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Organising for Innovation in Professional Services Firms:

Econometric evidence from the UK

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Abstract

Undertaking innovation involves a range of different activities from ideation to the commercialisation of innovations. Each activity may have very different resource and organisational requirements, however, most prior studies treat innovation as a single un-differentiated activity. Here, using new survey data for professional service firms in the UK, we are able to examine separately how a range of organisational work practices influence success in ideation and commercialisation. In particular, we use principal component analysis to identify and compare the benefits of four groups of organisational work practices relating to Strategy & Information Sharing, Recruitment & Training, Work Flexibility & Discretion and Culture & Leadership. Strong contrasts emerge between those work practices that are important for success in ideation and commercialisation. Work practices linked to Culture & Leadership are important for ideation activities, while Strategy & Information sharing practices are more strongly associated with commercialisation success. The results suggest clear managerial implications depending on the priority which firms attach to ideation and commercialisation outcomes.

Key words: Innovation; Organisational work practices; Professional Service Firms.

JEL Codes: O31, O33, K40

1. Introduction

Professional services are a subgroup of the wider services sector; mainly advisory in nature, focusing on problem solving, with services being provided by a skilled professional (Marr, Sherrard, and Prendergast 1996). In professional service firms (PSFs), the fundamental resource is knowledge and information as both an input and an output in the production process (Nachum 1996). In the UK, the sector accounts for 11 per cent of gross value added and 13 per cent of employment (UK Parliament 2017). Similar to all firms, PSF's ability to maximise their innovative potential is fundamental to long-term survival and growth of the firm (Baumol 2002; Schumpeter 1939), and their services significantly contribute to the value creation and competitiveness of their clients (OECD 2006). Despite the important role of PSFs in the economy, innovation studies often overlook the professional services sectors (Miles 2005; Ross 2016).

Definitions of service innovation tend to reflect novelty and commercialisation rather than new technology. In their review of the service innovation literature Carlborg et al. (2014), for example, refer to the definition suggested by Barcet (2010, p. 51) that service innovation 'introduced something new into the way of life, organisation timing and placement of what can generally be described as the individual and collective processes that relate to consumers'. This emphasises the potential diversity of innovation activity that may, for example, focus on different elements of organisations' operations and/or marketed services. Innovation is a collective process of idea generation and commercialisation; early, ideation activities may involve 'the pursuit of knowledge, of things that might come to be known,' while subsequent commercialisation activities may require more market focussed knowledge as part of 'the use and development of things already known' (Levinthal and March 1993). In addition to introducing new products and processes, firms face the challenge of introducing new or changing current organisational practices, processes and structures (Hecker and Ganter, 2013, Nieves, 2016). While it is generally acknowledged that organising for innovation is not a straightforward process (Faems, Van Looy, and Debackere 2005), empirical evidence specifically on how PSFs can organise work practices to encourage and enhance innovation is limited.

In this paper, we employ UK survey data, Organisational Practices in Professional Services (OPIPS), which specifically differentiates between ideation and commercialisation activities within professional services, and covers the following sectors Software & IT Services, Accountancy, Architectural Services, Consultancy and Specialist Design. The unique nature of the OPIPS data allows us to answer the question: Which organisational work practices best enable ideation and commercialisation innovation activities in PSFs? Previous studies which have examined the relationship between organisational work practices and innovation generally focus solely on one activity (e.g. ideation or commercialisation) in the innovation process or treat the innovation process itself as a single activity (Arundel et al., 2007; Tether et al. 2005; Toner 2011; Combs et al. 2006; Guest 2011; Gahan et al. 2021). At a sectoral level, prior research on the relationship between organisational work practices and innovation tends to focus on manufacturing firms (Katila and Ahuja 2002; Bourke and Roper 2016, 2017), or specific service industries such as hospitality (Nieves, 2016), or considers manufacturing and service firms together (Arundel et al. 2007). The design and coverage of the OPIPS data allows us both to consider the impact of organisational work practices on ideation and commercialisation separately and across a range of professional service sectors.

Our main empirical contribution is to identify those organisational work practices that are most beneficial during the ideation and commercialisation stages of the innovation process in PSFs. This responds to Martin's (2016, p. 438) call for further research which examines the factors which shape success in the ideation and commercialisation stages of the innovation process in different sectors. In theoretical terms, our analysis contributes to the limited literature on the impact of work practices on innovation outcomes, integrating elements of leadership (Love and Roper 2015; Garcia-Morales, Jimenez-Barrionuevo, and Gutierrez-Gutierrez 2012), culture (Hogan and Coote 2014) and organisational practices (Cuijpers, Guenter, and Hussinger 2011) to examine their interplay during different stages of the innovation process. Adopting this integrative approach leads to clear managerial implications for PSF firms and suggests that the work practices adopted should relate directly to firms' prioritisation between the ideation and commercialisation stages of the innovation process. Where PSFs emphasise ideation, perhaps with a view to commercialisation by other companies, practices related to culture and leadership prove critical. Conversely, where firms emphasise commericalisation based, for example, on ideas licensed or copied from elsewhere, practices related to information sharing appear more important.

The argument proceeds as follows. In Section 2, we focus on the conceptual context. Section 3 describes our data and empirical approach and Section 4 outlines the key results, as well as robustness tests. A discussion of the main implications follows in Section 5.

2. Conceptual context – organisational work practices and innovation activities

2.1 Organisational Work Practices

Underlying our study is the notion of organisational capital which describes the knowledge preserved within a firm over time by behaviours, mental maps, norms, customs and values (Subramaniam and Youndt 2005; Crossan, Lane, and White 1999). Within this, organisational work practices may include HR and/or management practices (see Gahan et al. 2021; Bloom and van Reenen 2007), but more generally refers to a broader range of practices by which firms organise and structure work. Within practice theory, practices have been defined as "routinized ways in which bodies are moved, objects are handled, subjects are treated, things are described, and the world is understood" (Reckwitz, 2002, p. 250). This would include how work is planned, organised and managed – via production processes, job design, task allocation, rules, procedures, communication, responsibilities, management and supervisory styles, work scheduling, work pace, career development, decision-making processes, interpersonal and interdepartmental relationships (Valeyre et al. 2009). Work practices not only establish patterns of behaviour and interpretation that guide knowledge acquisition and sharing (Crossan, Lane, and White 1999), but can also provide an essential mechanism for integrating and combining that knowledge into the knowledge base of the organisation (Grant 1996).

