and acquisition of knowledge, and facilitated through solver rankings, solver recognition and appropriate reward selection.

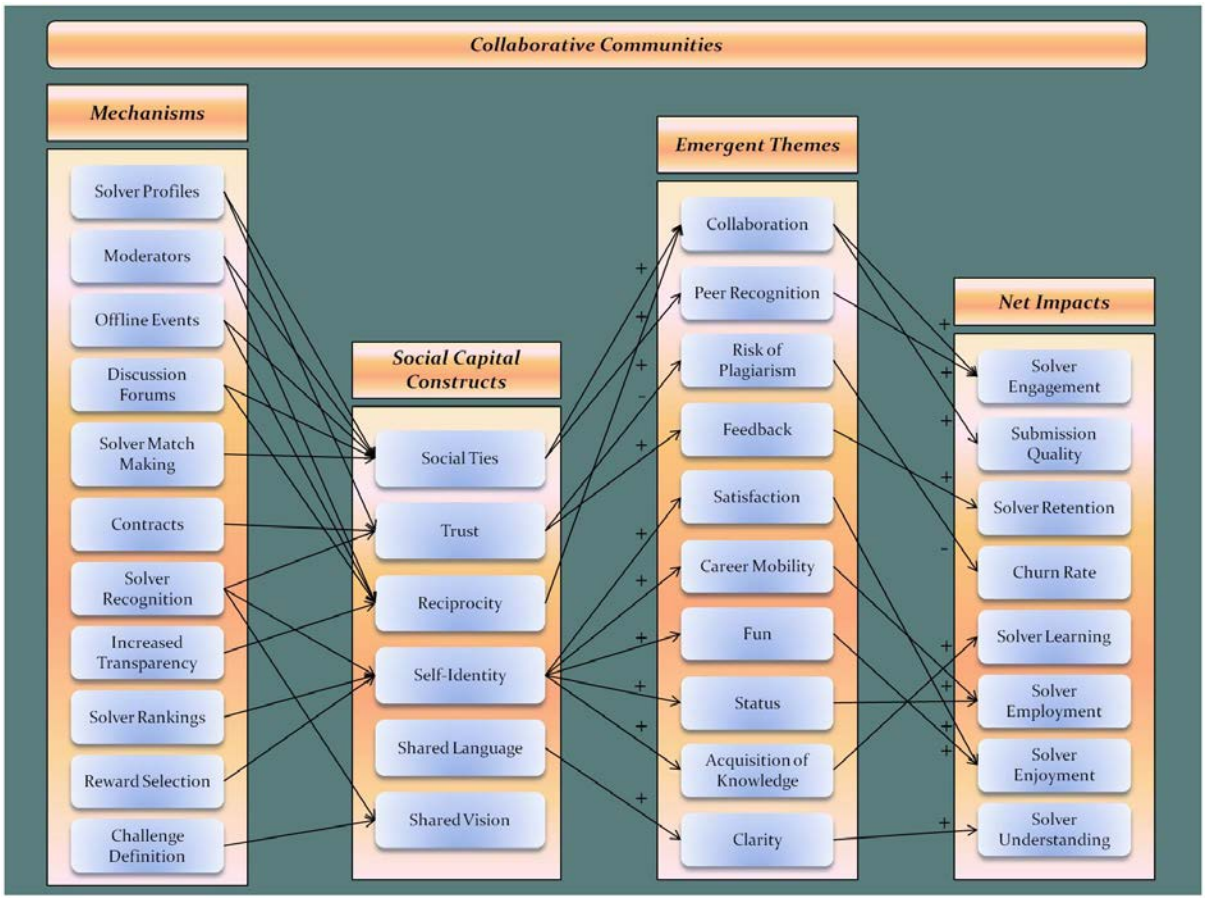


Figure 7-3: A Preliminary Theory of Social Capital for Collaborative Communities

Lastly, for the cognitive dimension of social capital shared language was shown to impact on the levels of solver understanding by increasing the overall clarity. However, the platforms investigated revealed no mechanisms through which shared language was facilitated. Conversely, the findings reveal that shared vision has no emergent themes, nor impacts, yet is facilitated through challenge definitions and solver recognition.

7.3 Discussion of Findings

This section discusses the research questions and emergent models via-à-vis prior research.

7.3.1 Research Question One

Given the lack of existing knowledge surrounding social capital and its influence in IT-enabled innovation contest settings, research question one of this study addressed:

"What are the impacts of social capital on innovation contest platforms?"

This section will therefore discuss the findings of research question one, and outline the eight distinct impacts encountered as a result of social capital.

Churn Rate

Churn is defined by Strouse (1999) as being the "*annual turnover of the market base*". While the levels of solver retention and acquisitions are matters of great concern for innovation platforms, so too are the levels of churn being experienced. While the incumbent competitors focus on acquiring new solvers, established, more mature platforms strive towards keeping existing or loyal solvers. Long term, these users are more likely to be profitable for a company (Lejeune, 2001). Therefore, relationship building and solver-orientated management are key factors to which a platform's success or failure is closely linked. Churn management should thus consist of developing techniques that enable platforms to keep their profitable users and to increase their loyalty.

The churn rate was encountered within the collaborative communities investigated, with the findings revealing it to be impacted by the levels of trust present within the community of solvers. This echoes previous findings by Aurier and N'Goala (2010) in their investigations toward the mediating roles of trust in service relationship maintenance. Similarly, Dwyer et al. (1987) argue that customers decide to make durable and non-retrievable inputs in the exchange relationship because they trust their providers and can thus overcome the risks associated with higher dependence.

This level of churn reflects the amount of solvers that ultimately do not encounter a positive user experience with the platform. The platforms investigated outlined that an absence of trust occurs when solvers fear for the security of their IP. This of course is a difficult concept to enforce within such collaborative platforms, however if left unchecked has the potential to cause ill-will and resentment towards the platform itself. As the platforms explained, once the trust between the two parties is gone, the relationship is also gone and the solvers will leave the platform to search for a better alternative.

In order to maintain a healthy community of solvers, platforms need to identify processes and mechanisms by which to promote the levels of trust. Several mechanisms have been identified in this study that platforms can implement to increase the levels of trust present. These mechanisms were presented in Chapter 6, and are discussed further in Section 7.3.3. Failure to address this social capital construct will inevitably lead to a drop in participation levels, which will be evident to both new acquisitions of the platform, and the clients they seek to work with.

Solver Employment

Both competitive markets and collaborative communities revealed solver employment to be an impact of the levels of self-identity experienced by solvers towards their platforms. This finding is validated by previous studies (Adamczyk et al., 2011, Andersen et al., 2013, Bayus, 2013, Felin and Zenger, 2013, Jeppesen and Frederiksen, 2006, Jouret, 2009, Mortara et al., 2013, Piller and Walcher, 2006) that have suggested the potential for employment opportunities constitutes a powerful means of motivating solvers to engage in the innovation contest process. This research differentiates itself from its predecessors however by theorising the root cause of this impact, while providing further clarity as to how it can be achieved. The findings from both competitive markets and collaborative communities reveal that for the innovation contest setting, the impact of solver employment comes from the relational dimension of social capital, in particular through self-identifying with the platform or the contest being issued. Furthermore, two identical themes were identified by both platform sets by which to achieve this impact:

i. Career Mobility
ii. Solver Status

Through self-identification, the enhancement of the solvers status and exposure to increased levels of career mobility serves to improve the value of the solver's work. This provides the solvers the opportunity to reach new levels of professionalism that would allow them to improve their own economic standing, without depending on winning the contest outright.

Solver Engagement

The findings reveal that while competitive markets attribute increased levels of solver engagement to the construct of reciprocity, collaborative communities believe it is a result of social ties.

For competitive markets, this finding was perhaps surprising given how these platforms are primarily focused towards solvers acting independently, holding little or no regard for the well-being of the overall community functionality. Regardless, reciprocity has previously been highlighted as being a key component within user-centred design literature (Brereton et al., 2014, Schaedel and Clement, 2010, Edwards, 2012) validating this claim further. The analysis of the findings also revealed one key theme that shaped the enhancement of solver engagement: shared knowledge. Again, this theme was not expected to be present within the competitive market subset of platforms investigated. Yet this correlation was outlined by several platforms including *CrowdANALYTIX*, *InnoCentive* and *NineSigma*. These findings outline that previous expectations of reciprocity not having an impact toward competitive markets are misguided. In fact, the construct of reciprocity is arguably the most important, as it is responsible for increasing the levels of overall solver engagement with the platform itself. It was noted however that developing a culture of reciprocity within competitive markets is difficult to achieve and does not occur instantly. Instead, it is a by-product of the type of challenge being issued, the reward being offered, and the target solver demographic.

Conversely, collaborative communities identified social ties as impacting on the levels of solver engagement, which is also validated by prior research (Ugander et al., 2012,

Valenzuela et al., 2009, Chu and Kim, 2011). In contrast to competitive markets however, there were two emergent themes encountered in its development within collaborative communities: peer recognition and increased collaboration. In terms of peer recognition, several platforms also highlighted the desire that solvers have to promote themselves among their peers, in this instance, by building social ties. As a result, their levels of engagement increase as the solvers seek means of promoting themselves within the community for overall recognition of their efforts. Similarly, for increased collaboration, such an approach allows the solvers to build engagement through their actions with one another on all levels, from conceptualisation to solution delivery. This serves to strengthen the social ties between the communities at large, while also increasing the rates of contribution from the solvers.

By identifying the reasons as to why solvers engage with their platforms, beyond the prospect of monetary compensation, it provides the platform managers with the knowledge of how to increase overall community interaction. The mechanisms by which to promote this impact are further outlined in the subsequent section.

Solver Enjoyment

The social capital construct of self-identity was also shown to play an important role in the overall enjoyment of the solvers engaging with the collaborative communities. It is worth noting that this particular impact was not identified within the data analysis for competitive markets, further highlighting the comparisons between the two platform subsets. Two themes emerged from the findings that promoted the overall impact of solver enjoyment within collaborative communities:

i. Increased Fun
ii. Enhanced Satisfaction

Literature has previously investigated the motivation of enjoyment within the innovation contest domain (Jeppesen and Frederiksen, 2006, Lakhani et al., 2007, Soliman and Tuunainen, 2012, Boudreau and Lakhani, 2009, Bullinger et al., 2009, Bullinger and Moeslein, 2010, Feller et al., 2010), providing further validation to these findings. Collaborative communities therefore are argued to provide their solvers with a more intrinsic experience to problem solving, while still maintaining the element of

competition within the platform. Indeed, platforms such as *Appirio, NASA Tournament Lab* and *Phantominds* outlined how competitions that are structured for fun surprisingly have stronger participation levels than commercial competitions. This finding is of particular note, in that up until now efforts have been made by both competitive markets and collaborative communities to organise the most efficient and effective contest they have the ability to provide, with arguably little or no second thought being given towards the overall enjoyment of the process, or how they can make it more worthwhile from a solvers perspective.

Solver Learning

Similar to solver employment, the findings also reveal solver learning to be a vital component as to why solvers self-identify with the innovation contest platform in question. While previous studies (Boudreau and Lakhani, 2009, Feller et al., 2012, Frey et al., 2011a, Hutter et al., 2011, Lampel et al., 2012, Maxmen, 2012, Park et al., 2013, Silva and Ramos, 2012) have merely suggested the opportunities for learning as being important to solvers, these findings delve deeper to provide novel insights into why the solver communities associate with this impact, as well as illustrating how they pursue this impact.

For the platforms investigated, the ability to learn something new through exposure to challenges in new disciplines was outlined as being a strong self-identifying factor for the solvers. The analysis of the findings revealed two key themes that shaped the enhancement of solver learning:

i. Acquisition of Knowledge
ii. Application of Knowledge

This study theorises that the solver's desire for learning comes from increased levels of self-identification toward the platform or the contest in question. Interestingly however, while competitive markets previously outlined that such learning comes about from both acquiring and applying knowledge, the collaborative communities investigated argued otherwise. The collaborative communities argued that the primary method of learning for their solvers came about solely due to the acquisition of knowledge.

The findings revealed that the challenges hosted by these platforms afford solvers the chance of testing and applying their skill sets to real life problems in a scenario that doesn't provide a fear of failure, while also competing against some of the best solvers in the industry. Through competing, the findings also revealed that the solvers increased their existing knowledge base, learning how to approach future challenges to construct higher quality solutions. This process also allows the solvers to further refine their existing skill sets.

These findings further outline that by increasing the opportunity for solvers to acquire new skills or knowledge it also increases the levels of self-identity the solvers have toward the platform hosting the challenge. The higher the self-identification, the more likely the solvers are to remain on the platform in question. This correlation between levels of self-identity and solver retention however is in need of further investigation beyond the remit of this study.

Solver Retention

Solver retention was revealed by both sets of platforms investigated to be the result of increased trust within the platform. Through this development of trust, solvers increase their sense of community, as was shown through both the competitive markets and the collaborative communities. For example, collaborative communities described how the risk of plagiarism lowered levels of trust within the community, thus increasing the churn rate. Similarly, competitive markets outlined how increased trust results in increased use, and subsequently has a positive effect on solver retention within the community.

Both scholars and psychologists have investigated what causes users to remain committed to their communities, even years before Sarason (1974) established his seminal work on the subject. McMillan and Chavis (1986) would subsequently develop a theory by identifying the elements that work together to produce the experience of sense of community. They proposed the following definition for the concept: "*...a feeling that members have a belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their*

commitment" (p. 9). This in essence is describing the relational dimension of social capital, of which trust is an integral part of.

Although understanding this sense of community continues to progress, the elements and sub-elements that McMillan et al. presented include several possible explanations for a link between sense of community and retention, whether the theory is viewed from the perspective of the community as a resource or responsibility (McCole, 2013). These include:

i. Members make a personal investment to the community
ii. Members are attracted to groups over which they are allowed influence
iii. A bond develops among those who spend time together, and deepens the more time they spend with one another
iv. Members feel a sense of responsibility for the well-being of the community
v. Members with similar values come together, they find that they have similar priorities, needs and goals and therefore realise they might be better able to meet their needs by remaining together

These links between the elements of sense of community and retention have been supported by theory. For example, Skinner (1938) presents one of the oldest theories to explain that behaviour is the reinforcement theory of motivation. Therefore, this serves to validate our findings herein that increased levels of trust within innovation contest platforms also serves to increase the levels of solver retention.

Solver Understanding

The main impact of the cognitive dimension is theorised herein to result in increased levels of solver understanding. This is achieved through the implementation of shared language to increase the clarity of what the contest is aiming to achieve by both competitive markets and collaborative communities. In addition, competitive markets also identified shared vision as having an impact on the levels of solver understanding. The study reveals however that the cognitive dimension is arguably perceived to be less important than that of its structural and relational counterparts based on the data gathered from the respective platforms. This claim is made due to several observations:

i. The analysis of competitive markets revealed similar themes and net impacts for both social capital constructs being investigated (shared language and shared vision)
ii. The analysis of collaborative communities did not reveal any emergent themes, or net impacts of the construct of shared vision
iii. The analysis of competitive markets and collaborative communities revealed no mechanisms by which to promote shared language (explored further in the next section)

It is worth outlining that this bears no reflection on the quality of questions posed to the interviewees, as similar questions were constructed for the structural and the relational dimensions which bore substantial data by which to construct and validate other findings.

This lack of attention however is worrying, when considering that shared language for example facilitates solver's ability to gain access to their peers and their information. Furthermore, shared language provides a common conceptual apparatus for evaluating the likely benefits of information exchange and combination (Chiu et al., 2006). Shared language also enhances the capability of different solvers to combine the knowledge they gained through social exchange, making the construct itself a vital component within the innovation contest setting. When taking shared vision into consideration, this construct is described by Tsai and Ghoshal (1998) as being "*a bonding mechanism that helps... to combine resources*" (p.467). Solvers that share a vision will therefore be more likely to become peers that share and exchange their resources.

In contrast to the previously outlined impacts of solver engagement and solver learning, there has been little, if any research into the cognitive dimension implications of solvers engaging within innovation contests. This finding is therefore revelatory in the extreme, in need of further validation from future research endeavours.

Submission Quality

Another novel finding within this study is the theorisation that social capital impacts on the overall submission quality of solvers within innovation contest platforms. Both competitive markets and collaborative communities identified social ties as being responsible for improving the levels of submission quality, while collaborative communities also highlighted reciprocity to have this impact.

Arguing that social ties impacts submission quality validates the argument of Larson (1992) and Ring and Van de Ven (1994) where they suggest the more social interactions undertaken by individuals, the greater the intensity, frequency and breadth of information exchanged. Nahapiet and Ghoshal (1998) also argued that "*network ties influence both parties for combining and exchanging knowledge and anticipation of value through such exchange*" (p.252). Similarly, reciprocity through knowledge contribution in an innovation contest setting primarily occurs when solvers are motivated to engage with the platform, review the challenges being posed, choose the ones they feel capable of answering and time the time and effort to develop a solution.

In order to facilitate this reciprocity however, the solvers need to think their contribution to others will be worth the effort and that some new value will be created, with the expectations of receiving some of that value for themselves (Nahapiet and Ghoshal, 1998). The findings of this study highlight that these social capital constructs are responsible for improving the overall levels of what is being produced by the solver community.

7.3.2 Research Question Two

Having investigated the impacts of the various social capital constructs within an innovation contest setting, the analysis subsequently addressed the second research question of this study as outlined below:

"What are the mechanisms used in innovation contest platforms to enable the development of social capital?"

In terms of drawing comparisons from existing literature, this study represents the first to explore the underlying mechanisms by which to enhance the constructs of social capital within an online environment. Despite the significance of Nahapiet and Ghoshal (1998) and Tsai and Ghoshal (1998) in terms of establishing the role of social capital in knowledge transfer, their work fails to address the mechanisms that develops the respective constructs of social capital (Gooderham, 2007). Also, while current literature has examined social capital from the individual's point of view in various settings as noted previously, little if any work has been directed toward the perspective of the platform, and how they facilitate these constructs.

Without clear indications of how social capital can be actually promoted, platform managers cannot effectively utilise the information that social capital is conducive to knowledge sharing (Foss and Pedersen, 2004). This section will therefore discuss the findings of research question two, and outline the fourteen distinct mechanisms encountered that facilitate social capital.

Challenge Definition

Both competitive markets and collaborative communities identified how the challenge is defined initially to be a critical mechanism in achieving a shared vision among the solver community. Such activities have received significant attention previously from a decision support perspective (Amason, 1996, Carnevale and Probst, 1998, Castore and Murnighan, 1978, Cronin and Weingart, 2007), however none thus far within the realms of innovation contest literature.

A challenge is described by Baer et al. (2013) when it involves:

i. A large number of different variables, many of which may not be directly observable
ii. A high degree of connectivity among the elements of the problem such that change in any one variable will affect the status of many others
iii. A dynamic component resulting in the pattern of interactions changing over time

Due to a general lack of understanding of the variables involved, few formalised and agreed upon approaches are often put in place for formulating and making decisions regarding such problem constructions, rendering them not only complex, but also ill-structured (Fernandes and Simon, 1999, Funke, 1991, Mason and Mitroff, 1981). Because of these features, strategic problems invite the development of multiple, often competing views of the problem. As a result, problem formulation activities are of particular importance with respect to strategic problems and the decision making activities surrounding them (Lyles, 1981, Lyles and Mitroff, 1980, Mason and Mitroff, 1981).

Such arguments validate these findings, outlining that the provision of an accurate, well formulated challenge definition enhances the overall shared vision between the solver community and the organisation issuing the innovation challenge.

Contracts

A mechanism outlined by a minority of collaborative communities investigated, the provision of contracts to the solver community was identified by *Battle of Concepts* and *IdeaConnection* as being an important mechanism to enhance levels of trust within the solver community. While only a minority showcased its use, the provision of contracts has been widely considered to be an important avenue through which an organisation can sustain or enhance its competitive position (Kale et al., 2002, Kale and Singh, 2007). Indeed, extensive literature has provided a wealth of insights into how contracts can be used to align expectations and establish meaningful safeguards for those involved (Argyres et al., 2007, Macaulay, 1963). Current innovation contest research however, has given this matter relatively little attention (Harmon et al., 2015).

In fact, because the primary literatures have traditionally been on how contracts are formed (Macaulay, 1963, Reuer and Arino, 2007) or how they are crafted to function more effectively (Mayer and Argyres, 2004, Ryall and Sampson, 2009, Vanneste and Puranam, 2010), they have generally not investigated what the parties' reactions to contract violations might be, or how those reactions might be affected. While recent work has begun to explore such issues by providing valuable insights into the

relationship between contract structure and the likelihood of a dispute (Malhotra and Lumineau, 2011) and the process by which disputes might be resolved (Lumineau and Oxley, 2012), there has been no such investigations within the innovation contest domain.

Further research is needed to ascertain the prevalence of these contracts within innovation contest platforms, and to what end they are enforced. Our theorisation shows that the provision of such contracts not only decreases the levels of solver churn within collaborative communities, but also increases the levels of solver retention within the community.

Discussion Forums

Both platforms revealed that discussion forums were an important mechanism to facilitate reciprocity. In addition competitive markets also outlined how they facilitate levels of trust in their community, while collaborative communities conversely identified social ties as being facilitated by this mechanism.

The discussion forums described by both platform sets represent the primary mechanism at their disposal to promote collaboration and knowledge sharing among their communities. These forums therefore essentially act as the central hub of reciprocity within the platform where solvers can interact and share their ideas with their peers. As previously outlined, these discussion forums result in differing net impacts of reciprocity depending on the platform group. Competitive markets for example have been found to credit reciprocity for increased levels of solver engagement through increased knowledge sharing, while collaborative communities view reciprocity to be responsible for submission quality through increased collaboration. Regardless, the very success of reciprocity within these platforms is that it is borne of community goodwill and is not dependent on extrinsic factors such as monetary rewards to promote it further.

This finding mirrors several studies investigating the role of individual action and interaction on the use of rewards for knowledge transfer. For example, Bock et al. (2005) found that the use of extrinsic rewards appears to be counterproductive in

creating a positive attitude towards knowledge transfer. Similarly, Frey (1997) outlines that introducing extrinsic motivators to activities that are intrinsic in nature such as learning and creativity may have a negative effect. One explanation for this phenomenon might be that when pecuniary rewards are introduced, an incentive for the individual solver to withhold knowledge for future gains is also introduced (Gooderham et al., 2011).

However, while the platform managers identified these as being an important mechanism to facilitate social ties and reciprocity within their platforms, research from the solvers point of view is currently lacking. This is surprising given that the levels of forum participation seem to be vital in ensuring that the benefits of innovation contest platforms can be realised. While there is little empirical work within the innovation contest domain, studies from further afield have often reported less than satisfactory participation in similar forums such as those found on e-government platforms (Komito, 2005, Olphert and Damodaran, 2007). For instance, Olphert and Damodaran (2007) revealed that the quality of inputs received in a forum set up for the discussion of a local UK e-government project was described as "*a real disappointment*" (p. 502). Instances of low quality participation have also been observed for example in a forum set up by French municipal authorities to engage citizens in city planning (Wojcik, 2007). Failure to obtain greater levels of participation can not only defeat the purpose of these forums, but can also lead to the user dismissing them as futile (Phang et al., 2014).

While these findings cannot be strictly compared to those presented herein, it does pose interesting questions as to the health of discussion forums on such platforms, and whether the rate of use is satisfactory to the platform managers. If not, what approaches can be taken to promote engagement further given the net impact as shown herein would involve a higher level of submission quality.

