Innovation and HR practices in five professional service sectors

A report for the UK Commission for Employment and Skills

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EXECUTIVE SUMMARY

Key findings

We investigated the link between human resource practices, innovation, growth and productivity growth in 900 firms across five UK service sectors: Software & IT Services, Accountancy, Architectural Services, Consultancy and Specialist Design.

We find no direct relationship between HR practices and firm growth or productivity growth. There is a strong positive link between HR practices to innovation, however, and between innovation and firms' sales and productivity growth.

HR practices are therefore positively associated with firm growth and productivity growth. However, this relationship is indirect, working through – or mediated by – innovation. In other words HR practices are related to innovation, innovation is related to growth and productivity improvement.

Around nine-tenths of firms reported having a culture and leadership team which supports the introduction of new ideas. This fell to around half of firms reported having in place structured processes to support the development of new ideas, and a third of firms had in place written strategies to support new ideas and/or incentive structures to support the development of new ideas. Around a fifth of firms' current sales are derived from services which were either newly introduced or improved during the previous three years.

A significant gap was therefore evident in all sectors between the proportion of organisations suggesting that their culture and leadership was supportive of innovation and the implementation of practical initiatives which might support innovation activity. This gap was largest in Accountancy.

Our analysis is based on a new survey of HR practices and innovation outcomes. The survey focussed on staff recruitment and development, high performance work practices and their role in generating innovation and

productivity. We explore how these HR practices contribute to the way in which firms source new knowledge, build marketable innovations and then commercialise those innovations.

Measuring innovation

Most respondents to the survey regarded themselves as having introduced at least one new service during the previous three years. In general, Accountants and Architectural Services firms were less likely to see themselves as innovative than respondents from other sectors. This may be linked to the regulatory framework faced by these professions.

The proportion of revenue accounted for by newly introduced services varies markedly across the sectors, perhaps reflecting the differing competitive environment faced by different sectors: sectors with more national or international competition tend to have a higher revenue proportion from innovative services. Accountants have markedly low levels of revenue accounted for by new services, and are the most likely to have only local competition.

The ability to recruit new staff was the biggest perceived barrier to innovation, followed by the competitive environment. There were some marked differences among the sectors. Most notably, regulation and legislation was not seen as a major innovation barrier except for accountants, for whom it was the single biggest perceived constraint.

HR practices

The adoption of HR practices fell into three broad groups:

- Almost all respondents had in place an equal opportunities policy and a formal process for dealing with disciplinary issues;
- Around 50-62 per cent of firms had in place established communication mechanisms for employees, varied employee work practices offering flexibility and discretion and elements of team-working

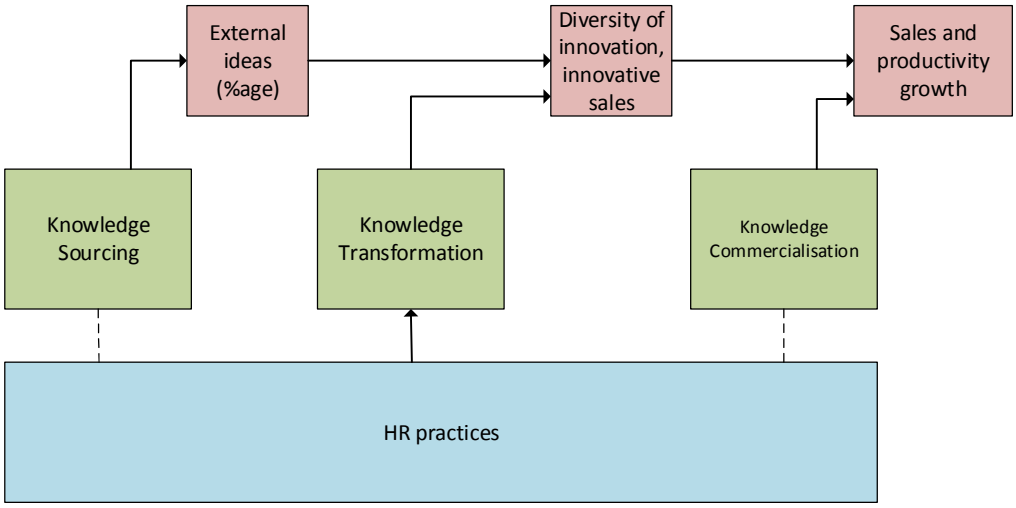
- Only around 25 percent of firms had IS0 9000 standards in place to ensure service or process quality.

Delivering on innovation and growth

We adopt an activity level perspective to see how firms generate innovation and growth and identify three separate activities – knowledge sourcing, knowledge transformation and knowledge commercialisation. We investigate the role of HR practices at each element of the value chain (Figure 1).

At the activity level we see sizable differences between sectors in terms of firms' investment in and approaches to ideation. The most significant sectoral differences arise in terms of research intensity (expenditure as a proportion of turnover) varying from a minimum of 0.5% in Specialist Design to a maximum of 4.3 per cent in Software and IT. Multi-functional working and collaborating with external partners to develop new ideas for innovation are relatively common across all sectors. Firms in the software and IT sector are most active on both metrics. As a consequence the proportion of externally sourced ideas (21.4 per cent) is highest in Software and IT – the most 'open' of the sectors - and lowest in Architectural Services and Specialist Design.

Figure 1: Linking HR practices, innovation and growth



In the intermediate stage of the innovation value chain Software and IT companies achieve the highest values on each of the input metrics relating to multi-functional working, team-working and external knowledge sourcing. Consultancy firms are broadly similar in terms of their levels of multi-functional working and use of teams but less likely to be working with external partners as part of the development of specific innovations. Perhaps unsurprisingly levels of sales of innovative services and the diversity of firms' innovation activity are highest in Software and IT and most modest in Accountancy and Architectural Services.

Commercialising innovation is the final element of the innovation value chain linking knowledge creation and the generation of value for firms' their various stakeholders. Firms in the Software and IT and Consultancy sector adopt the broadest range of mechanisms for engaging with customers with Accountancy firms lagging somewhat in this respect. Branding and promotional investments in Consultancy stand out, however, being almost twice that of each of the other sectors considered. The extent of multi-functional working in terms of commercialisation reflects that in other links in the innovation value chain: greater in Consultancy and Software and IT and more limited in the other three sectors.

Linking HR practices to innovation and growth

We use multivariate regression models to explore the association between HR practices and innovation and growth outcomes.

In relation to the first and final stage of the innovation value chain, there is no significant relationship between HR and sourcing knowledge for innovation from external partners and commercialising innovation. HR practices have no significant influence on firms' capabilities in sourcing knowledge from external partners. Nor do they significantly impact firms' ability to commercialise innovation, as measured by turnover growth and productivity growth (Figure 1)

HR practices are an important influence in the intermediate stage – building innovation – of the innovation value chain. Firms employing a greater

number of HR practices are more likely to be service innovators and more diverse in their innovation activity. Both innovation indicators are in turn linked to sales and productivity growth.

CONTENTS

SECTION 1. INTRODUCTION

1.1 Background

Innovation in new services and new ways of delivering value to clients plays a key role in generating growth and competitiveness. This report investigates how human resource (HR) practices contribute to supporting innovation in five professional services sectors: Software & IT Services, Accountancy, Architectural Services, Consultancy and Specialist Design. The objectives of the study are to consider:

1. How do professional services firms develop their human resources capabilities to deliver value to current and potentially new customers?
2. How do firms organise staff to maximise creativity and productivity? This might involve team-working, knowledge sharing, open innovation.
3. How do HR practices contribute to the generation of new innovations with these sectors and how does innovation itself contribute to value creation?

Our analysis is based on a new survey of HR practices and innovation outcomes covering over 900 firms across the five sectors. The survey focusses on staff recruitment and development, high performance work practices and their role in generating innovation and productivity. We explore how these HR practices contribute to the way in which firms source new knowledge, build marketable innovations and then commercialise those innovations.

1.2 Sectoral coverage

Our analysis covers five professional services sectors. These sectors differ markedly in their level of regulation from Accountancy at one extreme to Consultancy and Design Services at the other. The nature of competition also varies markedly between sectors. For many Accountancy firms'

competition is predominantly local whereas for Consultancy and Architectural Services firms competition is often national or international. Some common trends are also evident across the sectors, however, most notably perhaps the breakdown of traditional functional divisions between firms. Shaped by these factors, the nature of innovative activity in each sector also differs somewhat and we now provide a brief review of previous studies of innovation in each sector.

1.2.1 Software & IT Services

This sector which covers SIC 2007 58.2 and 62.9, 62.1 and 63.1 includes the development and publishing of computer games, other software development, computer services such as web hosting and data processing and IT consultancy activities. In terms of the number of businesses covered this is the largest of the five sectors considered here including around 41,100 businesses (with more than 5 employees) of which around half have less than 9 employees (Table 1.1).

Studies of innovation in the Software & IT Services sector have also 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). Interactions with suppliers, customers and external bodies such as public organisation and trade associations have also been highlighted as providing critical inputs which the firm itself would be unable to provide (Bygstad and Lanestedt 2009).

Table 1.1: Number of businesses in each sector, by employment size band

	Employment sizeband						
	5-9	10-19	20-49	50-99	100-249	250+	Total
Software & IT Services	6845	3840	2215	700	350	180	14130
Accountancy	4850	2170	860	220	110	90	8300
Consultancy	5690	2510	1010	305	140	80	9735
Architectural Services	5415	2920	1360	450	220	120	10485
Specialist Design	1480	635	215	35	15	5	2385
Total population	24280	12075	5660	1710	835	475	45035
Software & IT Services	48.4	27.2	15.7	5.0	2.5	1.3	100.0
Accountancy	58.4	26.1	10.4	2.7	1.3	1.1	100.0
Consultancy	58.4	25.8	10.4	3.1	1.4	0.8	100.0
Architectural Services	51.6	27.8	13.0	4.3	2.1	1.1	100.0
Specialist Design	62.1	26.6	9.0	1.5	0.6	0.2	100.0
Total population	53.9	26.8	12.6	3.8	1.9	1.1	100.0

Source: **ONS Enterprise Unit data 2015 derived from the Inter-departmental Business Register.**

1.2.2 Accountancy

This relatively tightly defined sector covering SIC 2007 69.2 includes accounting and audit activities, book-keeping and tax consultancy. There are around 8,300 Accountancy businesses across the UK (with more than 5 employees) the majority of which have fewer than 9 employees. One recent study tracing the history of the profession describes the move from professionalism to commercialism as Accountancy firms have moved from the traditional domains of reviewing and auditing company accounts into environmental auditing, forensic accounting and consulting services. This raises implicit conflicts of interest: 'professionalism prioritizes high-quality services and the protection of the public interest, and is founded on values, such as objectivity, integrity, rigor, and independence, which are supposed to prevail over commercial interests. By contrast, commercialism involves promoting a wide range of services designed to increase market share and

short-term profitability' (Picard, Durocher, and Gendron 2014) p. 74). One consequence of this shift towards broader commercial objectives has been the development of separate specialisms within accountancy such as tax, audit and management consultancy (Khalifa 2013). These commercial pressures have been accompanied by an increasing emphasis on international or supra-national accountancy regulation challenging the role of national regulatory bodies particularly where firms are global in nature (Gillis, Petty, and Suddaby 2014).