In the literature on strategic human resource management work practices have been discussed extensively in the context of high-performance work systems, generally in relation to the diffusion of Japanese-style organisational work practices in the US and Europe. High-performance organisational practices and arrangements are seen as enhancing a firm's capacity for making incremental improvements to efficiency and quality (Arundel et al. 2007; Rehman et al. 2021). These practices tend to centre on increasing employee involvement in problem solving and decision-making. Organisational work practices that delegate decision-

making authority and responsibility down the hierarchy and facilitate employee participation can generate upward feedback mechanisms (Subramony 2009; Li et al. 2017). Heterogeneity in decision making and problem solving styles relieves information-processing bottlenecks (Mendelson and Pillai 1999), produces better decisions through the operation of a wider range of perspectives and a more thorough analysis of issues (Richard 2000). It is generally accepted that most technological knowledge resides in the lower levels of an organised hierarchy (Hayton 2005).

Fu (2015) characterises high performance work practices as involving relational routines or relational coordination. Relational routines allow colleagues to learn about each other and the organisation in which they work, something which is especially important in project-based, multifunctional teams. Relational coordination involves clear communication and direction in terms of task-based relationships, again important in the task- and team-based relationships which are common in PSFs. Relational coordination therefore 'builds role relationships among professional staff during their interactions and fosters the knowledge exchange and combination as well as the promotion, generation and commercialisation of new ideas for innovation' (Fu 2015 p. 739).

In a multi-sectoral EU study, Arundel et al. (2007) identify four clusters of organisational work practices. The first cluster, Discretionary Learning, incorporates practices that ensure high levels of autonomy in work, combined with high levels of learning, problem-solving and task complexity. Lean Production is characterised by low levels of employee discretion in setting work pace and methods, although organisational work practices also include job rotation and team-work. The third category they classify as Taylorism, and while it involves similar practices to the second cluster – teams, job rotation and quality norms, it also contains low discretion and problem-solving work practices. The final cluster is Traditional Organisation, where practices are informal and non-codified, and work is monotonous. Arundel et al.'s (2007) study highlights that pure organisational types are unlikely to be found in the real world, as adhocracies are likely to exist across units and department in firms, and may be combined with other forms of work organisation. Arundel et al. (2007) report that in countries where work practices are employed that support high levels of discretion in solving complex problems, firms tend to be more active with respect to 'in-

house' innovation. However, where organisational work practices are in place that constrain on-the-job learning and problem-solving and employees are given little discretion, firms' innovation activity tends to involve the adoption of innovations developed elsewhere (Zhou, Fan, & Son, 2019). A study of US firms previously classified firms as 'transformed' as those which involved at least 50 per cent of their employees in four high performance work practices: teams, job rotation, quality circles and total quality management (Osterman 1994).

2.2 Ideation and commercialisation activities in innovation

Innovation scholars have long recognised the different activities implicit in the innovation process (Harmancioglu et al. 2007; Gronlund, Sjodin, and Frishammar 2010), ranging from opportunity recognition and ideation to commercialisation (Carlborg, Kindstrom, and Kowalkowski 2014). Here we focus on two key activities: ideation – which involves the search for and identification of market opportunities and potential solutions; and commericalisation, involving the bringing to market and initial market introduction of new product or service innovations. Other studies have adopted different approaches to categorising and differentiating innovation activities. For instance, Hidalgo and D'Alvano (2014) identify five separate innovation activities – scan, focus, resource, implement and learn – in their examination of the organisation of service innovation activity in Venezuela. Love et al. (2011) suggest a less specific breakdown - the innovation value chain or IVC - comprising three different activities: knowledge acquisition, knowledge transformation and knowledge commercialisation. The value chain notion is useful in emphasising the inter-dependency of different innovation activities, and firms that successfully manage innovation activities, spanning ideation to commercialisation, tend to be in a better position to consistently search and absorb novel information as well as integrate new knowledge associated with exploratory learning (Kollmann and Stoeckmann 2010; Chang and Hughes 2012; Kang and Snell 2009), benefiting product innovation, firm survival and prosperity (March 1991; Kollmann and Stoeckmann 2010; Chang and Hughes 2012). However, different activities require distinct configurations of absorptive capacity at the individual level, perhaps creativity and enhancing competencies at earlier stages and routinized competencies at later stages in the innovation process (Enkel et al., 2017, Hafkesbrink and Schroll, 2014).

In addition, previous studies report the positive influence of innovation strategies and information-sharing on innovation performance (Cuijpers, Guenter, and Hussinger 2011; Peeters and Van Pottelsberghe 2006), as well as the importance of culture (Hogan and Coote 2014) and leadership in shaping firms' innovation outcomes (Love and Roper 2015; Garcia-Morales, Jimenez-Barrionuevo, and Gutierrez-Gutierrez 2012). Many studies report the benefits to innovation from external collaboration (Faems, Van Looy, and Debackere 2005; Love and Roper 2001, 2004; Bourke and Crowley 2016), and there is also evidence that firms that strategically outsource activities can obtain economies of scope within the innovation process (Love and Roper 2001; Bourke and Crowley 2016).

Recently, a number of studies have examined the impact of management innovation on firm performance. For instance, Nieves (2016), reports that management innovation activities favour the introduction of learning capability and product innovation within the services industry. In addition, management innovation indirectly affects the achievement of financial performance through its effect on product innovation. Also, empirical studies reveal significant differences in the determinants of 'technological' and management innovation (Hecker and Ganter, 2013). Management innovation is the introduction of management practices which are *new* to the firm and intended to enhance firm performance in some manner, while organisational innovation is usually defined in a broader manner to include any innovative activity within the firm (Volberda et al., 2013). Therefore, it is important to note that while many of the practices used to measure management or organisational innovation are similar to the organisational work practices discussed earlier, they must be considered new to the firm to be categorised as innovation (Nieves, 2016, Volberda et al., 2013).