Increased Transparency

Both competitive markets and collaborative communities outlined that increasing the levels of transparency within their platforms served to increase the levels of reciprocity. For the most part, these innovation contest platforms represent an

intricate structure of coopetition (Tsai, 2002). While collaboration is encouraged to realise economies of scale, competition has also been revealed to achieve efficiency. When solvers compete against each other for glory however, suspicion may replace reciprocity in their relationship and consequently knowledge sharing may be affected (Inkpen and Tsang, 2005). It is important that the platform managers establish clear and transparent protocols so that solvers will not suspect any aspects of favouritism, and be happy in the rigor of how their submissions have been judged.

This finding supports the view of Nahapiet and Ghoshal (1998) whereby they argue that "*the development of social capital represents a significant investment*" (p.260) and like all investments, it should be managed. Similarly, Adler and Kwon (2002) outline that while authority based hierarchical mechanisms are suitable for promoting "*obedience to authority for material and spiritual security*" (p.19), "*the effects of hierarchy on social capital are primarily destructive*" (p. 28). On the individual level, cooperation with colleagues is based on the assumption of compliance and conformity with a set of impersonal rules and regulations. As such, hierarchical governance mechanisms not only fail to presume goodwill, but they may also undermine any development of goodwill among solvers. Interactions are based on the latent threat that a lack of cooperation will trigger an appeal to authority with the prospect of sanctions. In other words, rather than increased cooperation, Moran and Ghoshal (1996) argue that a lack of transparency may result in purely "*perfunctory compliance*" (p.25) leading to reduced levels of reciprocity (Gooderham et al., 2011), validating the findings herein.

Moderators

While competitive markets outlined the use of moderators in facilitating trust, collaborative communities revealed their use to facilitate social ties and reciprocity. This mechanism has been previously investigated in the organisational setting in terms innovation development (Damanpour, 1991), however they also found that the role of a moderator in innovation research has seldom been considered explicitly. It is important to note that the definition of moderator being utilised herein involves the

use of an independent third party, who acts a mediator between the group of solvers and the organisation issuing the challenge for the contest platform.

Rohfeld and Hiemstra (1995) argue the role of a moderator to include "*the responsibility of keeping discussions on track, contributing special knowledge and insights, weaving together various discussion threads and maintaining group harmony*" (p. 91). Berge (1995) categorises moderators into the following four areas, with brief description of these roles being presented also (Feenberg, 1986, Gulley, 1968, Kerr, 1986, McCreary, 1990, McMann, 1994, Paulsen, 1995):

i. *Managerial*-This involves setting the agenda for the group, the objectives of the discussion, the timetable, procedural rules and decision making norms.
ii. *Pedagogical*-Some of the most important roles of online discussion moderator revolves around their duties as an educational facilitator. The moderator uses questions and probes for responses that focus discussions on critical concepts, principles and skills.
iii. *Social*-Creating a friendly, social environment in which learning is promoted is also essential for successful moderating. This suggests that promoting relationships, developing group cohesiveness and helping members to work together in a mutual cause are all critical successes.
iv. *Technical*-The ultimate goal of the moderator is to make the technology transparent. In doing so, they must make the group comfortable with the system and the software the platform is using.

Regardless of the role, the provision of these moderators has been shown to increase the levels of trust within competitive markets, thereby increasing the levels of solver retention. While in collaborative communities this mechanism facilitates social ties and reciprocity, improving the levels of solver engagement and submission quality.

Offline Events

A mechanism revealed only within collaborative communities, offline events were identified as being an important mechanism used to increase levels of social ties and reciprocity within the platform communities. For social ties, *Appirio, Battle of*

Concepts and *NASA Tournament Lab* described how their solver community can meet each other in an offline setting to network and strengthen their ties. Indeed, both *Appirio* and *NASA Tournament Lab* describe *TopCoder* Open, an annual event that takes the best coders in the world based on their ratings and performance in various contests and brings them together. Obviously for logistical reasons, such an approach may not be feasible for the majority of platforms; however the findings reveal that when they do occur they are capable of increasing the levels of solver engagement, and the levels of submission quality being received.

Unfortunately there is a lack of current research aimed toward revealing the value involved in such events, and as such this represents another area in need of validation.

Problem Deconstruction

Competitive markets outlined problem deconstruction as being a key mechanism to facilitate a shared vision within their platforms, and in doing so, increase the levels of understanding. This mechanism provides the opportunity to platforms to break complex problems down to core deliverables, ensuring each is successfully delivered before completion of the whole.

This strategy, while not previously investigated within innovation contests, has received attention in academic literature from different fields. For example, problem formation has long been acknowledged as a core activity in strategic decision making (Quinn, 1980, Shrivastava and Grant, 1985, Witte et al., 1972). Problem formulation has also been shown to profoundly determine what problem is to be solved, and ultimately, the quality of the solution (Emery and Ackoff, 1972, Stevens, 1975, Duncker and Lees, 1945, Loanby, 1976, Nutt, 1992, Simon, 1973, Simon and Hayes, 1976, Volkema, 1983).

Indeed, Baer et al. (2013) most recently investigated the micro-foundations of strategic problem formulation. They also argue that before a strategy can be developed, the problem it is supposed to address needs to be formulated. Their findings show that complex, ill-structured problems that are addressed by heterogeneous teams fundamentally constrain and narrow problem formulation, thereby limiting solution

search and potential value creation. Similarly, according to Mitroff and Featheringham (1974), one of the most important challenges of the problem solving activity is solving the wrong problem by adopting a formulation that is either too narrow, or inappropriate. Comparably, Mintzberg et al. (1976) concluded that diagnosing or formulating the problem may be the most important aspect of strategic decision making, thereby validating the findings of this study.

Protection of Solver IP

Protection of solver IP was revealed by competitive markets as being a key mechanism to facilitate levels of trust. Among others, Harhoff et al. (2003) show that users may derive several benefits by freely revealing information about their own ideas to online communities. Free revealing is described by Füller et al. (2007) as when "*the innovator voluntarily gives up all intellectual property rights to that information, and gives access to all interested parties-the information becomes public property*" (p.62). This has a number of effects that explain the received benefits (Harhoff et al., 2003, Von Hippel, 2007), such as:

i. Network effects
ii. Reputational gains
iii. Revealing of related innovations by others
iv. Setting of an informal standard

Alexy et al. (2009) observes that the protection of IP would seem to be at odds with the pursuit of open innovation. However, as content contributed to online systems in commercial and non-commercial instances grows, the question of IP protection gets more and more crucial. Consequently, adequate copyright protection mechanisms must be investigated and developed. In addition to discussion forums and moderators therefore, the protection of solver IP was also identified by competitive markets as being an important mechanism of facilitating trust within the platform. Indeed, this echoes the findings of Gassman et al. (2010) who claim that the source of competitive advantage within open innovation initiatives is the protection and the leveraging of solver IP.

However, numerous policies are further needed to ensure the solver community are required to follow fundamental privacy rules (Preece, 2001). A better understanding is required however of how cooperation and trust develop online and how these relationships change over time.

It is also worth noting that existing research shows that small companies tend to engage in OSS communities with copyleft licensed projects in order to avoid investing in a project that may be closed over time (Gamalielsson and Lundell, 2014, Gamalielsson and Lundell, 2011). Concerns among these community members include perceptions on vendor dominance, copyright assignment, lack of influence, lack of fun and bureaucracy in open community projects. To protect the IP of solvers within these projects, the OSS licences are often broadly categorised as either copyleft licences or permissive licences. For example, copyleft data can be achieved by use of the service agreement option in various creative commons licenses, which would contribute one mechanism by which contributors could ensure continued openness of their contributions. However, this is dependent on the desires of other stakeholders involved in the project also. The main difference between the two licence categories is that copyleft licences ensure that derivative work remains open source, whereas permissive licenses do not (Brock, 2013). Regardless, the essence of these circumstances seems to originate from a lack of trust.

Reward Selection

Within the competitive markets investigated, the reward selection was revealed to be an important mechanism used to facilitate levels of reciprocity. Conversely, within collaborative communities it was shown to facilitate levels of self-identity. This is validated by previous studies, in particular by Janssen and Mendys-Kamphorst (2004) who argued that introducing financial incentives for individuals to contribute to a socially desirable outcome tends to decrease the number of contributions.

In social capital research, this is also validated by Leana and Van Buren (1999) whereby a consistent use of reward mechanisms sends a "*signal to organisational members about the kinds of activities and habits of practice that are valued by the organisation*" (p. 545). The individual subsequently chooses to behave in a certain way

because that behaviour leads to desired organisational consequences that are external to the individual, separate from the activity, but desired by the group. Therefore, cooperation in terms of knowledge exchange on the solver level is based on price-based or market-like quid-pro-quo contracts or agreements with colleagues when being financially motivated. In such instances, solver not only assume no mutual goodwill, but also, because of the latent danger of opportunism and asymmetries be exploitative (Gooderham et al., 2011).

There has been substantial work identifying the various rewards for solvers within open innovation platforms, with several motivating rewards being identified in current literature, including:

i. Entrepreneurial mind-set (Tapscott and Williams, 2008)
ii. Opportunity to express individual creativity (Teresa, 1998, Ryan and Deci, 2000a)
iii. Care for community (Aalbers, 2004, Antikainen and Vaataja, 2010, Antikainen et al., 2010)
iv. Sense of cooperation (Teresa, 1998, Antikainen et al., 2010, Antikainen and Vaataja, 2010)
v. Social responsibility (Benbya and Belbaly, 2010, Hemetsberger, 2003, Lakhani and Wolf, 2005)
vi. Monetary rewards (Aalbers, 2004, Anderson, 2009, Antikainen et al., 2010, Roberts et al., 2006)
vii. Free products (Anderson, 2009, Bitzer et al., 2007, Hemetsberger, 2003, Tapscott and Williams, 2008, Wu et al., 2007)
viii. Free services (Bitzer et al., 2007, Ghosh, 2005, Lakhani and Von-Hippel, 2003, Osterloh and Rota, 2007)
ix. Individual accountability (Antikainen and Vaataja, 2010, Antikainen et al., 2010, Lakhani and Wolf, 2005, von Krogh et al., 2008)

However there have been no studies examining the correlation between the type of reward being offered and the resulting performance within the innovation contest domain. While these findings show that selecting the appropriate type of reward has

an impact on the overall levels of self-identity for solver communities within collaborative communities, more work is needed to examine what type of reward provides optimal self-identification.

Solver Profiles

Both competitive markets and collaborative communities identified the role of solver profiles as being a core mechanism for promoting the levels of social ties within their respective communities. This mechanism was used by both sets of platforms to increase the levels of submission quality. In addition to social ties, collaborative communities also revealed solver profiles to facilitate trust within their platforms.

These findings can be compared with existing knowledge transfer literature for example, where the concept of social relations as a driver of knowledge flow has received substantial empirical support (Bresman et al., 1999, Gupta and Govindarajan, 2000, Tsai and Ghoshal, 1998). For example, when examining knowledge transfer from new product development teams, Hansen and Løvås (2004) argues that good informal relations are of critical importance if teams are to engage with competence. The implication herein based on current literature is that management can positively influence knowledge transfer by providing their solvers with mechanisms such as profiles that according to Foss (2007), allows "*for establishing psychological contracts based on emotional loyalties*" (p.38-9) which in turn raises the motivation of individuals to share knowledge.

Findings such as this have been proposed in similar strands of literature, though not within the innovation contest stream. For example, when users have frequent contact with their peers for information exchange or social purposes, trust can be developed because users can observe each other's behaviours across a variety of situations. These observations can build mutual expectations and trust among the community (Doney and Cannon, 1997). Furthermore, users with frequent social interaction with their peers are likely to accumulate information that allows for evaluations and predictions over time. With such information, these users should develop high levels of trust with one another, and be willing to share valuable knowledge (Madjar and Ortiz-Walters, 2009). Previous literature has argued that high degrees of interaction and personal

contact will also reduce opportunistic behaviour because individuals do trust one another, and hold others' interests in advance of their own (Singh and Sirdeshmukh, 2000), with such situations being more conducive to work environments (Clegg et al., 2002).

In addition, according to the social perspective on individual creativity presented by Perry-Smith (2006), the creativity process through which network ties parameters influence creativity can be connected with creativity-relevant cognitive processes and domain-relevant knowledge. A creativity-relevant and domain-relevant process helps an individual to develop new problem-solving methods with different alternatives or concepts through diverse network ties (Mumford and Gustafson, 1988). By implementing solver profiles, it serves to increase the number of direct ties with exchange partners within the community, while also increasing the diversity of knowledge, ideas and information, allowing the community to generate the higher levels of submission quality as described previously. Therefore, enlarging the boundaries of network ties are important to creativity, as they increase the probability of acquiring the specific resources needed for a successful solution.

Solver Rankings

The mechanism of ranking solvers was identified by both competitive markets and collaborative communities to promote levels of self-identification, in order to facilitate the net impacts of solver employment and solver learning as illustrated previously. The effective design of these rating mechanisms also serves to enhance the validity and the reliability of resulting idea ratings and supports the selection of the best ideas for further refinement or implementation.

The use of ranking is not a new phenomenon, and has been used previously to assuage consumers' fears in various ecommerce sites (Bae and Lee, 2011, Chen et al., 2008, Chen et al., 2004, Cheung and Thadani, 2010, Chevalier and Mayzlin, 2006, De Maeyer, 2012, Duan et al., 2008, Forman et al., 2008, Robinson et al., 2012). However, the extent to which these consumers address such online ratings compared to other information cues, and how they influence perceptions remains unclear (Flanagin et

al., 2014). So too within the domain of innovation contest does this issue need to be addressed, with this research providing the foundation for future efforts.

The ranking of ideas is strongly related to the assessment of their inherent creativity (Kristensson et al., 2004). Creativity and idea quality are both complex constructs that have been subject for group support system and innovation researchers for years (Riedl et al., 2010). In the context of solver generated new product ideas, Blohm et al. (2011) argue that idea quality consists of four distinct dimensions

i. Novelty
ii. Feasibility
iii. Strategic Relevance
iv. Elaboration

Effective and accurate design of rating mechanisms is critical to harness the wisdom of the crowds, as it is through this process that they self-identify with the platform. These findings support those of Riedl et al. (2010) who argue for a combination of quality rating and populating signalling mechanisms for innovation communities. Such criterion validates our theorisation as to solver rankings influencing the levels of solver employment and solver learning. Through self-identifying with the challenge, solvers develop solutions that will not only enable them to showcase their skills and talents, but will also help to develop their existing knowledge base. However, despite widespread use of rating mechanisms in innovation contest platforms, these popular tools have not yet been analysed in depth, and as such these findings represent another area of future research.

Solver Recognition

Both competitive markets and collaborative communities identified solver recognition as being a key mechanism to facilitate levels of self-identity, while collaborative communities also revealed its use to facilitate trust. Such solver recognition occurs when a solver receives praise (formal or informal) and acknowledgement from their peers and/or the organisation issuing the innovation challenge.

The desire for solvers to be recognised in their virtual community has received previous attention in literature before, for example within the open source domain (Hann et al., 2004, Hertel et al., 2003, Lerner and Tirole, 2002). Okoli and Oh (2007) in particular describe such recognition to be "*equivalent to promoting an employee to manager status in a traditional organisation and thus is a recognition of achievements*" (p.240). From the perspectives labour economics and industrial organisations, Lerner and Tirole (2002) examined OSS economics and argued that signalling incentives such as career concern incentives, future job opportunities and ego gratification were the main drivers of the volunteers' participation, further validating the findings of this study.

Similarly, solver recognition has also been revealed as a compelling motivation for solvers to join and participate in online communities (Antikainen et al., 2010). However, authors in this field such as Ebner et al. (2009) and Franke and Shah (2003) demand further research attention on the interaction structures of innovation contest communities to gain a deeper understanding of the antecedents, structural elements, design parameters, and the outcomes of idea communities. Indeed, according to West and Lakhani (2008), it is important to be clear about what interactions constitute the basis for persons to become part of a community, and what role interactions between members play in defining communities in the open innovation process. This research represents a contribution towards this endeavour.

Our findings show that by providing increased levels of recognition to the solvers, it facilitates increased levels of self-identify. This is further validated by the findings of Okoli and Oh (2007) who found that the more the number of interactions with a participant, the better his or her performance within a community. It is therefore in the interests of platform managers to understand the value inherent to providing recognition, and to re-configure their structure in ways that best mobilise the embedded social structure. Therefore, considering the importance of formal recognition for the self-identification of solvers within an innovation contest platform, our findings provide platform managers methods to improve the levels of solver commitment to their communities.

Solver Match-Making

A mechanism only encountered within the collaborative communities investigated, solver match-making was described by *Chaordix*, *IdeaConnection* and *Phantominds* as having an important role in the facilitation of social ties. This mechanism can be implemented both manually and automatically, depending on the resources of the platform in question. For example, while both *Chaordix* and *IdeaConnection* outlined their use of software to match potential solvers together, *Phantominds* described how they make proposals of matched solvers to their community based on their experience in the particular discipline.

As previously theorised, facilitating social ties within collaborative communities generates higher levels of solver engagement and submission quality from the solvers. Previous research has sought to explore the role of matchmaking strategies in support of opportunistic collaboration. Several studies exist in the matchmaking field, especially in relation to recommendation systems. For example Vivacqua et al. (2003) provide a set of criteria used by profiling agents including:

i. Contact information
ii. Areas of interest
iii. Previous projects
iv. Previous work history
v. Existing networks

By gaining such knowledge, platforms can ensure that the best solvers available for the challenge are placed within the same team. The process begins by finding individuals in similar contexts, and then finding resources these users should share. Once the match has been established, solvers can be directed to collaborate synchronously and exchange thoughts and ideas. This study theorises that by doing so, it ensures a higher submission quality while also providing to strengthen their existing social ties.

Targeted Outreach

Developing a targeted outreach for solvers was described by the competitive markets as being an important mechanism used to facilitate a shared vision among the solver community.

Such an approach offers a tailored distribution of information, with scholars such as Ashcroft and Hoey (2001), Mangold and Faulds (2009), Hurme (2001), Wang et al. (2006) and Pavlik (2007) identifying several inherent advantages to its implementation:

i. Speed and effectiveness of communication
ii. Interactivity
iii. Unified message
iv. Direct communication with elimination of traditional intermediaries
v. Lower cost of relationship building
vi. Enhancement of loyalty
vii. Openness and transparency

These findings validate our own herein, arguing that a shared vision not only promotes solver understanding, but does so by means of performing a targeted outreach of the best suited solvers.

It is worth reiterating that the shared vision construct represents one part of the cognitive dimension of social capital, with the other construct being a shared language. There were, however, no mechanisms revealed within this analysis to suggest that platforms have dedicated strategies by which to promote this element of social capital. As such, this represents a rich avenue of future research going forward.

7.4 Chapter Conclusion

This Chapter presents the reader with an overall summary of the study's research findings by presenting the three distinct theoretical models that emerged from the investigation. Section 7.2 provides a brief description toward each model, outlining

the relationships between the various impacts and mechanisms of social capital development. This provides the reader with a concise synopsis of both Chapter 5 and Chapter 6, before Section 7.3 proceeds to discuss each impact and mechanism revealed in the study at length. Section 7.3.1 presents the eight distinct impacts of social capital uncovered within this study: churn rate, solver employment, solver engagement, solver enjoyment, solver learning, solver retention, solver understanding, and submission quality.

Section 7.3.2 thereafter describes each mechanism encountered to develop social capital within the innovation contest platforms: challenge definition, contracts, discussion forums, increased transparency, moderators, offline events, problem deconstruction, protection of solver IP, reward selection, solver profiles, solver rankings, solver recognition, solver match making, and having a targeted outreach for specific solvers. Sections 7.3.1 and 7.3.2 both also draw on existing literature to highlight previous research undertaken toward the impact or mechanism in question. For example, the impacts of enjoyment (Jeppesen and Frederiksen, 2006, Lakhani et al., 2007, Soliman and Tuunainen, 2012, Boudreau and Lakhani, 2009, Bullinger et al., 2009, Bullinger and Moeslein, 2010, Feller et al., 2010) and learning (Boudreau and Lakhani, 2009, Feller et al., 2012, Frey et al., 2011a, Hutter et al., 2011, Lampel et al., 2012, Maxmen, 2012, Park et al., 2013, Silva and Ramos, 2012) have previously been explored. These Sections describe what is known from previous research streams, and how they can be further interpreted within the innovation contest platform domain to make these findings more robust.

The following Chapter presents the research conclusions, outlining the contributions and implications, while also presenting future research directions.

CHAPTER 8: CONCLUSIONS

8.1 Introduction

In order to theorise how social capital influences IT-enabled innovation contest platforms, Chapter 2 discussed the emergence of crowdsourcing and open innovation movement. Social capital was then presented as an appropriate theoretical lens given its use in similar domain such as virtual knowledge sharing (Ardichvili et al., 2003), entrepreneurship (Gedajlovic et al., 2013), organisational advantage (Nahapiet and Ghoshal, 1998), and innovation (Landry et al., 2002). Chapter 3 subsequently outlined the design of the study to theorise how social capital affects IT-enabled innovation contest platforms, arguing that a post-positivist approach is the most suitable for this study.

Chapter 4 then described the findings of the pilot study of *Trend Micro*, while also verifying the importance of social capital within an innovation contest setting. Chapter 5 thereafter addressed research question 1:

"*What are the impacts of social capital on innovation contest platforms?*"

Chapter 6 subsequently addressed research question 2:

"*What are the mechanisms used in innovation contest platforms to enable the development of social capital?*"

The summary and discussion of these research findings are then presented in Chapter 7. This chapter presents the conclusions of this study, providing an overview of the study's motivation, objective, research questions and methodology (Section 8.2). The chapter then concludes by identifying the key contributions of the study, discussing the implications of these contributions for both research and practice, and discussing the limitations of the study including suggested directions for future research (Section 8.3).

8.2 Research Background

As illustrated previously, this research represents an exploratory study into the positioning of social capital within IT-enabled innovation contest platforms. This section outlines the research objective and the two research questions that were addressed within this study. In doing so, the description of social capital that was used to guide the data collection and analysis is outlined.

8.2.1 Study Motivation and Research Objective

The ability for an organisation to achieve continuous innovation is indispensable as it subsequently leads to stronger growth, competitive advantage, increasing sales, profitability and overall success (Nonaka and Takeuchi, 1995). The movement from a closed innovation approach to one of an open innovation paradigm for developing innovation enables companies to use external channels of knowledge (Chesbrough, 2003). Forged by globalization and digitalization, IT-enabled innovation contest platforms allow organisations to post an innovation challenge to a population of problem solvers. This process allows vast quantities of geographically dispersed individuals to actively participate in idea generation and development. The solvers that produce the best solutions are subsequently rewarded for their submissions.

In contrast to the closed innovation paradigm previously implemented, these innovation contest platforms encourage solvers to submit their ideas, while also allowing them to interact and collaborate with like-minded peers (Morgan and Wang, 2010). This provides the solvers with opportunities to communicate and share their insights and experiences, thus establishing a sense of community (Bullinger et al., 2010). However, these contests only add value to an organisation's innovation process if the solvers are willing to share their ideas and submit their solutions (Kathan et al., 2013), making their decisions to do so an imperative research area.

As identified in Chapter 2, Nahapiet and Ghoshal (1998) defined social capital as "*the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit*" (p. 243). By stressing the social basis of cognition in which solvers organise their

thinking and actions about innovation, social capital can be fostered and utilised whenever required for solvers to develop solutions more efficiently and effectively. Since collaboration and knowledge sharing develops the creativity and innovativeness of the solvers (Franke and Shah, 2003, Hutter et al., 2011), the research objective of this study was to:

"Theorize the relationship between social capital and IT-enabled innovation contest platforms."

8.2.2 Study Design

To address the research objective above, this study was grounded in the social capital model developed by Nahapiet and Ghoshal (1998), and the objective was operationalized via two research questions:

Research Question 1: *What are the impacts of social capital on innovation contest platforms?*

Research Question 2: *What are the mechanisms used in innovation contest platforms to enable the development of social capital*

To answer these questions, two different types of IT-enabled innovation platforms were investigated (competitive platforms and collaborative communities) using multiple cases. The overall study design comprised four major stages.

