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Strategic Investment Appraisal: Multidisciplinary Perspectives

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Introduction

Strategic investment projects are substantial investments, involve high levels of risk, produce hard-to-quantify (or intangible) outcomes, and have a significant long-term impact on corporate performance. Typical examples of strategic investment decisions include mergers and acquisitions (M&A). Strategic investment projects calls for a variety of decision-making approaches – from 'rational economic' to 'incremental-adaptive' - and a variety of analysis tools. M&A are arguably one of the CEOs greatest challenges, and there is a critical need to get these decisions right. It is clear that no single theory is adequate to describe or inform how M&A are evaluated in uncertain conditions, but there are several that offer partial explanations or at least contribute towards our understanding of how managers can deal with the uncertain environment and assess the likely risks associated with M&A. The literature suggests how relevant theories might be aggregated to make sense of strategic investment decision and investment appraisal techniques in an organizational context and considers the implications for further research in this important area of M&A.

This chapter focuses on strategic investment appraisal in organizations and draws together a variety of theoretical perspectives, especially from the field of psychology. which may be unfamiliar to both scholars in and practitioners. For this purpose, a strategic investment appraisal refers to approaches used in an allocation of the firm's capital to a specific strategic option such as merger or acquisition in pursuance of the organization's goals.

Strategic investment appraisal generally requires an evaluation of the likely outcomes of M&A, both positive and negative, in terms of the financial and non-financial consequences that are predicted to flow from an initial commitment of capital. Although the future cannot be accurately predicted, M&A decisions must be made with limited information in conditions of uncertainty. Some outcomes can be foreseen with some certainty, especially where we have knowledge and experience of making similar decisions in the past – these we call risks, which may be "calculated" in some sense. Others may be less foreseeable, so stay within the realm of "uncertainty" (Harris, 2014).

INTRODUCTION

Strategic investment decision-making processes are the art and science of achieving an organization's strategy. During the past four decades, a considerable body of literature on the theory and practice of various themes of strategic investment decisions and investment appraisal techniques has emerged. Established financial analysis techniques remain important in appraising investment choices, despite their limiting assumptions and their recognized shortcomings in capturing strategic investment decision-making. Therefore, it is not surprising that the theory and practice of both conventional and sophisticated financial appraisal techniques practices have received much attention in previous studies (Klammer and Walker, 1984; Klammer and Wilner, 1991; Kim and Farragher, 1981; Pike, 1982, 1984 and 1988; Pike and Wolf 1988; Arnold and Hatzopoulos, 2000; Alkaraan and Northcott, 2006; Ma and Tayles, 2009).

"Strategic management and strategic management accounting literatures suggest that a company's tendency to emphasize strategic versus financial considerations may be moderated or reinforced by its strategic orientation" (Carr *et al*., 2010, p. 9). A tendency to emphasise strategic versus financial considerations in strategic investment appraisal practice s may be moderated or reinforced by a company's management style, which can be categorised as strategic planning, strategic control or financial control. The strategic decision process must be aligned with the organizational strategies and strategic choices cannot be properly understood unless we understand the context surrounding strategic investment decision- making processes (Elbanna, 2006; Elbanna and Child, 2007; Carr *et al*., 2010; Alkaraan and Northcott, 2013). Researchers have used various conceptual frameworks, including cognitive, social, cultural and political aspects to achieve a better understanding of the strategic investment appraisal process

(e.g. Harris and Woolley, 2009; Harris *et al*., 2009; Carr *et al*., 2010; Emmanuel, *et al*., 2010; Harris, 2014).

The remainder of the chapter is structured as follows: Section 2 reviews the existing literature on strategic investment appraisal. Section 3 explores strategic investment appraisal approaches through a review of relevant literature. Section 4 reviews the cognitive perspective of strategic investment appraisal. Section 5 completes the chapter with some concluding remarks, a consideration of the limitations of the research and suggestions for future research.