1.2.3 Consultancy

This sector (SIC 2007 70.22) includes financial management and management consulting activities. As with Accountancy and Software & IT Services the majority of the 9,800 firms in this sector (with more than 5 employees) have fewer than 9 employees. The innovation process in consultancy firms is often thought of as a collective process in which consultants play a key role as both producers and carriers of knowledge (Bessant and Rush 1995). From the clients' perspective the services provided by consultancy firms reinforce in-house expertise and complement existing skills (Czarnitzki and Spielkamp 2003). During this process there are exchanges, collaborations and interactions which may drawing on knowledge from a variety of industries to provide solutions to clients based on a combination of new and existing knowledge (Hargadon 1998). Relatively few studies directly explore innovation metrics in consultancy services specifically but there is considerable evidence that partnering with management consultants can enhance other firms' innovation outcomes (Back, Praveen Parboteeah, and Nam 2014).

It has been suggested that the consultancy sector – in contrast to professions such as law 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, p. 20). At an individual level one consequence o of this weak professionalism has been concern about the sense of identity of individual consultants (Gill 2015). At a sectoral level, Kipping and

Kirkpatrick (2013, p. 782) suggest that this weak professionalism may …' 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. This has resulted – at least in the UK – in a dynamic sector characterised by the entry of new firms providing different kinds of services and entering the industry often from other related sectors (Kipping and Kirkpatrick 2013). These new entrants have brought with them greater variety in organisational forms and management practices, a marked contrast to the more strongly regulated and routinized structures in professional services such as law or Accountancy.

1.2.4 Architectural Services

This broadly defined sector includes a range of activities related to architecture and the built environment covered in SIC 2007 71.1 and 74.9. This includes architectural activities, urban planning, engineering design activities and quantity surveying. This is the second largest of the sectors we consider, covering around 10,500 firms (with more than 5 employees). Innovations in architecture tend to be produced from team work within the firm and collaborative arrangements between experts with different skill sets (Falconbridge 2006). This requires strategic management and the effective deployment and utilisation of project knowledge and project management skills. It has been suggested, however, that one of the key difficulties in architectural practices is the management of architects who tend to be "culturally resistant" to being managed (Winch and Schneider 1993).

In their study of architecture, engineering and construction firms Kamara *et al*.(2002) stressed the importance of a number of factors in knowledge management in these firms. These factors include the accumulation of knowledge from individuals, long standing relationships with suppliers, lessons learnt from completed projects, formal and informal feedback, transfer of people in different activities, informal networks and collaborations, the reliance on the departments to disseminate the

knowledge gathered and the use of IT tools to support information sharing and communication.

1.2.5 Specialist Design

This tightly defined sector (SIC 2007 74.1) is the smallest sector we consider with around 2,300 firms across the UK (with more than 5 employees). These are highly concentrated in the 5-9 employee sizeband. The design firms included in the survey include fashion design related to textiles, wearing apparel, shoes, jewellery, furniture and other interior decoration and other fashion goods as well as other personal or household goods. This is therefore a relatively heterogeneous sector consisting of a number of distinct subsectors; interior designers work directly for individual consumers and for companies while textile designers tend to work for other companies or are self-employed. Firms in this sector tend to be small with the emphasis on creativity rather than commercial processes and previous studies have often stressed the failure of design companies to effectively protect and exploit their intellectual property.

Designers play a significant role in both shaping the appearance and usability of products but also in shaping the success of development projects (Roper et al. 2016; Valencia, Person, and Snelders 2013). This focuses attention on the role of designers as strategic consultants rather than just having a concern with product aesthetics emphasising the importance of design thinking. This has implications for the marketing of design services (Eneberg and Holm 2015), the skills needed by designers and the business model of design firms. A focus on the application of design thinking, rather than aesthetic considerations, also broaden the applicability of designers' services beyond the manufacturing sector.

Innovation in the design sector is seen as 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). Environmental factors are also seen as important, however, with government playing a role in facilitating the creation of networks, encouraging enterprise and finance and academia

providing suitably skilled and design educated graduates (Rusten and Bryson 2007). The importance of human capital in design services emphasizes the role of training and continuing professional development as part of the development process. Innovation processes in this sector are often unstructured dominated by individual creative staff or small teams working under close direction. Network collaborations with suppliers, customers, competitors and universities and interactions with clients are all seen as important as firms seek new creative opportunities and attempt to secure the requisite capacity and capability to address new design challenges.

1.2 Report overview

The remainder of the report is organised as follows:

- Section 2 provides a brief overview of prior studies of innovation in professional services and describes the activity-based approach we adopt in the survey;
- Section 3 profiles the level and breadth of innovation activity across the individual sectors, examines the barriers to innovation and profiles the reported benefits cited by firms;
- Section 4 focuses on HR practices both at the level of the individual activities which comprise the innovation value chain and the leadership and cultural factors which shape the environment for innovation in each firm.
- Section 5 reports an exploratory multivariate analysis relating firms' innovation activity, innovation outputs and growth and productivity outcomes to HR practices.
- Section 6 concludes with a brief commentary on the study findings and implications.

Annex material to the report includes a detailed description of the survey conduct and weighting, the survey questionnaire itself and some of the detailed results from the econometric analysis.

SECTION 2. INNOVATION AND HR PRACTICES IN SERVICES

2.1 Introduction

There is a relatively extensive research literature on innovation in business and professional service sectors, particularly in sectors such as IT Services and Consultancy. In this section we draw on this research literature to develop an activity-based framework for examining innovation performance and delivery in professional services, and to identify the contribution of HR practices[1].

2.2 Innovation in professional and business services

Service activity is characterised by 'bidirectional knowledge exchange with suppliers and customers acting as co-producers, a dynamic disposition of resources (people, technology, organisations and shared information) that creates and delivers value between service provider and customer' (Hidalgo and D'Alvano 2014, p. 699). This emphasises the networked, iterative and open nature of innovation in services with the potential for customers to play a lead role in identifying market needs with positive implications for innovation quality (Jespersen 2010). Definitions of 'innovation' itself vary, but generally stress the commercialisation of new knowledge or technology to generate increased sales or business value. The US Advisory Committee on Measuring Innovation, for example, defines innovation as:

[1] This section provides a brief overview of the related literature. More detail is included in Annex 1 of Roper, S., et al. (2015). Innovation in legal services. London.

> *'The design, invention, development and/or implementation of new or altered products, services, processes, systems, organisational structures or business models for the purpose of creating new value for customers and financial returns for the organisation' (Advisory Committee on Measuring Innovation in the 21st Century Economy 2008, p. i).*

Implicit in this – and other similar definitions of innovation such as that used in the OECD Oslo Manual - is the notion of innovation as a technological rather than a business process, a view driven largely by the manufacturing focus of many innovation studies.

Increasingly, this position is being re-evaluated even in terms of manufacturing, but in services there is a recognition that 'technological innovation is by no means the only field in which service firms innovate … over time there has been a shift from the focus on binary frameworks towards frameworks that recognise a wider range of different types of innovation' (Vergori 2014, p. 147). Definitions of service innovation therefore tend to be more general, reflecting novelty and commercialisation rather than new technology. In their recent 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 which may, for example, focus on different elements of organisations' operations and/or marketed services. However, a standard distinction is made between:

- ***Service innovation*** - relating to the production and delivery of new or improved services by existing suppliers.

- ***Delivery innovation*** - relates to new or improved processes thorough which services – either new or existing - are made available to customers. Here, we might distinguish between four different types of delivery innovation:

- Strategic innovation - reflecting the impact of a change in corporate strategy: a move to fixed price services, for example.

- Management innovation involving the implementation of new managerial approaches such as a structured innovation process.

- Organisational innovation involving structural changes to an organisation such as the introduction of multi-functional teams or joint development teams.

- Marketing innovation involving changes to marketing concepts or strategies, e.g. a move to media advertising or commercial partnerships.

Undertaking innovation in both manufacturing and services involves a number of diverse activities from opportunity recognition and ideation to commercialisation (Carlborg, Kindstrom, and Kowalkowski 2014). For example, Hidalgo and D'Alvano (2014) adopt a five-fold distinction – 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 (Hansen and Birkinshaw 2007):

- ***Knowledge acquisition*** - this includes firms' efforts to source the bundle of different types of knowledge necessary for innovation. This may involve firms undertaking in-house knowledge creation - through either design or research activities - alongside, and either complementing or substituting for, external knowledge sourcing. Innovation practices in the knowledge sourcing element of the innovation value chain are likely to focus on knowledge search and exploration or the management and organisation of these activities.

- ***Knowledge transformation*** - is the process of transforming this knowledge and delivering new services or ways of delivering

services. This activity may again involve a combination of firms' internal and external resources. Here practices are likely to involve the codification of knowledge into either new market offerings or the development of new business processes.

- ***Knowledge commercialisation or exploitation*** - relates to the exploitation of firms' innovations through service creation and the generation of added value through commercialisation. This may involve an organisation's own marketing activities but may also involve activities such as selling through agents, partners or franchising.

Each of these three activities require different resources and capabilities, which may imply different patterns of investment and external relationships. Patterns of engagement with external partners such as customers may also differ between activities and between different types of innovation activity (e.g. service v delivery, incremental v radical)[2]. The extent and value of partnering in the innovation process, and differences in the type of partners with which services firms engage, will also depend on firms' boundary spanning capabilities and the attitudes of the decision makers leading or shaping the innovation process (Agrawal, Cockburn, and Rosell 2010; Jespersen 2010). Different organisational and leadership approaches may also be necessary in the early exploratory and later exploitation stages of an innovation process (Rosing, Frese, and Bausch 2011).

2.3 HR practices and innovation

There is general evidence of a positive relationship between human resources practices and innovation outcomes (Tether et al. 2005; Toner 2011; Combs et al. 2006; Guest 2011). Clear differences emerge between the nature of innovation activity across different sectors, however, and the

[2] Jespersen (2008), for example, identifies five different modes of customer engagement - first buyers, requesting, launching, pioneering and lead users – each of which delivers different value and engages with different elements of an innovation process.

related skill needs. Where innovation is technologically-led, which might be more characteristic of some manufacturing sectors, high level R&D and technical skills are important. Leiponen (2005), for example, finds a positive relationship between technical skills and innovation outcomes in a panel of Finnish manufacturing businesses. However, where incremental innovation dominates – and this is probably true of most of the economy – broadly based capabilities are required to maximise the potential for learning-by-using and learning-by-doing (Toner 2011). For example, Doran and Ryan (2014) examine skills use among Irish firms using data from the Irish element of the Community Innovation Survey. Identifying eight skill sets and whether these are sourced internally or externally to the firm they find that internal design and engineering/applied sciences are more important for radical innovation, whereas internal market research skills are more important where innovation is incremental. Studies have emphasised the importance of skills and flexible work practices in shaping incremental innovation in business processes in more traditional sectors (tourism, hospitality, food processing etc.) and so increasing productivity (Verma 2012). Skill needs may also vary during the development of an innovation. For example, technical staff or creative staff may play a key role in the early, developmental, stages of an innovation project but marketing staff are likely to be more important in terms of commercialisation (Herrmann and Peine 2011).