The first stage involved an in-depth synthesis and analysis of the current state of knowledge regarding IT-enabled innovation contest platforms and social capital. This revealed a gap in our understanding of social capital in IT-enabled innovation contest platforms, leading to the development of the research objective and research questions.

Stage	*Outcome*
Stage 1 **(Chapter 2- Literature Review)**	A concept centric matrix of 116 research articles was created from a comprehensive and hierarchical search strategy.
	IT-enabled innovation contest platforms can be sub-classified depending on particular traits exhibited. Both competitive markets and collaborative communities are identified and explored.
	Revelation of social capital being under-utilised within this domain, while outlining its prevalence within similar settings such as virtual knowledge sharing communities and innovation.
	Exploration of social capital as a theory, revealing three distinct dimensions: Structural, Relational and Cognitive.
	The structural dimension of social capital involves the various levels of social ties solvers exhibit towards one another.
	The relational dimension of social capital encompasses the trust, reciprocity and self-identity among solvers within a community.
	The cognitive dimension of social capital presents the shared language and the shared vision present within the solver community.
	There is a lack of social capital research within both competitive markets and collaborative communities.
Stage 2 **(Chapter 3- Research Strategy)**	Construction of a validated interview protocol to ensure rigor and reliability. This was subsequently tested with an independent academic, and subsequently refined.
Stage 3 **(Chapter 4- Pilot Study)**	Pilot case study of *Trend Micro* involved three interviews; two with contest solvers and one with a KDM.
	Confirmation of social capital importance within an innovation contest setting.
	This also validated the coding strategy for subsequent case study analysis, investigating the impacts and mechanisms of social capital.
Stage 4 **(Chapter 5&6- Field Studies)**	The various impacts of social capital constructs were revealed and illustrated for both platform sets, before providing a cross comparison.
	The various mechanisms used to develop social capital constructs were also identified and explored for both platform sets, before presenting a cross comparison.

Table 8-1: Strategy of the Research Process

The second stage involved the construction and the validation of a research interview protocol. This included a pre-data gathering interview with an independent and an unbiased academic, in order to address potential issues such as external validity and researcher bias, and to ensure the rigor and reliability of the protocol before conducting the pilot case study.

The third stage involved a pilot study (see Chapter 4) of one platform to validate the relevance of the research topic and the utility of the data gathering and analysis methods (including sampling strategy, interview protocol, and coding techniques). Data was gathered and analysed through interviews with two innovation contest participants and one senior platform manager.

The fourth stage involved a full study of 15 separate platforms (see Chapters 5 and 6). Data was gathered and analysed through interviews with KDMs (CEOs, founders, and managers) from each platform.

The outcomes of each of these stages are summarized above in Table 8-1.

8.3 Contributions, Implications, Limitations and Future Research

The objective of this study was to theorise the relationship between social capital and IT-enabled innovation contest platforms. In answering the study's research questions, we are now better equipped to understand the influence of social capital toward these platforms, with a number of contributions being offered to both theory and practice.

Section 8.3.1 will present the main contributions of this study, before Section 8.3.2 and Section 8.3.3 will outline the implications for researchers and practice respectively. Section 8.3.4 will then describe the limitations of this study, while also presenting suggested areas for future research.

8.3.1 Contributions

This study presents several contributions by way of not only what was achieved, but also how this investigation was accomplished. Firstly, this study addresses the research objective by formulating three distinct preliminary theoretical models of

social capital impacts and mechanisms for two specific innovation contest platform types, along with a shared model for innovation contest platforms in general. These models provide combined and specific preliminary theories for the utilisation of social capital, while also identifying the social capital constructs, and their relationships to both the platform and the solver communities. Throughout these models, eight impacts of social capital and fourteen mechanisms used to facilitate social capital are presented. These preliminary models can be used by researchers to help understand the influences of social capital, as well as applying the resulting theories to other research areas in the open innovation settings for comparative purposes.

Secondly, while previous investigations of social capital sought to investigate various domains including virtual communities (Chiu et al., 2006), economic development (Woolcock, 1998), small-medium enterprises (Spence and Schmidpeter, 2003), and local communities (Liff, 2005), this research is the first to investigate social capital within the innovation contest setting. This research developed existing social capital theory and for the first time, expanded it within the realm of IT-enabled innovation contest platforms. The result is a unique understanding as to how social capital can be used for the betterment of such innovation platforms. This research further helps develop the literature in the still infant field of IT-innovation contest platforms and the application of social capital therein. This study is also the first to identify social capital as having a fundamental role in the facilitation of innovation contests, while singularly investigating each of the inherent dimensions (structural, relational, cognitive) of social capital, along with their associated constructs. This study validated and verified social capital as an appropriate theoretical lens for understanding innovation contest platforms, as it identifies various empirical constructs and a comprehensive list of social capital impacts, mechanisms and themes. These findings are all original contributions to the field.

Thirdly, this study has successfully extended and validated prior understandings of social capital, and brought them to bear within this domain. This research adds to our general knowledge by providing KDMs of innovation contest platforms with a roadmap to develop the various social capital constructs. In doing so, empirical measurements for both impacts and mechanisms have been identified, further adding

to our knowledge base. This generates a richer view of innovation contest platforms via social capital for use in future research by providing a demarcation of social capital impacts based on measurable constructs.

Fourthly, the results of the analysis provide an empirical foundation for future investigations seeking to explore the influence of social capital within the IT-enabled innovation contest platform phenomenon. While prior literature toward innovation contests has interpreted social capital as being a singular entity, it is important to re-emphasize this is not the case, as it is comprised of six distinct constructs. By applying social capital theory to IT-enabled innovation contests, it is clear there is not one overall impact of social capital, but multiple instances of its influence. It is also important to remember that the influences of social capital are broader than just summarising the core of the constructs; they must also include the processes and values underlining social capital research. By studying the implications of these impacts, as well as the mechanisms used to facilitate such impacts, a clearer picture has emerged, detailing how social capital can shape the interactions of the solvers using the platforms, while also affecting the overall platform design.

8.3.2 Directions for Future Research

The contributions described in the last section have implications for future researchers, as it advances theoretical development in the area of social capital in general, and innovation contest platforms in particular.

Firstly, there are a number of important advantages to integrating the range of resources provided by the structure of social relations under a concept of social capital. This integration offers valuable opportunities for theoretical cross-fertilisation and promises to provide a better understanding of some crucial social processes. This call also mirrors that of Leenders and Gabbay (1999), who also call for more research on what they call the "*co-evolution*" of social capital and social structure. If social capital has the manifold effects we have ascribed to it, then it seems prudent that researchers investigate not only its effects on the individual solver's endeavours, but also its resulting structural effects. To that extent, social capital is more than the sum of the

various kinds of relationships that we entertain. By applying a social capital lens to future studies, it can in fact reveal a reality that may otherwise remain invisible.

Secondly, the research strategy implemented herein is a valid and useful method that can be replicated by future researchers to further investigate the social capital constructs that KDMs target within their own solver communities. Its main strength is that this approach achieves both a shared and a unique perspective of innovation contest platforms, similar to the process outlined by Kelly (1955). This strategy provided a successful methodology for the mapping of structural, relational and cognitive dimensions of social capital, which for future endeavours could provide data that could be analysed qualitatively or quantitatively through statistical methods. Recent calls for relevance (Benbasat and Zmud, 1999, Robey and Markus, 1998) and a broader approach to relevance in IS research (Lee, 1999) agree an increased emphasis should be placed on applied theories and methods that can produce utilizable and consumable deliveries. By calling researcher's attention in an explicit and systematic way to the concerns of KDMs and their way of thinking, this research strategy would be providing essential information to researchers-information that is vital to doing research that KDMs would find relevant, and presenting research that would make sense to them also.

Proposition 1	Social ties generate a higher level of submission quality from participating solvers within innovation contest platforms.

Proposition 2 (a)	In a competitive setting, both shared language and shared vision impact on solver understanding.
Proposition 2 (b)	In a collaborative setting, shared vision does not impact solver understanding.
Proposition 2 (c)	Innovation contest platforms do not seek to develop a shared language among their solvers.
Proposition 3	Increased levels of trust result in increased levels of solver retention within the innovation contest platform.
Proposition 4 (a)	Within a collaborative setting, increased levels of trust will reduce the risk of plagiarism between solvers.
Proposition 4 (b)	Within a collaborative setting, increased levels of trust will result in a reduced level of solver churn.
Proposition 5 (a)	Solvers that self-identify most with the contest process will acquire a higher degree of knowledge.
Proposition 5 (b)	Solvers that self-identify most with the contest process will increase their likelihood of career mobility.
Proposition 6	Solvers find the setting of a collaborative contest more enjoyable than a competitive contest setting.
Proposition 7	Promoting transparency among the solvers will increase reciprocity within innovation contest platforms.
Proposition 8 (a)	In a competitive setting, solver recognition will increase the levels of self-identity for the solvers.
Proposition 8 (b)	In a collaborative setting, solver recognition increases the levels of trust, self-identity and shared vision within the solver community.
Proposition 9 (a)	In a competitive setting, the reward on offer will impact the levels of reciprocity among solvers.
Proposition 9 (b)	In a collaborative setting, the reward on offer will impact the levels of self-identity among solvers.
Proposition 10	Innovation contest platforms use challenge definitions as the primary mechanism of developing a shared vision within their contests.

Table 8-2: List of propositions for future research

Thirdly, it is hoped that the findings of this study encourages the continued examination of the role that social capital plays within these settings. To accommodate this, based on the research models outlined previously there are several propositions that should be examined, outlined above in Table 8-2. More research is also required

towards validating our proposed theorisations. Of particular note, for both competitive markets and collaborative communities no mechanism was presented that sought to facilitate the construct of shared language. Further research is needed to ascertain why this is, and present suggestions as to how this construct might be successfully facilitated. Future research may also seek to test the theories outlined herein through the implementation of a large quantitative study, given that the empirical measures for the various constructs have previously been outlined in Chapters 5 and 6.

Fourthly, it is important to reiterate that these findings are from the perspective of the KDMs of the various platforms. This decision was made as it offered an in-depth understanding to the various mechanisms that develop social capital constructs within the contest platforms themselves, while also having the requisite knowledge with which to judge the overall impacts of social capital. These insights offer an insight into several net impacts towards the solvers themselves as a result of social capital. For example, our findings reveal that:

i. Self-identity increases the levels of solver learning and solver employment within innovation contest platforms
ii. In competitive markets, reciprocity increases the overall levels of solver engagement
iii. In collaborative communities, self-identity increases the overall levels of solver enjoyment

Future research should seek to confirm these findings by using solvers as a target demographic for data gathering to verify the findings herein. This research strategy might also reveal additional impacts, which would further verify the importance of social capital within these settings.

Fifthly, in pursuing the above propositions this research strategy of this study can be extended and used in conjunction with other methods as a means of validating other techniques, or as a secondary phase to further investigations. When doing so, IS researchers should avoid treating social capital as being generically synonymous, as there is a distinct lack of existing research incorporating the various social capital dimensions outlined by Nahapiet and Ghoshal (1998), especially toward innovation

contests. Instead, the IS aspects of the phenomena being investigated should be brought to the forefront to make clear the unique, specific contributions to the IS scholarship.

Lastly, in validating social capital as an appropriate theoretical lens within a competitive and a collaborative setting, it is also recommended that the findings of this study be tested in a similar research setting. For example, the collaboration of solvers within OSS projects (van der Linden et al., 2009) would represent an ideal study to test these propositions of social capital during the generation of ideas and the production of software artefacts.

The results of this study can ultimately be used to help IS scholars position their research topics into a broader context. These results can also enable new scholars to efficiently gain an understanding of the breadth of social capital literature, and identify potential areas of interest based on corresponding research dynamics.

8.3.3 Implications for Practice

This section presents the contributions that this study makes to the practitioner community. One of the main contributions to this study is the development of three preliminary theoretical models, which outlines the impacts of and mechanisms used to facilitate the various social capital constructs within a competitive market, collaborative community and a general innovation contest platform setting. In doing so, it offers several approaches to how the study's findings can be utilised in practice to assist KDMs in the implementation and exploitation of certain social capital constructs.

Firstly, this research serves to identify the strategic value of certain social capital constructs for innovation contest platform KDMs. The platforms investigated herein reacted positively to the presence of social capital, and offer an extensive menu of impacts ranging from increased solver retention and engagement, to increased solver understanding and submission quality. For example, the findings reveal that social ties within an innovation contest setting, regardless of whether it is of a competitive or collaborative nature increases the standard of submission quality from the solvers.

This finding is of particular relevance to the competitive market subset of innovation contest platforms, especially when one considers that *InnoCentive* revealed previous attempts to develop social ties within their own platform. For reasons they did not wish to go in to, these attempts ultimately proved unsuccessful highlighting the need for a strategic approach for social capital development. Additionally, in the case of *Phantominds*, they revealed issues they have previously encountered regarding the churn rate of solvers due to an increased fear of IP plagiarism and lack of trust. The models presented within this study provide the KDMs of innovation contest platforms with an effective roadmap to not only measure the overall impacts of social capital, but to also tailor their strategy by targeting specific mechanisms to develop particular social capital constructs.

To foster this value within innovation contest platforms, our theoretical models reveal that KDMs need to do more than merely encourage social interactions among solvers. The various impacts of social capital demonstrate its dynamic nature, which highlights further that distinct management strategies are required to facilitate it. Understanding these impacts allows for a more microscopic view of social capital and hence a more in-depth understanding of how social capital as a resource may be developed and managed to leverage its benefits. As outlined previously, these benefits include:

i. Increased levels of solver retention within the contest platform
ii. Increased standards of submission quality from the solver community
iii. Increased levels of solver understanding toward what the contest is aiming to achieve
iv. Increased levels of solver engagement within both the platform and the solver community
v. Increased opportunities for personal (learning) and professional (career mobility) growth for the platform solvers
vi. Lower churn rates for solvers within a collaborative contest environment
vii. Increased levels of enjoyment for solvers within a collaborative contest environment

Secondly, the findings of this study further highlight the need for an understanding of appropriate management strategies towards social capital within the innovation contest domain, and an understanding of the dynamics at play. By identifying the impacts of the various social capital constructs to both the platforms and the solver communities, as well as the mechanisms used to facilitate such constructs, this study broadens the practitioner's understanding of how to further refine the management and deployment of IT-enabled innovation contest platforms. For example, the study outlines how:

i. Solver profiles develop the social ties within innovation contest platforms
ii. Discussion forums develop reciprocity within innovation contest platforms
iii. Protecting the IP of solvers develops trust within competitive markets
iv. Moderators develop social ties and reciprocity within collaborative communities
v. Increased levels of transparency develop reciprocity within innovation contest platforms
vi. Offline events are used to develop social ties and reciprocity within collaborative communities

These findings further emphasise that KDMs of innovation contest platforms should proactively take part in facilitating social capital within their solver communities. However, KDMs should bear in mind that social capital can only achieve its full potential when leveraged with the correct mechanisms. KDMs are therefore advised to first focus on the impacts of social capital that are vital to adding value to their platform, and then independently assess the integration efforts required for the mechanisms therein. Describing the mechanisms through which innovation contest platforms have a strategic role in the development of their solvers' social capital is an important contribution to practitioners who seek to understand when and how the value of such constructs are created.

Thirdly, this study also alerts KDMs to consider not only the social capital mechanisms in which they invest, but also the relationships between the individual social capital constructs and the emergent impacts as a result of their development. This study

suggests several recommendations with which to extrapolate the inherent value of social capital. With this in mind, the mechanisms of social capital outlined herein are required to both underpin the pursuit of high-value added impacts, and to capitalise on the solvers' ability to deliver heightened levels of commitment and quality to the platform. Specifically, KDMs should think about the synergy and compatibility between the platforms and the solvers, and make an effort to integrate social capital mechanisms that are conductive to their respective models for the realisation of social capital.

For example, the data analysis reveals that while *Phantominds* acknowledged the importance of self-identity; they revealed no understanding for the impacts, or indeed the mechanisms with which to develop it. *Chaordix* in contrast provided a rich narrative for both. The findings argue that for *Phantominds* to capitalise on the construct of self-identity, they should implement their own means of ranking and recognising their solvers, while also offering tailored rewards to the demographic of solvers they work with. If this was achieved, *Phantominds* would see an increase in the levels of solver enjoyment, learning and successful employment within their platform. Similarly, while *InnoCentive* described the importance of trust within the competitive market setting, they only revealed one mechanism used to promote the construct within their platform: moderators. The findings highlight that *InnoCentive* should additionally promote the use of discussion forums and protect the IP of their solvers which would subsequently result in increased levels of use and solver retention.

From a practical point of view, these are original results that reveal the importance of developing social capital within an innovation contest platform setting. While this relationship has not previously been explored, this investigation highlights that should platforms neglect or ignore its development, they are immediately placing themselves at a distinct disadvantage. The findings show that social capital has far reaching consequences, impacting on both the platform itself as well as their solver community. This is quite important as the majority of interviewees that took part in this study were unfamiliar with the concept of social capital to begin with. It was only when the specific dimensions and associated constructs of social capital were presented to them did they begin to understand how prevalent it was within their platforms, before describing

their impacts and mechanisms accordingly. Through these theoretical models, practitioners are now capable of immediately understanding the nature of social capital theory, the emergent themes and impacts of each construct, and how they are developed.

8.3.4 Study Limitations and Future Research

Although the researcher endeavoured to achieve the highest levels of objectivity, accuracy and validity, the analysis is not without limitations. Indeed, despite the best efforts of scholars research studies will often be constrained by one or more factors, such as time and resources. Many studies therefore inherently suffer from flaws which can affect the quality or the robustness of the knowledge claims of the study. As is true of any research, this study has several limitations, which can be addressed by future research.

Firstly with respect to potential sampling limitations, the field study data collected and used for the analysis was exclusively from KDMs from a limited amount of IT-enabled innovation contest platforms. As a result, our understanding of social capital and its influence was presented by those responsible for the platforms operationalization. As noted previously, future studies are now advised to capture the understanding of social capital from the solvers perspective also, and to investigate how successfully the models presented in this study translate from the KDMs to the solvers. To achieve this, the researchers fully encourage this study to be not only replicated, but also to be extended to provide further validation to these findings.

Secondly, the introduction of social capital variables into the analysis of IT-enabled innovation contest platforms adds a level of complexity that has not yet been examined empirically. Given the fact that this investigation is the first of its kind, a relatively small population size of qualitative interviewees was pursued which might present generalizability limitations. To combat this, the researchers also call for future large scale, quantitative investigations, aimed at a larger population size of either KDMs or solvers to confirm the findings presented herein. In particular, identifying and developing unique mechanisms of facilitating shared language within such platforms. Studies with larger samples would provide more accurate statistical analysis and the

ability to study the relationship between social capital and knowledge sharing in more depth.

Thirdly, while this study focused predominantly on the impacts and mechanisms of social capital within the innovation contest platform setting, several past studies have emphasized the impact of social capital on other process variables, e.g. knowledge integration (Bhandar et al., 2007) and resource exchange (Tsai, 2002). Future research is also encouraged to examine the direct and indirect effects of the various social capital constructs on such variables.

Regardless of limitations, the implementation of social capital to support IT-enabled innovation contest platforms is an exciting research area, and one which is ripe for future study. Indeed, the compelling findings from this study highlight the need for further research by highlighting gaps in our understanding of how social capital influences innovation contest platforms.

BIBLIOGRAPHY

AALBERS, M. 2004. Motivation for participating in an online open source software community.

ADAMCZYK, S., BULLINGER, A. C. & MÖSLEIN, K. M. 2012. Innovation contests: A review, classification and outlook. *Creativity and Innovation Management,* 21**,** 335-360.

ADAMCZYK, S., HALLER, J., BULLINGER, A. C. & MOESLEIN, K. Knowing is Silver, Listening is Gold: On the importance and impact of feedback in IT-based innovation contests. Proceedings of the 10th International Conference on Wirtschaftsinformatik, Lulu, 2011. 221-230.

ADLER, P. S. & HECKSCHER, C. 2006. Towards collaborative community. *The firm as a collaborative community: Reconstructing trust in the knowledge economy***,** 11-105.

ADLER, P. S. & KWON, S.-W. 2000. Social capital: the good, the bad, and the ugly. *Knowledge and social capital: Foundations and applications***,** 89-115.

ADLER, P. S. & KWON, S.-W. 2002. Social capital: Prospects for a new concept. *Academy of management review,* 27**,** 17-40.

AFUHA, A. 2003. Redefining Firm Boundaries in the Face of the Internet: Are Firms Really Shrinking? *Academy of Management Review,* 28**,** 34-53.

AHUJA, M. K., GALLETTA, D. F. & CARLEY, K. M. 2003. Individual centrality and performance in virtual R&D groups: An empirical study. *Management Science,* 49**,** 21-38.

AITAMURTO, T., LEIPONEN, A. & TEE, R. 2011. The promise of idea crowdsourcing–benefits, contexts, limitations. *Nokia Ideasproject White Paper*.

AL-ZEERA, Z. 2001. *Wholeness and Holiness in Education: An Islamic Perspective,* Herndon, VA, International Institute of Islamic Thought.

ALCHIAN, A. A. 1950. Uncertainty, Evolution, and Economic Theory. *Journal of Political Economy,* 58**,** 211-221.

ALEXY, O., CRISCUOLO, P. & SALTER, A. 2009. Does IP strategy have to cripple open innovation? *MIT Sloan Management Review,* 51**,** 71.

ALLEN, R. C. 1983. Collective Invention. *Journal of Economic Behaviour and Organisation,* 4**,** 1-24.

ALLEN, T. J. 1977. Managing the flow of technology: Technology transfer and the dissemination of technological information within the research and development organization. *Boston, Mass.: Massachusettes Institute of Technology*.

ALONSO, O. & LEASE, M. Crowdsourcing 101: putting the WSDM of crowds to work for you. WSDM, 2011. 1-2.

AMASON, A. C. 1996. Distinguishing the effects of functional and dysfunctional conflict on strategic decision making: Resolving a paradox for top management teams. *Academy of management Journal,* 39**,** 123-148.

AMIT, R. & ZOTT, C. 2001. Value creation in E-Business. *Strategic Management Journal,* 22**,** 493-520.

ANAND, B. N. & KHANNA, T. 2000. Do firms learn to create value? The case of alliances. *Strategic Management Journal,* 21**,** 295-315.

ANAND, V., GLICK, W. H. & MANZ, C. C. 2002. Thriving on the knowledge of outsiders: Tapping organizational social capital. *The Academy of Management Executive,* 16**,** 87-101.

ANAND, V., MANZ, C. C. & GLICK, W. H. 1998. An organizational memory approach to information management. *Academy of management review,* 23**,** 796-809.

ANDERSEN, P. H., KRAGH, H. & LETTL, C. 2013. Spanning Organizational Boundaries to Manage Creative Processes: The Case of the Lego Group. *Industrial Marketing Management,* 42**,** 125-134.

ANDERSON, C. 2009. *Free: The future of a radical price,* Random House.

ANDERSON, M. H. 2008. Social networks and the cognitive motivation to realize network opportunities: A study of managers' information gathering behaviors. *Journal of Organizational Behavior,* 29**,** 51-78.

ANHEIER, H. K., GERHARDS, J. & ROMO, F. P. 1995. Forms of capital and social structure in cultural fields: Examining Bourdieu's social topography. *American Journal of Sociology***,** 859-903.

ANTIKAINEN, M., MAKIPAA, M. & AHONEN, M. 2010. Motivating and supporting collaboration in open innovation *European Journal of Innovation Management,* 13**,** 100 - 119.