Strategic Investment Appraisal

Strategic investment decisions are non-programmed, complex, uncertain, subjectively influenced by the values and expectations of those who determine the organization's strategy, and have significant effects on long-term performance and the organization as a whole. Typical examples of such decisions include mergers and acquisitions, joint ventures, the introduction of major new product lines and markets, the introduction of advanced manufacturing/business technologies and substantial shifts in production capability (Butler *et al*., 1991 and 1993; Slagmulder *et al*., 1995; Van Cauwenbergh *et al*., 1996; Carr and Tomkins, 1996, 1998; Slagmulder, 1997; Northcott and Alkaraan, 2007; Harris *et al*., 2009; Northcott and Alkaraan, 2007; Harris, 2014; Alkaraan, 2015). Empirical surveys have reported a good deal about capital investment decision-making practice in general. Practice in regard to the use of capital investment financial analysis techniques has been well investigated (see for example the following UK studies: Pike & Wolfe, 1988; Pike, 1988; Pike & Sharp, 1989; Ho & Pike, 1991 & 1992; Lefley, 1994; Pike, 1996; Arnold & Hatzopoulos, 2000). The use of 'conventional' investment appraisal techniques, (payback [PB], return on assets or investment [ROA or ROI],

internal rate of return [IRR] and net present value [NPV]), and risk analysis approaches (e.g. sensitivity analysis; adjustment of the payback period or discount rate), have been examined in almost all of these prior studies. Yet, despite the importance of strategic investments, little specific attention has been given to developments in how these complex and uncertain projects are assessed.

Although DCF analyses have long been considered the most effective technique for evaluating investment alternatives[1], writers have attacked DCF techniques for their theoretical and implementation problems in practical business contexts. As already noted, financial project appraisals, particularly those involving DCF models, tend to be biased towards short-term, less strategic investments whose benefits are most easily quantified. Also, the rationality of such financial analyses is compromised where techniques are improperly applied, cash flows are inaccurately estimated, hurdle-rates are inappropriate, or important non-quantifiable project attributes are omitted (Dugdale & Jones, 1995; Adler, 2000). Critics of conventional investment appraisal methods further argue that DCF analysis is an inadequate and incomplete means of securing a 'rational' decision process in regard to strategic investments, because it fails to capture 'intangible' project attributes and ignores the value of future flexibility embedded within some strategic projects (Pike *et al*., 1989; Slagmulder *et al*, 1995; Carr & Tomkins, 1996 & 1998; Dempsey, 2003; Busby & Pitts, 1997).

In light of these shortcomings of conventional financial analyses, it has been argued that strategic investment projects should not be justified solely on their capacity to create economic value for the firm. Rather, a complementary evaluation of their contribution to competitive strategy is required (Butler *et al*., 1991; Carr *et al*., 1994;

[1] The past decade has seen the emergence of three popular techniques for measuring value creation - the equity spread model, the shareholder value approach, and the economic value-added model. For all their differences in implementation, each approach is fundamentally based on the DCF model.

Adler, 2000). Product quality, fit with business strategy and improved competitive position are amongst those factors identified as important influences on strategic investment decision-making (Pike *et al.*, 1989). Yet, these hard-to-quantify benefits from strategic investments remain difficult to evaluate using conventional financial techniques. Strategic investment decision-making may require a different approach, therefore (Butler et al., 1991; Van Cauwenbergh et al., 1996). Empirical studies (e.g. Butler et al., 1991; Carr et al., 1994; Slagmulder et al.1995; Van Cauwenbergh et al., 1996) suggest that a 'subjective' decision-making approach is often evident in practice, with strategic factors forming a crucial part of the decision-making input. Butler et al. (1991, p.402) noted "In making decisions on strategic investments, quantifiable financial performance factors (whether measured by discounted cash flow techniques, payback period, or impact on sale and profits) were viewed as of secondary importance by most respondents…. Product quality, fit with business strategy and improving the competitive position of the firm were the most important factors considered by all informants".