A small number of studies have explored innovation in some of the sectors included in our analysis. Studies of innovation in the Software & IT Services sector have tended to emphasise the importance of human capital (i.e. levels of education, prior experience), R&D expenditure per employee, external collaborations and innovation networks (West and Gallagher 2006). Innovations in architecture tend to be produced from team work within the firm and collaborative arrangements between experts with different skill sets (Falconbridge 2006). It has been suggested that the consultancy sector and specialist design – in contrast to

professions such as accountancy or architecture – is characterised by 'weak professionalism' with limited regulation and professional organisations which have only limited control over entry and/or the supply of qualified labour (Fincham 2006; Valencia, Person, and Snelders 2013). Kipping and Kirkpatrick (2013, p. 782) suggest that this weak professionalism may provide '… a greater freedom to establish new firms and, for organisations from other sectors to enter the market… changes in population will be associated with a greater diversity in organisational forms'. Innovation in the design sector is highly dependent on human capital both in-house and external and on networks with customers, colleagues, friends, suppliers, and design authorities and associations (Rusten and Bryson 2007).

2.3 Work Practices, Ideation and Commercialisation

Organisational work practices include both institutionalized knowledge and codified experience (Kang and Snell 2009), and over time a firm develops a specific organisational culture which has both 'rule following' and 'enactment' characteristics (Morgan 1986). In terms of ideation, practices which increase the extent and depth of collaboration, emphasise knowledge and information sharing within and across the boundaries of the firm, and facilitate flexible working approaches have all been positively associated with success. Within the firm these practices would include multi-functional working and team-working (Love, Roper, and Bryson 2011; Love and Roper 2004) with team and workforce diversity also linked to enhanced creativity and ideas generation as a result of engaging with a broader range of perspectives (Shipton et al. 2006). Boundary spanning links to customers, suppliers or other organisations may also enhance firms' ideation outcomes (Witwell et al. 2011).

At the commercialisation stage of the innovation process, positive relationships between HR practices and innovation output measures are widely reported (Michie and Sheehan, 2003; Shipton et al., 2005; Laursen and Foss, 2003; Arvanitis, 2005; Beugelsdijk, 2008; Zhou et al, 2011; Jimenez-Jimenez and Sanz-Valle, 2008; Zoghi et al., 2010; Madia, 2013; Eriksson et al., 2014; Stock et al., 2014; Fu, 2015). Arundel et al. (2007) report that where work is organized to support high levels of discretion in solving complex problems, both manufacturing and services firms tend to be more active in terms of innovation outputs developed through their in-house creative efforts. When learning and problem solving on the job are more constrained, firms are more likely to adopt innovations from elsewhere. External

collaboration may also be important for commercialisation with studies emphasising the importance of links to existing and potential customers (Love et al. 2011).

It is important to note that while previous studies typically report a positive relationship between organisational work practices and innovation (Tether et al. 2005; Toner 2011; Combs et al. 2006; Guest 2011), they generally focus on one activity within the innovation process or treat the innovation process itself as a single activity. It is increasingly accepted that learning and interaction within organizations is as important for innovation as external collaborations (Arundel et al. 2007), and the successful organisation of work practices benefits innovation. However, we know little about which organisational work practices benefit ideation and/or commercialisation activities within PSFs. Our data and analysis described in the next section enables us to address this knowledge gap.

3. Data and methods

3.1 Data and variable measurement

Our analysis is based on new OPIPS survey data, intended to provide a representative view of organisational work practices, innovation activity and firm characteristics across five UK professional services sectors - Software & IT Services, Accountancy, Architectural Services, Consultancy and Specialist Design. The survey sample was purchased from a commercial provider (Experian) and was structured by sizeband (5-19 employees; 20-49 employees and 50 plus employees). Over-sampling in the 20-49 employee and 50 plus employee size groups was intended to ensure reasonable cell sizes in these groups. Following a series of pilot interviews, the main survey was conducted by telephone between January and March 2016 and the achieved response included 900 firms across the five sectors. Coverage ranged from 1.4 per cent of UK Software & IT Services firms to 2.9 per cent of Specialist Design firms.[1]

[1] Sectoral coverage in each sector was: Software & IT Services, 1.4 per cent; Accountancy, 2.3 per cent; Consultancy, 2.3 per cent; Architectural Services, 2.1 per cent; and, Specialist Design, 2.9 per cent.

Our analysis is based on information provided by a single rater in each organisation with the dependent and explanatory variables derived from the same survey. Common methods variance is therefore a concern (Podsakoff et al. 2003). In the questionnaire design we use different scale types to reduce potential concerns and, wherever possible, randomise item lists to offset any cognitive biases. We also use multivariate statistical analysis and alternative dependent variables which use different scale types to reduce any related biases (Chang, van Witteloostuijn, and Eden 2010).

Dependent Variables: Ideation and commercialisation

As discussed in Section 2.2, innovation researchers have long recognised the different activities which form part of an innovation process. Early in an innovation process, ideation activities dominate as the definition of a target innovation is specified and the relevant knowledge or technology developed or sought. Subsequent commercialisation activities may involve marketing, advertising and interacting with new and existing consumers. Both may require rather different resources and work practices. This was reflected in our survey design with separate sections of the questionnaire devoted to firms' ideation and commercialisation, collecting both outcome metrics and related organisational work practices (see Table 1 for sample descriptives).[2] To reflect the outcomes of firms' ideation activity, the survey includes a measure of the proportion of new service ideas originating outside the firm. This measure provides an indication of the openness of firms to external knowledge and their ability to incorporate external ideas into new service offerings (Love, Roper, and Bryson 2011). For the firms in this sample, 11.6 per cent of new ideas originate from external sources.

Outcomes from firms' commercialisation activities are reflected in two innovation output measures. First, we reflect the diversity of firms' innovation activity by deriving an index variable indicating the number of types of innovation - service, process, managerial, organisational, strategic and marketing - a firm undertakes. This index takes a value of 100% if a firm undertakes all six types of innovation. In our sample, the mean value for this variable is 46.3 per cent, indicating that on average firms undertake almost three of six types of innovation. Second, the success of firms' innovation activity is reflected by the share of sales derived from innovative products (Doran and Ryan 2014; Hewitt-Dundas and Roper

[2] See Roper, Love, and Bourke (2016) for more detail on survey design and administration.