ANTIKAINEN, M. J. & VAATAJA, H. K. 2010. Rewarding in open innovation communities–how to motivate members. *International Journal of Entrepreneurship and Innovation Management,* 11**,** 440-456.

ANTILL, L. 1985. Selection of a Research Method. *In:* MUMFORD, E., HIRSCHHEIM, R., FITZGERALD, G. & WOOD-HARPER, T. (eds.) *Research Methods in Information Systems.*

ARCHAK, N. Money, glory and cheap talk: analyzing strategic behavior of contestants in simultaneous crowdsourcing contests on TopCoder.com. *Proceedings of the 19th international conference on World wide web,* 2010 ACM. 21-30.

ARCHAK, N. & SUNDARARAJAN, A. 2009. Optimal design of crowdsourcing contests. *ICIS 2009 Proceedings***,** 200.

ARDICHVILI, A., PAGE, V. & WENTLING, T. 2003. Motivation and barriers to participation in virtual knowledge-sharing communities of practice. *Journal of knowledge management,* 7**,** 64-77.

ARGOTE, L. & INGRAM, P. 2000. Knowledge transfer: A basis for competitive advantage in firms. *Organizational behavior and human decision processes,* 82**,** 150-169.

ARGYRES, N. S., BERCOVITZ, J. & MAYER, K. J. 2007. Complementarity and evolution of contractual provisions: An empirical study of IT services contracts. *Organization science,* 18**,** 3-19.

ASHCROFT, L. & HOEY, C. 2001. PR, marketing and the Internet: implications for information professionals. *Library Management,* 22**,** 68-74.

ATKINSON, J. W. 1958. *Motives in fantasy, action, and society: A method of assessment and study,* England, Oxford.

ATKINSON, J. W. 1964. An introduction to motivation. *Van Nostrand An introduction to motivation.* England: Oxford.

AURIER, P. & N'GOALA, G. 2010. The differing and mediating roles of trust and relationship commitment in service relationship maintenance and development. *Journal of the Academy of marketing Science,* 38**,** 303-325.

BAE, S. & LEE, T. 2011. Gender differences in consumers' perception of online consumer reviews. *Electronic Commerce Research,* 11**,** 201-214.

BAER, M., DIRKS, K. T. & NICKERSON, J. A. 2013. Microfoundations of strategic problem formulation. *Strategic Management Journal,* 34**,** 197-214.

BAGOZZI, R. P. & DHOLAKIA, U. M. 2002. Intentional social action in virtual communities. *Journal of interactive marketing,* 16**,** 2-21.

BAKER, W. E. 1990. Market networks and corporate behavior. *American Journal of Sociology***,** 589-625.

BAKER, W. E. 2000. *Achieving success through social capital: Tapping the hidden resources in your personal and business networks*, Jossey-Bass San Francisco, CA.

BALANEJI, S. G., TURKYILMAZ, A., TEMIZER, L. & BULAK, M. E. Analysis of Open Innovation Systems. *Active Citizenship by Knowledge Management & Innovation: Proceedings of the Management, Knowledge and Learning International Conference,* 2013. ToKnowPress, 731-737.

BALDWIN, C. Y. & CLARK, K. B. 2006. The architecture of participation: Does code architecture mitigate free riding in the open source development model? *Management Science,* 52**,** 1116-1127.

BARBER, B. 1963. Some problems in the sociology of the professions. *Daedalus***,** 669-688.

BATTISTELLA, C. & NONINO, F. 2012. Open innovation web-based platforms: The impact of different forms of motivation on collaboration. *Innovation: Management, Policy & Practice,* 14**,** 557-575.

BATTISTELLA, C. & NONINO, F. 2013. Exploring the impact of motivations on the attraction of innovation roles in open innovation web-based platforms. *Production Planning & Control,* 24**,** 226-245.

BAYUS, B. 2013. Crowdsourcing new product ideas over time: an analysis of the Dell IdeaStorm community. *Management Science,* 59**,** 226-244.

BEDERSON, B. B. & QUINN, A. J. Web workers unite! addressing challenges of online laborers. CHI'11 Extended Abstracts on Human Factors in Computing Systems, 2011. ACM, 97-106.

BEM, D. J. 1970. *Beliefs, attitudes and human affairs,* Belmont, CA, Brooks/Cole.

BENBASAT & ZMUD 1999. Empirical Research in Information Systems: The Practice of Relevance. *MIS Quarterly,* 23**,** 3 - 16.

BENBASAT, I., GOLDSTEIN, D. & MEAD, M. 1987. The Case Research Strategy in Studies of Information Systems. *MIS Quarterly,* 11**,** 369-386

BENBYA, H. & BELBALY, N. 2010. Understanding developers' motives in open source projects: a multi-theoretical framework. *Communications of the Association for Information Systems Research,* 27**,** 589-610.

BENGS, A. & WIKLUND-ENGBLOM, A. How do B2B companies motivate participation in online innovation? *Proceeding of the 16th International Academic MindTrek Conference,* 2012. ACM, 119-124.

BENKLER, Y. 2002. Coase's Penguin, or, Linux and 'The Nature of the Firm'. *Yale Law Journal,* 112**,** 369-446.

BERGAMI, M. & BAGOZZI, R. P. 2000. Self-categorization, affective commitment and group self-esteem as distinct aspects of social identity in the organization. *British Journal of Social Psychology,* 39**,** 555-577.

BERGE, Z. L. 1995. The role of the online instructor/facilitator. *Educational technology,* 35**,** 22-30.

BERKOWITZ, S. D. 2013. *An introduction to structural analysis: The network approach to social research,* Elsevier.

BERNARD, H. R. 1988. *Research methods in cultural anthropology,* Sage Newbury Park, CA.

BHANDAR, M., PAN, S. L. & TAN, B. C. 2007. Towards understanding the roles of social capital in knowledge integration: A case study of a collaborative information systems project. *Journal of the American Society for Information science and Technology,* 58**,** 263-274.

BIANCHI, M., CAVALIERE, A., CHIARONI, D., FRATTINI, F. & CHIESA, V. 2011. Organisational modes for Open Innovation in the bio-pharmaceutical industry: An exploratory analysis. *Technovation,* 31**,** 22-33.

BILLINGTON, C. & DAVIDSON, R. 2013. Leveraging Open Innovation Using Intermediary Networks. *Production & Operations Management,* 22**,** 1464-1477.

BINGHAM, A. & SPRADLIN, D. 2011. *The open innovation marketplace: creating value in the challenge driven enterprise,* Ft press.

BIRD, A. & LEHRMAN, W. G. 1993. The effects of major information technology adoption in Japanese corporations. *Japan and the World Economy,* 5**,** 217-242.

BITZER, J., SCHRETTL, W. & SCHRÖDER, P. J. 2007. Intrinsic motivation in open source software development. *Journal of Comparative Economics,* 35**,** 160-169.

BJELLAND, O. & WOOD, R. C. 2008. An Inside View of IBM's 'Innovation Jam'. *MIT Sloan Management Review,* 50**,** 32-40.

BLAU, P. M. 1955. *The dynamics of bureaucracy: A study of interpersonal relations in two government agencies,* Chicago, U. P.

BLAU, P. M. 1964. *Exchange and power in social life,* Transaction Publishers.

BLOHM, I., BRETSCHNEIDER, U., LEIMEISTER, J. M. & KRCMAR, H. 2011. Does collaboration among participants lead to better ideas in IT-based idea competitions? An empirical investigation. *International Journal of Networking and Virtual Organisations,* 9**,** 106-122.

BOCK, G.-W., ZMUD, R. W., KIM, Y.-G. & LEE, J.-N. 2005. Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate. *MIS Quarterly***,** 87-111.

BOCKSTEDT, J., DRUEHL, C. & MISHRA, A. 2015. Problem-solving effort and success in innovation contests: The role of national wealth and national culture. *Journal of Operations Management,* 36**,** 187-200.

BODDY, D. & BUCHANAN, D. 1986. *Managing New Technology,* Oxford, Basil Blackwell.

BOGDAN, R. & BILKEN, S. 1982. *Qualitative research for Education: An Introduction to Theory and Methods,* Allyn and Bacon.

BOISOT, M. 1995. *Information space: A framework for learning in organizations, institutions and culture*, Cengage Learning Business Pr.

BOJIN, N., SHAW, C. D. & TONER, M. 2011. Designing and deploying a 'compact'crowdsourcing infrastructure: A case study. *Business Information Review,* 28**,** 41-48.

BOLAND JR, R. J. 1985. Phenomenology: A Preferred Approach to Research on Information Systems. *In:* MUMFORD, E., HIRSCHHEIM, R., FITZGERALD, G. & WOOD-HARPER, T. (eds.) *Research Methods in Information Systems.* Amsterdam: North Holland Publishing Co.

BOLAND JR, R. J. & TENKASI, R. V. 1995. Perspective making and perspective taking in communities of knowing. *Organization science,* 6**,** 350-372.

BONABEAU, E. 2009. Decisions 2.0: The Power of Collective Intelligence. *MIT Sloan Management Review,* 50**,** 45-52.

BONACCORSI & ROSSI 2004. Altruistic individuals, selfish firms? The structure of motivation in open source software. *First Monday,* 9.

BORGES, R. 2012. Tacit knowledge sharing between IT workers: The role of organizational culture, personality, and social environment. *Management Research Review,* 36**,** 89-108.

BOTHOS, E., APOSTOLOU, D. & MENTZAS, G. 2009. Collective intelligence for idea management with Internet-based information aggregation markets. *Internet Research,* 19**,** 26-41.

BOUDREAU, K. J. & LAKHANI, K. R. 2009. How to manage outside innovation. *MIT Sloan Management Review,* 50**,** 69-76.

BOUDREAU, M.-C., GEFEN, D. & STRAUB, D. W. 2001. Validation in information systems research: a state-of-the-art assessment. *MIS Quarterly***,** 1-16.

BOURDIEU, P. 1983. The forms of capital. *In:* RICHARDS, J. (ed.) *Handbook of Theory and Research for the Sociology of Education.*

BOUTY, I. 2000. Interpersonal and interaction influences on informal resource exchanges between R&D researchers across organizational boundaries. *Academy of management Journal,* 43**,** 50-65.

BOWMAN, C. & AMBROSINI, V. 2000. Value Creation Versus Value Capture: Towards a Coherent Definition of Value in Strategy. *British Journal of Management,* 11**,** 1-15.

BOXMAN, E. A., DE GRAAF, P. M. & FLAP, H. D. 1991. The impact of social and human capital on the income attainment of Dutch managers. *Social networks,* 13**,** 51-73.

BRABHAM, D. C. 2008a. Crowdsourcing as a model for problem solving: An introduction and cases. *Convergence: The International Journal of Research into New Media Technologies,* 14**,** 75-90.

BRABHAM, D. C. 2008b. Moving the crowd at iStock-photo: The composition of the crowd and motiva-tions for participation in a crowdsourcing application. *First Monday,* 13**,** 2-33.

BRABHAM, D. C. 2010. Moving the crowd at Threadless: Motivations for participation in a crowdsourcing application. *Information, Communication & Society,* 13**,** 1122-1145.

BRABHAM, D. C. 2011. Crowdsourcing: A model for leveraging online communities. *In:* J., H. (ed.) *The Participatory Cultures Handbook.* New York.

BRANDS, R. A. 2013. Cognitive social structures in social network research: A review. *Journal of Organizational Behavior,* 34**,** 82-103.

BREHM, J. & RAHN, W. 1997. Individual-level evidence for the causes and consequences of social capital. *American journal of political science***,** 999-1023.

BRERETON, M., ROE, P., SCHROETER, R. & LEE HONG, A. Beyond ethnography: engagement and reciprocity as foundations for design research out here. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 2014. ACM, 1183-1186.

BRESMAN, H., BIRKINSHAW, J. & NOBEL, R. 1999. Knowledge transfer in international acquisitions. *Journal of International Business Studies***,** 439-462.

BROCK, A. 2013. Understanding commercial agreements with open source companies. *Thoughts on Open Innovation-Essays on Open Innovation from leading thinkers in the field, OpenForum Europe LTD for OpenForum Academy, Brussels*.

BRONOWSKI 1956. The Common Sense of Science. *London, Pelican*.

BROOKE 2002. What Does it Mean to be "Critical" in IS Research? *Journal of Information Technology,* 17.

BROWN, J. S. & DUGUID, P. 2002. *The social life of information,* Harvard Business Press.

BRYMAN, A. & BELL, E. 2015. *Business Research Methods,* Oxford, UK, Oxford University Press.

BRYNJOLFSSON, E. 1993. Productivity Paradox of Information Technology. *Communications of ACM,* 36**,** 67-77.

BUCHANAN, R. A. 1994. *The power of the machine: The impact of technology from 1700 to the present day,* Penguin London.

BULLINGER, A. C., HALLER, J. & MOESLEIN, K. Innovation Mobs-Unlocking the Innovation Potential of Virtual Communities. *AMCIS*, 2009. 540.

BULLINGER, A. C. & MOESLEIN, K. 2010. Innovation contests–Where are we? *Innovation,* 8**,** 1-2010.

BULLINGER, A. C., NEYER, A. K., RASS, M. & MOESLEIN, K. M. 2010. Community-based innovation contests: Where competition meets cooperation. *Creativity and Innovation Management,* 19**,** 290-303.

BURT, R. S. 1992. *Structural Holes,* Cambridge, MA, Harvard University Press.

BYGSTAD, B. Information Infastructure as organization: A critical realist view. *International Conference on Information Systems* 2008. 190.

CAO, G. 2010. A four dimensional view of IT Business Value. *Systems Research and Behavioural Science,* 27**,** 267-284.

CARLSSON, S. 2011. Critical Realist Information Systems Research in Action. *Researching the future in information systems***,** 269-284.

CARNEVALE, P. J. & PROBST, T. M. 1998. Social values and social conflict in creative problem solving and categorization. *Journal of Personality and Social Psychology,* 74**,** 1300.

CASTELLS, M. 2000. Toward a sociology of the network society. *Contemporary sociology***,** 693-699.

CASTORE, C. H. & MURNIGHAN, J. K. 1978. Determinants of support for group decisions. *Organizational behavior and human performance,* 22**,** 75-92.

CECEZ-KECMANOVIC, D., KLEIN, H. & BROOKE, C. 2008. Exploring the Critical Agenda in Information Systems Research. *Information Systems Journal,* 18**,** 123-135.

CHANAL, V. & CARON-FASAN, M.-L. How to invent a new business model based on crowdsourcing: the Crowdspirit® case. Conférence de l'Association Internationale de Management Stratégique, 2008. 1-27.

CHANAL, V. & CARON-FASAN, M.-L. 2010. The Difficulties involved in Developing Business Models open to Innovation Communities: the Case of a Crowdsourcing Platform. *M@n@gement,* 13**,** 318-340.

CHAWLA, S., HARTLINE, J. D. & SIVAN, B. 2015. Optimal crowdsourcing contests. *Games and Economic Behaviour***,** 856-868.

CHE, Y.-K. & GALE, I. 2003. Optimal design of research contests. *The American Economic Review,* 93**,** 646-671.

CHECKLAND, P. 1999. *Systems Thinking, Systems Practice,* Chichester, UK, John Wiley & Sons.

CHEN, A. N. & EDGINGTON, T. M. 2005. Assessing value in organizational knowledge creation: considerations for knowledge workers. *MIS Quarterly***,** 279-309.

CHEN, I. Y. & CHEN, N.-S. 2009. Examining the factors influencing participants' knowledge sharing behavior in virtual learning communities. *Journal of Educational Technology & Society,* 12**,** 134-148.

CHEN, L. & LIU, D. Comparing Strategies for Winning Expert-Rated and Crowd-Rated Crowdsourcing Contests: First Findings. *AMCIS*, 2012.

CHEN, P.-Y., DHANASOBHON, S. & SMITH, M. D. 2008. All reviews are not created equal: The disaggregate impact of reviews and reviewers at amazon. com. *Com (May 2008)*.

CHEN, P.-Y., WU, S.-Y. & YOON, J. 2004. The impact of online recommendations and consumer feedback on sales. *ICIS 2004 Proceedings***,** 58.

CHESBROUGH, H. 2003. *Open Innovation: The New Imperative for Creating and Profiting from Technology,* Boston, Harvard Business School Press.

CHESBROUGH, H. 2006a. The era of open innovation. *Managing innovation and change,* 127**,** 34-41.

CHESBROUGH, H. 2006b. *Open Business Models: How to Thrive in the New Innovation Landscape,* MA, Harvard Business Review School Press.

CHESBROUGH, H. 2006c. Open Innovation: A New Paradigm for Understanding Industrial Innovation. *In:* CHESBROUGH, H., VANHAVERBEKE, W. & WEST, J. (eds.) *Open Innovation: Researching a New Paradigm.* Oxford University Press: Oxford, UK.

CHESBROUGH, H. & APPLEYARD, M. 2007. Open Innovation and Strategy. *California Management Review,* 50**,** 57-76.

CHESBROUGH, H. & SPOHRER, J. 2006. A Research Manifesto for Services Science. *Communications of the ACM,* 49**,** 35-40.

CHEUNG, C. M. & THADANI, D. R. The State of Electronic Word-Of-Mouth Research: A Literature Analysis. *Pacific Asia Conference on Information Systems*, 2010. 151.

CHEVALIER, J. A. & MAYZLIN, D. 2006. The effect of word of mouth on sales: Online book reviews. *Journal of marketing research,* 43**,** 345-354.

CHILD, J. & RODRIGUES, S. 1996. The role of social identity in the international transfer of knowledge through joint ventures. *The politics of management knowledge***,** 46-68.

CHIRBAN, J. T. 1996. *Interviewing in depth: The interactive-relational approach*, Sage Publications Thousand Oaks.

CHIU, C.-M., HSU, M.-H. & WANG, E. T. 2006. Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision support systems,* 42**,** 1872-1888.

CHU, S.-C. & KIM, Y. 2011. Determinants of consumer engagement in electronic word-of-mouth (eWOM) in social networking sites. *International journal of Advertising,* 30**,** 47-75.

CHUA, C. E. H., STRAUB, D., KHOO, H. M., KADIYALA, S. & KUECHLER, D. 2005. The Evolution of E-Commerce Research: A Stakeholder Perspective. *Journal of Electronic Commerce Research,* 6**,** 262-279.

CHUNG, W., CHEN, H. & REID, E. 2009. Business stakeholder analyzer: An experiment of classifying stakeholders on the Web. *Journal of the American Society for Information science and Technology,* 60**,** 59-74.

CLARK, A. M. 1998. The qualitative-quantitative debate: moving from positivism and confrontation to post-positivism and reconciliation. *Journal of advanced nursing,* 27**,** 1242-1249.

CLEGG, C., UNSWORTH, K., EPITROPAKI, O. & PARKER, G. 2002. Implicating trust in the innovation process†. *Journal of Occupational and Organizational Psychology,* 75**,** 409-422.

COASE, R. 1937. The Nature of the Firm. *Economica,* 4**,** 386-405.

COHEN, D. & PRUSAK, L. 2001. *In good company: How social capital makes organizations work*, Harvard Business Press.

COHEN, W. & LEVINTHAL, D. 1990. Absorptive-Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly,* 35**,** 128-152.

COLEMAN, J. S. 1989. *Social capital in the creation of human capital*, University of Chicago Press.

COLEMAN, J. S. & COLEMAN, J. S. 1994. *Foundations of social theory*, Harvard University Press.

COLLIS, J. & HUSSEY, R. 2013. *Business Research: A Practical Guide for Undergraduate and Postgraduate Students,* New York, Palgrave McMillan.

COMMISSION, P. 2003. Social capital: reviewing the concept and its policy implications. EconWPA.

CONSTANT, D., SPROULL, L. & KIESLER, S. 1996. The kindness of strangers: The usefulness of electronic weak ties for technical advice. *Organization science,* 7**,** 119-135.

COOK, T. D. & CAMPBELL, D. T. 1979. *Quasi-experimentation: Design and analysis for field settings,* Rand McNally.

COOPER, H. M. 1998. *Synthesizing research: A guide for literature reviews,* Sage.

CRONBACH, L. J. 1949. Essentials of psychological testing.

CRONIN, M. A. & WEINGART, L. R. 2007. Representational gaps, information processing, and conflict in functionally diverse teams. *Academy of management review,* 32**,** 761-773.

CRONK, M. C. & FITZGERALD, E. P. 1999. Understanding "IS Business Value": Derivation of Dimensions. *Logistics Information Management,* 12**,** 40-49.

CROSS, R. & PRUSAK, L. 2002. The people who make organizations go-or stop. *Harvard Business Review,* 80**,** 104-112.

CROSSAN, F. 2003. Research philosophy: Towards an understanding. *Nurse Researcher,* 11**,** 46-55.

CURRIE, W. L. & PARIKH, M. A. 2006. Value Creation in Web Services: An Integrative Model. *Journal of Strategic Information Systems,* 15**,** 153-174.

D'AVENI, R. & GUNTHER, R. 2007. Hypercompetition: Managing the dynamics of strategic maneuvering. *Das Summa Summarum des Management***,** 83-93.

DAHLANDER, L. & GANN, D. M. 2010. How open is innovation? *Research Policy,* 39**,** 699-709.

DAKHLI, M. & DE CLERCQ, D. 2004. Human capital, social capital, and innovation: a multi-country study. *Entrepreneurship & regional development,* 16**,** 107-128.

DAMANPOUR, F. 1991. Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of management Journal,* 34**,** 555-590.

DASGUPTA, P. & SERAGELDIN, I. 2000. *Social capital: A multifaceted perspective,* Washington, DC, World Bank.

DAVENPORT, T. H. & PRUSAK, L. 2000. *Working knowledge: How organizations manage what they know,* Harvard Business Press.

DE MAEYER, P. 2012. Impact of online consumer reviews on sales and price strategies: A review and directions for future research. *Journal of Product & Brand Management,* 21**,** 132-139.

DECI, E. L. & RYAN, R. M. 1985. *Intrinsic motivation and self·determination in human behavior*, Springer Science & Business Media.

DEETZ, S. 1996. Crossroads-describing differences in approaches to organization science: Rethinking Burnell and Morgan and their legacy. *Organization Science,* 7**,** 191-207.

DEHNING, B. & RICHARDSON, V. J. 2002. Returns on investments in information technology: A research synthesis. *Journal of Information Systems,* 16**,** 7-30.

DENZIN, N. K. 2001. Interpretive interactionism. Sage.

DENZIN, N. K. & LINCOLN, Y. S. 2000. The discipline and practice of qualitative research. *Handbook of qualitative research,* 2**,** 1-28.

DHOLAKIA, U. M., BAGOZZI, R. P. & PEARO, L. K. 2004. A social influence model of consumer participation in network-and small-group-based virtual communities. *International Journal of Research in Marketing,* 21**,** 241-263.

DI-BENEDETTO, A. 2010. Comment on 'Is open innovation a field of study or a communication barrier to theory development?'. *Technovation,* 30**,** 557.

DICICCO-BLOOM, B. & CRABTREE, B. F. 2006. The qualitative research interview. *Medical education,* 40**,** 314-321.

DICK, R. 1990. *Convergent Interviewing,* Chapel Hill, Australia, Interchange.

DIMAGGIO, P. J. & POWELL, W. W. 1983. The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organisational Fields. *American Sociological Review,* 48**,** 147-160.

DIPALANTINO, D. & VOJNOVIC, M. Crowdsourcing and all-pay auctions. Proceedings of the 10th ACM conference on Electronic commerce, 2009. 119-128.

DOBSON, P. J. 2001. The philosophy of critical realism—an opportunity for information systems research. *Information Systems Frontiers,* 3**,** 199-210

DOLBY, R. 1996. A theory of pathological science. *Uncertain knowledge***,** 227-244.

DONEY, P. M. & CANNON, J. P. 1997. An examination of the nature of trust in buyer-seller relationships. *the Journal of Marketing***,** 35-51.