Strategic Investment Appraisal Approaches

Numerous calls have issued for a more sophisticated approach to supporting strategic investment project appraisal by integrating strategic and financial considerations (Slagmulder *et al.*, 1995; Lefley,1996; Shank & Govindarajan, 1993; Shank, 1996; Adler, 2000). To this end, various strategic investment appraisal tools, which combine quantitative and qualitative factors, have been linked with strategic capital investment decision-making. Key tools at the forefront of recent strategic management accounting developments, are outlined below.

The balanced scorecard

Kaplan and Norton (1992) devised the popular "balanced scorecard" as a set of measures that link financial measures of performance with non-financial measures (focused on customers, internal business processes, and innovation and learning), to give managers an integrated framework for managing and evaluating their businesses. Kaplan and Norton (2001) advocated the balanced scorecard as a strategic management and decision-making tool, leading others to suggest that a balanced scorecard approach could be usefully applied to strategic investment decision-making

Real options analysis

As noted, traditional financial analysis tools such as NPV do not explicitly incorporate the value of project flexibility. The DCF model assumes a static environment where *all* capital investment decisions are reversible without penalty - an assumption that may not hold in a competitive environment. Real options analysis has been proposed as a means of addressing this limitation of the DCF model. Derived from the financial option-pricing model, real options analysis recognises that the flexibility (options) inherent in some capital projects has value. For example, options to expand, defer, downsize or abandon a major capital investment project have value because they allow a firm to respond to strategic and competitive opportunities rather than remaining locked into a fixed course of action. Conversely, projects without this flexibility have a relatively lower value to the firm. While real options analysis has been widely advocated for strategic investment appraisal, empirical evidence of its uptake remains thin (MacDougall & Pike, 2003) and the findings to date are inconsistent. On the one hand it has been suggested that few practitioners understand or use the real options

approach (Busby & Pitts, 1997), but other studies note that some companies have begun to draw on it in their strategic investment analyses (Trigeorgis, 1999).

Value chain analysis

Value chain analysis is advanced as a useful tool to help businesses identify their strategically important value-creating activities and develop appropriate competitive strategies (Porter, 1985; Shank & Govindarajan, 1992; Hoque, 2001). As such, it has the potential to inform strategic capital investment decision-making (see Shank, 1996; Carr & Tomkins, 1996). While Carr & Tomkins (1996) examined the relative use of value chain analysis in UK and West German companies, little research has been done since then to examine its use in UK companies.

Technology roadmapping

Technology roadmapping is emerging as an approach at the cutting edge of strategic decision-making developments. It is described as "a process that contributes … to the definition of technology strategy by displaying the interaction between products and technologies over time" (Groenveld, 1997, p.48) by using charts and graphs to reveal the links between technology and business needs. A key aim of technology roadmapping is to look both within and beyond the firm to ensure that the right capabilities are in place, at the right time, to achieve strategic objectives (McCarthy, 2003). It therefore has clear potential for application to strategic investment decision-making, as Miller and O'Leary (forthcoming) note: "Technology roadmap can be used to ensure that investments in assets such as new fabrication processes, products and factory layouts, made by different sub-units of the firm, are coordinated with one another and with investments in enabling and related technologies made by other

firms…. The requirement that investments be consistent with a technology roadmap means that proponents of individual investments have to ensure that their proposals synchronize and fit with related investments taking place within and beyond the firm in a manner that enhances value." While Miller and O'Leary (forthcoming) documented extensive use of technology roadmaps in their Intel Corporation case study, published surveys of capital investment decision-making practice have yet to examine the wider use of technology roadmapping. Its inclusion in this study serves to explore the uptake of a very new approach to strategic investment appraisal.