Work arrangements and their potential contribution to innovation have also attracted significant research attention. For example, Laursen and Foss (2014) provide a recent overview of the literature relating to HR practices and innovation and identify four groups of studies relating to: studies of HR practices and firm financial performance with innovation as an intermediate link; studies of HR practices and innovation; moderating factors in the HR practices-innovation relationship; and, studies of the antecedents of HRM practices. The majority of studies of HR practices and innovation focus on the role of high performance work systems or the 'system of HRM practices design to enhance employees' skills, commitment and productivity in such a way that employees become a source of sustainable

competitive advantage' (Fu et al. 2015, p. 211). Toner (2011) identifies ten HR practices which can form part of high-performance work systems:

1. Rigorous Selection Procedures- selection procedures may be oriented to select employees who have attributes which complement HPWS such as communication, numeracy, problem solving and team working skills.

2. Broad Job Classifications- facilitate flexibility in the deployment of employees but may also require broadly based training

3. Job Rotation- can be used to maximise flexibility of the workforce, maximise understanding and contribute to continuous improvement

4. Team working - can stimulate creativity and rapid problem solving

5. Worker initiative- delegation can encourage employee engagement and empowerment and contribute to continuous improvement

6. Flat Management Structure- eases control and may enhance flexibility

7. Worker Voice- formalised mechanisms for employee communication may also encourage employee engagement.

8. Incentives- financial incentives for valuable ideas may be part of a HPWS or other incentives such as profit sharing or employee share ownership schemes may operate.

9. Capturing Learning- mechanisms to capture learning by teams and rapidly diffuse these to other parts of the firm

10. Extensive Training- broad job definitions, rotation and team-working are likely to require significant training

Evidence suggests complementarity between HR practices and therefore the value of bundling of different practices. The effect of bundling may have direct effects on behaviour but may also signalling effects which may

influence employee engagement and motivation (Bowen and Ostroff, 2004) or perceived job quality (Storey et al., 2010). 'Much more inclusive, 'democratic' and incremental, rather than elitist, imposed and radical. By empowering their relatively well-educated workforces to make changes … [firms take] advantage of …'learning by doing' and 'learning by using' on the shopfloor to make incremental improvements in the efficiency and reliability of production. These forms of improvement are denied in a command and control organisation structure" (Tether et al., (2005, p. 76) quoted in Toner (2011)).

A number of studies suggest a positive relationship between HRM practices – usually implemented as a count variable of the adoption of different bundles of HR practices - and innovation output measures: in the UK, Michie and Sheehan (2003) and Shipton (2005); in Denmark, Laursen and Foss (2003); in Switzerland Arvanitis (2005); in the Netherlands Beugelsdijk (2008) and Zhou et al (2011); in Spain Jimenez-Jimenez and Sanz-Valle (2008); in Canada Zoghi et al. (2010); in Italy Giannetti and Madia (2013); in China Eriksson et al. (2014); in the US Stock et al. (2014); and in Ireland Fu (2015).

More recent studies of HRM practices and innovation have considered moderating factors Laursen (2002) for example, provides evidence that HRM practices may be more significant in knowledge intensive sectors (Chi and Lin 2011). The value of formal HR practices may also vary with firm size (Wu et al. 2015). Other recent studies have suggested the potential non-linearity of the HR practices-innovation relationship, particularly for smaller firms and potential for what White and Bryson (2016) call 'thresholds' of effectiveness: low levels of HPWS implementation have negative effects on job attitudes but higher levels have more positive effects.

2.4 HR along the value chain

To date studies of the relationship between HR practices and innovation have treated innovation as a single activity. This is surprising as the new

product development literature has long recognised the different activities implicit in an innovation process (Harmancioglu et al. 2007; Gronlund, Sjodin, and Frishammar 2010), while the management literature has focussed on the exploration/exploitation distinction following (March 1991) and more recently emphasised the importance of ambidexterity (Kollmann and Stoeckmann 2010; Chang and Hughes 2012).

The innovation value chain or IVC provides a framework within which we can consider how firms' HR practices contribute to the success of each specific innovation activity. For example, skill needs may vary during the development of an innovation. Technical staff or creative staff may play a key role in the early, developmental, stages of an innovation project but marketing staff are likely to be more important in terms of commercialisation (Herrmann and Peine 2011). Varying skill needs are also reflected in the need for 'ambidextrous leadership' which moves from transformational leadership towards more focussed transactional leadership as innovation projects move closer to market (Rosing, Frese, and Bausch 2011).

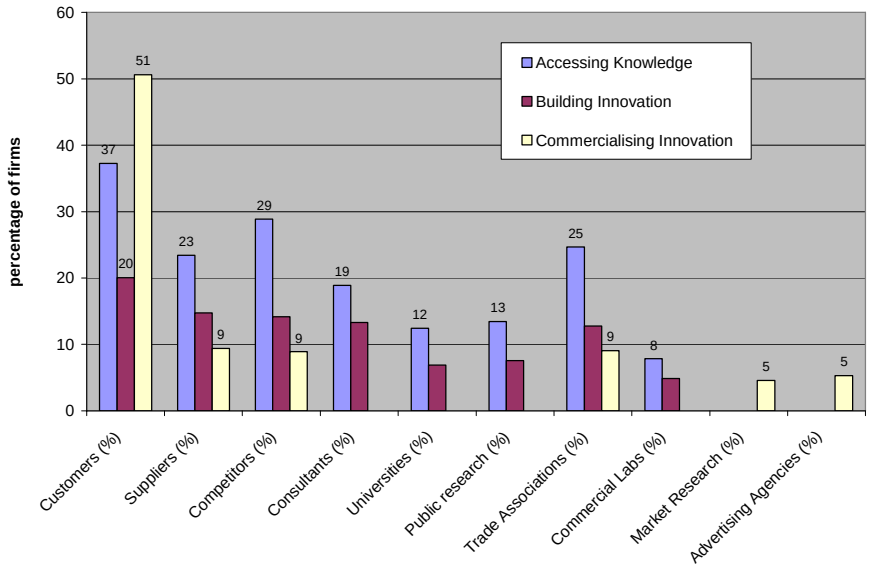
This suggests that certain HR practices may be specific to different innovation activities. Other attributes or practices may also be important which characterise HR practices across the firm (Figure 2.1). For example, firms' willingness to partner with other organisations may be important at each stage of the IVC (Love, Roper, and Bryson 2011). Partnering or collaborative working for innovation offers firms a potential route for accessing external skills and so overcoming internal skill constraints (Doran and Ryan 2014). Maintaining and developing collaborative relationships also has significant skills and people management implications, however, and one recent study of technology transfer centres in Italy identifies the importance of the combination of technical skills and networking competences as well as relevant relational capital (Comacchio, Bonesso, and Pizzi 2012).

Figure 2.1: HR practices along the IVC

	Accessing Knowledge	Building Innovation	Commercialising Innovation
Performance	External ideas (%)	Innovative sales (%) Innovation diversity (%)	Sales growth (%) Productivity increase (%)
HR practices at activity level	Multi-functional work Collaboration	Multi-functional work Collaboration	Multi-functional work Collaboration
HR practices at firm level	Training plan and budget Team-working for development and problem solving Financial incentives for new ideas Open communication with staff and structured communication mechanisms An equal opportunities policy Hold quality standards certification Formal disciplinary procedures Offer job flexibility and variety		

Figure 2.2 is based on information for UK business services organisations, and highlights that business services organisations have more linkages to external partners of all types in the first stage of the innovation value chain. There are three exceptions which all relate to the commercialisation stage of the IVC.

Figure 2.2: External connections of UK business services organisations – by stage of the innovation value chain



Source: Love, J.H., S. Roper, and J.R. Bryson, 2011, Op. Cit.

Among business services organisations it is links to customers which are most common in the knowledge transformation stage. Links to other types of organisations may also play an important role in knowledge transformation, although again the specific evidence is limited. Perhaps surprisingly, such links matter less in the process of actually translating innovations into growth and profitability. Despite this we see the highest proportion of business services organisations have external linkages to clients as part of their commercialisation activities. This emphasises the activity specific element of collaboration for innovation.

The important role of multi-functional teams on organisation innovation is well established. Although much of the empirical evidence relates to the manufacturing sector, it is important to note that there are usually more departments and project teams involved in the innovation process in the services sector than in the manufacturing sector. Bringing professionals with different skills together to achieve a common goal should lead to communication, information exchange and mutual learning. A recent study examined the role of such teams for a range of UK business services. In this study, teams prove of greater value for knowledge transformation where they are more multi-functional, i.e. involve more functional groups from within the organisation (Love, Roper, and Bryson 2011). Other studies have, however, emphasised the importance of team leadership and the potential difficulties of communication raised by having teams including staff from multiple occupations (Carbonell and Rodriguez-Escudero 2009).

At firm level a range of HR practices might be adopted which support high performance working and are conducive to effective innovation. For example, effective training investment has been shown to play an important role in developing innovative products, services and processes (Figure 2.1). Skilled staff are often said to play a dual role in innovation – assisting organisations with the development of new ideas inside the organisation but also having greater absorptive capacity – i.e. the ability to identify, assess and appropriate knowledge from outside the organisation. R&D and

design staff are often said to play a similar role in their specific functions. As indicated earlier there is significant positive evidence on the relationship between workforce quality and innovation. There is less evidence on whether or how staff training and development contributes to knowledge transformation in any sector. Given that the most dominant resource in the provision of services to clients is human capital, however, improvements to this resource are likely to be useful in the transformation of knowledge to new services and business processes.

The ability of teams to contribute to successful innovation also depends significantly on the business culture and organisation within which they are operating. This is difficult to capture in empirical terms but the evidence suggests that where teams are valued, independent, embedded and include customers' or suppliers' knowledge, knowledge transformation is most effective.

Successful innovation requires that managers provide clear and consistent signals to employees about the goals and objectives of the organisation. Clear signals and public recognition of employees' accomplishments serve to motivate other employees to greater effort in meeting the organisations objectives. The practical consequence of rewarding desired behaviours is that other employees repeat and emulate these behaviours. A study of Australian law organisations found that acknowledging and rewarding practices (such as, adoption of new practices and processes, implementation of new services, solving problems in a novel way and bringing new practices to the organisation) positively influenced innovative behaviour and performance (Hogan and Coote 2013). Providing employees with the space to think, experiment, discuss ideas and be creative is an important organisational characteristic that can facilitate the innovation process. Allowing individuals a certain amount of 'slack' for innovation is a practice sometimes employed by organisations.

Alongside these HR practices a range of other internal factors are likely to be important in shaping firms' innovation success:

- The importance of research and design investment to innovation is well documented, although the evidence in relation to business service organisations is less conclusive.

- Investment in reputation building through advertising and branding may enable firms to better appropriate the benefits of any innovation.

- Intellectual Property (IP) concerns the legal rights associated with creative effort of commercial reputation. There are many types of IP (e.g. patents, copyright, trademarks, registered designs) with some being more relevant to specific industries.

SECTION 3. MEASURING INNOVATION

3.1 Introduction

This section provides an overview of top level survey findings, including a brief description of the responding professional service firms. All tables are based on data taken from the telephone survey of professional services firms carried out between January and March 2016, details of which are provided in Annex 1.