DOUGLAS, J. D. 1985. *Creative interviewing,* Sage Beverly Hills, CA.

DUAN, W., GU, B. & WHINSTON, A. B. 2008. Do online reviews matter?—An empirical investigation of panel data. *Decision support systems,* 45**,** 1007-1016.

DUARTE, V. & SARKAR, S. 2011. Separating the wheat from the chaff: A taxonomy of open innovation. *European Journal of Innovation Management,* 14**,** 435-459.

DUBÉ, L. & PARE, G. 2003. Rigor in information systems positivist case research: current practices, trends, and recommendations. *MIS Quarterly,* 27**,** 597-635.

DUNCKER, K. & LEES, L. S. 1945. On problem-solving. *Psychological monographs,* 58**,** i.

DUPUIS, S. L. 1999. Naked truths: Towards a reflexive methodology in leisure research. *Leisure Sciences,* 21**,** 43-64.

DURKHEIM, E. 1884. The division of labor in society. *Journal des Economistes***,** 211.

DURLAUF, S. N. 2002. On The Empirics Of Social Capital. *The economic journal,* 112**,** 459-F479.

DURLAUF, S. N. & FAFCHAMPS 2004. Social Capital. *National Bureau of Economic Research Working Paper*: Cambridge, MA.

DWYER, F. R., SCHURR, P. H. & OH, S. 1987. Developing buyer-seller relationships. *the Journal of Marketing***,** 11-27.

DYER & SINGH 1998. The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage. *Academy of Management Review,* 23**,** 660 - 679.

DYER, J. & NOBEOKA, K. 2000. Creating and managing a high performance knowledge-sharing network: the Toyota case. *Strategic Management Journal,* 21**,** 345-367.

EASTON, G. 2010. Critical realism in case study research. *Industrial Marketing Management,* 39**,** 118-128.

EBNER, W., LEIMEISTER, J. M. & KRCMAR, H. 2009. Community engineering for innovations: the ideas competition as a method to nurture a virtual community for innovation. *R&D Management,* 39**,** 342-356.

EDWARDS, A. 2012. User engagement and the processes of educational research. *Knowledge mobilization and education research: Politics, languages and responsibilities*.

EISENHARDT, K. 1989. Building Theories from Case Study Research. *Academy of Management Journal,* 14**,** 532-550

EISENHARDT, K. M. & GRAEBNER, M. E. 2007. Theory building from cases: opportunities and challenges. *Academy of Management Review,* 50**,** 25-32.

EISENMANN, T., PARKER, G. & VAN ALSTYNE, M. 2008. Opening platforms: How, when and why? *Harvard Business School Entrepreneurial Management Working Paper*.

ELLEMERS, N., KORTEKAAS, P. & OUWERKERK, J. W. 1999. Self-Categorisation, Commitment to the Group and Group Self-Esteem as Related but Distinct Aspects of Social Identity. *European Journal of Social Psychology,* 29**,** 371-389.

EMERY, F. E. & ACKOFF, R. 1972. On purposeful systems. *Chicago: &Mine Atherton,* 10.

ESTELLÉS-AROLAS, E. & GONZÁLEZ-LADRÓN-DE-GUEVARA, F. 2012. Towards an integrated crowdsourcing definition. *Journal of Information Science,* 38**,** 189-200.

EVANS, P. & WURSTER, T. 1999. Getting Real About Virtual Commerce. *Harvard Business Review***,** 84 - 94

FEENBERG, A. 1986. Network design: An operating manual for computer conferencing. *Professional Communication, IEEE Transactions on***,** 2-7.

FELIN & ZENGER 2013. Closed or Open Innovation? Problem Solving and the Governance Choice. *Research Policy*.

FELLER, J., FINNEGAN, P., HAYES, J. & O'REILLY, P. 2009. Institutionalising information asymmetry: governance structures for open innovation. *Information Technology & People,* 22**,** 297-316.

FELLER, J., FINNEGAN, P., HAYES, J. & O'REILLY, P. 2010. Leveraging 'The Crowd': An Exploration of how Solver Brokerages enhance Knowledge Mobility. *European Conference on Information Systems.*

FELLER, J., FINNEGAN, P., HAYES, J. & O'REILLY, P. 2012. 'Orchestrating' sustainable crowdsourcing: A characterisation of solver brokerages. *Journal of Strategic Information Systems,* 21**,** 216-232.

FERNANDES, R. & SIMON, H. A. 1999. A study of how individuals solve complex and ill-structured problems. *Policy Sciences,* 32**,** 225-245.

FICHMAN, R. 2000. The diffusion and assimilation of information technology innovations. *Framing the Domains of IT Management Research: Projecting the future through the past***,** 105-128.

FINK, L. & NEUMANN, S. 2009. Exploring the Perceived Business Value of the Flexibility Enabled Information Technology Infrastructure. *Information & Management,* 46**,** 90-99

FISCHER, C. S. 1982. *To dwell among friends: Personal networks in town and city*, University of Chicago Press.

FITZGERALD, B. 2006. The Transformation of Open Source Software. *MIS Quarterly,* 30**,** 587-598.

FITZGERALD, B. & AGERFALK, P. 2008. Outsourcing to an Unknown Workforce: Exploring Opensourcing as a Global Sourcing Strategy. *Management Information Systems Quarterly,* 32**,** 385-409.

FITZGERALD, B. & HOWCROFT, D. 1998a. Competing Dichotomies in IS Research. *International Conference on Information Systems.* Association for Information Systems.

FITZGERALD, B. & HOWCROFT, D. 1998b. Towards dissolution of the IS research debate: from polarization to polarity. *Journal of Information Technology,* 13**,** 313-326.

FLAK, L. S. & ROSE, J. 2005. Stakeholder governance: Adapting stakeholder theory to e-government. *Communications of the Association for Information Systems,* 16**,** 31.

FLANAGIN, A., METZGER, M., PURE, R., MARKOV, A. & HARTSELL, E. 2014. Mitigating risk in ecommerce transactions: perceptions of information credibility and the role of user-generated ratings in product quality and purchase intention. *Electronic Commerce Research,* 14**,** 1-23.

FORMAN, C., GHOSE, A. & WIESENFELD, B. 2008. Examining the relationship between reviews and sales: The role of reviewer identity disclosure in electronic markets. *Information Systems Research,* 19**,** 291-313.

FOSS, N., LYLES, M. & VOLBERDA, H. 2009. Absorbing the concept of absorptive capacity: How to realise potential on the organisation field. *Organisation Science,* 21**,** 931-951.

FOSS, N. J. 2007. The emerging knowledge governance approach: Challenges and characteristics. *Organization,* 14**,** 29-52.

FOSS, N. J. & PEDERSEN, T. 2004. Organizing knowledge processes in the multinational corporation: an introduction. *Journal of International Business Studies***,** 340-349.

FOUNTAIN, J. E. 1998a. Social capital: a key enabler of innovation. *In:* BRANSCOMB, L. & KELLER, J. (eds.) *Investing in Innovation: Toward a Consensus Strategy for Federal Technology.* Cambridge, MA.

FOUNTAIN, J. E. 1998b. Social capital: Its relationship to innovation in science and technology. *Science and Public Policy,* 25**,** 103-115.

FRANKE, N. & SHAH, S. 2003. How communities support innovative activities: an exploration of assistance and sharing among end-users. *Research Policy,* 32**,** 157-178.

FREEL, M. 2000. External linkages and product innovation in small manufacturing firms. *Entrepreneurship & regional development,* 12**,** 245-266.

FREEMAN, R. E. 2010. *Strategic management: A stakeholder approach*, Cambridge University Press.

FREEMAN, R. E., HARRISON, J. S. & WICKS, A. 2007. *Managing for stakeholders: Survival, reputation, and success*, New Haven, Yale University Press.

FREIDSON, E. 1992. Professionalism as model and ideology. *Lawyers' ideals/lawyers' practices: Transformations in the American legal profession***,** 215-229.

FREY, B. S. 1997. *Not just for the money*, Edward Elgar.

FREY, K., HAGG, S. & SCHNEIDER, V. 2011a. The Role of Interests, Abilities, and Motivation in Online Idea Contests. *10th International Conference on Wirtschaftsinformatik.* Zurich, Switzerland.

FREY, K., LÜTHJE, C. & HAAG, S. 2011b. Whom Should Firms Attract to Open Innovation Platforms? The Role of Knowledge Diversity and Motivation. *Long Range Planning,* 44**,** 397-420.

FUKUYAMA, F. 1995. *Trust: The social virtues and the creation of prosperity*, Free Press New York.

FULLER, J. 2010. Refining virtual co-creation from a consumer perspective. *California Management Review,* 52**,** 98-122.

FÜLLER, J., BARTL, M., ERNST, H. & MÜHLBACHER, H. 2006. Community based innovation: How to integrate members of virtual communities into new product development. *Electronic Commerce Research,* 6**,** 57-73.

FÜLLER, J., HUTTER, K., HAUTZ, J. & MATZLER, K. 2014. User Roles and Contributions in Innovation-Contest Communities. *Journal of management information systems,* 31**,** 273-308.

FÜLLER, J., JAWECKI, G. & MUHLBACHER, H. 2007. Innovation creation by online basketball communities. *Journal of Business Research,* 60**,** 60-71.

FUNKE, J. 1991. Solving complex problems: Exploration and control of complex systems. *Complex problem solving: Principles and mechanisms***,** 185-222.

GALLIERS, R. 1992. Choosing Information Systems Research Approaches. *In:* GALLIERS, R. (ed.) *Information Systems Research: Issues, Methods and Practical Guidelines.* Henley-on-Thames: Alfred Waller Ltd.

GAMALIELSSON, J. & LUNDELL, B. Open Source communities for long-term maintenance of digital assets: what is offered for ODF & OOXML. Proceedings of SOS, 2011. 19-24.

GAMALIELSSON, J. & LUNDELL, B. 2014. Sustainability of open source software communities beyond a fork: How and why has the libreoffice project evolved? *Journal of Systems and Software,* 89**,** 128-145.

GASSMAN, ENKEL, E. & CHARLES 2010. The Future of Open Innovation. *R&D Management,* 40**,** 213 - 221.

GASSMAN, O. 2006. Opening up the innovation process: towards an agenda. *R&D Management,* 36**,** 223-226.

GASSMANN, O. & ENKEL, E. Towards a theory of open innovation: three core process archetypes. R&D management conference, 2004. 1-18.

GEBAUER, J., FÜLLER, J. & PEZZEI, R. 2013. The dark and the bright side of co-creation: Triggers of member behavior in online innovation communities. *Journal of Business Research,* 66**,** 1516-1527.

GEDAJLOVIC, E., HONIG, B., MOORE, C. B., PAYNE, G. T. & WRIGHT, M. 2013. Social capital and entrepreneurship: A schema and research agenda. *Entrepreneurship Theory and Practice,* 37**,** 455-478.

GEFEN, D., KARAHANNA, E. & STRAUB, D. W. 2003. Trust and TAM in online shopping: an integrated model. *MIS quarterly,* 27**,** 51-90.

GHOSH, R. A. 2005. *Understanding free software developers: Findings from the FLOSS study,* Cambridge, MIT Press.

GIANNOPOULOU, E., YSTROM, A., OLLILA, S., FREDBERG, T. & ELMQUIST, M. 2010. Implications of openness: A study into (all) the growing literature on open innovation. *Journal of Technology Management & Innovation,* 5**,** 162-180.

GIDDENS, A. 1990. The consequences of modernity: The Raymond Fred West memorial lectures. Stanford, CA: Stanford University Press.

GIOIA, D. & PITRE, E. 1990. Multiparadigm Perspectives on Theory Building. *Academy of Management Review,* 15**,** 584-602.

GOLD, A. H. & ARVIND MALHOTRA, A. H. S. 2001. Knowledge management: An organizational capabilities perspective. *Journal of management information systems,* 18**,** 185-214.

GOLDMAN, A. E. & MCDONALD, S. S. 1987. *The group depth interview: Principles and practice,* New Jersey, Englewood Cliffs.

GOODERHAM, P., MINBAEVA, D. B. & PEDERSEN, T. 2011. Governance mechanisms for the promotion of social capital for knowledge transfer in multinational corporations. *Journal of Management Studies,* 48**,** 123-150.

GOODERHAM, P. N. 2007. Enhancing knowledge transfer in multinational corporations: a dynamic capabilities driven model. *Knowledge management research & practice,* 5**,** 34-43.

GOSWAMI, S. & MATHEW, M. 2005. Definition of innovation revisited: An empirical study on Indian information technology industry. *International Journal of Innovation Management,* 9**,** 371-383.

GOULD 2012. Open Innovation and Stakeholder Engagement. *Journal of Technology Management & Innovation,* 7**,** 1 - 11.

GRANOVETTER, M. 1973. The strength of weak ties. *American Journal of Sociology,* 78**,** l.

GRANOVETTER, M. 1992. Problems of explanation in economic sociology. *Networks and organizations: Structure, form, and action,* 25**,** 56.

GRANT, R. M. 1997. The knowledge-based view of the firm: implications for management practice. *Long range planning,* 30**,** 450-454.

GRANT, R. M. & BADEN-FULLER, C. A knowledge-based theory of inter-firm collaboration. Academy of management proceedings, 1995. Academy of Management, 17-21.

GREGOR, S. 2006. The Nature of Theory in Information Systems. *MIS Quarterly,* 30**,** 611 - 642

GRONROOS, C. 2011. Value co-creation in service logic: A critical analysis. *Marketing Theory,* 11**,** 279-301.

GROOTAERT, C., NARAYAN, D., JONES, V. N. & WOOLCOCK, M. 2003. Integrated questionnaire for the measurement of social capital. *The World Bank Social Capital Thematic Group*.

GROOTAERT, C. & VAN BASTELAER, T. 2002. *Understanding and measuring social capital: A multidisciplinary tool for practitioners,* World Bank Publications.

GROVER, V. & KOHLI, R. 2012. Cocreating IT Value: New Capabilities and Metrics for Multifirm Environments. *MIS Quarterly,* 36**,** 225-232.

GUBA, E. 1990. *The Paradigm Dialogue,* Newbury Park, CA, Sage Publications.

GUBA, E. & LINCOLN, Y. 1994. Competing Paradigms in Qualitative Research. *Handbook of Qualitative Research,* 2**,** 163-194.

GUBRIUM, J. F. & HOLSTEIN, J. A. 2002. *Handbook of interview research: Context and method,* Sage.

GULLEY, H. E. 1968. *Discussion, conference, and group process,* Holt, Rinehart and Winston New York.

GULSHAN, S. S. 2011. Innovation Management: Reaping the benefits of Open Platforms by assimilating internal and external innovations. *Procedia-Social and Behavioral Sciences,* 25**,** 46-53.

GUPTA, A. K. & GOVINDARAJAN, V. 2000. Knowledge flows within multinational corporations. *Strategic Management Journal,* 21**,** 473-496.

HABERMAS, J. 1972. *Knowledge and Human Interests,* Beacon Press.

HAIR, J. F., MONEY, A. H., SAMOUEL, P. & PAGE, M. 2007. Research methods for business. *Education+ Training,* 49**,** 336-337.

HALPERN, D. 1999. Social capital: the new golden goose. *London: Institute for Public Policy Research*.

HAMEL, G. 1991. Competition for competence and inter-partner learning within international strategic alliances. *Strategic Management Journal,* 12**,** 83-103.

HAMEL, G., DOZ, L. D. & PRAHALAD, C. 1989. Collaborate with your competitors and win. *Harvard Business Review,* 67**,** 133-139

HAMEL, J., DUFOUR, S. & FORTIN, D. 1993. *Case study methods,* Beverly Hills, Sage.

HAMPTON, K. & WELLMAN, B. 2003. Neighboring in Netville: How the Internet supports community and social capital in a wired suburb. *City & Community,* 2**,** 277-311.

HAN, K., OH, W., IM, K. S., CHANG, R. M., OH, H. & PINSONNEAULT, A. 2012. Value cocreation and wealth spillover in open innovation alliances. *MIS Quarterly,* 36**,** 291-315.

HANIFAN, L. J. 1916. The rural school community center. *Annals of the American Academy of political and Social Science,* 67**,** 130-138.

HANIFAN, L. J. 1920. Social capital: Its development and use. *The Community Center***,** 78-90.

HANN, I.-H., ROBERTS, J. & SLAUGHTER, S. 2004. Why developers participate in open source software projects: An empirical investigation. *Internation Conference on Information Systems.*

HANNABUSS, S. 1996. Research interviews. *New Library World,* 97**,** 22-30.

HANSEN, M. T. & LØVÅS, B. 2004. How do multinational companies leverage technological competencies? Moving from single to interdependent explanations. *Strategic Management Journal,* 25**,** 801-822.

HANSON, N. R. 1965. *Patterns of discovery: an inquiry into the conceptual foundations of science,* CUP Archive.

HARHOFF, D., HENKEL, J. & VON HIPPEL, E. 2003. Profiting from voluntary information spillovers: how users benefit by freely revealing their innovations. *Research Policy,* 32**,** 1753-1769.

HARMON, D. J., KIM, P. H. & MAYER, K. J. 2015. Breaking the letter vs. spirit of the law: How the interpretation of contract violations affects trust and the management of relationships. *Strategic Management Journal,* 36**,** 497-517.

HARRISON, J. S. & WICKS, A. C. 2013. Stakeholder Theory, Value, and Firm Performance. *Business Ethics Quarterly,* 23**,** 97-124.

HARS, A. & OU, S. 2001. Working for free? Motivations of participating in open source projects. *Proceedings of the 34th Annual Hawaii International Conference on. IEEE.* System Sciences.

HARSANYI, J. C. 1976. *Essays on ethics, social behaviour, and scientific explanation,* Springer Science & Business Media.

HAYEK, F. A. 1945. The use of knowledge in society. *The American Economic Review***,** 519-530.

HEALY, M. & PERRY, C. 2000. Comprehensive criteria to judge validity and reliability of qualitative researh within the realism paradigm. *Qualitative Market Reseach-An International Journal,* 3**,** 118-126.

HEMETSBERGER, A. 2003. When consumers produce on the internet: the relationship between cognitive-affective, socially based, and behavioral involvement of prosumers. *The Journal of Social Psychology*.

HENDERSON, K. A. 2011. Post-positivism and the pragmatics of leisure research. *Leisure Sciences,* 33**,** 341-346.

HERTEL, G., NIEDNER, S. & HERRMAN, S. 2003. Motivation of software developers in open source projects: an internet-based survey of contributors to the Linux Kernel. *Research Policy,* 32**,** 1159-1177.

HERZOG, P. 2011. *Open and closed innovation: Different cultures for different strategies,* Springer Science & Business Media.

HIRSCHHEIM 1985. Information Systems Epistemology: An Historical Perspective. *In:* FITZGERALD, MUMFORD & WOOD-HARPER (eds.) *Research Methods in Information Systems.* Amsterdam: Elisiver Science Publishers.

HIRSCHHEIM, R. 1992. IS Epistemology: An Historical Perspective. *Research Methods in Information Systems.*

HIRSCHMAN, E. 1986. Humanistic inquiry in marketing research: philosophy, method, and criteria. *Journal of Marketing,* 52**,** 20-35.

HJØRLAND, B. 2005. Empiricism, rationalism and positivism in library and information science. *Journal of Documentation,* 61**,** 130-155.

HODGINS, H. S. & KNEE, C. R. 2002. The integrating self and conscious experience. *Handbook of self-determination research***,** 87-100.

HOFFMAN, L. 2009. Crowd Control. *Communications of the ACM,* 52**,** 16-17.

HOSSAIN, M. 2012. Performance and potential of open innovation intermediaries. *Procedia-Social and Behavioral Sciences,* 58**,** 754-764.

HOWE, J. 2006a. Crowdsourcing: A definition. *Crowdsourcing: Tracking the rise of the amateur*.

HOWE, J. 2006b. The Rise of Crowdsourcing. *Wired Magazine,* 14**,** 1-4.

HRASTINSKI, S., KVISELIUS, OZAN & EDENIUS 2010. A Review of Technologies for Open Innovation: Characteristics and Future Trends. *International Conference on System Sciences.*

HUIZINGH, E. K. 2011. Open innovation: State of the art and future perspectives. *Technovation,* 31**,** 2-9.

HURME, P. 2001. Online PR: emerging organisational practice. *Corporate Communications: An International Journal,* 6**,** 71-75.

HUSSERL, E. 2012. *Ideas. General Introduction to Pure Phenomenology*, Routledge.

HUTTER, K., FÜLLER, J., HAUTZ, J., BILGRAM, V. & MATZLER, K. 2015. Machiavellianism or Morality: Which Behavior Pays Off In Online Innovation Contests? *Journal of management information systems,* 32**,** 197-228.

HUTTER, K., HAUTZ, J., FÜLLER, J., MUELLER, J. & MATZLER, K. 2011. Communitition: The tension between competition and collaboration in community-based design contests. *Creativity and Innovation Management,* 20**,** 3-21.

IHDE, D. 1986. *Experimental phenomenology: An introduction*, SUNY Press.

INKPEN, A. C. & TSANG, E. W. 2005. Social capital, networks, and knowledge transfer. *Academy of management review,* 30**,** 146-165.

JANSSEN, M. C. & MENDYS-KAMPHORST, E. 2004. The price of a price: on the crowding out and in of social norms. *Journal of Economic Behavior & Organization,* 55**,** 377-395.

JANZIK, L. 2010. Contribution and participation in innovation communities: a classification of incentives and motives. *International Journal of Innovation and Technology Management,* 7**,** 247-262.

JARVENPAA, S. L. 1988. The Importance of Laboratory Experimentation in IS Research. *Communications of ACM,* 31**,** 1502-1504.

JARVENPAA, S. L., KNOLL, K. & LEIDNER, D. E. 1998. Is Anybody Out There? Antecedents of Trust in Global. *Journal 0/Management Information Systems/Spring I998,* 4**,** 29-64.

JEFFREY, S. A. 2009. Justifiability and the motivational power of tangible noncash incentives. *Human Performance,* 22**,** 143-155.

JENKINS, M. 1986. Research methodologies and MIS research. *Research Methods in Information Systems***,** 103-117.

JEPPESEN, L. B. & FREDERIKSEN, L. 2006. Why do users contribute to firm-hosted user communities? The case of computer-controlled music instruments. *Organization science,* 17**,** 45-63.

JOHNSON, G., SCHOLES, K. & WHITTLINGTON, R. 2008. *Exploring Corporate Strategy: Text and Cases,* United Kingdom, Pearson Education.

JOHNSON, J. M. 2002. In-depth interviewing. *Handbook of interview research: Context and method***,** 103-119.

JONES, E. E. & GERARD, H. 1967. *Foundations of social psychology,* New York, Wiley.

JOURET, G. 2009. Inside cisco's search for the next big idea. *Harvard Business Review*.

JUELL-SKIELSE, G., HJALMARSSON, A., JUELL-SKIELSE, E., JOHANNESSON, P. & RUDMARK, D. 2014. Contests as innovation intermediaries in open data markets. *Information Polity: The International Journal of Government & Democracy in the Information Age,* 19**,** 247-262.

KALE, P., DYER, J. H. & SINGH, H. 2002. Alliance capability, stock market response, and long-term alliance success: the role of the alliance function. *Strategic Management Journal,* 23**,** 747-767.

KALE, P. & SINGH, H. 2007. Building firm capabilities through learning: the role of the alliance learning process in alliance capability and firm-level alliance success. *Strategic Management Journal,* 28**,** 981-1000.

KANE, G. & ALAVI, M. 2007. Information technology and organisational learning: An investigation of exploration and exploitation processes. *Organisation Science,* 18**,** 796-812.

KANFER, R. 1990. Motivation theory and industrial and organizational psychology. *In:* DUNENETTE & HOUGH (eds.) *Handbook of industrial and organiza-tional psychology* Chichester: Wiley.