Benchmarking

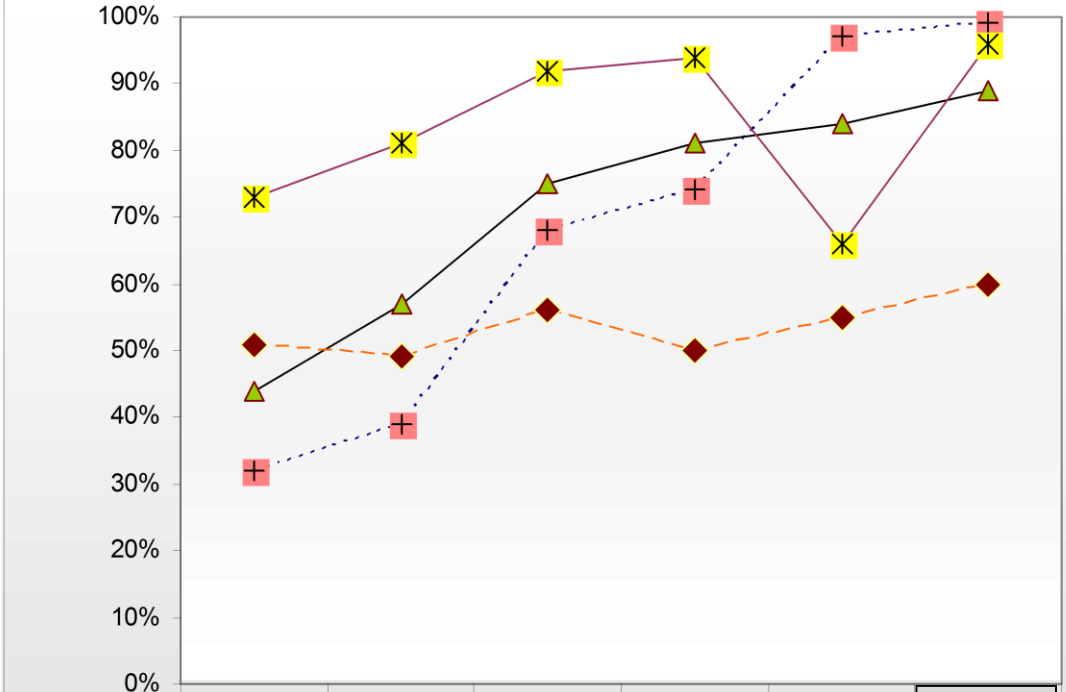
Benchmarking has been defined as "a search for industry best practices that lead to superior performance" (Hoque, 2001, p.184). Benchmarking is considered a useful tool in assisting organisations to (among other things) "promote competitive awareness …link operational tactics to corporate vision and strategy … [and] trigger major step changes in business performance" (Hoque,2001, p.185) – all areas which are integral to strategic capital investment. Since its origins in the Xerox Corporation in the late 1980s (Camp, 1989), benchmarking has become widely used as "one of the more popular of management fashions" (Mayle *et al.*, 2002, p.212). Its potential application to strategic capital investment lies in its ability to direct attention outside the firm towards competitors, the "best in class" firms and innovation (Putterill *et al.*, 1996).

In particular over-reliance on financial appraisal tools is thought to bias decision-makers against undertaking strategic projects that are crucial to the development of business capability and innovation (Adler, 2000). In response to this concern, several emergent strategic investment appraisal techniques have been advanced as means to integrate strategic and financial analyses of capital investment projects. The study of

Alkaraan and Northcott (2006) explored this issue, reporting the results of an investigation into the strategic investment decision-making practices of large U.K. manufacturing companies. They examined the use of both conventional financial analysis tools and selected strategic investment appraisal approaches in the capital investment decision-making of large UK manufacturing companies. And also examined how their use varies between strategic and non-strategic investment projects and the extent to which emergent strategic investment appraisal approaches are impacting decision-making practice. Little evidence emerges of integration between strategic and financial analysis approaches. Financial analysis techniques still dominate the appraisal of all categories of capital investment projects, while risk analysis approaches remain simplistic, even for complex strategic projects. Despite their noted potential for informing strategic investment decisions, emergent strategic investment appraisal approaches barely register in practice.

Previous studies have investigated the use of various approaches to risk analysis in capital investment decision-making. The overall levels of use for each technique, and comparisons with earlier studies, are presented in the study of Alkaraan and Nortchott (2006) as shown in Figure 1 and Figure 2.