Section 3.2 provides an overview of respondents in terms of size and ownership characteristics, and their views on the competitive conditions they face. Section 3.3 gives a detailed description of the nature of service innovation in professional services, including a breakdown by organisations of different sizes. Sections 3.4 and 3.5 consider the perceived benefits of, and barriers to, innovation by sector. Section 4 provides more detail on HR practices and the management and delivery of innovation in each of the five sectors.

3.2 Overview of survey respondents

Tables 3.1 to 3.3 provide information on characteristics of the responding firms, broken down by sector. Table 3.1 indicates that there was little

difference between sectors in terms of the level of graduate employment (around half of the workforce). The average size of responding firms varied more considerably, from 13.4 employees in Specialist Design to 49.1 in Consultancy. The vast majority of respondents were UK owned, with only Software and IT and Consultancy showing foreign ownership rates of above 5%. Table 3.2 shows that firms were typically around 20 years old, and the vast majority were single-site enterprises which were not part of a larger group.

Table 3.1: Survey respondents: Workforce and Ownership

	Graduates	Average Employ.	UK Owned	Externally Owned	Jointly Owned
	%	No.	%	%	%
Accountancy	48.3	27.0	99.4	0.2	0.4
Architectural Services	63.7	40.1	96.1	1.6	2.3
Consultancy	57.8	49.1	93.1	5.5	1.4
Software & IT Services	52.0	30.4	90.1	8.4	1.5
Specialist Design	48.9	13.4	99.2	0.8	0.0
Total	55.1	35.1	94.3	4.3	1.4

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

Table 3.2: Survey respondents: Age and Status

	Business Age	Single Site	HQ Site	Subsidiary Site
	Years	%	%	%
Accountancy	21.8	77.6	15.2	7.2
Architectural Services	21.1	80.3	12.4	7.3
Consultancy	17.3	80.7	13.6	5.7
Software & IT Services	16.3	73.1	17.2	9.7
Specialist Design	14.4	86.9	9.0	4.1
Total	18.6	78.0	14.5	7.5

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

Table 3.3 provides information on where respondents saw the source of their principal competition, and the extent to which their services were sold

abroad. Perhaps unsurprisingly, accountants tended to be very locally focussed and with a very low proportions of services performed for overseas clients. Firms in the other sectors were much more internationally oriented, with around half of respondents having overseas customers for at least 5% of their services, and over a quarter of respondents viewing their principal competitors as being international organisations.

Table 3.3: Survey respondents: Markets and competition

		Competition is:			
	Export 5% or more %	Local %	Regional %	National %	International %
Accountancy	6.3	66.6	20.9	10.1	0.3
Architectural Services	36.9	21.9	25.2	39	12.9
Consultancy	48.3	9.8	12	52.4	23.7
Software & IT Services	41.7	10.3	13.3	44.8	27.8
Specialist Design	16.3	15.6	21.3	57.5	5.6
Total	34.1	23.6	17.6	39.4	17.2

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

3.3 Profiling service and delivery innovation

This section shows various measures of innovation broken down by sector and by employment size bands. The first key indicator is the number of firms reporting that they had introduced at least one new service over the previous three years (Table 3.4). On average, around two-thirds of firms had done so, with notably fewer accountants and architects claiming to have introduced new services than those in other sectors. As is typical in studies of innovation, the proportion of innovators tends to rise with firm size: however, while this is the case for accountants and architects, it is by no means the case in the other sectors, suggesting that smaller firms may be highly innovative in the less regulated sectors. Table 3.5 performs the same analysis for services introduced which are regarded as being completely new to the market (as opposed to being simply new to the firm).

A similar overall pattern is evident to that of Table 3.4, but (naturally) with lower overall levels of recorded innovation activity.

A number of Accountancy firms reported service changes related to new technology including 'implementation of accounting software' or 'computerisation including tools for faster input of info'. Other changes related to the extension of services into less traditional areas with the introduction of 'probate services within the accountancy profession' or moves towards an 'accountancy practice which has left plain accountancy and taxation, moving toward a full business overview'. A number of firms, however, noted that changes to pensions legislation had created new business opportunities: 'we have introduced payroll and auto enrolment in line with government policies'; 'providing auto pension enrolment services - something that is a new requirement for us to offer'.

Regulatory opportunities were less commonly cited in Architectural Services where innovation seemed largely to be driven by the advent of new technologies. Firms commented: 'It's to do with virtual technology and remote working', 'More computer generated images. More CGIs', 'The use of 3rd modelling has helped to show client products in various stages and allows direct input from them during the production process'. Other architectural firms had broadened their service offering. One architectural practice commented 'we have two new areas, one is transport planning and the other is flood risk'. And, an engineering consultancy which started by doing civil engineering 'has now expanded into structural, traffic and transport engineering'.

Table 3.4: Percentage of firms introducing service innovations

	5-19 %	20-49 %	50 plus %	Total %
Accountancy	46.7	63.9	80.5	50.1
Architectural Services	46.2	59.2	66.7	49.3
Consultancy	72.5	76.2	77.4	73.1
Software & IT Services	79.4	71.2	71.7	77.5
Specialist Design	46.2	63.6	33.3	47.5
Total	62.1	67.8	72	63.4

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

Table 3.5: Percentage of firms introducing new to the market service innovation

	5-19 %	20-49 %	50 plus %	Total %
Accountancy	10.0	19.0	21.4	11.5
Architectural Services	10.0	16.9	18.5	11.5
Consultancy	29.6	41.5	39.7	31.4
Software & IT Services	33.8	32.0	39.6	34.0
Specialist Design	9.3	9.1	33.3	9.8
Total	21.4	27.2	31.4	22.8

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

As befits the breadth of the sector Consultancy firms cited a range of different forms and drivers of service innovation. Applications of web-based technologies were important in a number of cases with firms commenting on the introduction of 'a web based portal for clients to access directly', 'cloud based software solutions', 'improved processes and improved web based support for clients', 'digital campaign management', and 'operational databases, data warehouses, customer facing applications, interactive dashboards'. In common with firms in Architectural Services and accounting a number of consultancy firms had innovated to broaden their market offering. One firm remarked 'we have introduced finance brokerage services' and another 'we have become a full service agency. As opposed to just offering one product, we have a whole range, some of which are unique to the industry'.

In the Software & IT Services sector cloud-computing developments were an often cited source of new innovation, hence: 'we created a Cloud payment document and delivery platform'; 'cloud services as our clients have been requesting them'; 'it's services based upon Cloud technology'. On line support services were also an important area of development for some firms: 'We have developed our web portal which is all done in-house so customers can interact with us online. We also have additional services for providing consultancy and support services to customers'. Upgrading

and tailoring software to users' requirements was also regularly cited as a major focus of innovation, viz, 'functionality is our business. We tailor-make software to each customer'.

In Specialist Design firms, most of which are small, innovation was often linked to the development and employment of new staff: 'When we started we only did urban design and landscape architecture, and then at the end of the first year we employed an architect and offered architectural services'; 'a new member of staff with landscape and visual assessment training was brought into company'. Other innovations related to the 'the efficiency of the staff, needing to be trained, and keeping on top of technology'.

In terms of innovation in how services are delivered (Table 3.6), few differences are evident between sectors, although there is a tendency for larger firms to be more likely to report new forms of service delivery.

Table 3.6: Percentage of firms introducing delivery innovations

	5-19 %	20-49 %	50 plus %	Total %
Accountancy	34.4	52.4	52.5	37.2
Architecture	37.5	28.6	37.1	36.3
Consultancy	42.5	42.5	50.0	42.9
Software & IT Services	51.5	45.9	51.1	50.6
Specialist Design	35.2	27.3	66.7	35.2
Total	42.0	41.4	47.7	42.3

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

The main changes to the way Accountancy firms were delivering services were the increasing use of on-line and cloud based applications:

> 'We have introduced Cloud based information sharing and electronic filing'.
>
> 'It is far more electronic than it used to be and virtually all info is now passed electronically'.

> ‘3 years ago they used a lot of paper post to interact with clients, now they tend to use more email and attachments rather than paper post’.

Process changes were also reflected in some comments

> ‘We segregated the work between ourselves because before we had to do it all alone. Every individual employee now has specialist knowledge which has helped us greatly’.

> ‘We are trying to improve our delivery, particularly the time taken to respond to client requests. We are trying to action client directions much quicker than we previously did’.

The implementation of new technology based systems dominated delivery innovation among firms in architectural services. This included both developments in design software and systems, for example:

> ‘Adoption of 3D CAD software and standards to enable us to reach BIM level 2’.

> ‘We moved more towards electronic leads, use of emails and 3D imagery’.

> ‘We introduced 3D modelling, the way they have to deliver has changed because the software has changed, this means that the design process has been directly impacted’.

Development in back office systems was also important for some firms, e.g. ‘we have introduced a new document management system and are introducing a programme called CNAP’, alongside more standard business improvement processes: ‘we have better communication and have been tightening up details for quotes’. One other aspect of delivery innovation in Architectural Services not seen in the other sectors covered was standards recognition

> ‘We are an engineering firm and deliver engineering services and now we are ISO 9000 and ISO 13485 compliant which are engineering quality standards’.

> ‘We rolled out a new IT platform and data storage over the last 3 years, and became accredited to ISO 9000 standard’.

New technology was also cited as a driver of delivery innovation in Consultancy but perhaps rather surprisingly the emphasis here was changing systems to enable more regular face-to-face contact with clients as part of the delivery of consultancy services:

> ‘We actually do more face-to-face stuff and match different clients with other appropriate clients. We try to bring our clients together a lot more than we used to. It's all a more 'hands on' approach than before’.

> ‘The way we deliver - we are more people focused now. We have more qualified staff now, which allows us to focus on our services’.

> ‘More face-to-face time with client direct from staff, plus outsource certain aspects of service provided’.

> ‘Departmental restructures, changes in personnel. Representatives closer to clients, allows us to react faster’.

In contrast to the consultancy sector, firms in Software & IT Services were using technology and training staff to enable services to be delivered remotely. One firm commented that the biggest change was the ‘training of technical staff enabling more work to be done remotely instead of physically attending the sites’. Another firm commented: ‘No more site visits, just delivery of services over the internet. Don't need to go out and install software on site, we can do it remotely. Can be done at a convenient time for client and don't need to travel’. A number of other firms described organisational changes which they had made within the business to improve client services:

> 'We have increased quality by documenting and identifying processes'.

> 'The formation of our Client Services Department which is responsible for delivering those services'.

> 'We introduced a service delivery desk so now have ability to answer client queries on managed services in-house. If customers have problem logging on etc., there is now a team to help them with these queries'.

In Specialist Design the emphasis of firms' delivery innovation reflected that in consultancy with attempts to ensure services were strongly customer oriented and services were tailored to the needs of specific customers:

> 'We are more customer oriented, quicker responses to enquiries and faster delivery of service'.

> 'Pretty much bending over backwards and giving everyone a tailor made service that meets their needs. Working around them and what they need rather than them fitting in with us'.

> 'There are dedicated account managers that look after specific clients in different sectors'.

In terms of strategic, management and organisational innovations (Tables 3.7 to 3.10), a similar pattern emerges to that of service innovation: accountants are least innovative, followed by architectural services, with the other sectors displaying higher (and broadly similar) levels of innovation. Although the reasons for this cannot be established with certainty, it suggests that more tightly regulated professions – Accountancy, Architectural Services - tend to be less innovative in the wider aspects of innovation, as well as in the introduction of new services.