KAPLAN, B. & MAXWELL, J. 1994. Qualitative research methods for evaluating computer information systems. *In:* ANDERSON, AYDIN & JAY (eds.) *Evaluating Healthcare Information Systems: Methods and Applications.* Thousand Oaks, California: Sage.

KAPLAN, R. 1985. *The Role of Empirical Research in Management Accounting,* Boston, Massachusetts, Harvard Business School.

KATHAN, W., FÜLLER, J. & HUTTER, K. 2013. Reciprocity in innovation contest communities reciprocity vs. free-riding in an environment of competition. *ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM).* IEEE.

KATHAN, W., HUTTER, K., FÜLLER, J. & HAUTZ, J. 2015. Reciprocity vs. Free-Riding in Innovation Contest Communities. *Creativity & Innovation Management,* 24**,** 537-549.

KATZ, L. 1987. *The experience of personal change.* Union Institute, formerly the Union for Experimenting Colleges and Universities.

KAVANAUGH, A. L., REESE, D. D., CARROLL, J. M. & ROSSON, M. B. 2005. Weak ties in networked communities. *The Information Society,* 21**,** 119-131.

KELLY, G. A. 1955. *The psychology of personal constructs. Volume 1: A theory of personality,* WW Norton and Company.

KELTY, C. M. 2009. *Two bits: The cultural significance of free software,* Durham, NC, Duke University Press.

KERR, E. B. 1986. Electronic leadership: A guide to moderating online conferences. *IEEE transactions on professional communication,* 29**,** 12-18.

KEVIN O'NEILL, D. 2004. Building social capital in a knowledge-building community: Telementoring as a catalyst. *Interactive Learning Environments,* 12**,** 179-208.

KHAN, Z. 2005. *The Democratization of Invention: Patents and Copyrights in American Economic Development, 1790–1920,* New York, Cambridge Univeristy Press.

KHURANA, A. & ROSENTHAL, S. 1997. Integrating the Fuzzy Front End of New Product Development. *Sloan Management Review,* 38**,** 103-120.

KIM, W. C. & MAUBORGNE, R. 2009. How strategy shapes structure. *Harvard Business Review,* 87**,** 72-80.

KIM, W. C. & MAUBORGNE, R. 2015. *Blue Ocean Strategy, Expanded Edition: How to Create Uncontested Market Space and Make the Competition Irrelevant,* Boston, MA, Harvard Business School Press.

KLEEMANN, F., VOß, G. G. & RIEDER, K. 2008. Un (der) paid innovators: The commercial utilization of consumer work through crowdsourcing. *Science, technology & innovation studies,* 4**,** PP. 5-26.

KLEIN, H. & MYERS, M. 1999. A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly,* 23**,** 67-93.

KLEIN, H. K. 2004. Seeking the new and the critical in critical realism: déjà vu? *Information and organization,* 14**,** 123-144.

KNACK, S. & KEEFER, P. 1997. Does social capital have an economic payoff? A cross-country investigation. *The Quarterly journal of economics***,** 1251-1288.

KNOKE, D. 1999. Organizational networks and corporate social capital. *Corporate social capital and liability.* Springer.

KOKA, B. R. & PRESCOTT, J. E. 2002. Strategic alliances as social capital: A multidimensional view. *Strategic Management Journal,* 23**,** 795-816.

KOLAKOWSKI, L. 1972. *Positivist Science,* Harmondsworth, Penguin Books.

KOMITO, L. 2005. e-Participation and Governance: Widening the net. *The Electronic Journal of e-government,* 3**,** 39-48.

KRACKHARDT, D. 1992. The strength of strong ties: The importance of philos in organizations. *Networks and organizations: Structure, form, and action,* 216**,** 239.

KRAMER, R. M. & TYLER, T. R. 1996. *Trust in organizations: Frontiers of theory and research,* Sage.

KRAUSS, S. E. 2005. Research paradigms and meaning making: A primer. *The Qualitative Report,* 10**,** 758-770.

KRISTENSSON, P., GUSTAFSSON, A. & ARCHER, T. 2004. Harnessing the creative potential among users*. *Journal of Product Innovation Management,* 21**,** 4-14.

KUHN, T. S. 1970. *The structure of scientific revolutions,* Chicago, USA, University of Chicago Press.

LAKHANI, K. R., JEPPESEN, L. B. & LOHSE, P. A. 2007. The value of openness in scientific problem solving. *Harvard Business School Working Paper*.

LAKHANI, K. R. & KANJI, Z. 2008. Threadless: The Business of Community. *Harvard Business School Case***,** 608-707.

LAKHANI, K. R. & VON-HIPPEL, E. 2003. How open source software works:"free" user-to-user assistance. *Research Policy,* 32**,** 923 - 943.

LAKHANI, K. R. & WOLF, R. G. 2005. Why hackers do what they do: Understanding motivation and effort in free/open source software projects. *In:* FELLER, J., FITZGERALD, P., HISSAM & LAKHANI, K. R. (eds.) *Perspectives on Free and Open Source Software.* Cambridge, MA: MIT Press.

LAMPEL, JHA & BHALLA 2012. Test Driving the Future: How Design Competitions are Changing Innovation. *Academy of Management Perspectives***,** 71 - 85.

LANCASHIRE 2001. Code, culture and cash: the fading altruism of open source development. *First Monday,* 6.

LAND, F. 1987. Social Aspects of Information Systems. *Management Information Systems*.

LANDRY, R., AMARA, N. & LAMARI, M. 2002. Does social capital determine innovation? To what extent? *Technological Forecasting and Social Change,* 69**,** 681-701.

LANE, P. J. & LUBATKIN, M. 1998. Relative absorptive capacity and interorganizational learning. *Strategic Management Journal,* 19**,** 461-477.

LAPOINTE, L. & RIVARD, S. 2005. A multilevel model of resistance to information technology implementation. *MIS Quarterly,* 29**,** 461-491.

LARSON, A. 1992. Network dyads in entrepreneurial settings: A study of the governance of exchange relationships. *Administrative science quarterly,* 37.

LAURSEN, K., MASCIARELLI, F. & PRENCIPE, A. 2012. Regions matter: how localized social capital affects innovation and external knowledge acquisition. *Organization science,* 23**,** 177-193.

LAURSEN, K. & SALTER, A. 2006. Open for innovation: The role of openness in explaining innovation performance among UK manufacturing firms. *Strategic Management Journal,* 27**,** 131-150.

LAZEAR, E. P. & ROSEN, S. 1979. Rank-order tournaments as optimum labor contracts. Mass., USA: *National Bureau of Economic Research Cambridge*.

LAZONICK, W. 1993. *Learning and the dynamics of international competitive advantage,* New York, St. Martin's Press.

LEANA, C. R. & VAN BUREN, H. J. 1999. Organizational social capital and employment practices. *Academy of management review,* 24**,** 538-555.

LEE 1999. Rigor and Relevance in MIS Research: Beyond the Approach of Positivism Alone. *MIS Quarterly,* 23**,** 29 - 34

LEE, S., OLSON, D. & TRIMI, S. 2012. Co-innovation: convergenomics, collaboration, and co-creation for organizational values. *Management Decision,* 50**,** 817-831.

LEENDERS, R. T. A. J. & GABBAY, S. M. 1999. An agenda for the future. *In:* LEENDERS, R. T. A. J. & GABBAY, S. M. (eds.) *Corporate social capital and liability.* Boston: Kluwer.

LEIMEISTER, J. M., HUBER, M., BRETSCHNEIDER, U. & KRCMAR, H. 2009. Leveraging crowdsourcing: activation-supporting components for IT-based ideas competition. *Journal of Management Information Systems,* 26**,** 197-224.

LEJEUNE, M. A. 2001. Measuring the impact of data mining on churn management. *Internet Research,* 11**,** 375-387.

LENSSEN, G., PERRINI, F., TENCATI, A., LACY, P., HOLMES, S. & MOIR, L. 2007. Developing a conceptual framework to identify corporate innovations through engagement with non-profit stakeholders. *Corporate Governance: The international journal of business in society,* 7**,** 414-422.

LEONARD, D. A. 1998. The Role of Tacit Knowledge in Group Innovation. *California Management Review,* 40**,** 112-132.

LERNER, J. & TIROLE, J. 2002. The simple economics of open source *Journal of Industrial Economics,* 52**,** 197-234.

LESSER, E. L. & STORCK, J. 2001. Communities of practice and organizational performance. *IBM systems journal,* 40**,** 831-841.

LEVINTHAL, D. & MARCH, J. 1993. The myopia of learning. *Strategic Management Journal,* 14**,** 95-112.

LEVY, Y. & ELLIS 2006. A Systems Approach to Conduct an Effective Literature Review in Support of Information Systems Research. *Informing Science Journal,* 9**,** 181 - 222.

LEWICK, R. & BUNKER, B. B. C. 1996. Developing and maintaining trust in work relationships. *Trust in Organizations: Frontiers of Theory and Reach***,** 114-39.

LEWRICK, M., RAESIDE, R. & PEISL, T. 2007. The innovators's social network. *Journal of Technology Management & Innovation,* 2**,** 38-48.

LICHTENTHALER, U. 2008. Open innovation in practice: An analysis of strategic approaches to technology transactions *IEEE Transactions on Engineering Management,* 55**,** 148-157.

LICHTENTHALER, U. & FRISHAMMAR, J. 2011. The impact of aligning product development and technology licensing: A contingency perspective. *Journal of Product Innovation Management,* 28**,** 89-103.

LICHTENTHALER, U. & LICHTENTHALER, E. 2010. Technology Transfer across Organizational Boundaries: Absorptive Capacity and Desorptive Capacity. *California Management Review,* 53**,** 154-170.

LIFF, S. 2005. Local Communities: Relationships between "Real" and "Social" Virtual Capital. *Communities and Technologies.* Kluwer Academic Publishers.

LIN, N. 1999. Building a network theory of social capital. *Connections,* 22**,** 28-51.

LIN, N., COOK, K. S. & BURT, R. S. 2001. *Social capital: theory and research,* Transaction Publishers.

LINCOLN & GUBA 1985. *Natualistic Inquiry,* Thousand Oaks, CA, Sage.

LINDERMANN, N., SCHAARSCHMIDT, M. & VON-KORTZFLEISCH, H. Participation and control in online communities: Comparing three cases of user involvement in service networks. ECIS 2012 Proceedings, 2012.

LING, P. & MIAN, Z. An empirical study of social capital in participation in online crowdsourcing. E-Product E-Service and E-Entertainment (ICEEE), 2010 International Conference on, 2010. IEEE, 1-4.

LIU, W. T. & DUFF, R. W. 1972. The strength in weak ties. *Public Opinion Quarterly,* 36**,** 361-366.

LOANBY, B. J. 1976. Choice, complexity and ignorance.

LOCKE, E. A. & LATHAM, G. P. 1990. *A theory of goal setting & task performance,* Prentice-Hall, Inc.

LOCKE, E. A. & LATHAM, G. P. 2004. What should we do about motivation theory? Six recommendations for the twenty-first century. *Academy of management review,* 29**,** 388-403.

LOREN, J. 2011. What is Open Innovation? *In:* SLOAN, P. (ed.) *A guide to Open Innovation and Crowdsourcing: Advice from leading Experts.* London: Koganpage.

LOURY, G. 1992. The economics of discrimination: Getting to the core of the problem. *Harvard Journal for African American Public Policy,* 1**,** 91-110.

LUMINEAU, F. & OXLEY, J. E. 2012. Let's work it out (or we'll see you in court): litigation and private dispute resolution in vertical exchange relationships. *Organization science,* 23**,** 820-834.

LUNDSTROM, J. S. E., WIBERG, M., HRASTINSKI, S., EDENIUS, M. & ÅGERFALK, P. J. 2013. *Managing Open Innovation Technologies,* Springer.

LYLES, M. A. 1981. Formulating strategic problems: Empirical analysis and model development. *Strategic Management Journal,* 2**,** 61-75.

LYLES, M. A. & MITROFF, I. I. 1980. Organizational problem formulation: An empirical study. *Administrative science quarterly***,** 102-119.

LYYTINEN, K. 1992. Information Systems and Critical Theory. *In:* ALVESSON & WILLMONT (eds.) *Critical Management Studies* London: Sage Publications.

LYYTINEN, K. & KLEIN, H. 1985. The critical theory of Jurgen Habermas as a basis for a theory of information systems. *In:* MUMFORD, HIRSCHHEIM & FITZGERALD (eds.) *Research methods in Information Systems.* Amsterdam.

MACAULAY, S. 1963. Non-contractual relations in business: A preliminary study. *American Sociological Review***,** 55-67.

MADJAR, N. & ORTIZ-WALTERS, R. 2009. Trust in supervisors and trust in customers: Their independent, relative, and joint effects on employee performance and creativity. *Human Performance,* 22**,** 128-142.

MAHR, D., RINDFLEISCH, A. & SLOTEGRAFF, R. 2010. Innovation Beyond Firm Boundaries: The Routines and Resource Investment of Successful External Problem Solvers. *American Marketing Association Winter Educators' Conference.* New Orleans.

MAIER, F. H. 1998. New product diffusion models in innovation management—A system dynamics perspective. *System Dynamics Review,* 14**,** 285-308.

MALHOTRA, D. & LUMINEAU, F. 2011. Trust and collaboration in the aftermath of conflict: The effects of contract structure. *Academy of management Journal,* 54**,** 981-998.

MALINOWSKI, B. 1926. *Myth in primitive psychology,* Norton London.

MANGOLD, W. G. & FAULDS, D. J. 2009. Social media: The new hybrid element of the promotion mix. *Business Horizons,* 52**,** 357-365.

MARSHALL, C. & ROSSMAN, G. 2014. *Designing Qualitative Research,* California, Sage Publications.

MARWELL, G. & OLIVER, P. 1993. *The critical mass in collective action*, Cambridge University Press.

MARX, K. 1894. Capital: Vol. 111. *Karl Marx: Selected Writings in Sociology and Social Philosophy***,** 99.

MASKELL, P. 2000. Social capital, innovation and competitiveness. *Social capital: Critical perspectives***,** 111-123.

MASON, R. O. & MITROFF, I. I. 1981. *Challenging strategic planning assumptions: Theory, cases, and techniques*, Wiley New York.

MATA ET AL. 1995. Information Technology and Sustained Competitive Advantage: A Resource Based Analysis. *MIS Quarterly,* December**,** 487 - 505

MATARIC, M. J. 1993. Designing emergent behaviors: From local interactions to collective intelligence. *International Conference on Simulation of Adaptive Behavior*.

MAXMEN 2012. Driving Innovation: Ready, Set, Go! *Cell,* 140**,** 171 - 173.

MAYER, K. J. & ARGYRES, N. S. 2004. Learning to contract: Evidence from the personal computer industry. *Organization science,* 15**,** 394-410.

MAYER, R. C., DAVIS, J. H. & SCHOORMAN, F. D. 1995. An integrative model of organizational trust. *Academy of management review,* 20**,** 709-734.

MAZZOLA, D. & DISTEFANO, A. Crowdsourcing and the participation process for problem solving: The Case of BP. Proceedings of ItAIS 2010 VII Conference of the Italian Chapter of AIS, 2010. Napoles: ItAIS, 42-49.

MCCOLE, D. 2013. Seasonal Employees: The Link between Sense of Community and Retention. *Journal of Travel Research***,** 0047287513513169.

MCCREARY, E. K. 1990. Three behavioral models for computer-mediated communication. *Online education: Perspectives on a new environment***,** 117-30.

MCFARLAN, F. W. 1984. Information technology changes the way you compete. *Harvard Business Review,* 62**,** 98-109.

MCMANN, G. W. The changing role of moderation in computer mediated conferencing. Proceedings of the Distance Learning Research Conference, 1994. 27-29.

MCMILLAN, D. W. & CHAVIS, D. M. 1986. Sense of community: A definition and theory. *Journal of community psychology,* 14**,** 6-23.

MEGLINO, B. & ELIZABETH, R. 1998. Individual Values in Organisations: Concepts, Controversies and Research. *Journal of Management,* 24**,** 351-389.

MEYER, J. P., BECKER, T. E. & VANDENBERGHE, C. 2004. Employee commitment and motivation: a conceptual analysis and integrative model. *Journal of applied psychology,* 89**,** 991.

MEYER, J. P., STANLEY, D. J., HERSCOVITCH, L. & TOPOLNYTSKY, L. 2002. Affective, continuance, and normative commitment to the organization: A meta-analysis of antecedents, correlates, and consequences. *Journal of vocational behavior,* 61**,** 20-52.

MILES, M. & HUBERMAN, M. 1984. *Qualitative data analysis: A source book for new methods,* Beverly Hills California, Sage Publications.

MILES, M. & HUBERMAN, M. 1994. *Qualitative Data Analysis: An expanded source book,* Thousand Oaks, CA, Sage publications.

MILES, R., SNOW, C., MEYER, A. & COLEMAN, H. 1978. Organisational Strategy, Structure and Process. *The Academy of Management Review,* 3**,** 546-562.

MILLER, W. L. & CRABTREE, B. F. 2004. Depth interviewing. *Approaches to qualitative research***,** 185-202.

MINGERS 2004. Realizing information systems: critical realism as an underpinning philosophy for information systems. *Information and Organization,* 14**,** 87-103.

MINIOTAITĖ, A. & BUČIŪNIENĖ, I. 2013. Explaining authentic leadership work outcomes from the perspective of self-determination theory. *Organizacijų Vadyba: Sisteminiai Tyrimai***,** 63-75.

MINTZBERG, H., RAISINGHANI, D. & THEORET, A. 1976. The structure of" unstructured" decision processes. *Administrative science quarterly***,** 246-275.

MISHRA, A. & MISHRA, D. 2013. Applications of Stakeholder Theory in Information Systems and Technology. *Engineering Economics,* 24**,** 254-266.

MISHRA, A. K., KRAMER, R. & TYLER, T. R. 1996. Organizational responses to crisis: The centrality of trust. Sage Thousand Oaks, CA.

MISZTAL, B. 2013. *Trust in modern societies: The search for the bases of social order,* John Wiley & Sons.

MITHAS, S., RAMASUBBU, N. & SAMBAMURTHY, V. 2011. How information management capability influences firm performance. *MIS Quarterly,* 35**,** 237-256

MITROFF, I. I. & FEATHERINGHAM, T. R. 1974. On systemic problem solving and the error of the third kind. *Behavioral Science,* 19**,** 383-393.

MO, J., ZHENG, Z. & GENG, X. 2011. Winning crowdsourcing contests: A micro-structural analysis of multi-relational networks. *In:* YE, Q., ZHANG, M. & ZHANG, Z. (eds.) *The Fifth China Summer Workshop on Information Management.* Harbin, China.

MOORE, G. A. 2003. Darwin and the demon: innovating within established enterprises. *Harvard Business Review,* 82**,** 86-92, 187.

MORAN, P. & GHOSHAL, S. 1996. Value Creation by Firms. *Academy of Management,* 1**,** 41-45.

MORGAN, J. & WANG, R. 2010. Tournaments for ideas. *California Management Review,* 52**,** 77-97.

MORTARA, L., FORD, S. J. & JAEGER, M. 2013. Idea Competitions under scrutiny: Acquisition, intelligence or public relations mechanism? *Technological Forecasting and Social Change,* 80**,** 1563-1578.

MOUSTAKAS, C. 1994. *Phenomenological research methods,* Sage Publications.

MOWERY, D. & ROSENBERG, N. 1991. *Technology and the Pursuit of Economic Growth,* New York, Cambridge University Press.

MUMFORD, E., HIRSCHHEIM, R., FITZGERALD, B. & WOOD-HARPER, T. 1985. *Research Methods in Information Systems,* Amsterdam, North Holland Publishing Co.

MUMFORD, E. & WEIR, M. 1979. Computer Systems in work design—The ETHICS method. *Associated Business Press*.

MUMFORD, M. D. & GUSTAFSON, S. B. 1988. Creativity syndrome: Integration, application, and innovation. *Psychological Bulletin,* 103**,** 27.

MUTCH, A. 2010. Technology, organization, and structure-a morphogenetic approach. *Organization science,* 21**,** 507-520.

MYERS 1997. Qualitative Research in Information Systems. *MIS Quarterly,* 21**,** 241-242.

MYERS, M. 1995. Dialectical hermeneutics: a theoretical framework for the implementation of information systems. *Information Systems Journal,* 5**,** 51-70.

MYERS, S. & MARQUIS, D. G. 1969. *Successful industrial innovations: A study of factors underlying innovation in selected firms,* National Science Foundation Washington, DC.

NAHAPIET, J. & GHOSHAL, S. 1998. Social capital, intellectual capital, and the organizational advantage. *Academy of management review,* 23**,** 242-266.

NAIR, G. & RIEGE, A. 1995. Using convergent interviewing to develop the research problem of a postgraduate thesis. *Marketing Educators and Researchers International Conference.* Griffith University, Gold Coast.

NATALICCHIO, A., PETRUZZELLI, A. M. & GARAVELLI, A. 2014. A literature review on markets for ideas: Emerging characteristics and unanswered questions. *Technovation,* 34**,** 65-76.

NDOU, V., VECCHIO, P. D. & SCHINA, L. 2011. Open Innovation Networks: The Role of Innovative Marketplaces for Small and Medium Enterprises' Value Creation. *International Journal of Innovation & Technology Management,* 8**,** 437-453.

NEGOITA, B., RAHROVANI, Y., LAPOINTE, L., PINSONNEAULT, A. & MIRZA, M. 2012. IT Champions as Agents of Change: a Social Capital Perspective.

NELSON, K. M. & COOPRIDER, J. G. 1996. The Contribution of Shared Knowledge to IS Group Performance. *MIS quarterly,* 20.

NEUMAN, W. L. 1997. *Social Research Methods: Qualitative and Quantitative Approaches,* Needham Heights, MA, Allyn and Bacon.

NGWENYAMA, O. 1991. The critical social theory approach to information systems: problems and challenges. *In:* NISSEN, H.-E., KLEIN, H. & HIRSCHHEIM, R. (eds.) *Information systems research: Contemporary approaches and emergent traditions.* North Holland, Amsterdam.

NISSEN, H.-E. 1985. Acquiring knowledge of information systems research in a methodological quagmire. *In:* MUMFORD, HIRSCHHEIM, FITZGERALD & WOOD-HARPER (eds.) *Research Methods in Information Systems.* Amsterdam.

NONAKA, I. 1994. A dynamic theory of organizational knowledge creation. *Organization science,* 5**,** 14-37.

NONAKA, I. & TAKEUCHI, H. 1995. *The knowledge-creating company: How Japanese companies create the dynamics of innovation*, Oxford university press.

NOOTEBOOM, B. 1994. Innovation and diffusion in small firms: theory and evidence. *Small Business Economics,* 6**,** 327-347.

NOOTEBOOM, B. 2000. Learning by interaction: absorptive capacity, cognitive distance and governance. *Journal of management and governance,* 4**,** 69-92.

NORTHROP, F. S. C. 1949. *Einstein's conception of science,* Library of Living Philosophers.

NUTT, P. C. 1992. Formulation Tactics and the Success of Organizational Decision Making*. *Decision Sciences,* 23**,** 519-540.

O'FLAHERTY, B. & WHALLEY, J. Qualitative Analysis Software Applied to IS Research - Developing a Coding Strategy. ECIS, 2004.

O'BRIEN, M. S., BURDSAL, C. A. & MOLGAARD, C. A. 2004. Further development of an Australian-based measure of social capital in a US sample. *Social Science & Medicine,* 59**,** 1207-1217.

OATES, B. 2005. *Researching Information Systems and Computing,* Great Britain, Sage Publications.

OGAWA, S. & PILLER, F. T. 2006. Reducing the risks of new product development. *MIT Sloan Management Review,* 47**,** 65.