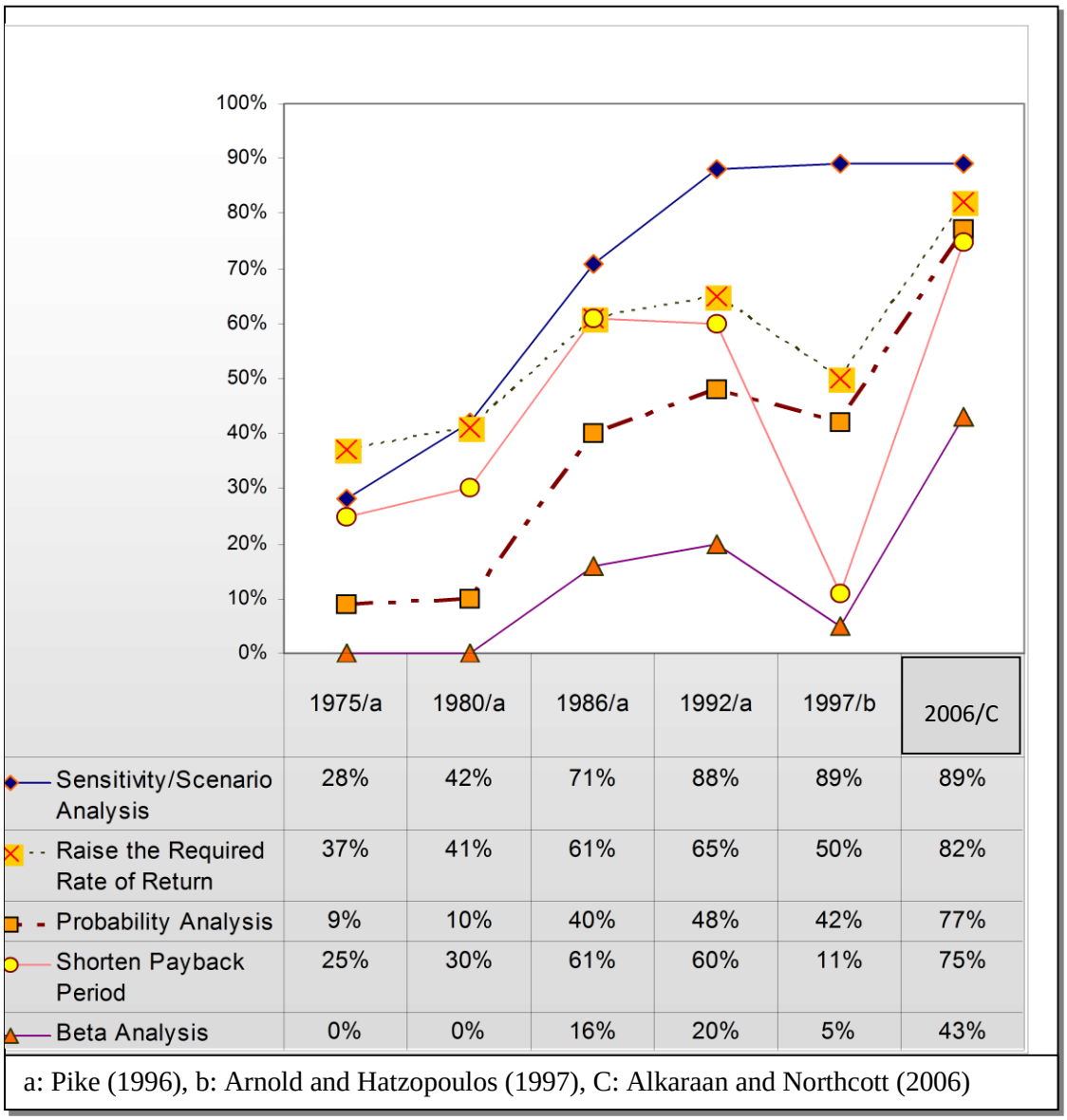
Figure (1) - Financial analysis techniques used by large UK companies (1975-2006).