Table 3.7: Percentage of firms introducing Strategic innovation

	5-19 %	20-49 %	50 plus %	Total %
Accountancy	11.1	17.7	35.7	13.0
Architectural Services	25.0	34.7	35.0	26.9
Consultancy	40.7	54.3	58.6	43.0
Software & IT Services	40.9	46.5	47.9	42.4
Specialist Design	28.8	36.4	66.7	30.4
Total	30.7	40.2	45.0	32.8

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

Table 3.8: Percentage of firms introducing management innovation

	5-19 %	20-49 %	50 plus %	Total %
Accountancy	7.9	19.0	14.6	9.4
Architectural Services	16.3	28.6	30.2	18.9
Consultancy	26.3	35.8	46.8	28.3
Software & IT Services	19.1	31.1	32.6	22.0
Specialist Design	16.7	18.2	66.7	18.0
Total	17.8	29.0	32.6	20.1

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

Table 3.9: Percentage of firms introducing organisational innovation

	5-19 %	20-49 %	50 plus %	Total %
Accountancy	24.4	34.9	48.8	26.7
Architectural Services	31.3	51.9	51.6	35.5
Consultancy	49.4	57.0	61.9	50.8
Software & IT Services	44.1	66.2	48.9	48.0
Specialist Design	38.9	45.5	100.0	40.9
Total	38.3	55.5	52.8	41.4

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

Table 3.10: Percentage of firms introducing marketing innovation

	5-19 %	20-49 %	50 plus %	Total %
Accountancy	31.1	61.3	80.0	36.6
Architectural Services	54.4	66.2	64.1	56.7
Consultancy	70.0	64.2	80.0	69.9
Software & IT Services	67.6	75.3	72.7	69.2
Specialist Design	66.7	72.7	100.0	68.0
Total	58.0	68.9	73.2	60.3

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

A key measure of innovation is the proportion of total revenue (i.e. turnover) accounted for by innovative services (those introduced in the last three years). On average, respondents obtained 19.8 per cent of turnover from new services (Table 3.11). However, there is a very marked variation between the sectors here, with architectural service providers and (especially) accountants indicating very low levels of turnover from innovative services compared while the other sectors display markedly higher rates. Some variation by sizeband is evident here, but there is little systematic pattern. This pattern of results affords an interesting contrast with Table 3.4 (levels of service innovation), suggesting that while many firms saw themselves as 'being innovative', for accountants and architects this did not translate into markedly increased revenue from these new services. This issue is considered further in the section below, which examines the perceived benefits of innovation.

Table 3.11: Percentage of sales from innovation - a measure of innovation success: by employment sizeband

	5-19 %	20-49 %	50 plus %	Total %
Accountancy	8.3	5.0	9.8	8.0
Architectural Services	10.4	10.6	9.9	10.4
Consultancy	26.4	23.4	17.8	25.7
Software & IT Services	32.4	21.3	22.2	30.0
Specialist Design	15.0	15.9	23.3	15.3
Total	20.5	16.4	16.6	19.8

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

3.4 The benefits of innovation

In the survey innovators are also asked what effect their new or improved service(s) has had (Table 3.12). Clearly these responses are to some extent linked to the motivational factors: if competition is a factor, then extending the range of services or reducing costs is going to be both a motivator and an effect of innovation. The major effects are in extending the range of services offered, improving quality, improved tailoring of services, and attracting new clients. By contrast, improved speed of delivery and increasing revenue from existing clients were less important, although still mentioned by a majority of organisations. Reducing costs was not an important benefit for most respondents.

The benefits anticipated from innovation were broadly similar across the different types of service providers, but there are some differences. For example, accountants and (to some extent) Architectural Services firms saw innovation less as a means to attract new clients than was the case in the other sectors, and were slightly less inclined to see innovation as a means of extending the range of services on offer. Intriguingly, however, Accountants are the most interested in innovation as a means of increasing revenue from existing clients.

Table 3.12: The benefits of innovation – percentage of firms reporting significant benefits

	Accounts	Architectural Services	Consultancy	Software_&_IT	Specialist_design	Total
Extended the range of services you offer	90.3	91.4	94.9	95.6	92.8	93.8
Improved the speed of delivery of your services	64.1	53.4	66.9	68.3	49.9	64.0
Reduced the costs of delivery	39.8	31.5	46.0	47.5	35.9	42.6
Improved the quality of the services you offer	95.7	89.6	89.1	96.1	96.3	93.1
Enabled you to attract new clients	79.7	86.3	95.0	91.4	92.8	89.7
Increased your revenue from existing clients	83.0	74.5	79.9	80.4	71.4	79.3
Involved tailoring services	91.6	86.9	95.0	90.5	100.0	91.5
Reduced environmental impacts	31.4	53.7	34.2	36.3	46.3	38.6

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

3.5 Barriers to innovation

Perceptions of the key barriers to service innovation are shown in Table 3.13. Respondents were invited to indicate whether each factor was a significant constraint, a small constraint or no constraint to innovation. The percentages in Table 3.13 relate to those organisations responding that the relevant factor was a 'significant' constraint.

By far the most common barrier to innovation was the ability of the business to recruit new staff or talent, mentioned by one third of respondents. This was notably less of a problem for accountants and consultants, however. Intensity of competition was the next biggest barrier, followed by lack of finance. While the former was quite consistent across sectors, in the latter case again there were marked inter-profession differences, with accountants not perceiving this as an issue, while it was very important in software/IT and Specialist Design. Perhaps unsurprisingly, regulation and legislation was not seen as a major innovation barrier except for accountants, for whom it was the single

biggest perceived constraint. Accountants were also more preoccupied by perceived lack of market opportunities for new services than the other professions, which may again reflect regulatory constraints.

As part of the survey firms were also asked to describe the main constraint on their innovation activity. Accountancy firms identified a range of constraints on the potential for innovation with managerial constraints and resource constraints within the firm a common theme. One firm commented: 'Recruitment - getting a high quality of applicants is an issue' and another commented 'we offer a lot of services and the biggest constraint is lack of expertise. We would have to grow significantly to offer more services'. And, similarly: 'There hasn't really been a constraint. Time could probably be one of the biggest constraints. We are a small firm and everyone is very busy so pursuing anything new is difficult'. Aside from these internal issues, although some firms mentioned external economic factors, more common was reference to the regulatory environment and changes in the regulatory framework. One firm suggested the main barrier to innovation was 'Changes within Revenue and Companies House. Changes within the governing body merging with other organizations and another simply commented 'the regulatory constraints – the FSA Handbook'.

Finance and skills were most commonly mentioned as the main constraints by firms in the Architectural Services sector.

> 'New services need people ready and available, and there is a problem recruiting people with the relevant experience as it takes time for people to learn the ropes. Then in-house training uses two people which means no fees while they are training'.
>
> 'Recruiting staff with suitable experience'.
>
> 'Skill shortage within our sector, especially structural engineering'.
>
> 'Sometimes it's finding the right balance, getting a client to collaborate, obtaining information, willingness for people to listen,

and accept to change. Channels of communication. An element of financial and time constraints'.

'Biggest constraint is development of services. Dedicating the time and resources. Staff are dedicated to ongoing project work rather than dedicated teams to set up for R&D. Reactive rather than proactive approach is necessary'.

'The main constraint is trying to, or being able to, recruit the right engineers. There are about 70-80 good engineers in the country, and we have about 20. The main constraint is being able to prise them away from competitors'.

Unlike other sectors difficulties in accessing external (bank) finance were described as the most significant innovation constraint by a number of Architectural Services firms:

'It's mainly the general attitude of the banking sector towards small businesses. The continuous lack of support and ongoing changes'.

'Lack of finance, no government help/grants for private business. Too many promises, not enough action'.

Consultancy firms cited a range of internal and external factors as the main barriers to innovation. For some firms the nature of market competition and the attitudes of clients to service changes were an issue:

'Market conditions of cautiousness amongst clients, economic constraints, not willing to take risks'.

'It's about clients accepting the new technological improvements and the delivery of them'.

'Winning new business. It is a competitive market'.

Other consultancy firms cited internal constraints, particularly difficulties in accessing appropriate skills as the main innovation constraint. For different firms the main constraint on innovation was:

> ‘The right skillsets for technical services’.
>
> ‘Knowledge expertise’.
>
> ‘It's finding the right people who have the right experience’.
>
> ‘Lack or shortages of skill’.

For other firms the revenue impacts of undertaking innovation were a barrier. One firm commented that the greatest barrier was ‘the revenue cost. Spending time away from doing work for our clients, for our own needs is the main constraint’ and another commented that the main constraint was: ‘finding the time and resources, above and beyond the day to day task’.

Software and IT businesses emphasised resource factors as the main constraints on their innovation activity. Typical comments were:

> ‘It's purely financial and being able to find suitably skilled employees that are ready for the job and the experience’.
>
> ‘It's mainly been financial constraints and finding the right staff, of the right calibre. The reason we have struggled to find the right staff has been partly financial. But also, we are a niche business, so have had to look abroad’.
>
> ‘The main constraint has been the money available within our service sector to buy new services. So money that our clients have for new services. They've had budgetary restrictions’.
>
> ‘Probably not being able to recruit enough experienced staff’.

Other firms stressed the competitive and unstable nature of the market, with one firm commenting that ‘the lack of financial stability has resulted in a lack of investor confidence and financial investment by large companies in the projects we would like to offer’.

Firms across the Specialist Design sector tended to stress skills and finance as the main constraints on their innovation activity. Typical comments were:

> '… I'd say to get the right people is the main one. It's a recruitment issue and there's a lack of people in the market.
>
> 'Finding the correctly qualified people and finding the time for senior management to be able to develop'.
>
> 'Probably time, more specifically just staff resources to devote time'.
>
> 'I think one of the main issues is a lot of landscape architecture departments at universities are closing down so it's difficult to find new graduates'.

In general terms the relative frequency with which the different constraints on innovation are mentioned by respondents reflects to some extent that in other innovation surveys. In the UK Innovation Survey for 2011, for example, the most frequently mentioned innovation barriers were cost and availability of finance, said to be 'significant' by 14 per cent of UK firms followed by the costs and risks of innovation. UK Government regulation was said to be 'significant' by only 5 per cent of UK firms[3]. Regulatory and legislator constraints on innovation are therefore cited more frequently as an innovation constraint by professional services providers.

[3] Source: First findings from the UK Innovation Survey 2011 (Revised). Department of Business Innovation and Skills, May 2013, Table 5.

Table: 3.13: Barriers to innovation – percentage of firms citing as significant barrier

	Accountancy	Architectural Services	Consultancy	Software_&_IT	Specialist_design	Total
Attitudinal or expertise barriers to change in your business	4.9	7.2	5.7	8.7	4.1	6.7
Attitudinal barriers to change among your clients	9.9	9.4	17.8	10.3	8.2	11.5
Lack of necessary finance	5.5	21.5	20.0	29.7	33.3	21.4
Limited market opportunities for new services	16.9	12.1	6.7	14.2	9.3	12.3
Regulatory or legislative factors	27.1	11.2	10.3	8.8	4.1	12.9
Lack of collaborators for developing new services	4.0	2.5	8.9	4.5	8.2	5.1
The intensity of competition	18.4	29.4	19.2	26.1	26.3	23.9
Your business's ability to recruit new staff or talent	21.3	41.4	24.0	34.3	42.6	31.7
Lack of ideas for new services from your customers	7.8	3.7	4.7	4.6	1.6	4.9
Total	12.9	15.4	13.0	15.7	15.3	14.5

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

3.6 Summary of key findings

Most respondents to the survey regarded themselves as having introduced at least one new service during the previous three years. In general, Accountants and Architectural Services firms were less likely to see themselves as innovative than respondents from other sectors, a tendency notable for all types of innovation. This may be linked to the regulatory framework faced by these professions.