OKOLI, C. & OH, W. 2007. Investigating recognition-based performance in an open content community: A social capital perspective. *Information & Management,* 44**,** 240-252.

OLIVEIRA, F., RAMOS, I. & SANTOS, L. 2010. *Definition of a crowdsourcing innovation service for the European SMEs,* Springer.

OLPHERT, W. & DAMODARAN, L. 2007. Citizen participation and engagement in the design of e-government services: The missing link in effective ICT design and delivery. *Journal of the Association for Information Systems,* 8**,** 491.

ORLIKOWSKI, W. & BAROUDI, J. 1991. Studying IT in organisations: Research approaches & assumptions. *Information Systems Research,* 2**,** 1-28.

ORLIKOWSKI, W. J. 1992. Learning from notes: Organizational issues in groupware implementation. *ACM Conference on Computer-Supported Cooperative Work.* ACM.

ORR, J. E. 1996. *Talking about machines: An ethnography of a modern job,* Cornell University Press.

OSTERLOH & ROTA 2007. Open source software development just another case of collective invention? *Research Policy,* 36**,** 157 - 171.

OTIM, S., DOW, K. & WONG, J. 2012. The impact of information technology investments on downside risk of the firm: alternative measurement of the business value of IT. *Journal of Management Information Systems,* 29 159-194.

OUCHI, W. 1981. Theory Z: How American business can meet the Japanese challenge. *Business Horizons,* 24**,** 82-83.

OZMAN, M. 2011. Modularity, industry life cycle and open innovation. *Journal of Technology Management & Innovation,* 6**,** 26-37.

PAGE, S. E. 2008. *The difference: How the power of diversity creates better groups, firms, schools, and societies,* Princeton University Press.

PAHLKE, I. 2012. Leveraging social capital in the virtual work environment-Knowledge exchange through social media Platforms. *European Conference on Information Systems.*

PALDAM, M. 2000. Social capital: one or many? Definition and measurement. *Journal of economic surveys,* 14**,** 629-653.

PARK, C. H., SON, K., LEE, J. H. & BAE, S.-H. Crowd vs. crowd: large-scale cooperative design through open team competition. Proceedings of the 2013 conference on Computer supported cooperative work, 2013. ACM, 1275-1284.

PARKHE, A. 1993. Messy research, methodological prepositions, and theory development in international joint ventures. *Academy of Management Review,* 18.

PARSONS, T. 1968. Professions. *International encyclopedia of the social sciences,* 12**,** 536-547.

PATTON, M. Q. 1990. *Qualitative evaluation and research methods*, Newbury Park, CA, Sage Publications.

PATTON, M. Q. 2005. *Qualitative research,* Wiley Online Library.

PAULSEN, M. F. 1995. Moderating educational computer conferences. *Computer mediated communication and the online classroom,* 3**,** 81-89.

PAVLIK, J. V. 2007. Mapping the consequences of technology on public relations. *Institute for Public Relations***,** 1-20.

PAWLOWSKY, P. 2001. The treatment of organizational learning in management science. *Handbook of organizational learning and knowledge***,** 61-88.

PELLED, L. H. 1996. Demographic diversity, conflict, and work group outcomes: An intervening process theory. *Organization science,* 7**,** 615-631.

PENNAR, K. & MUELLER, T. 1997. The ties that lead to prosperity. *Business Week,* 15**,** 153-154.

PERRY-SMITH, J. E. 2006. Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of management Journal,* 49**,** 85-101.

PETTIGREW, A. M. 1973. *The politics of organizational decision-making,* Tavistock London.

PHANG, C. W., KANKANHALLI, A. & HUANG, L. 2014. Drivers of Quantity and Quality of Participation in Online Policy Deliberation Forums. *Journal of management information systems,* 31**,** 172-212.

PHILLIPS, D. C. 1987. *Philosophy, Science and Social Inquiry,* Oxford, Pergamon.

PHILLIPS, D. C. 1990. Postpositivistic science: Myths and realities. *The paradigm dialog,* 31-45.

PILLER, F. T. & WALCHER, D. 2006. Toolkits for idea competitions: A novel method to integrate users in new product development. *R&D Management,* 36**,** 307-318.

PINDER, C. C. 2014. *Work motivation in organizational behavior,* Psychology Press.

PISANO & VERGANTI 2008. Which Kind of Collaboration is Right for You? *Harvard Business Review*.

PONDY, L. R. & MITROFF, I. I. 1979. Beyond open system models of organization. *Research in organizational behavior,* 1**,** 3-39.

POPPER 1959. The Logic of Scientific Discovery. *London, Hutchinson*.

PORTER, L. W. & LAWLER, E. E. 1968. Managerial attitudes and performance.

PORTER, M. 1980. Competitive Strategy: Techniques for Analysing Industries and Competitors. *New York: Free Press*.

PORTES, A. 2000. Social capital: Its origins and applications in modern sociology. *LESSER, Eric L. Knowledge and Social Capital. Boston: Butterworth-Heinemann,* 43-67.

PORTES, A. & SENSENBRENNER, J. 1998. Embeddedness and immigration: Notes on the social determinants of economic action. *The new institutionalism in sociology,* 127-49.

PRAHALAD, C. & RAMASWAMY, V. 2004. Co-creating unique value with customers. *Strategy and Leadership,* 32**,** 4-9.

PREECE, J. 2001. Online communities: Usability, sociabilty, theory and methods. *Frontiers of human-centered computing, online communities and virtual environments.* Springer.

PUTNAM, R. D. 1993. The prosperous community. *The american prospect,* 4**,** 35-42.

PUTNAM, R. D. 1995a. Bowling alone: America's declining social capital. *Journal of democracy,* 6**,** 65-78.

PUTNAM, R. D. 1995b. Tuning in, tuning out: The strange disappearance of social capital in America. *PS: Political Science & Politics,* 28**,** 664-683.

PUTNAM, R. D. 2000. *Bowling alone: The collapse and revival of American community,* Simon and Schuster.

QU, S. Q. & DUMAY, J. 2011. The qualitative research interview. *Qualitative Research in Accounting & Management,* 8**,** 238-264.

QUINN, J. B. 1979. Technological innovation, entrepreneurship, and strategy. *Sloan Management Review,* 20**,** 19.

QUINN, J. B. 1980. *Strategies for change: Logical incrementalism,* Irwin Professional Publishing.

RADCLIFFE-BROWN, A. R., EVANS-PRITCHARD, E. E. & EGAN, F. 1952. Structure and Function in Primitive Society. Essays and Addresses.

RAMASWAMY, V. 2009. Leading the transformation to co-creation of value. *Strategy and Leadership,* 37**,** 32-37.

REAGANS & MCEVILY 2003. Network structure and knowledge transfer: the effects of cohesion and range. *Administrative Science Quarterly,* 48**,** 240 - 267.

REEVE, J. 2001. *Understanding motivation and emotion,* Wiley New York.

REICHWALD, R. & PILLER, F. 2006. Organisation der arbeitsteiligen Wertschöpfung: Entwicklungen und Trends auf dem Weg zur interaktiven Wertschöpfung. *Interaktive Wertschöpfung: Open Innovation, Individualisierung und neue Formen der Arbeitsteilung***,** 11-94.

REINHARDT, HETZENECKER, FRIEZ & AMBERG. Stiff Structures for Loose Folks - A Platform for an Open Innovation Community. PACIS 2010 Proceedings, 2010.

REISS, S. 2000. A mindful approach to mental retardation. *Journal of social issues,* 56**,** 65-80.

REUER, J. J. & ARINO, A. 2007. Strategic alliance contracts: Dimensions and determinants of contractual complexity. *Strategic Management Journal,* 28**,** 313-330.

RIDINGS, C. M., GEFEN, D. & ARINZE, B. 2002. Some antecedents and effects of trust in virtual communities. *The Journal of Strategic Information Systems,* 11**,** 271-295.

RIEDL, C., BLOHM, I., LEIMEISTER, J. M. & KRCMAR, H. 2010. Rating scales for collective intelligence in innovation communities: Why quick and easy decision making does not get it right. *International Conference on Information Systems.*

RIEGE, A. 2009. Gültigkeit und Zuverlässigkeit von Fallstudien. *Qualitative Marktforschung.* Springer.

RIEMER, K. & KLEIN, S. 2004. How can virtual organizations deliver? Promises, challenges and potential remedies. *E-Learning: Modelle, Instrumente und Erfahrungen-Software Produktlinien-Communities in E-Business***,** 275-291.

RING, P. S. & VAN DE VEN, A. H. 1994. Developmental processes of cooperative interorganizational relationships. *Academy of management review,* 19**,** 90-118.

ROBERTS, HANN & SLAUGHTER 2006. Understanding the motivations, participation, and performance of open source software developers: A longitudinal study of the Apache projects. . *Management Science,* 52**,** 984 - 999.

ROBEY, D. & MARKUS, M. L. 1998. Beyond rigor and relevance: producing consumable research about information systems. *Information Resources Management Journal (IRMJ),* 11**,** 7-16.

ROBINSON, L. J., SCHMID, A. A. & SILES, M. E. 2002. Is social capital really capital? *Review of social economy,* 60**,** 1-21.

ROBINSON, R., GOH, T.-T. & ZHANG, R. 2012. Textual factors in online product reviews: a foundation for a more influential approach to opinion mining. *Electronic Commerce Research,* 12**,** 301-330.

ROGERS, E. M. & KINCAID, D. L. 1981. *Communication networks: Toward a new paradigm for research,* New York, Free Press.

ROGERS, E. M. & SHOEMAKER, F. F. 1971. *Communication of Innovations; A Cross-Cultural Approach,* New York, Free Press.

ROHFELD, R. W. & HIEMSTRA, R. 1995. Moderating discussions in the electronic classroom. *Computer mediated communication and the online classroom,* 3**,** 91-104.

ROTTER, J. B. 1980. Interpersonal trust, trustworthiness, and gullibility. *American psychologist,* 35**,** 1.

ROWLANDS, B. 2005. Grounded in Practice Using Interpretive Research to Build Theory. *The Electronic Journal of Business Research Methodology,* 3**,** 81 - 92

RUBIN, H. J. & RUBIN, I. S. 2012. *Qualitative interviewing: The art of hearing data,* Sage Publications.

RYALL, M. D. & SAMPSON, R. C. 2009. Repeated interaction and contract structure: evidence from technology development contracts. *Management Science,* 55**,** 906-925.

RYAN, A. B. 2006. Post-positivist approaches to research. *Researching and Writing your Thesis: a guide for postgraduate students***,** 12-26.

RYAN, R. M. & DECI, E. L. 2000a. Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology,* 25**,** 54-67.

RYAN, R. M. & DECI, E. L. 2000b. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist,* 55**,** 68.

RYAN, R. M. & DECI, E. L. 2002. Overview of Self-Determination Theory: An Organismic Dialectical Perspective. *The University of Rochester Press.*

SAKO, M. 1992. *Price, quality and trust: Inter-firm relations in Britain and Japan*, Cambridge University Press.

SALICKAITĖ, R. & BANYTĖ, J. 2008. Successful diffusion and adoption of innovation as a means to increase competitiveness of enterprises. *Engineering economics***,** 48-56.

SARASON, S. B. 1974. *The psychological sense of community: Prospects for a community psychology*, Jossey-Bass.

SAVITSKAYA, I., SALMI, P. & TORKKELI, M. 2010. Barriers to open innovation: Case China. *Journal of Technology Management & Innovation,* 5**,** 10-21.

SAWHNEY, M., VERONA, G. & PRANDELLI, E. 2005. Collaborating to create: The Internet as a platform for customer engagement in product innovation. *Journal of interactive marketing,* 19**,** 4-17.

SCHAEDEL, U. & CLEMENT, M. 2010. Managing the online crowd: Motivations for engagement in user-generated content. *Journal of Media Business Studies,* 7**,** 17-36.

SCHEPERS, J., SCHNELL, R. & VROOM, P. 1999. From idea to business—How Siemens bridges the innovation gap. *Research-Technology Management,* 42.

SCHUHMACHER, M. C. & KUESTER, S. 2012. Identification of lead user characteristics driving the quality of service innovation ideas. *Creativity and Innovation Management,* 21**,** 427-442.

SCHUMACHER, K. L. & GORTNER, S. R. 1992. (Mis) conceptions and reconceptioons about traditional science. *Advances in Nursing Science,* 14**,** 1-11.

SCHUMPETER, J. 1934. *he theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*, Transaction Publishers.

SCHUNK, D. H., PINTRICH, P. R. & MEECE, J. L. 2008. Motivation in education: Theory, research, and applications.

SCOTCHMER, S. 2004. *Innovation and incentives*, MIT Press.

SELTZER, E. & MAHMOUDI, D. 2012. Citizen participation, open innovation, and crowdsourcing: Challenges and opportunities for planning. *Journal of Planning Literature***,** 0885412212469112.

SEN, S. & COWLEY, J. 2013. The Relevance of Stakeholder Theory and Social Capital Theory in the Context of CSR in SMEs: An Australian Perspective. *Journal of Business Ethics,* 118**,** 413-427.

SHANE, S. A. & ULRICH, K. T. 2004. 50th anniversary article: Technological innovation, product development, and entrepreneurship in management science. *Management Science,* 50**,** 133-144.

SHANKS, G. 1997. The challenges of strategic data planning in practice: an interpretive case study. *The Journal of Strategic Information Systems,* 6**,** 69-90.

SHARMA, S. 2005. Through the lens of managerial interpretations: Stakeholder engagement, organizational knowledge and innovation. *Environmental Strategy and Competitive Advantage. Edward Elgar Academic Publishing, Northampton***,** 49-70.

SHRIVASTAVA, P. & GRANT, J. H. 1985. Empirically derived models of strategic decision-making processes. *Strategic Management Journal,* 6**,** 97-113.

SHUMAKER, S. A. & BROWNELL, A. 1984. Toward a theory of social support: Closing conceptual gaps. *Journal of Social Issues,* 40**,** 11-36.

SILVA, C. & RAMOS, I. 2012. Crowdsourcing Innovation Intermediaries Functions. *Mediterranean Conference on Information Systems.*

SILVERMAN, D. 2001. *Interpretive Qualitative Data,* London, Sage.

SIMON, H. A. 1973. The structure of ill structured problems. *Artificial intelligence,* 4**,** 181-201.

SIMON, H. A. & HAYES, J. R. 1976. The understanding process: Problem isomorphs. *Cognitive psychology,* 8**,** 165-190.

SIMON, L. & DAVIES, G. 1996. A contextual approach to management learning: the Hungarian case. *Organization Studies,* 17**,** 269-289.

SIMULA, H. & VUORI, M. 2012. Benefits and barriers of crowdsourcing in B2B firms: Generating ideas with internal and external crowds. *International Journal of Innovation Management,* 16**,** 1240011.

SINGH, J. & SIRDESHMUKH, D. 2000. Agency and trust mechanisms in consumer satisfaction and loyalty judgments. *Journal of the Academy of marketing Science,* 28**,** 150-167.

SKINNER, B. F. 1938. The behavior of organisms: an experimental analysis.

SLOAN, P. 2009. Redefining stakeholder engagement. *Journal of Corporate Citizenship,* 2009**,** 25-40.

SMITH, M. L. 2006. Overcoming theory-practice inconsistencies: Critical realism and information systems research. *Information and Organization,* 16**,** 191-211.

SOLIMAN, W. & TUUNAINEN, V. 2012. Crowdsourcing as a mobile service-case study: Publishing photography.

SORENSEN, H. T., SABROE, S. & OLSEN, J. 1996. A framework for evaluation of secondary data sources for epidemiological research. *International journal of epidemiology,* 25**,** 435-442.

SPENCE, L. J. & SCHMIDPETER, R. 2003. SMEs, social capital and the common good. *Journal of Business Ethics,* 45**,** 93-108.

STÅHLBRÖST, A. & BERGVALL-KÅREBORN, B. 2013. Voluntary Contributors in Open Innovation Processes. *Managing Open Innovation Technologies.* Berlin Heidelberg: Springer.

STEERS, R. M., MOWDAY, R. T. & SHAPIRO, D. L. 2004. Introduction to special topic forum: The future of work motivation theory. *The Academy of Management Review***,** 379-387.

STENMARK, D. 2000. Leveraging tacit organizational knowledge. *Journal of management information systems,* 17**,** 9-24.

STEVENS, E. 1975. Design of Inquiring Systems-Basic Concepts of Systems and Organisation-Churchman, CW. Amer Educational Research Assoc 1230 17th ST NW, Washington, DC 20036-3078.

STONE 1978. *Research Methods in Organizational Behavior,* Glenview, IL, Scott, Foresman and Co.

STROUSE, K. G. 1999. *Marketing telecommunications services: New approaches for a changing environment,* Norwood, MA, Artech House Inc.

SUTTON, R. I. & STRAW, B. M. 1995. What theory is not. *Administrative Science Quarterly,* 40**,** 371-384.

SWANSON, E. B. & RAMILLER, N. C. 2004. Innovating Mindfully with IT. *MIS Quarterly,* 28**,** 553-583.

SYKES, W. 1990. Validity and reliability in qualitative market research: a review of the literature. *Journal of Market Research Society,* 32.

SYMON, G. E. & CASSELL, C. E. 1998. *Qualitative methods and analysis in organizational research: A practical guide,* Sage Publications Ltd.

SYMONS, V. 1991. A review of information systems evaluation: Content, context and processes. *European Journal of Information Systems,* 1**,** 205-212.

TAPSCOTT, D. & WILLIAMS, A. 2008. *Wikinomics - How mass collaboration changes everything,* London, Penguin.

TERESA, A. 1998. How to kill creativity: keep doing what you're doing. Or, if you want to spark innovation, rethink how you motivate, reward, and assign work to people. *Harvard Business Review***,** 77 - 87.

TERWIESCH, C. & XU 2008. Innovation Contests, Open Innovation and Multiagent Problem Solving. *Management Science,* 54**,** 1529 - 1543.

TESCH, R. 2013. *Qualitative research: Analysis types and software*, Routledge.

THIBAUT, J. W. & KELLEY, H. H. 1959. *The social psychology of groups,* Oxford, England, John Wiley.

THORN, B. K. & CONNOLLY, T. 1987. Discretionary Data Bases A Theory and Some Experimental Findings. *Communication Research,* 14**,** 512-528.

TROTT, P. 2004. *Innovation management and new product development*, Pearson Education.

TROTT, P. & HARTMANN, D. A. P. 2009. Why Open Innovation is old wine in new bottles. *International Journal of Innovation Management,* 13**,** 715-736.

TSAI, W. 2002. Social structure of "coopetition" within a multiunit organization: Coordination, competition, and intraorganizational knowledge sharing. *Organization science,* 13**,** 179-190.

TSAI, W. & GHOSHAL, S. 1998. Social capital and value creation: The role of intrafirm networks. *Academy of management Journal,* 41**,** 464-476.

UGANDER, J., BACKSTROM, L., MARLOW, C. & KLEINBERG, J. 2012. Structural diversity in social contagion. *Proceedings of the National Academy of Sciences,* 109**,** 5962-5966.

UZZI, B. 1997. Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative science quarterly***,** 35-67.

VALENZUELA, S., PARK, N. & KEE, K. F. 2009. Is there social capital in a social network site?: Facebook use and college students' life satisfaction, trust, and participation1. *Journal of Computer-Mediated Communication,* 14**,** 875-901.

VAN DE VEN, A. H. 1986. Central problems in the management of innovation. *Management Science,* 32**,** 590-607.

VAN DE VRANDE, V., JONG, J. P. D., VANHAVERBEKE, W. & ROCHEMONT, M. D. 2009. Open innovation in SMEs: Trends, motives and management challenges. *Technovation,* 29**,** 423 - 437.

VAN DER LINDEN, F., LUNDELL, B. & MARTTIIN, P. 2009. Commodification of industrial software: A case for open source. *IEEE software,* 26**,** 77-83.

VANHAVERBEKE, W. & CLOODT, M. 2006. Open innovation in value networks. *In:* CHESBROUGH, H., VANHAVERBEKE, W. & WEST, J. (eds.) *Open Innovation: Researching a New Paradigm.* Oxford: Oxford University Press.

VANHAVERBEKE, W., CLOODT, M. & VAN-DE-VRANDT, V. 2007. Connecting absorptive capacity and open innovation. Centre for Advanced Study Workshop on Innovation in Firms.

VANNESTE, B. S. & PURANAM, P. 2010. Repeated interactions and contractual detail: Identifying the learning effect. *Organization science,* 21**,** 186-201.

VANSTEENKISTE, M., SOENENS, B., SIERENS, E., LUYCKX, K. & LENS, W. 2009. Motivational Profiles from a Self Determination Perspective: The Quality of Motivation Matters. *Journal of Educational Psychology,* 101**,** 671-688.

VARGO, S. & LUSCH, R. 2004. Evolving to a new dominant logic for marketing. *Journal of Marketing,* 68**,** 1-17.

VASQUEZ 1995. The Post-Positivist Debate: Reconstructing Scientific Enquiry and International Relations Theory after Enlightenment's Fall. *In:* BOOTH & SMITH (eds.) *International Relations Theory Today.* Cambridge: Polity Press.

VIVACQUA, A., MORENO, M. & DE SOUZA, J. 2003. Profiling and matchmaking strategies in support of opportunistic collaboration. *On The Move to Meaningful Internet Systems 2003: CoopIS, DOA, and ODBASE.* Springer.

VOLKEMA, R. J. 1983. Problem formulation in planning and design. *Management Science,* 29**,** 639-652.

VON-HIPPEL, E. 1988. *The sources of innovation,* New York, Oxford University Press.

VON HIPPEL, E. 2005. Democratizing innovation: The evolving phenomenon of user innovation. *Journal für Betriebswirtschaft,* 55**,** 63-78.

VON HIPPEL, E. 2007. Horizontal innovation networks—by and for users. *Industrial and corporate change,* 16**,** 293-315.

VON HIPPEL, E. & KROUGH 2003. Open source software and the 'private-collective innovation model: issues for organisation science. *Organisation Science,* 14**,** 209 - 223.

VON KROGH, G., SPAETH, S., HAEFLIGER, S. & WALLIN, M. 2008. Open source software: What we know (and do not know) about motives to contribute. *DIME-DRUID Fundamental on Open and Proprietary Innovation Regimes", May 17th, Copenhagen, Denmark.*

VROOM, V. H. 1964. *Work and motivation,* Oxford, England, Wiley.

VUKOVIC, M., LOPEZ, M. & LAREDO, J. Peoplecloud for the globally integrated enterprise. Service-Oriented Computing. ICSOC/ServiceWave 2009 Workshops, 2010. Springer, 109-114.

WADHAW, A., BODAS-FRITAS, I. M. & SARKER, M. B. 2011. The paradox of being open: External technology sourcing and knowledge protection. *Dynamics of Institutions and Markets (DIME) Final Conference.* Maastricht, Netherlands.

WALSHAM, G. 1993. *Interpreting information systems in organizations,* Chichester, John Wiley & Sons, Inc.

WALSHAM, G. 1995. Interpretive case studies in IS research: nature and method. *European Journal of Information Systems,* 4**,** 74-81.

WALTER, J., LECHNER, C. & KELLERMANNS, F. W. 2007. Knowledge transfer between and within alliance partners: Private versus collective benefits of social capital. *Journal of Business Research,* 60**,** 698-710.

WANG, Y., HWANG, Y.-H. & FESENMAIER, D. R. 2006. Futuring internet marketing activities using change propensity analysis. *Journal of Travel Research,* 45**,** 158-166.

WASKO, M. & FARAJ, S. 2000. "It is what one does": why people participate and help others in electronic communities of practice. *Journal of Strategic Information Systems,* 9**,** 155-173.

WASKO, M. M. & FARAJ, S. 2005. Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS Quarterly***,** 35-57.