	1975/a	1980/a	1986/a	1992/a	1997/b	2006/C
NPV	32%	39%	68%	74%	97%	99%
IRR	44%	57%	75%	81%	84%	89%
PB	73%	81%	92%	94%	66%	96%
ARR	51%	49%	56%	50%	55%	60%

a: Pike (1996), b: Arnold and Hatzopoulos (1997), C: Alkaraan and Northcott (2006)

Figure (2) - Risk analysis techniques used by large UK companies (1975-2006).



	1975/a	1980/a	1986/a	1992/a	1997/b	2006/C
Sensitivity/Scenario Analysis	28%	42%	71%	88%	89%	89%
Raise the Required Rate of Return	37%	41%	61%	65%	50%	82%
Probability Analysis	9%	10%	40%	48%	42%	77%
Shorten Payback Period	25%	30%	61%	60%	11%	75%
Beta Analysis	0%	0%	16%	20%	5%	43%

a: Pike (1996), b: Arnold and Hatzopoulos (1997), C: Alkaraan and Northcott (2006)

Figures 1 reveal that NPV is the most used analysis technique for strategic investment appraisal, while ARR is much less utilised across the board. The payback approach (PB) ranks second to NPV, with IRR ranking third, but this order is reversed for strategic project. This suggests that managers are favouring DCF techniques (NPV and IRR) above less sophisticated approaches (e.g. PB) when it comes to more complex strategic projects. Sensitivity analysis emerged as the most widely technique employed for assessing the risk of strategic investment projects. The least used techniques across the board were computer simulation and beta (CAPM) analysis. The most widely used

risk technique, sensitivity/scenario analysis, has dominated since the 1980s, although strong upward trends in the use of adjusted required rates of return, shortened payback periods and probability analysis can also be observed. Beta analysis continues to lag significantly behind.

Benchmarking was most widely used, rated as "of average importance" or" important" respondents. This result is perhaps not surprising because benchmarking is now well established and has been applied in many world-class companies (Hoque, 2001). However, its application to strategic capital investment analysis had not been identified previously. Other strategic analysis approaches fared less well. Value chain analysis and the balanced scorecard were the next most used approaches, but their mean 'perceived importance' scores fell well below the midpoint of 'average importance'.

Technology roadmapping approaches and real options analysis were considered least important; more than 50% of respondents rated these approaches 'not important' at all and the real options approach failed to garner even one respondent who considered it 'very important'.

Overall, these findings suggest that recently developed strategic analysis tools have made little impact on investment decision-making practice, despite the growing academic call for the use of such techniques to inform strategic investment decisions (Alkaraan and Northcott, 2006). While it was unsurprising to find that non-financial criteria were considered more important for strategic projects, the interview evidence revealed that those 'strategic criteria' considered most important tended to be those perceived as most closely linked to financial outcomes. This suggests that the dichotomy between 'financial' and 'qualitative/strategic' investment criteria is perceived as less real by managers than is suggested in our textbooks and that these two

dimensions of capital projects are more readily linked than we might expect. This issue warrants further investigation in future research (Alkaraan and Northcott, 2006).

The Cognitive Perspective of Strategic Investment Appraisal

Finance theory assumes that managers rationally consider all possible outcomes and their likelihood of occurrence. Thus techniques, e.g. probability, standard deviation, decision trees, expected value tables, discounted cash flows and sensitivity analysis, have been used to incorporate risk in decision making. This theoretical approach to risk assessment during decision making, however, appears to ignore the social construction and psychological paradigms, which include the sensitivity of what managers do in practice while assessing risk. Most scholars researching M&A have devoted efforts to exploring and refining the theory and the mathematics of investment appraisal, with very few recognising that policies and process of investment appraisal arise from human factors and attributes. The evaluation stage is where investment options are formally appraised and it is here that the dominant concerns with financial analysis, risk analysis and economic decision criteria are centred. But, by the time an investment decision gets to this stage, most of the strategic thinking has already occurred. The project has been conceived, identified as fitting the organization's aims, and judged worthy of evaluation. It has also been scoped, defined, and framed as a decision alternative, meaning that its relevant features and expected outcomes have been conceptualised and captured.