The proportion of revenue accounted for by newly introduced services varies markedly across the sectors, perhaps reflecting the differing competitive environment faced by different sectors: sectors with more national or international competition tend to have a higher revenue

proportion from innovative services. Accountants have markedly low levels of revenue accounted for by new services, and are the most likely to have only local competition. This raises the issue of whether competition or regulation has the greatest effect on driving the introduction of new services.

Extending the range of services offered, improving quality, and improved tailoring of services are the most commonly perceived benefits of innovation. Again, however, there were quite marked sectoral differences, with accountants and (to some extent) architectural service providers seeing innovation less as a means to attract new clients than was the case in the other professions.

The ability to recruit new staff was the biggest perceived barrier to innovation, followed by the competitive environment. Again, there were some marked differences among the sectors. Most notably, regulation and legislation was not seen as a major innovation barrier except for accountants, for whom it was the single biggest perceived constraint.

SECTION 4. DELIVERING INNOVATION – THE IMPORTANCE OF HR PRACTICES

4.1 Introduction

This Section of the report focuses on HR practices and their contribution to supporting innovation in the five sectors. We focus initially (Section 4.2) on firm level practices which support innovation through the overall policies and management structures which organisations have in place to facilitate innovation such as written policies, supportive cultures and structured innovation processes. We also consider the importance which firms attach to the recruitment and training of those with specialist skills and those with cross-sectoral experience. Section 4.3 then focuses on first element of the innovation value chain relating to how firms gather or create the knowledge they need for innovation. Section 4.4 deals with the processes though

which innovations are brought to the market and Section 4.5 deals with commercialisation.

4.2 HR practices to support innovation

As part of the survey we asked firms whether they had implemented five cultural and leadership practices to support the development of new or improved services or delivery processes (Table 4.1). In each case these are firm, rather than activity-level, metrics. Key observations are:

- Around nine-tenths of firms reported having a culture and leadership team which support the introduction of new ideas;
- Around half of firms reported having in place structured processes to support the development of new ideas
- Around a third of firms had in place written strategies to support new ideas and/or incentive structures to support the development of new ideas.

A significant gap was therefore evident in all sectors between the proportion of organisations suggesting that their culture and leadership was supportive of innovation and the implementation of practical initiatives which might support innovation activity. This gap was largest in Accountancy, where the proportion of firms having written strategies to support new ideas was less than half that in Consultancy (Table 4.1).

Table 4.1: HR Culture and leadership (% firms)

	Accountancy	Architectural Services	Consultancy	Software & IT	Specialist design	Total
Culture that supports the introduction of new ideas	29.1	32.9	54.3	35.3	30.8	37.4
A leadership team that supports new ideas	83.7	90.5	98.4	93.0	81.8	91.3
Structured processes to support new ideas	47.9	44.4	56.0	44.9	42.5	47.6
Written strategies to support the introduction of new ideas	36.0	33.0	43.5	37.0	35.0	37.2
Rewards or incentives for valuable new ideas	78.6	86.8	95.2	88.0	85.2	87.4

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

As part of the survey we also asked firms about whether their firm had in place ten different HR practices which have in the past been linked to firms' innovation (Table 4.2). The adoption of these practices fell into three broad groups:

- Almost all respondents had in place an equal opportunities policy and a formal process for dealing with disciplinary issues;
- Around 50-62 per cent of firms had in place established communication mechanisms for employees, varied employee work practices offering flexibility and discretion and elements of team-working
- Only around 25 percent of firms had IS0 9000 standards in place to ensure service or process quality.

Table 4.2: Percentage of firms with specific HR practices

	Accountancy	Architectural Services	Consultancy	Software & IT Services	Specialist Design	Total
Give employees information about the financial position of the establishment	42.8	57.0	74.6	63.1	77.9	61.2
Create teams of people, who don't usually work together, to work on a specific project	37.5	53.6	56.2	47.6	39.1	48.6
Have teams of people that solve specific problems or discuss aspects of work performance?	57.6	58.3	62.0	59.7	59.8	59.5
Have an equal opportunities policy	90.1	94.9	94.9	92.3	97.5	93.3
Have formal procedures in place for employee consultation	64.0	67.2	63.6	65.1	67.5	65.2
Currently hold any of the ISO 9000 Standards	9.0	39.5	16.6	27.7	27.7	24.8
Have a formal procedure for dealing with discipline and dismissals for non-managerial employees	88.2	94.7	85.1	94.8	91.6	91.3
Employees have variety in their work	44.9	66.7	53.4	52.5	64.0	55.2
Employees have access to flexible working	51.8	50.8	49.5	53.8	44.3	51.3
Employees have discretion over how they do their work	35.4	57.4	56.5	55.6	36.3	51.4

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

Another key enabler or driver of innovation is appropriate recruitment, and particularly recruitment from outside the sector. We asked organisations about the importance of recruiting staff from outside the sector and around 12 per cent of organisations regarded this as 'very important' across the five sectors although this proportion fell to 8.0 per cent in Accountancy (Table 4.3). Recruiting others with sectoral experience was seen as considerably more important by around 39.1 per cent of firms. Training in

professional skills was seen as more important in each sector than training to develop new ideas (Table 4.3).

Table 4.3: Recruitment and training priorities

	Accountancy	Architectural Services	Consultancy	Software & IT Services	Specialist Design	Total
You recruit people with experience outside your sector	8.0	10.5	14.2	12.1	15.5	11.6
You recruit people with experience working in other firms in your sector	35.5	47.4	36.6	33.6	56.6	39.1
You develop your staffs' professional skills	85.0	80.5	72.1	65.6	77.8	74.7
You train staff on how to develop ideas for new services	40.3	56.5	49.0	45.5	42.6	47.7

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

4.3 Internal and external sources of new ideas

Where do new ideas for service or delivery innovation come from in services? Do these emerge from within the organisation itself or from outside sources? Previous research suggests the importance of this question, emphasising a positive link between the proportion of external ideas which are implemented by the organisation and future growth. In this section we focus on this initial stage in the value chain and organisations' capabilities in terms of identifying new ideas. In particular we focus on four intermediate metrics which provide an indication of the commitment to ideation and the strength of organisations' ideation – idea generation - activities.

These four metrics reflect firms' activity specifically targeted at ideation. Their success is likely to depend on the broader firm level leadership and human resource metrics described earlier. The first three metrics provide an indication of financial and organisational commitment to ideation and reflect both HR and other organisational factors:

- ***Research intensity (%)*** – expressed as a share of turnover in the last year, this measures organisations' investment in internal and external research activity.

- ***Multi-functionality in accessing knowledge (%)*** – the extent to which different occupational groups across the organisation are involved in the developing of new ideas. Here as a summary measure we use a percentage indicator based on the number of (six) occupational groups involved in knowledge gathering activities.

- ***External knowledge sources for accessing knowledge* (%)** – previous studies have emphasised the potential importance of external knowledge sources for innovation. Here as a summary measure we use a percentage indicator based on the number of (eight) types of external partner with which organisations are engaging to generate new ideas[4].

The fourth metric provides an indication of the outcomes of firms' ideation activities in terms of the balance between internally generated and externally sourced ideas:

- ***The proportion of externally sourced ideas (%)*** – intended to reflect the openness of organisations' knowledge gathering activities this metric is a commonly used 'openness' measure. This metric is defined as the 'proportion of new services typically coming from ideas initially developed outside the organisation'.

Table 4.4 summarises these four indicators for firms in each sector and suggests sizable differences between sectors in terms of firms' investment in and approaches to ideation. There is also a notable correlation across sectors between the different indicators. The most significant sectoral differences arise in terms of research intensity (expenditure as a proportion

[4] We identify eight potential types of external partners: suppliers, clients or customers, competitors, business or management consultants, universities, professional and trade associations, regulatory bodies, technology providers.

of turnover) varying from a minimum of 0.5% in Specialist Design to a maximum of 4.3 per cent in Software and IT (Table 4.4). Accountancy and Architectural Services also have levels of research spend well below that in consultancy. Multi-functional working and collaborating with external partners to develop new ideas for innovation are relatively common across all sectors. Firms in the software and IT sector are most active on both metrics. As a consequence the proportion of externally sourced ideas (21.4 per cent) is highest in Software and IT – the most 'open' of the sectors - and lowest in Architectural Services and Specialist Design.

Table 4.4: Knowledge gathering indicators: by sample group

	Research intensity (%)	Multi-functionality in accessing knowledge (%)	External knowledge sources for accessing knowledge (%)	The proportion of externally sourced ideas (%)
Accountancy	1.3	25.5	18.4	11.7
Architectural Services	1.2	29.4	19.9	7.6
Consultancy	3.3	41.7	22.9	12.6
Software & IT Services	4.3	46.7	26.7	21.4
Specialist Design	0.5	29.9	19.2	6.5
Total	2.5	36.8	22.3	13.6

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

4.4 Building specific innovations

The intermediate stage of the innovation value chain relates to organisations' capabilities in translating new knowledge, generated internally or sourced externally, into specific service innovations or delivery processes. Here we focus on five indicators, three relating to the organisational inputs to the innovative process and two relating to the nature of organisations' innovative outputs. Again, these metrics relate specifically to firms' efforts to develop specific innovations and their success will depend both on these specific activities as well as the broader

leadership and HR metrics considered in Section 4.2. In terms of organisational inputs to the innovation process we consider here:

- ***Multi-functionality in building innovation (%)*** – intended to reflect the engagement of multiple occupational groups in building innovation this metric reflects the percentage of the six identified occupational groups used in this element of the innovation process. Organisations involving all occupational groups score 100 per cent.

- ***Embeddedness of team-working in building innovation (%)*** – this metric is intended to reflect the extent of commitment to team-working. We identify five different attributes of team working activity:

    - Team-working plays a major role in the development of new products/services;
    - 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;
    - Teams often involve customers or suppliers.

  Respondents agreeing with all five statements score 100 per cent.

- ***External knowledge sources for building innovation (%)*** – previous studies have emphasised the potential importance of external knowledge sources for innovation. We identify eight potential types of external partners. Organisations reporting using all of these in helping them to develop new or improved services/products score 100 per cent.

We use two metrics to measure innovative outputs:

- ***Percentage of turnover of innovative products (%)*** – a relatively standard measure of the percentage of current turnover derived from services newly introduced or improved over the last three years.

- ***Diversity of innovation activity (%)*** – in the survey we identify six different types of innovation activity relating to services, delivery, strategy, management systems, organisational change and marketing innovation. This metric is designed to reflect the diversity of innovation activity and takes value 100 if an organisation is engaged in all six types of innovation activity and 50 if an organisation undertook three different forms of innovation.