2008; Leiponen and Byma 2009; Leiponen 2012). On average, sales derived from innovation products account for 16.7 per cent of total sales. Previous studies of service sector businesses suggest a strong link between firms' ideation and commercialisation activities, and so the proportion of new service ideas originating outside the firm is also included as an independent variable in our analysis of firms' commercialisation activities (Figure 1).

Independent Variables : Organisational work practice variables

The OPIPS survey also asked a series of questions concerning firms' adoption of twenty-one organisational work practices using a series of binary measures. Strategically, firms do not always adopt an individual organisational practice in isolation (Arundel et al. 2007). To reflect potential complementarities, and the way firms combine different groups of organisational work practices, we undertake principal component analysis (PCA), a form of factor analysis, to reduce the broad set of 21 practices to 'bundles' which then form our key indicators of firms' adoption of organisational work practices. Prior to undertaking PCA, we assert that the data is suitable for factor analysis (Pallant, 2010). Our sample size of 900 ensures that the suggested requirements of five cases for each factor to be analysed by Tabachnick and Fidell (2007) and 10 cases for each item by Nunnally (1978) are easily met. In addition, the Bartlett Test of Sphericity is highly significant (p=0.000) and Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.783.

The PCA method estimates linear combinations of the underlying variables, which in this case are the organisational practice variables, which explain the highest possible fraction of the remaining variance in the dataset (Laursen and Foss, 2003). The first principal component is estimated to explain the highest possible fraction of the total variance. The second principal component is estimated to explain the highest possible fraction of the total variance that is not explained by the first, and so forth, until the explained residual variance in each round is maximised. The organisational practice indicators are discrete in this study. There is no consensus on using PCA on binary data, specifically because standard methods of performing factor analysis (i.e. those based on a matrix of Pearson's correlations) assume that the variables are continuous and follow a multivariate normal distribution. To overcome this issue, we do not use the 'raw' binary data for the PCA analysis, but transform the variables

and make them smooth (see Laursen and Foss, 2003). To do this, we employ a polychoric correlation matrix on the underlying data for the discrete management practices making the variables suitable for PCA analysis (UCLA, 2015). Following Laursen and Foss (2003), an economic interpretation of the sets of factor loadings from the PCA analysis is that the typical pattern is one in which some of the organisational work practices play a major role in the configuration of the factor.

The sets of factor loadings for each factor are presented in Table 2. Following consideration of eigenvalues and visually inspecting the scree plot, four factors are identified which explain most of the variability in the data. The first factor, named Strategy and Information Sharing, is dominated by variables capturing the communication and sharing of information via annual staff surveys, suggestion schemes, newsletters and team meetings as well as written strategies to support the introduction of new ideas. The next factor, Recruitment and Training, comprises the formal recruitment and training procedures. The third factor, Work Flexibility and Discretion, captures the extent to which employees have access to flexible working, discretion over how they do their work, and variety in their work. The final factor, Culture and Leadership, includes indicators of leadership, culture and structured processes that supports the introduction of new ideas. These four factors explain 67 per cent of the total variance explained, which is considered a satisfactory threshold (Hair et al., 2018). Based on the PCA, we create four variables to represent firms' adoption of organisational work practices and these are included as independent variables in our ideation and commercialisation models.

These four factors – Strategy and Information Sharing, Recruitment and Training, Work Flexibility and Discretion and Culture and Leadership - measure some of the intangible assets of these firms, which studies show can be more important for service innovation than what would be considered the more tangible assets (Gallouj and Savona, 2009, Hipp and Grupp, 2005, Crowley and Bourke, 2017) We expect that firms that engage in strategy and information sharing which provide clear and consistent signals to employees about the goals and objectives of the firm to perform better (Barnes et al., 2006), including across innovation measures (Cuijpers et al., 2011). Equally, recruitment and training can be a critical determinant of whether firms succeed or fail (Greer et al., 2016), and staffing can be

leveraged to support and enhance firms' innovation performance (Searle and Ball, 2003) by ensuring employee diversity and combining fundamentally different skills (Laursen, Mahnke, and Vejrup-Hansen 2005; Østergaard, Timmermans, and Kristinsson 2011). There is considerable evidence that empowering employees with practices that provide flexibility, discretion and variety benefits firm performance (Bratton and Gold, 2012), while culture and leadership benefits innovation outcomes (Love and Roper, 2015, Hogan and Coote, 2014), with structured processes for innovation especially important for services firms (Bourke et al., 2020). *A priori*, we expect theses factors to positively influence innovation activities at the ideation and commercialisation stages. It is important to note that the descriptive statistics and coefficients of the four factors do not produce any real meaningful interpretation. However, the coefficient sign is important in identifying if combining practices has a positive or negative effect on the dependent variable in question.

Control Variables

We also include in the estimated models a number of firm-level controls which have proved important in previous studies of innovation. We include variables related to the scale and quality of firms' internal resource base team-working, as well as exporting (Gourlay, Seaton, and Suppakitjarak 2005; Wakelin 1998; Love and Roper 2015; Toner 2011). The average size of firms is 87 employees. 20 years is the average vintage of firms in this sample. 54.7 per cent of workers are educated to at least degree level. A little over a third of firms (35.5 per cent) are exporting firms.

We also include a series of binary variables reflecting firms' current investments – IT, Research and Design -which might support innovation (Cohen and Levinthal 1989; Hertenstein et al., 2005; Utterback et al., 2006; Verganti, 2006; Ravasi and Stigliani, 2012). Two-thirds of firms invest in IT (65.5 per cent) and research (67.4 per cent) and almost half of firms invest in design (0.480).

Other control variables include breadth of firms' external partnering and multi-functional working (Laursen and Salter 2006; Love et al., 2011). The external knowledge seeking for ideation and commercialisation variables are percentage indicators based on the number of (eight) types of external partner with which organisations are engaging to generate new ideas and implement innovative ideas. On average, firms have two types partners (23.9 per cent) of that they engage with to generate new ideas and one type of partner (12 per cent) to implement innovations. The multi-functional variables are percentage indicators of those occupational groups involved in 'obtaining the ideas and information needed to develop new or improved services or how they are delivered' (ideation) and 'the process of actually developing new or improved services or how they are delivered' (commercialisation).[3] Multi-functional working for ideation and commercialisation innovation activities generally involves 2-3 (39.9 and 37.1 per cent) of the seven occupational groups identified. The teamwork index is a percentage indicator of organisations' agreement with five statements about team-working for innovation commercialisation activities.[4] On average, firms agree with 1-2 of five statements on teamworking (31.4 per cent).