Researchers have noted that, although financial analysis techniques might constitute a framework within which to formalise investment decisions, the techniques are unlikely to determine the strategic investment appraisal outcomes (Bromwich and Bhimani, 1991; Butler *et al.*, 1993; Shank and Govindarajan, 1992 and 1993; Carr *et al*., 1994;

Shank, 1996; Carr and Tomkins, 1996 and 1998; Alkaraan and Northcott, 2013; Harris; 2014).

In the strategic decision field, there is evidence that managers use their intuition and tacit knowledge when forming their views about potentially complex projects and exercising their judgements using simplifying heuristics in personal and shared cognition. Simon (1957-1976) laid the groundwork for the treatment of cognitive simplification in his discussion of "bounded rationality" which suggests that decision makers must construct simplified mental models when dealing with complex problems (1976, pp. 79-96). They may be subject to selective perception since they are unable to comprehensively evaluate all variables relevant to the decisions (Mason and Mitroff, 1981).

Kahneman and Tversky's (1979) prospect theory challenged the accepted wisdom in economics by showing how people overestimate some probabilities and underestimate others, depending on the size of the expected gain or loss. This is best demonstrated by the sale of lottery tickets, where the chance of a big win (however slim) can persuade people to buy a ticket whereas a smaller prize with a greater probability of winning might not do so. Then they are persuaded to continue buying tickets, imagining their chances of a win will increase over time. Whilst this theory may be categorized as behavioural finance, it still fits within the positivist philosophy of reducing decision-making to a mathematical model, so focusing on a single behaviour and ignoring many other human or contextual factors

Strategic investment appraisal is influenced by the cognitive frames of decision-makers (Hambrick and Mason, 1984). For some companies, understanding a strategic problem involves less diagnosis and information search because understanding may be achieved by applying a previously developed schemas to the current strategic problem (Schwenk,

1988, pp. 42-43). The research on strategic issue diagnosis, problem formulation, and decision process highlights the need to examine strategists' cognitions (see Mintzberg *et.al*., 1976; Lyles and Mitroff , 1980; Lyles, 1981; Schwenk, 1988). Lyles (1981, p. 62) noted that subjectivity is involved in the process of problem definition and suggests that strategists' problem definitions will be guided by their past experiences.

Intuition is "a cognitive conclusion based on a decision maker's previous experiences and emotional inputs" (Burke and Miller, 1999, p. 92). Khatri and Ng (2000) found that intuitive processes are positively correlated with organizational environment in an unstable environment. Similarly, Anderson (2000) concluded that decisions are likely to be more effective if more intuitive judgement is applied to problems instead of economic calculus, which seems appropriate in conditions of high uncertainty. Dane and Pratt (2007) examined the effectiveness of intuition and managerial judgement in managerial decision-making. "Reliably skilled intuitions are likely to develop when the individual operates in a high-validity environment and has an opportunity to learn the rules of that environment" (Kahneman and Klein, 2009, p. 521).

Risk is perceived and acted on in two fundamental ways. Risk as feelings refers to individuals' fast, instinctive, and intuitive reactions to danger. Risk as analysis brings logic, reason, and scientific deliberation to bear on risk management. Reliance on risk as feelings is described with "the affect heuristic." Slovic *et al*. (2005) discussed some of the important practical implications resulting from the ways that this heuristic impacts how people perceive and evaluate risk, and, more generally, how it influences all human decision making. The dual-process explanation of "mindful judgement" has become known as system 1 (intuitive) and system 2 (analytical) in the psychology perspective of risk and decision-making (see Sunstein, 2001; Weber and Johnson, 2009; Kahneman and Klein, 2009). Other researchers (e.g. Evaristo and Zaheer, 2012) have