As with the ideation metrics considered earlier we see considerable variation across sectors in terms of the metrics related to building specific innovations (Table 4.5). On average Software and IT companies achieve the highest values on each of the input metrics relating to multi-functional working, team-working and external knowledge sourcing. Consultancy firms are broadly similar in terms of their levels of multi-functional working and use of teams but less likely to be working with external partners as part of the development of specific innovations. This may be a reflection of the extent of competition in the Consultancy sector. Lower levels of multi-functional working and external collaboration are evident among Accountancy and Architectural Services firms, with firms' commitment to team-working particularly low in Accountancy firms. Perhaps unsurprisingly levels of sales of innovative services and the diversity of firms' innovation activity are highest in Software and IT and – as noted earlier - most modest in Accountancy and Architectural Services. The suggestion is that in addition to the external factors noted earlier – particularly regulatory issues and the nature of competition – internal factors related to firms' commitment and organization for innovation may also be important in shaping innovation outputs.

Table 4.5: Building Innovation – summary measures by type of organisation

	Multi-functionality in building innovation (%)	Embeddedness of team-working in building innovation (%)	External knowledge sources for building innovation (%)	Percentage of turnover of innovative services (%)	Diversity of innovation activity (%)
Accountancy	23.6	15.8	10.0	8.0	28.2
Architectural Services	26.3	21.2	9.4	10.4	37.4
Consultancy	41.8	34.7	11.0	25.7	51.7
Software & IT Services	44.0	34.2	13.9	30.0	51.5
Specialist Design	27.8	17.8	8.6	15.3	40.3
Total	34.8	26.9	11.2	19.8	43.2

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

4.5 Commercialising innovation

Commercialising innovation is the final element of the innovation value chain linking knowledge creation and the generation of value for firms' their various stakeholders. In this section we focus on five main indicators relating to different aspects of organisations' commercialisation activity. Again, these need to be viewed within the context of the broader leadership and HR metrics outlined in Section 4.2 and which provide the firm level context within which commercialisation activity takes place. The commercialisation metrics are:

- ***Range of customer relation modes (%)*** – this metric reflects how firms interact with their clients and use these interactions to inform service development and delivery. We consider three aspects of customer interaction in particular: the involvement of clients in service evaluation, customer feedback and its role in shaping service development, and whether firms hold regular customer review meetings. Our summary measure reflects engagement with these alternative forms of customer interaction.

- ***Branding and marketing intensity*** – whether firms invested in improving their reputation and branding over the last year. Previous studies have linked this measure with the successful exploitation of innovation and feed through into enhanced business growth. The summary measure used here expresses spending on reputation and branding over the last year as a percentage of turnover.

- ***Multi-functionality in commercialising innovation (%)*** – the extent to which different occupational groups are involved in the commercialisation and marketing of new or improved services. Is this left to marketing staff or are professional staff also involved in this activity? Here as a summary measure we use a percentage indicator based on the number of six occupational groups involved in the commercialisation of innovation.

- ***External knowledge sources for commercialisation (%)*** – to what extent do firms collaborate with external organisations to help them market or commercialise new or improved services? Here we consider the role of ten types of potential marketing partner: suppliers, clients, competitors, business or management consultants, universities, professional and trade associations, regulatory bodies, technology providers, market research companies, advertising agencies. As a summary measure we reflect the percentage of these types of organisations with which organisations are engaging.

- ***Use of IP protection (%)*** – organisations' use of different forms of legal intellectual property (IP) protection considering use of the registration of new designs, trademarks, patents, copyrights, confidentiality agreements, non-disclosure agreements (NDAs). Again our summary indicator reflects the percentage of these different IP protection activities being used.

Firms in the Software and IT and Consultancy sector adopt the broadest range of mechanisms for engaging with customers with Accountancy firms lagging somewhat in this respect (Table 4.6). Branding and promotional investments in Consultancy stand out, however, being almost twice that of each of the other sectors considered. The extent of multi-functional working in terms of commercialisation reflects that in other links in the innovation value chain: greater in Consultancy and Software and IT and more limited in the other three sectors. A rather different pattern emerges in terms of firms' external collaboration for commercialisation. This is markedly lower than that in other elements of the IVC, suggesting that commercialisation is very much an internal rather than shared activity.

Marked differences are evident in the use of formal IP protection mechanisms with around of a third of Consultancy and Software and IT firms engaging in IP protection compared to only around 13.3 per cent of Accountancy firms. Perhaps surprisingly given that our measure includes registered designs only one-in-five firms in Specialist Design reported using any formal IP protection method.

Table 4.6: Commercialising Innovation – summary measures by type of organisation

	Range of customer relation modes (%)	Branding, marketing intensity (expenditure per turnover)	Multi-functionality in commercialising innovation (%)	External knowledge sources for commercialisation (%)	Use of IP protection (%)
Accountancy	60.6	0.5	20.4	6.6	13.3
Architectural Services	71.9	0.4	23.9	5.7	31.3
Consultancy	82.7	2.0	36.4	8.9	38.3
Software & IT Services	83.6	1.2	35.3	9.0	37.4
Specialist Design	62.9	0.8	23.1	4.8	20.3
Total	75.3	1.0	29.5	7.6	30.6

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

4.6 Summary of key points

Our survey provides information on the drivers of innovation at both the firm level and the level of specific innovation activities. At firm level, around nine-tenths of firms responding to the survey reported having a culture and leadership team which support the introduction of new ideas. This fell to around half of firms reported having in place structured processes to support the development of new ideas, and a third of firms had in place written strategies to support new ideas and/or incentive structures to support the development of new ideas. Around a fifth of firms' current sales are derived from services which were either newly introduced or improved during the previous three years. A significant gap was therefore evident in all sectors between the proportion of organisations suggesting that their culture and leadership was supportive of innovation and the implementation of practical initiatives which might support innovation activity. This gap was largest in Accountancy, where the proportion of firms having written strategies to support new ideas was less than half that in consultancy.

As part of the survey we also asked firms about whether their firm had in place a number of HR practices which have in the past been linked to firms' innovation. The adoption of these practices fell into three broad groups:

- Almost all respondents had in place an equal opportunities policy and a formal process for dealing with disciplinary issues;
- Around 50-62 per cent of firms had in place established communication mechanisms for employees, varied employee work practices offering flexibility and discretion and elements of team-working
- Only around 25 percent of firms had IS0 9000 standards in place to ensure service or process quality.

At the activity level we see sizable differences between sectors in terms of firms' investment in and approaches to ideation. The most significant sectoral differences arise in terms of research intensity (expenditure as a

proportion of turnover) varying from a minimum of 0.5% in Specialist Design to a maximum of 4.3 per cent in Software and IT. Accountancy and Architectural Services also have levels of research spend well below that in consultancy. Multi-functional working and collaborating with external partners to develop new ideas for innovation are relatively common across all sectors. Firms in the software and IT sector are most active on both metrics. As a consequence the proportion of externally sourced ideas (19.8 per cent) is highest in Software and IT – the most 'open' of the sectors - and lowest in Architectural Services and Specialist Design.

The intermediate stage of the innovation value chain relates to organisations' capabilities in translating new knowledge, generated internally or sourced externally, into specific service innovations or delivery processes. On average Software and IT companies achieve the highest values on each of the input metrics relating to multi-functional working, team-working and external knowledge sourcing. Consultancy firms are broadly similar in terms of their levels of multi-functional working and use of teams but less likely to be working with external partners as part of the development of specific innovations. Perhaps unsurprisingly levels of sales of innovative services and the diversity of firms' innovation activity are highest in Software and IT and – as noted earlier - most modest in Accountancy and Architectural Services.

Commercialising innovation is the final element of the innovation value chain linking knowledge creation and the generation of value for firms' their various stakeholders. Firms in the Software and IT and Consultancy sector adopt the broadest range of mechanisms for engaging with customers with Accountancy firms lagging somewhat in this respect. Branding and promotional investments in Consultancy stand out, however, being almost twice that of each of the other sectors considered. The extent of multi-functional working in terms of commercialisation reflects that in other links in the innovation value chain: greater in Consultancy and Software and IT and more limited in the other three sectors. A rather different pattern emerges in terms of firms' external collaboration for commercialisation.

This is markedly lower than that in other elements of the IVC, suggesting that commercialisation is very much an internal rather than shared activity.

Marked differences are also evident in the use of formal IP protection mechanisms with around of a third of Consultancy and Software and IT firms engaging in IP protection compared to only around 12 per cent of Accountancy firms. Perhaps surprisingly given that our measure includes registered designs only one-in-five firms in Specialist Design reported using any formal IP protection method.

Our results suggest the origins of the sectoral differences in innovation outputs identified in Section 3. In each sector there is a significant gap between the rhetoric and reality of firms' commitment to innovation, or between a leadership committed to innovation and the practical steps required to innovate. The rhetoric-reality gap is most striking in Accountancy. Sectors also differ markedly in their investment and engagement with the different elements of the innovation process. The consultancy and Software and IT sectors generally have higher levels of innovation related activity than other sectors with Accountancy and Architectural Services lagging on a number of metrics. As suggested by the discussion in Section 3, regulation may be a particular issue in these sectors, with competition driving innovation in Consultancy and Software and IT. Looking in more detail at the HR and organisational steps firms in each sector are taking to innovation also suggests the importance of taking these internal factors in seeking to understand what determines innovation outputs and their contribution to performance. This is the focus of Section 5.

The suggestion is that in addition to the external factors noted earlier – particularly regulatory issues and the nature of competition – internal factors related to firms' commitment and organization for innovation may also be important in shaping innovation outputs.

SECTION 5. INNOVATION AND HIGH PERFORMANCE WORK PRACTICES

5.1 Introduction

This section of the report focuses on the econometric analysis examining the influence of HR on the innovation behaviour of firms. In Section 5.2, the HR measures used in the analysis are described. Section 5.3 focuses on the first stage of the innovation value chain, the openness of firms' knowledge gathering activities. Section 5.4 focuses on the intermediate stage of the innovation value chain, specifically examining the influence of HR on turnover from innovative services; the diversity of innovation activity; and the introduction of service innovations. In Section 5.5, the analysis is on the final stage of the innovation value chain – commercialisation. Section 5.6 provides a brief summary of the econometric analysis.

5.2 HR metrics

For the econometric analysis, three HR variables are developed. These count variables measure the extent to which firms have introduced HR culture processes, HR practices and HR recruitment priorities. Respondents were asked which of five innovation and leadership processes they use to develop a culture to support the development of new or improved processes or delivery processes. On average, firms use three of five HR culture processes (Table 5.1). Respondents were also asked if they had in place ten HR practices which are linked to innovation. On average, firms have introduced four such HR practices. Respondents also provided information with regard to four recruitment and training practices which are considered enablers of innovation. Firms have introduced 1.7 of these practices on average. See Section 4.2 for a detailed description of the individual components of these variables.

Table 5.1: HR culture, practices and recruitment and training by sector

	HR culture	HR practices	HR recruitment & training
	mean	mean	mean
Accountancy	2.8	3.6	1.7
Architectural Services	2.9	4.0	1.9
Consultancy	3.5	3.9	1.7
Software & IT	3.0	4.2	1.6
Specialist design	2.8	3.4	1.9
Total	3.0	3.9	1.7

Source: HRIPS Survey – see Annex 1. Responses are weighted to give representative results.