3.2 Empirical approach

We first model the impact of organisational work practices on firms' openness to new innovation ideas XI_i (equation 1):

$$XI_i = \beta_0 + \beta_1 OP_i + \beta_2 FC_i + \beta_3 KAA_i + \beta_4 INV_i + \beta_5 MF_i + \varepsilon_1 \qquad (1)$$

Where (for firm i): OP_i are our four organisational practice indicators; FC_i is a vector of firm characteristics such as firm age, firm size, graduate share and exporting; KAA_i is a vector summarising firms' exploratory relationships with external partners; INV_i is a vector of investment, such as on design, research and IT; and MF_i is a multi-functional working for ideation activities.

[3] Seven occupational groups are identified - Managing partner, Partners and senior fee earners, Associates and junior fee earners, Executives/senior managers (non-fee earning), Para-legal staff, Administrative staff, Marketing staff/bid managers.

[4] The five statements include: Team-working plays a major role in the development of new services and how we deliver them; Our development teams are cross-functional and involve people from different parts of the organisation; Teams operate very independently and are left to get on with solving the problem; Our organisation invests in training in team-working; Our teams often involve clients or suppliers.

The second element of our analysis relates to firms' ability to generate marketable new services. Here, we estimate the innovation production function for innovative outputs IO_i as follows (equation 2):

$$IO_i = \delta_0 + \delta_1 OP_i + \delta_2 FC_i + \beta_3 KAA_i + \beta_4 INV_i + \beta_5 MFTW_i + \beta_6 XI_i + \varepsilon_2 \quad (2)$$

Where: OP_i are our organisational practice indicators , FC_i is a vector of firm characteristics, DES_i is internal spending on design, KAA_i is a vector summarising firms' external relationships; INV_i is a vector of investment, such as on design, research and IT; MF_i is a multi-functional and teamworking for commercialisation activities and XI_i is the proportion of externally sourced ideas. Coefficient β_6 represents the link between firms' ideation and commercialisation activities as suggested in Figure 1.

Our dependent variable for the ideation stage is openness to new innovation ideas. For the commercialisation stage, we use two dependent variables - innovative sales and diversity of innovation. As all three dependent variables – openness to new innovation ideas, innovative sales and the diversity of innovation – are expressed as percentages we use a tobit estimator (Bourke and Roper, 2016, Bourke and Roper, 2017, Roper et al., 2008). We include sectoral dummies in all estimated models.

4. Results

4.1 Econometric Results

We examine the relationship between organisation capital and firms' ideation (Table 3) and commercialisation innovation activities (Table 4). Perhaps the most notable feature of these models is the variability in the importance of the organisational work practices across ideation and commercialisation activities (See Table 5 for a symbolic summary). Culture & Leadership practices prove important in terms of sourcing new ideas from outside the firm, and Strategy and Information Sharing practices are positively associated with firms' innovation success and diversity of innovation activities.

Firms that implement leadership and culture work practices which support new ideas source a higher proportion of new ideas from outside the firm than those which do not use such practices (Table 3). The Culture & Leadership factor comprises organisational work practices related to culture, team leadership and incentive structures for staff for valuable new ideas. Previous studies have reported the importance of culture (Hogan and Coote 2014) and leadership in shaping firms' innovation outcomes (Love and Roper 2015; Garcia-Morales, Jimenez-Barrionuevo, and Gutierrez-Gutierrez 2012), although we are not aware of other studies examining the influence of culture and leadership on idea generation sourced from outside the firm. The Culture & Leadership factor is statistically significant at the 1 per cent level in relation to ideation (Table 3) but has no significant link to firms' commercialisation innovation activities (Table 4). None of the other three organisational practice factors have a statistically significant link to ideation activities.

Strategy & Information Sharing proves strongly associated with firms' innovation commercialisation activities, in relation to diversity of innovation and innovation success (Table 4). The Strategy & Information factor comprises work practices for communicating strategy and sharing information with a firms' workforce. Previous studies report the positive influence of innovation strategies and information sharing on innovation performance (Cuijpers, Guenter, and Hussinger 2011; Peeters and Van Pottelsberghe 2006).

In addition, the Recruitment & Training factor is statistically significant at the 10 per cent level in relation to innovation success. Therefore, recruitment, training and equal opportunities practices are positively associated with sales from new and/ or improved services. The Recruitment & Training factor comprises work practices that enable firms to hire and develop employees. Prior studies have found that employee diversity - combining fundamentally different skills - leads to a competitive advantage (Laursen, Mahnke, and Vejrup-Hansen 2005; Østergaard, Timmermans, and Kristinsson 2011). While our results in relation to recruiting staff with varying skill sets and developing their skills are not particularly strong, our results in relation to team-work and multi-functionality (discussed below) indicate that work practices which combine different skill sets and individuals benefits innovation. Surprisingly, the Work Flexibility & Discretion factor does not prove important for either ideation or commercialisation activities.

Our analyses include a number of controls. Surprisingly, we find no relationship between workforce education and firms' innovation activities. However, team-work and multi-functionality have strong and significant links to commercialisation innovation activities. Multi-functional teams combining different skill sets are also positively related to the diversity of innovation and innovation success, although there are diminishing returns from such teams (Table 4). The team-work index also has a positive and significant coefficient in the diversity of innovation model, indicating that developing and supporting teams is positively related to a more diverse range of innovations (Table 4).

Surprisingly, IT investment is negatively related to new service ideas from outside the firm (Table 4). However, in line with Love, Roper, and Bryson (2011), design investment is positively related to external service ideas, albeit only at a 10 per cent level of significance. Design investment also has a strong and significant link to firms' commercialisation activities (Canid and Saemundsson 2008) (Table 4). Indeed, our results suggest that for professional services firms design makes a more important contribution to innovation than in-house research. A possible explanation for the insignificance of research across ideation and commercialisation activities is that it may be the case that services innovation is less technologically-based than manufacturing innovation (Vergori, 2014).