WAYNE GOULD, R. 2012. Open innovation and stakeholder engagement. *Journal of Technology Management & Innovation,* 7**,** 1-11.

WEBER, M. 1947. *The Theory of Social and Economic Organization: Being Part I OfWirtschaft und Gessellschaft*, W. Hodge.

WEBSTER, J. & WATSON, R. 2002. Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly,* 26**,** 8 - 23

WEICK, K. 1984. Theoretical assumptions and research methodology selection. *In:* MCFARLAN (ed.) *The Information Systems Research Challenge.* Harvard Business School Press.

WELLMAN, B. 1982. Studying personal communities. *Social structure and network analysis***,** 61-80.

WELLMAN, B. & GULIA, M. 1999. Net surfers don't ride alone: Virtual communities as communities. *Networks in the global village***,** 331-366.

WELLMAN, B. & WORTLEY, S. 1990. Different strokes from different folks: Community ties and social support. *American Journal of Sociology,* 96**,** 558.

WEST, J. 2007. Value capture and value networks in open source vendor strategies. *Hawaii International Conference on System Sciences.*

WEST, J. & GALLAGHER, S. 2006. Challenges of open innovation: the paradox of firm investment in open-source software. *R&D Management,* 36**,** 319-331.

WEST, J. & LAKHANI, K. R. 2008. Getting clear about communities in open innovation. *Industry & Innovation,* 15**,** 223-231.

WEST, J. & O'MAHONY, S. 2008. The role of participation architecture in growing sponsored open source communities. *Industry and Innovation,* 15**,** 145 - 168.

WESTRUM, R. 1991. *Technologies & society: The shaping of people and things,* Wadsworth Publishing Company.

WHETTEN, D. A. 1989. What constitutes a theoretical contribution? *Academy of management review,* 14**,** 490-495.

WILDEMUTH 1993. Post-Positivist Research: Two Examples of Methodological Pluralism. *The Library Quarterly,* 63**,** 450-468.

WITTE, E., JOOST, N. & THIMM, A. L. 1972. Field research on complex decision-making processes-the phase theorem. *International Studies of Management & Organization,* 2**,** 156-182.

WITZEMAN, S., SLOWINSKI, G., DIRKX, R., GOLLOB, L., TAO, J., WARD, S. & MIRAGLIA, S. 2006. Harnessing external technology for innovation. *Research Technology Management,* 49.

WOJCIK, S. 2007. How does eDeliberation work? A study of French local electronic forums. *Understanding eParticipation. Contemporary PhD eParticipation research in Europe***,** 153-167.

WOLFE, C. & LORAAS, T. 2008. Knowledge sharing: The effects of incentives, environment, and person. *Journal of information systems,* 22**,** 53-76.

WOOLCOCK, M. 1998. Social capital and economic development: Toward a theoretical synthesis and policy framework. *Theory and Society,* 27**,** 151-208.

WU, C.-G., GERLACH, J. H. & YOUNG, C. E. 2007. An empirical analysis of open source software developers' motivations and continuance intentions. *Information & Management,* 44**,** 253-262.

YANG, CHEN & BANKER 2011. Winner Determination of Open Innovation Contests in Online Markets. *International Conference on Information Systems.* Shanghai.

YANG, S., LEE, H. & KURNIA, S. 2009. Social Capital in Information and Communications Technology Research: Past, Present, and Future. *Communications of the Association for Information Systems,* 25.

YIN, R. 1984. *Case Study Research 1st Edition,* London, SAGE.

YIN, R. 1994. *Case Study Research: Design and Methods 2nd Edition,* SAGE Publishing.

YIN, R. 2008. *Case Study Research: Design and Methods 4th Edition,* London: Sage Publisher.

YING, L. & MENGQING, S. 2011. Literature analysis of innovation diffusion. *Technology and investment,* 2011.

YLI-RENKO, H., AUTIO, E. & SAPIENZA, H. J. 2001. Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms. *Strategic Management Journal,* 22**,** 587-613.

YUTHAS, K. & DILLARD, J. 1999. Ethical development of advanced technology: A postmodern stakeholder perspective. *Journal of Business Ethics,* 19**,** 35-49.

ZAHEER, A., GULATI, R. & NOHRIA, N. 2000. Strategic Networks. *Strategic Management Journal,* 21**,** 203-215.

ZAJAC, E. J. & OLSEN, C. P. 1993. From transaction cost to transactional value analysis: Implications for the study of interorganizational strategies. *Journal of Management Studies,* 30**,** 131-145.

ZHAO, Y. & ZHU, Q. 2012. Exploring the Motivation of Participants in Crowdsourcing Contest. *International Conference on Information Systems.* Orlando.

ZHENG, H., LI, D. & HOU, W. 2011. Task Design, Motivation, and Participation in Crowdsourcing Contests. *International Journal of Electronic Commerce,* 15**,** 57-88.

ZIETSMA, C. & WINN, M. 2008. Building chains and directing flows: Strategies and tactics of mutual influence in stakeholder conflicts. *Business & Society,* 47**,** 68-101.

ZIMAN, J. 1991. *Reliable knowledge: An exploration of the grounds for belief in science,* Cambridge University Press.

APPENDICES

Appendix 1: Social Capital Coding Sample-Competitive Markets

		Impact of Construct	*Mechanisms Used*			
	Ties	***Trust***	***Reciprocity***	***Self-identity***	***Shared Vision***	***Shared Language***
Quote	InnoCentive solvers are solo, and InnoCentive has struggled for years to create this in a team challenge, they struggled to allow people to work in teams. And I don't want to get into the field of why is that, but for InnoCentive it just hasn't worked.	In fact we want to grow that aspect (Trust) of the platform, where today the primary activity is competitions, but what is going to happen is if we enable more collaboration between these folks and general discussions, the chances that they will become more engaged and remain on the platform longer will go up, so that is where we want to evolve going forward.	Well there is a forum where they can discuss with each other and communicate with each other...	Every time you can find a good crowd to solve your particular challenge, I don't care if these people are new, or if they are somehow affiliated within this crowd, I don't. There is nothing that I see that would make an affiliated solver better than its counterpart.	You really have to make sure that your solvers understand everything. So, to make sure they understand the requirements, the scope, yes, you must do that.	English is the primary language so you have to know that, except if the language of the expert and the client is the same. English is the most important, and it can be an obstacle if they do not speak it.
Platform	***InnoCentive***	***CrowdANALYTIX***	***NineSigma***	***InnoCentive***	***InnoCentive***	***Presans***
Quote	There is an automatic online system to do the match making.	The first one is that we focus on signing up big companies because they will build up the trust in our brand. If we for example release a competition with IKEA, I think people also give us trust because IKEA gives us trust.	Absolutely. I think these guys, you see a lot of discussions on the forums so yes, without a doubt. It is a community that wants to learn from each other and that is one reason why it's working.	There is also another part which is relevant to the community itself, it is both a global one in that we have members from all over the world, but also that you can find opportunities from many various business sectors and industry sectors, so that often allows people to keep track on what is going on in other sectors or technology areas where they can find the opportunities that they couldn't find elsewhere, or in their current industry.	Yeah, that is one of the arguments why you should have like a physical event at the beginning because at the event the company can have like a more, go deep in the brief and give more information.	If you can boil it down to that, and if you are clear about the output expectations, and mention that your benchmark prediction error needs to be less than .035, now they know what they need to do, it doesn't matter which country they are from.
Platform	***Innoget***	***Crowding***	***CrowdANALYTIX***	***Innoget***	***Crowding***	***CrowdANALYTIX***
Quote	On our platform, every project is held as a data competition, where 150+ people compete against each other to deliver the best solutions.	People must be certain that they don't cheat. And if you work with a large crowd of people, there are always people who complain that, they were cheated, they've been treated unfairly etc. So your role as a moderator is to minimize this kind of dissent.	We have found one model that works really good and it is the one that works with iterations. So we have like different steps and all the crowd can publish ideas in each step and between the steps we will announce winners and the people can build upon each others ideas.	We have built in a points system and then you can translate or convert points into whatever you want, it could be a gift or whatever, but it could only be from points if you want that. We also have an option that we can convert points to real money. So, in the end of the challenge we could put out a lot of money to the winners.	So I mean we are learning how to break these things down in a way that clients abstract problems can be solved through this mechanism, and we are still evolving this by the way. So this is our biggest challenge.	But I also see that technology starts solving those problems. So Google translate for example was the first version, but now you have more real time translators and also they start working for your voice for example.
Platform	***CrowdANALYTIX***	***InnoCentive***	***Crowding***	***Crowding***	***CrowdANALYTIX***	***Crowding***

Appendix 2: Social Capital Coding Sample-Collaborative Communities

		Impact of Construct	*Mechanisms Used*			
	Ties	***Trust***	***Reciprocity***	***Self-identity***	***Shared Vision***	***Shared Language***
Quote	Yeah, in this concept, people were allowed to work individually, or in teams. We saw that the teams had better performances especially when it was a multi-disciplinary team.	So bringing to other people arenas where they can engage and connect with each other and build upon the trust is an idea that is very instrumental in what we do.	Our goal is to have collaborative innovations, that is why we put an emphasis on this.	They say also that learning this process, coming up with ideas and selecting one that they want to develop further has been of value also.	For sure, we present the challenge in a kind of briefing	I think the challenge is that some people who run a challenge for their first time make it way too complicated, you know like the first deliverable is overwhelming and they put a lot of constraints, too many constraints, where they will have like a 48 question questionnaire, and then you are just deterring people away because it is just a long form.
Platform	***Battle of Concepts***	***Munktell Science Park***	***Phantominds***	***Munktell Science Park***	***Phantominds***	***Skild***
Quote	Some will say "I never want to work with that idiot again!" and some will say "The next team I am doing please put me on with so and so" and we keep that so next time the challenge comes up	And that is why we, we want to in our beta version, if you put the idea in it, then we will freeze it so you cannot change it.	As the way accelerators work, they engage with the mentors most of the time, or the mentors that are helping the start ups in the accelerator programs doing that solely on the voluntary basis, just giving back to the community. The accelerator programs, they always affiliate the mentors they have with the F6S platforms which kind of spreads the message around.	Some of them participate in both, commercial competitions and in competitions for fun. But there are a lot of people who only participate in competitions for fun.	We had a briefing per challenge	In the pilot project we had not such problems with the people not understanding each other because of using different terminologies or expertise specific terms, but I think it could be an issue if the community gets bigger.
Platform	***Idea Connection***	***Phantominds***	***F6S***	***NASA Tournament Lab***	***Battle of Concepts***	***Phantominds***
Quote	And it just, you know in terms of getting the extreme value outcomes, I think you can do it individually, I mean we have shown that, but why not collaborate, why not sort of integrate the ethos into the work experience and just take it a level further?	So they have all signed NDA's beforehand.	And for most of us, the main incentive there is sort of like delivery based but if you look to the sides and go more professional than that, you are getting the competition of the scientists and they actually like collaborating.	Besides that, because it was a competition everybody was on a ranking, so you could be the most creative of this year, or of this month, or in total, as long as the platform existed. So what you saw also was that the students and young professionals were really battling with each other to gain a higher spot in this ranking.	And when we did these things (to create a shared vision), and some of them took us a few years before we did them, the solve rate went way up, so it is really important to address what you just talked about.	Yeah, I highly believe it does, and that is the reason why we wanted to write all these briefings, because for example the difference in language between commercial companies and governmental companies, it is a completely different writing style.
Platform	***Appirio***	***Idea Connection***	***NASA Tournament Lab***	***Battle of Concepts***	***Idea Connection***	***Battle of Concepts***

Appendix 3: Interview Protocol

1. First, can you please provide me with an overview of your previous experiences of open innovation contest engagement?
2. What do you believe the benefits are of engaging with open innovation contests in general?
3. What do you feel are the challenges associated with these contests?
4. Was there anything in particular that motivated you to engage in these contests?
5. Social capital is usually defined as being the good will, fellowship, sympathy and social intercourse that exists between individuals in a community setting. How is social capital important to solvers in engaging with open innovation contests? Can you illustrate with some examples?

Social Capital is divided down into three sub-dimensions which will be addressed throughout the remaining questions. The first dimension is that of a Structural Dimension.

Structural Dimension of Social Capital – relevant for examining individual actions, such as the knowledge contributions within a collective, as it involves the pattern of relationships between the problem solvers.

This dimension revolves around the social ties between solvers.

6. How important do you feel is the ability for solvers to interact to their peers when engaging in the innovation process?
7. How do you think the social ties between solvers plays a role in the innovation process?
8. How does communication take place between solvers? Could you provide examples of this?
9. Do you think contests should be a collaborative, or an individual effort?
10. In your opinion, do you think solvers collaborate well? Why/why not?
11. What might increase collaboration between solvers?
12. How is technology utilised to facilitate this dimension?

Relational Dimension of Social Capital – this exists when members develop a strong identification with the collective, perceive an obligation to participate in the collective, trust others, while also recognising and abiding by the norms of the community.

This dimension revolves around trust, reciprocity and self-identification.

13. How sensitive are solvers about freely revealing knowledge or information?
14. Do you believe there is a general freedom of information that exists between solvers?
15. Do you think that solvers would have any problems working with anonymous users?
16. How important is trust between solvers and how does it impact the performance of the solver? In the contest settings that you have experienced, would there be a high level of trust? Examples?
17. How would solvers go about establishing trust with users they have not had any dealings with previously?
18. Is there a culture of reciprocity between solvers in contest settings? For example, if a solver is offered advice, would they in turn provide their own feedback or assistance? Is it an aspect most solvers would be aware of? (Reciprocity)
19. Some solvers engage in these contests to see themselves as being involved with a community, to self-identify with the community as it were. Is there anything based on your experience that solvers do to strengthen their commitment to the contest community? What about trying to heighten their reputation or influence?
20. How is technology utilised to facilitate this dimension?

Cognitive Dimension – this allows for shared representations, interpretations and systems of meaning within the collective, as meaningful exchange of knowledge requires some level of shared understanding between parties.

This dimension revolves around the shared language and the shared vision that exists between solvers.

21. The first criterion of this dimension involves having a shared language among solvers. When one considers the many difficulties inherent to terminology, slang, different languages between solvers etc., how do the solvers deal with such issues and how does it affect them? Have you ever seen a project break down as a result of this?
22. Once a challenge has been issued to the community of solvers, how do they in turn ensure there is a shared vision between each other that the direction they are taking will result in a successful solution? How do solvers become aware of the nature of their roles? (Shared vision)
23. Do you think such a shared vision serves to increase the collaboration between solvers, or does it simply serve to heighten the competition?
24. How is technology utilised to facilitate this dimension?

Wrap Up

25. Is there anything else you would like to comment on regarding this research?

Appendix 4: Additional Theoretical Lenses Explored

While social capital was the theoretical lens implemented within this investigation, the researcher also investigated several alternatives, which are outlined below. A brief summary of their concepts, along with the reasons of why they were not selected as part of this study are further outlined.

Self Determination Theory (SDT)

SDT was developed by drawing on humanistic, psychoanalytic and cognitive theories of human development, as well as studies comparing extrinsic and intrinsic motivations. SDT approves the humanistic approach toward organismic development, along with a post-modern approach that sees human nature as lacking such endowment, while integrating the phenomena of these viewpoints (Ryan and Deci, 2002). According to SDT, after basic psychological needs have been satisfied, people become filled with a sense of self authentic and congruent intrinsic aspect of their being (Hodgins and Knee, 2002). SDT is thus a theory of human motivation which focuses on the active, growth orientated human organism and social contexts that either support or undermine solvers' attempts to master and integrate their experiences into a cohesive sense of self (Miniotaitė and Bučiūnienė, 2013).

An inherent limitation however involves using the five motivational variables (i.e. external, introjected, intrinsic, identified and integrated) discerned within SDT when exploring social capital. The concept of social capital exists as an internalised extrinsic motivation of identified regulation. SDT was therefore deemed to reduce the required rigor of this study. Similar limitations have also been experienced by Vansteenkiste et al. (2009) when exploring the dimensions of autonomous and controlled motivations. By adopting a post-positivist approach of investigating cluster comparisons, Vansteenkiste et al. (2009) argued that more clusters might emerge if subjected to further clustering variables. For example, some solver groups may be characterised by strong external pressure (i.e. external regulation), whereas others are more characterised by strong internal pressure (i.e. introjection). Also, there might exist a group of solvers who do not experience contest platforms as particularly fun and challenging (i.e. intrinsic motivations), but understand the personal relevance to their

engagement (i.e. identification). This is an issue not addressed in current research (Vansteenkiste et al., 2009).

Transaction Cost Economics Theory

A prevalent theory encountered while reviewing prior literature of IT-enabled innovation contest platforms was that of transaction cost economics (TCE). This theory was first introduced by Ronald Coase in his article "*The Nature of the Firm*" in the 1930s (Coase, 1937). The prevalence of TCE was arguably to be expected as one of the founding streams of innovation contest literature is rooted in economics. Lazear and Rosen (1979) proposed the first contest model, in a linear format, to identify the optimal design for a contest prize.

This theory ultimately emphasises that companies choose to engage in open innovation processes in order to reduce transaction costs (Vanhaverbeke et al., 2007). Based on this reasoning, this theoretical framework is fundamentally a single firm orientated analysis of cost reduction where efficiency has been identified as being the source of value. Building from this, firms that economise on transaction costs can therefore be expected to be in a position of extracting more value from their transactions (Amit and Zott, 2001).

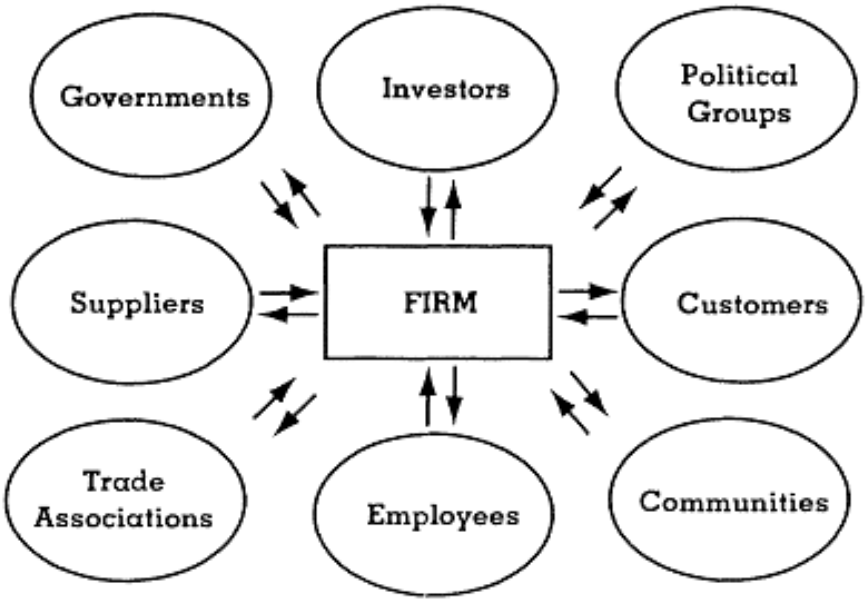
Bringing this theory to bear on the influences of social capital towards innovation provides several limitations to this theory. In an economic system, the realisation of profits is the primary criterion according for successful firms, with decisions and criteria being dictated by the system being more important than those made by the individuals in it (Alchian, 1950). Innovations create economic value by improving existing goods or services, decreasing their costs or alternatively creating new goods or services for which there is sufficient demand. However, this economic value is not necessarily caught by the innovator, and nor is it easily exploitable for the organisation seeking the innovation given that competitors and potential entrants will ultimately be in a position to imitate the innovation.

While research on open innovation is in its infancy, especially with respect of using such a theory as a lens, it has been found that emphasis on this aspect diverts attention

away from other important sources of value such as innovation and the allocation of resources (Moran and Ghoshal, 1996). These findings have also been highlighted by other authors (Amit and Zott, 2001, Lazonick, 1993) who agree that this theory not only neglects innovation while focusing on cost minimisation, but also the interdependence between exchange parties and emergent opportunities for value creation. More recent literature has found that organisations involved in open innovation practices are not interested in such transaction cost minimisation (Vanhaverbeke et al., 2007). Instead, by aiming for transactional value the organisations will strive towards cooperative modes with a higher transaction cost (so long as the predicted mutual gains will outweigh the transaction cost) (Zajac and Olsen, 1993).

Stakeholder Theory

While not encountered in preliminary research of research articles, stakeholder theory arguably holds significant promise to develop a theoretical lens in this emerging discipline of open innovation (Wayne Gould, 2012). Freeman (2010) defines the role of a stakeholder as being: "*any group or individual who can affect or is affected by the achievement of a corporation's purpose*" (p.6). This definition is still widely accepted and theorises that the firm is at the centre of a broad range of stakeholder groups (Harrison and Wicks, 2013) i.e. solvers. The foundational work of this theory identifies the importance of the role of stakeholders and their relationship to the organisation (Freeman, 2010). As multiple players interact with the organisation, each of these stakeholders must be taken into account by the organisation when facing decisions in the operating environment.



Stakeholder Model (Freeman, 1984)

The stakeholder model (illustrated above) highlights clearly the relationships among the various groups of actors in and outside the organisation as a map in which the organisation is the hub of a wheel and stakeholders are the ends of spokes around the rim. When traced back, stakeholder theory has its origins in management literature dating back to the Great Depression in the United States (1921-1941). More recent refinements to stakeholder theory distinguishes between two particular groups of stakeholders (Freeman et al., 2007):

i. *Primary stakeholders*. These stakeholders define the business, such as employees, customers, suppliers and communities etc... These individuals/groups aim to control and manage risks related to conflicts of interest.
ii. *Secondary stakeholders*. These stakeholders include competitors, media, government and social-interest groups. These individuals/groups provide up of collaborative activities that impacts, influences and supports the relationships with the primary grouping (Freeman et al., 2007, Sloan, 2009).

Although the primary groups are seen as being key, in some situations the secondary stakeholders are more important and they cannot *a priori* be relegated to a subsidiary

position (Mishra and Mishra, 2013). Early investigations of the stakeholder concept support the involvement of end-users as a component of effective IS development and implementation (Mumford and Weir, 1979). This correlation has resulted Boddy and Buchanan (1986) arguing that "*organisations can be viewed as comprising different* "stakeholder" *groups whose interests in promoting or resisting change, or apathy to innovation, may be explained by identifying their respective perceived interests and by examining how they will be affected by new technology*" (p. 11). Boddy and Buchanan (1986) subsequently define organisational information system stakeholders as being "*all those who have a practical concern for the effective application of new technologies, and who are in a position to take or to influence decisions about why and how they are used*" (p. 12).

Alongside accessing information, stakeholder engagement also facilitates relationship building between these stakeholders and the organisation (Sharma, 2005). This garnered information can in turn be used to generate innovations that successfully impact profitability and operations. As such, stakeholder theory has been applied to different domains in the IS area, most notably; E-government (Flak and Rose, 2005), E-commerce (Chua et al., 2005), business ethics (Yuthas and Dillard, 1999), health information technology (Lapointe and Rivard, 2005) and business intelligence (Chung et al., 2009). However, participating stakeholders may potentially be involved with a range of organisations and may be representing the interests of their own organisations to a greater or lesser extent, with some stakeholders often seeking to link with others on their own in efforts to improve capabilities and processes (Zietsma and Winn, 2008). As a result stakeholder relationships can be quite complex (Lewrick et al., 2007).

Therefore, stakeholder theory is primarily viewed as an analytical tool which serves to evaluate the nature of multiple interactions and interdependencies between and among stakeholder groups (Wayne Gould, 2012). In addition, there remains a distinct absence of studies when it comes to broadening the definition of stakeholders and investigating private persons' involvement in innovation activities (Ståhlbröst and Bergvall-Kåreborn, 2013).