argued that managers' cognitive biases could lead to lost opportunities and exposure to vulnerabilities as they engage in the complex cognitive tasks surrounding mergers and acquisitions. Mirc (2014), investigated the human impacts on the performance of M&A. Junni and Sarala (2014) examined the role of M&A leadership by conducting a review of recent empirical studies on M&A leadership. They examined how M&A leadership influences post-M&A outcomes. Marks and Mirvis (2015), examined recent practices being adopted in the precombination phase of a merger or acquisition–a period that typically has not been utilized by leaders to put deals on the track toward success. They reviewed the M&A process and highlighted the success factors and common problem areas in each of the three phases of a deal. They addressed emerging trends in making the precombination phase more successful, including conducting a more thorough due diligence, setting a vision for the combined organization, accelerating early integration planning, and establishing integration principles and priorities. Strategic investment appraisal involves cognitive processes as well as formal analytical models. Harris and Woolley (2009) noted that innovators encounter technological uncertainty, both in product specification and production processes. "Although the future cannot be accurately predicted, decisions must be made with limited information in conditions of uncertainty. Some outcomes can be foreseen with some certainty, especially where we have knowledge and experience of making similar decisions" (Harris, 2014, p. 163).

The scanning and screening stage is critical to a successful, since it is here that an initial decision is made about which projects will be given serious consideration. A project idea might be eliminated at the screening stage if it is physically impractical or does not fit with overall strategy. Pre-decision control mechanisms constitute a form of strategic control by creating a link between strategy and the strategic investment appraisal that led to a successful project. For some companies, certain non-programmed decisions may

become semi-programmed in the course of time by applying knowledge learned from having successfully handled non-programmed decision situations in the past (Alkaraan, 2016).

The evidence from the literature can be interpreted in a number of ways. Whilst the economic rationalists continue to search for enhanced quantitative theories and to present the use of instinct or intuition as "bad behaviour" on the part of decision-makers, others are more accepting of human tendencies to employ their intuitive feelings about alternative propositions and harness their years of business experience as emotional intelligence. However, to argue for intuitive (system 1) thinking alone to determine important business decisions would be foolish. Banks have been accused of *copycat behaviour* in their decision-making, accepting sub-prime lending risk just because other banks were doing so. One could question where the moderating effect of any cost–benefit analysis disappeared to in this case. Research into the banking sector is not the focus of this chapter, but there are lessons to be learned from the banking crisis where the level of equality arguably became too high and the control ineffective in organizations that may have allowed its decision-makers to adopt too high a risk appetite simply because they could see competitors getting away with it for awhile. Did they "feel the risk"?

Balancing the rational (analytical) and the intuitive (risk as feelings) aspects in decision-making therefore could benefit from the advantages and compensate for the limitations of both. There have been a number of authors advocating what they call "dual processing" in decision- making (see Harris, 2014).

Conclusions and Further Research

The main conclusions from the literature are that appraising M&A requires more than the single aim of profit maximization to be considered, that risk and other non-financial factors are not easily measured but need to be assessed, that managerial judgement is based on concepts from psychology, but decision-making involves multiple managers and most relevant behavioural theories relate to the individual.

This chapter offers insights into the organizational and cognitive aspects of the strategic investment appraisal. Evaluation heuristics are simple, efficient rules that people often use to form judgments and make strategic choices in order to solve strategic problems. Heuristics of analogy and metaphor are the basic processes by which some strategic assumptions are transferred from one investment opportunity to another. Managers use their intuition and knowledge when forming their views about potentially complex projects and exercising their judgements using simplifying heuristics in personal and shared cognition. They justify and explain their intuitions, and their intuition can be viewed as a strategic pre-decision control mechanism that complements—without replacing—other control mechanisms such as pre-determined financial analysis. Therefore, it is not surprising that some outcomes of strategic investment projects can be foreseen with some certainty, especially where mangers have knowledge and experience of making similar decisions. This suggests that professional intuitive judgements can be viewed as a valuable asset or as value added towards the effectiveness of the M&A process.

The framework of this chapter can help practitioners gauge the strengths and weaknesses of their M&A practices. Successful M&A processes require more attention to the choice and design of strategic control mechanisms. Finally, effective strategic pre-decision control mechanisms that maintain a good balance between rational and intuitive approaches are matters that remain open for debate in future research.

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