External knowledge sourcing is important for ideation, although the relationship is inverted-U shaped with the strength of the link to external connectivity diminishing after a certain point (Table 3). With respect to innovation commercialisation activities, external connectivity is not related to innovation success, although it is linked to innovation diversity (Table 3). Unlike previous studies, we find exporting has little relationship to professional service firms' innovation activities (Table 4), although it is negatively related to the diversity of innovation. This may indicate that professional services firms who export face less pressure to increase the range of innovations they introduce relative to their counterparts focused on the domestic-market.

4.2 Robustness Tests

Motivated by earlier studies, we determine if our results in relation to organisational work practices and innovation are moderated by firm size and/or sector (Wu et al. 2015; White and Bryson 2016; Leiponen 2005; Toner 2011; Doran and Ryan 2014; Verma 2012). Both robustness tests confirm our results and reveal there is no systematic difference between the size of the effects reported across sectors or by firm size.[5]

5. Discussion and Conclusion

Our findings indicate that culture & leadership practices matter at the ideation stage of the innovation process in PSFs, and strategy and information sharing practices matter in the successful commercialisation of innovative ideas. The importance of culture and leadership in shaping firms' innovation outcomes has previously been reported (Hogan and Coote 2014; Love and Roper 2015; Garcia-Morales, Jimenez-Barrionuevo, and Gutierrez-Gutierrez 2012); however our results reveal the importance of employing work practices which encourage and incentivise a culture for valuable new ideas. Our finding that strategy and information sharing practices benefit innovation diversity and success in PSFs is broadly in line with previous studies which have shown their importance for innovation albeit in manufacturing firms (Cuijpers, Guenter, and Hussinger 2011; Peeters and Van Pottelsberghe 2006).However it may initially appear surprising that its effect occurs exclusively in the commercialisation phase with no effect in the ideation phase. The reason for this appears to be because the Strategy & Information Sharing factor includes elements principally relating *internal* knowledge sharing within the firm: by contrast, openness to external ideas is driven both by Culture and Leadership, but also specifically by the formal external knowledge seeking activities of the firm, derived through the extent of formal external partnering. This in turn suggests that internal knowledge sharing and external knowledge seeking are somewhat different capabilities, and have to be accounted for separately.

While recruitment and training practices are only marginally important for innovation success for PSFs, team-work and multi-functionality strongly impact commercialisation activities. There is an increasing acceptance of the importance of learning and interaction within organisations and workplaces for innovation performance (Arundel et al. 2007), and our findings demonstrate its importance at earlier and later stages of the innovation process at PSFs. In addition, knowledge sourcing and connectivity matter across the innovation process

[5] Robustness tests are available from the authors by request.

for PSFs. This is unsurprising given that knowledge and information is a fundamental resource in the production process of professional services (Nachum 1996).

Previous studies have suggested a potential trade-off between organisational work practices that favour earlier and later stages of the innovation process (Rosing et al. 2011). Here, as in previous studies, we find clear evidence that different types of organisational work practices are more strongly associated with ideation and commercialisation activities. We find no evidence, however, of any significant trade-off between those practices that favour ideation and commercialisation. More specifically, the adoption of culture & leadership practices, which are associated with successful ideation, have no detrimental effect on firms' commercialisation activities. And, conversely, strategy & information practices, which are strongly associated with innovation diversity and success, appear to have no detrimental effect on firms' ideation activities. As we also find a strong association between ideation outcomes and commercialisation success (Table 4), this implies a complementarity (rather than a trade-off) relationship between those organisational work practices which favour ideation and commercialisation. In an investigation on enterprise performance across 15 countries, Derbyshire (2014) also reported a mutually enhancing relationship between exploration and exploitation in the Professional, Scientific and Technical Activities (NACE Rev. 2 section M) sector. Our finding that different types of organisational work practices matter for ideation and commercialisation activities refines our understanding of the context-specific nuances associated with the different type and nature of practices adopted within professional services (Derbyshire, 2014).

The lack of any trade-off between the organisational work practices enabling earlier and later activities in the innovation process may be linked to the focus of our analysis on PSFs. In manufacturing, these activities may be more distinct, involving very different investment priorities, external relationships and occupational groups within the firm. In professional services, where innovation may be less capital intensive, less technologically oriented (West and Gallagher 2006), and more strongly linked to human interaction and creativity, the functional distinction between these activities may be less marked. Nonetheless, our analysis does suggest a clear distinction between the organisational work

practices that favour each activity, and provides lessons for firms seeking to maximise innovation success.

A key limitation of our study is its cross-sectional nature limiting inference to correlation rather than causality. Our current study also focuses on five PSF sectors and omits other potentially important sectors such as financial services and legal services. Essentially similar results emerge when we consider these other sectors (Roper et al. 2015). Our results are also limited in that they only consider firms operating in the same UK labour market. Issues around leadership, hierarchy and job flexibility undoubtedly have a cultural dimension and this limits the generalisability of our results. Replication in different sectors and national contexts would therefore be a useful robustness check.

Our analysis has clear managerial implications for PSFs seeking to innovate effectively. At the broadest level we show that organisational work practices do have a significant impact on the effectiveness of both ideation and commercialisation activities. And, that rather different bundles of practices help optimise both activities (Parkhe 1991). Where firms' business model dictates a focus on a single innovation activity, e.g. ideation or commercialisation, our analysis suggests the adoption of *either* a set of organisational work practices associated with Culture & Leadership or a set of organisational work practices reflecting information sharing. Where firms seek to optimise across the entire innovation process, the adoption of the broader set practices included in our Strategy & Information Sharing factor seems most appropriate as this embodies elements of practices related to culture and leadership as well as a range of more formal organisational work practices related to information sharing. Currently, among our survey respondents, while around nine-tenths reported having a culture and leadership team that supports the introduction of new ideas, only around half have implemented structured processes or incentives to support the development of new ideas and information (Roper et al., 2016). The scope for more widespread adoption of such practices is clear.

Figure 1: Service Innovation: Activities and Practices Framework

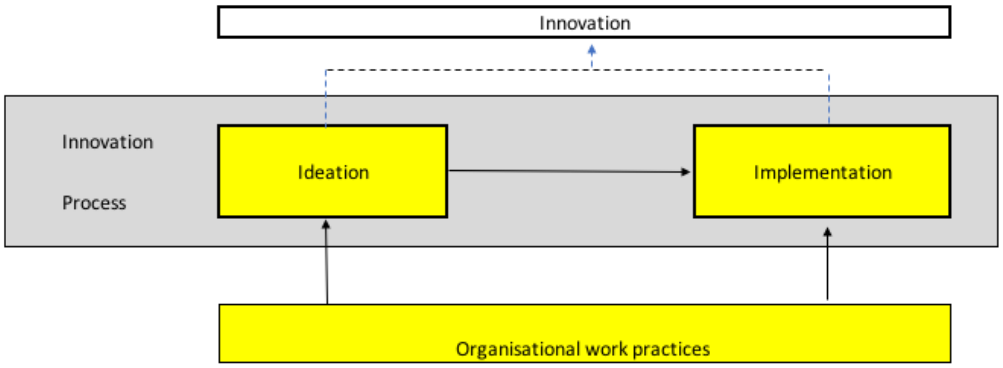


Table 1: Sample Descriptives

	Mean	Std. Dev.
Innovation: Ideation & Commercialisation		
New Service Ideas from outside the firm	11.601	20.920
Diversity of Innovation Activity	46.325	29.347
Innovative Sales (%)	16.658	24.247
Control Variables		
Firm Size (employment)	87.427	393.333
Firm age	20.174	9.666
Workforce with degree (%)	54.704	27.151
Exporting Firm (> 5% of sales)	0.355	0.479
IT investment (0/1)	0.655	0.476
Research investment (0/1)	0.674	0.469
Design investment (0/1)	0.480	0.500
Multi-functionality: Ideation	39.874	35.954
Multi-functionality: Commercialisation	37.140	34.839
External Knowledge Seeking: Ideation	23.947	27.866
External Connectivity: Commercialisation	12.043	21.893
Teamwork Index	31.379	39.777

Source: OPIPS Survey. Observations are weighted to give representative results.
Notes: Descriptive statistics for the Organisational work practices (factor) variables are in Table 2.

Table 2: Factor Loadings for Organisational Work Practices

	Factor 1 *Strategy & Information Sharing*	Factor 2 *Recruitment & Training*	Factor 3 *Work Flexibility & Discretion*	Factor 4 *Culture & Leadership*	Uniqueness
Written strategies or policies to support the introduction of new ideas	0.669				0.5045
Communicate or share information via formal staff suggestion schemes	0.629				0.122
Communicate or share information via annual staff surveys	0.562				0.5622
Communicate or share information via scheduled team meetings	0.636				0.7136
Communicate or share information via intranet	0.458				0.2529
Communicate or share information via newsletters	0.568				0.5806
Communicate or share information via employee forums or work councils	0.547				0.5513
Formal procedures for employee consultation	0.587				0.5782
Problem-solving or continuous improvement groups	0.539				0.7193
Structured processes to support the introduction of new ideas	0.585			0.307	0.6155
Project –specific teams (of people who don't usually work together)	0.479				0.6929
Offer staff rewards or incentives for valuable new ideas	0.482				0.5464
Give employees information about financial position	0.444				0.354
Hold ISO9000 Standards	0.536				0.3501
Disciplinary and dismissals formal procedures	0.508	-0.412			0.7738
Equal opportunities policy	0.457	0.408			0.7203
Recruit people with experience working in other firms in your sector		0.495			0.6544
Develop staffs' professional skills		0.422			0.5758
Train staff on how to develop ideas for new services		0.500	0.315		0.6326
Access to flexible working			0.791		0.6825
Discretion over how to do work			0.780		0.5422
Work variety			0.574	0.303	0.7909
A culture that supports the introduction of new ideas	0.443			0.774	0.6922
A leadership team that supports new ideas	0.464			0.728	0.6866
					0.5434
Variation explained	0.368	0.063	0.152	0.085	
Coefficient Score (means)	0.991	0.314	0.546	0.682	
Standard Deviation	0.354	0.342	0.463	0.561	
Min	-0.142	-1.207	-0.617	-1.079	
Max	1.784	1.451	1.709	2.242	

Source: OPIPS Survey. Observations are weighted to give representative results.

Notes: 1. After running the PCA, the factors were rotated to get a clearer pattern of the underlying variables in each factor. The rotation method chosen is oblimin given the relationship between the factors. Loadings of less than 0.3 are excluded for presentation purposes. Next, new variables were created that produce the regression coefficients to estimate the individual scores. **2.** A high coefficient score within the min and max represents a high level of bundling. The coefficients do not

produce any real meaningful interpretation. However, their sign is important in identifying if combining practices has a positive or negative effect on the dependent variable in question. **3.** These four factors explain 67% of the total variance observed.

Table 3: Ideation: Tobit model of the share of new ideas from outside the firm

	External Ideas	External Ideas
	Initial Estimates	Final Estimates
Organisational work practices		
Strategy & Information Sharing	7.624	8.440
	(6.986)	(6.701)
Recruitment & Training	4.012	4.479
	(5.516)	(5.516)
Work Flexibility & Discretion	-4.407	-4.684
	(4.194)	(4.050)
Culture & Leadership	11.542***	11.499***
	(3.810)	(3.799)
Firm size (employment)	-3.108*	-2.846
	(1.853)	(1.738)
Firm age (years)	-0.027	
	(0.189)	
Workforce with degree (%)	-0.094	-0.092
	(0.065)	(0.065)
Exporting firm	-0.729	
	(4.046)	
External Knowledge Seeking	2.537***	2.613***
	(0.229)	(0.218)
External Knowledge Seeking squared	-0.021***	-0.021***
	(0.003)	(0.003)
IT investment(0/1)	-12.092***	-12.206***
	(3.971)	(4.009)
Research investment(0/1)	-0.038	
	(4.082)	
Design investment (0/1)	5.757	6.095*
	(3.619)	(3.664)
Multi-functionality: ideation	0.080	
	(0.067)	
Number of observations	716	717
P	0.000	0.000
Pseudo-R^2	0.418	0.417

Notes and source: OPIPS Survey. Observations are weighted to give representative results. Models contain sector dummy variables and constant term. Reference category for competition: local. Marginal effects are reported. *denotes significance at the 10% level; **at the 5% level and *** at the 1% level.

Table 4: Implementing Innovation: Tobit models of innovation diversity and innovation success

	Diversity of Innovation	Diversity of Innovation	Innovation Success	Innovation Success
	Initial Estimates	Final Estimates	Initial Estimates	Final Estimates
Organisational work practices				
Strategy & Information Sharing	13.589***	14.032***	20.405***	19.773***
	(3.674)	(3.517)	(6.980)	(6.862)
Recruitment & Training	1.788	1.554	10.079*	10.051*
	(2.469)	(2.485)	(5.376)	(5.219)
Work Flexibility & Discretion	2.118	1.855	5.593	5.208
	(2.073)	(2.058)	(3.572)	(3.597)
Culture & Leadership	-1.730	-1.644	2.688	2.844
	(1.865)	(1.847)	(3.830)	(3.783)
Firm size (employment)	0.810		-5.308***	-5.189***
	(0.923)		(1.888)	(1.860)
Firm age (years)	-0.342***	-0.348***	-0.753***	-0.758***
	(0.104)	(0.102)	(0.213)	(0.204)
Workforce with degree (%)	-0.024		-0.009	
	(0.037)		(0.078)	
Exporting firm (0/1)	-4.064*	-3.982*	6.631	6.355
	(2.124)	(2.122)	(4.284)	(4.151)
External connectivity: commercialisation	0.211*	0.101**	0.055	
	(0.125)	(0.050)	(0.267)	
External connectivity: commercialisation (squared)	-0.002		-0.001	
	(0.002)		(0.004)	
IT investment(0/1)	3.017	2.896	4.075	
	(2.077)	(2.074)	(4.098)	
Research investment(0/1)	2.946	2.807	-2.138	
	(2.235)	(2.236)	(4.207)	
Design investment (0/1)	10.190***	10.330***	17.488***	16.928***
	(2.088)	(2.072)	(4.385)	(3.996)
Multi-functionality: commercialisation	0.948***	0.968***	1.932***	1.931***
	(0.100)	(0.099)	(0.197)	(0.187)
Multi-functionality (squared)	-0.008***	-0.008***	-0.016***	-0.016***
	(0.001)	(0.001)	(0.002)	(0.002)
Team-working index	0.069**	0.069**	-0.031	
	(0.030)	(0.031)	(0.052)	
Externally sourced ideas	0.088**	0.084**	0.114	0.097
	(0.041)	(0.041)	(0.081)	(0.082)
Observations	691	698	666	680
P	0.000	0.000	0.000	0.000
Pseudo-R^2	0.133	0.132	0.103	0.102

Source: OPIPS Survey. Observations are weighted to give representative results. Models contain sector dummy variables and constant term. Reference category for competition: local. Marginal effects are reported. *denotes significance at the 10% level; **at the 5% level and *** at the 1% level.

Table 5: Symbolic Summary of influence of Organisational Work Practices on Innovation

	Ideation	**Commercialisation**	
	External Ideas	Diversity of Innovation	Innovation Success
Strategy and Information Sharing	(+)	**+**	**+**
Recruitment and Training	(+)	(+)	+
Work variety and Discretion	(-)	(+)	(+)
Culture and Leadership	**+**	(-)	(+)

Notes: + a significant and positive effect; - a significant and negative effect; (+) an insignificant positive effect; (-) an insignificant negative effect

Annex 1: Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	External ideas	1																		
2	Diversity innov	0.3	1																	
3	Innov Success	0.26	0.42	1																
4	Firm size (employ)	0.06	0.07	-0.06	1															
5	Firm age	-0.08	-0.12	-0.24	0.07	1														
6	Workforce with degree	0.01	0	0.02	-0.01	0.01	1													
7	Exporting firm	0.03	0.1	0.12	0.1	-0.01	0.1	1												
8	IT investment	0.03	0.18	0.06	-0.05	0.02	0.06	-0.03	1											
9	Research Investment	0.16	0.38	0.19	0.08	-0.07	0.09	0.12	0.14	1										
10	Design Investment	0.17	0.47	0.35	0	-0.06	0.05	0.14	0.11	0.3	1									
11	Multif: ideation	0.27	0.52	0.33	0.07	-0.05	-0.01	0.15	0.15	0.31	0.29	1								
12	Multif: commercialisation	0.29	0.5	0.34	0.09	-0.08	0	0.17	0.12	0.33	0.32	0.82	1							
13	Ext_ Knowledge: ideation	0.49	0.47	0.21	0.07	-0.06	0.01	0.06	0.14	0.32	0.29	0.54	0.5	1						
14	Ext_ Knowledge: commercialisation	0.2	0.35	0.15	0.04	-0.01	-0.02	0.01	0.12	0.24	0.26	0.37	0.37	0.44	1					
15	Teamwork	0.16	0.5	0.26	0.1	-0.07	0.02	0.13	0.12	0.3	0.33	0.48	0.45	0.42	0.39	1				
16	Strategy & Info Sharing	0.08	0.38	0.13	0.17	0.04	0.06	0.06	0.13	0.33	0.24	0.28	0.29	0.26	0.24	0.37	1			
17	Work Flexibility & Discretion	0.01	-0.01	0.06	0.01	0.03	0.11	0.09	0.03	0.01	-0.01	-0.04	-0.03	-0.01	0.04	0.02	-0.07	1		
18	Culture & Leadership	0.06	-0.09	-0.02	-0.04	0.1	-0.02	0.01	0.03	-0.06	-0.1	-0.05	-0.08	-0.03	-0.01	-0.06	-0.38	0.23	1	
19	Recruitment & Training	0.02	0.04	0.11	-0.05	-0.1	0.07	0.03	0	-0.04	0.03	0	-0.01	0.01	0.01	0.08	-0.15	0.12	0.17	1

Source: OPIPS Survey. Observations are weighted to give representative results.

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