5.3 External knowledge sources

The section focuses on the first stage of the innovation value chain and firms capabilities in sourcing knowledge from external partners. In the survey, respondents are asked which of eight external partners they use in helping them to develop new or improved services/products. Table 5.2 presents a symbolic summary of the econometric results with respect to the HR and innovation measures. A full set of results tables is available in Annex 3. None of the HR variables pertaining to culture, practices and recruitment and training significantly impact the extent to which firms source knowledge from external partners.

Table 5.2: Symbolic Summary of influence of HR on Innovation

	Stage 1	**Stage 2**			**Stage 3**	
	External Ideas	Innovation Turnover	Innovation Diversity	Service Innovator	Turnover Growth	Productivity Growth
HR Culture	(+)	(+)	**+**	(+)	(+)	(-)
HR Practices	(-)	**+**	**+**	**+**	(-)	(-)
HR Recruitment & Training	(+)	**+**	**+**	(+)	(-)	(-)

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

5.4 Building innovation

The second stage of the innovation value relates to organisations' capabilities in translating new knowledge into specific service innovations or delivery processes. Three metrics are used to measures innovation output: the percentage of turnover of innovative services; the diversity of innovation activity; and the introduction of service innovations.

HR culture positively and significantly influences the diversity of innovation activity within firms; the more HR culture processes a firm uses, the more diverse the innovation activity. HR culture does not significantly influence the other building innovation metrics.

HR practices positively influence all three of the building innovation metrics – innovation sales, diversity of innovation activity and the introduction of service innovations. The more HR practices a firm uses, the higher the percentage of innovative sales, the more diverse the innovation activity and the more likely they are to introduce service innovations.

HR recruitment and training practices positively and significantly influence both innovation turnover and diversity. The more HR recruitment and training practices employed, the greater the turnover of innovation services and the diversity of innovation activity. HR recruitment and training practices do not significantly influence the probability of a firm introducing service innovations.

5.5 Commercialising innovation

The final stage of the innovation value chain focuses on the generation of value for firms' various stakeholders – commercialising innovation. Two metrics are used to measure commercialisation – turnover growth (% change per annum) and productivity growth (% change per employee per annum). The econometric analysis reveals that none of the HR variables significantly influence turnover growth or productivity growth.

5.6 Conclusion

In relation to the first and final stage of the innovation value chain, there is no significant relationship between HR and sourcing knowledge for innovation from external partners and commercialising innovation. The three measures of HR, culture, practices and recruitment and training, have no significant influence on firms' capabilities in sourcing knowledge from external partners. Nor do they significantly impact firms' ability to commercialise innovation, as measured by turnover growth and productivity growth.

The econometric analysis reveals that HR, in terms of culture, practices and recruitment and training, is a significant and important influence in the intermediate stage – building innovation – of the innovation value chain. Employing processes which create a culture supportive of new ideas benefits firms in terms of the diversity of innovation activity. Firms employing a greater number of specific HR practices are more likely to be service innovators and more diverse in their innovation activity. While firms using a greater number of recruitment and training practices are more likely to benefit in terms innovation diversity and turnover from new or improved services.

SECTION 6. KEY FINDINGS AND IMPLICATIONS

Our analysis traces the links from firms' investments in design, research and knowledge sourcing through the development of new service and delivery innovation to sales growth and higher productivity. Our first key result relates to the role of HR practices in the innovation process:

- Openness to outside ideas, research investment and team-working play an important role in firms' ability to source new ideas. HR practices prove unimportant here.
- HR practices – related to culture and leadership, high performance work practices and recruitment do prove important

in shaping firms' ability to translate these ideas into marketable innovation.

- These innovations are then linked positively to higher sales and productivity growth although we find no very significant association between HR practices and the commercialisation of innovations.

Higher levels of innovation activity are therefore a key mechanism through which the adoption of HR practices influences sales and productivity growth.

Second, we identify a significant rhetoric-reality gap between firms' perceptions of the openness of their leadership teams and their organisation for innovation: gap …

- Around nine-tenths of firms responding to the survey reported having a culture and leadership team which support the introduction of new ideas.

- Around half of firms reported having in place structured processes to support the development of new ideas, and a third of firms had in place written strategies to support new ideas and/or incentive structures to support the development of new ideas.

- Around a fifth of firms' current sales are derived from services which were either newly introduced or improved during the previous three years.

In all sectors a significant gap was evident between the proportion of organisations suggesting that their culture and leadership was supportive of innovation and the implementation of practical initiatives which might support innovation activity. This rhetoric-reality gap is most striking in Accountancy.

Third, sectors differ markedly in their investment and engagement with the different elements of the innovation process. The Consultancy and Software & IT sectors generally have higher levels of innovation related activity than other sectors with Accountancy and Architectural Services lagging on a number of metrics. Regulation may be a particular issue in these latter sectors, with competition driving innovation in Consultancy and Software & IT.

Finally, the ability to recruit new staff was the biggest perceived barrier to innovation, followed by the competitive environment. Regulation and legislation was not seen as a major innovation barrier except for Accountants, for whom it was the single biggest perceived constraint.

In policy and managerial terms our analysis clearly suggests that the wider adoption of HR practices such as those adopted here should have positive benefits for innovation and hence growth and productivity. These potentially unanticipated benefits strengthen the case for investment in HR systems and structures. In analytical terms our analysis highlights one rather specific and indirect route through which HR practices contribute to business performance through improved innovation outcomes reinforcing any positive contribution of HR practices to the efficiency of firms' day-to-day operations.

Our analysis also suggests the mechanism through which the contribution of HR practices to increased innovation outputs actually occurs. The HR practices – innovation linkage is most evident in the second stage of the IVC, in the formulation of specific innovations. Other elements of the IVC – ideation and exploitation – are largely unaffected by firms' HR practices. This new insight results from our adoption of an activity-based approach which treats the elements of the innovation process separately.

Next steps in our analysis will be to explore the value added associated with individual HR practices and also to explore whether there are some bundles of HR practices which are particularly powerful in boosting innovation. Other moderating factors also remain to be considered such as skill levels, firm size and levels of competition. We also need to be aware of

the limitations of this study relating as it does to a single cross-sectional survey. Causality is therefore difficult to establish although the results do suggest again the value to firms and the wider economy of more sophisticated HR management.

ANNEX 1. CONDUCTING THE FIRM SURVEY

A1.1 Introduction

This section provides a detailed description of the conduct of the survey of professional services businesses across the UK. The overall aim of the survey was to provide a representative view of HR practices and innovation activity across five professional services sectors defined in terms of SIC 2007 (Table A1.1):. The survey addresses the following broad questions:

- How do the professions develop their human resources capabilities to deliver value to current and potentially new customers?
- How do the professions organise staff to maximise creativity and productivity? This focuses on team-working, knowledge sharing, open innovation.
- How is best practice distributed across the sectors? What are the lessons within and between sectors?

Table A1.1: Sectoral definitions

Sector	SIC 2007	Description
Software & IT	58.21	Publishing of computer games
	58.29	Other software publishing
	62.01/1	Ready-made interactive leisure and entertainment software development
	62.01/2	Business and domestic software development
	62.02	Computer consultancy activities
	62.03	Computer facilities management activities
	62.09	Other information technology and computer service activities
	63.11	Data processing, hosting and related activities
	63.12	Web portals
Accountancy	69.20/1	Accounting, and auditing activities
	69.20/2	Bookkeeping activities
	69.20/3	Tax consultancy
Consultancy	70.22/1	Financial management
	70.22/9	Management consultancy activities (other than financial management)
Architectural Services	71.11/1	Architectural activities
	71.11/2	Urban planning and landscape architectural activities
	71.12/1	Engineering design activities for industrial process and production
	71.12/2	Engineering related scientific and technical consulting activities
	74.90/2	Quantity surveying activities
Specialist Design	74.1	Specialised design activities

The firm survey was designed as a telephone survey covering around 900 firms across the five sectors. The survey was structured by sizeband (5-19 employees; 20-49 employees and 50 plus employees).

A1.2 Sampling frame

The sample was purchased from a commercial provider (Experian) with over-sampling in the 20-49 and 50 plus size groups to ensure reasonable cell sizes in these groups. Some issues arose with the Specialist Design sector where the number of firms in the 50 plus sizeband is relatively small.

A1.3 Survey Instrument

The questionnaire was developed drawing on two earlier studies undertaken by the research team focussing on innovation in services (Roper et al. 2009) and innovation in legal services (Roper et al. 2015). In addition we added some questions related to high performance work practices derived from the Employer Skills Survey (ESS) run by the UK Commission for Employment and Skills.

The questionnaire is included in Annex 2 and comprised nine sections:

- Section A collects some basic information on the business to ensure that it was in scope and to identify the person most able to answer questions appropriately.
- Section B provides a profile of the business, its area of activity, and customers and some aspects of HR practice.
- Section C focuses on the overall innovation performance of the firm and its recent business performance.
- Sections D, E and F focus on different elements of the innovation value chain dealing successively with knowledge gathering, the creation of innovations and marketing and commercialisation.
- Section G relates to firm culture and overall steps the firm has taken either to encourage, facilitate or manage innovation. It includes a number of questions derived from the ESS designed to capture firms' engagement with high performance work practices.
- Section H relates to the external environment and its influence on the incentives for and occurrence of innovation.
- Section I of the questionnaire includes a series of wrap up questions as well as a question which provides explicit permission for data matching (H2).

Throughout the questionnaire we differentiate clearly between service innovation – the introduction of new or improved services for clients – and business process innovation – changes or improvements in the way in which services are delivered to clients.

A1.4 Survey conduct and response

The questionnaire was piloted using 'live' CATI interviewing over a 2 day period from 14th to 15th January 2016. The aim was to make improvements to the script to ensure common understanding and/or help to ensure that as many of the individual circumstances of survey respondents were reflected and catered for within the questionnaire. The pilot was also an opportunity to check interview flow and that the interview duration was within acceptable limits. Five pilot interviews were conducted over the two days.

Some wording changes were made to the questionnaire as a result of the pilot. The main issue highlighted, however, was one of questionnaire length. As a result some questions were dropped, options amalgamated and open ended questions were included for only a proportion of respondents. Once changes were agreed, fieldwork proper began on 20th January and was completed on 10th March 2016.

The timing of the survey – January – also coincided with the end of the tax year for many individuals and this was a particular issue for the accountants within the sample. Fieldwork for this group was therefore delayed and conducted primarily in February and early March.

A1.5 Deriving survey weights

Survey weights are necessary due both to structured sampling (higher target response proportions among larger firms) and differential survey response rates. Weights are constructed to provide results which are representative of the five sectors across the UK as well as the three sizebands identified earlier (5-19 employees; 20-49 employees and 50 plus employees). The target population is taken from the ONS Enterprise Unit data for 2015 derived from the Interdepartmental Business Register and

available by 4-digit SIC 2007 and sizeband. The target population, achieved sample and weights are included in Table A1.2.

Table A1.2: Target population, achieved interviews and sample weights

	Employee sizebands			
	5-19	20-49	50 plus	Total
A. Target population (ONS UK Business Entities, 2015)				
Software & IT Services	10685	2215	1230	14130
Accountancy	7020	860	420	8300
Consultancy	8200	1010	525	9735
Architectural Services	8335	1360	790	10485
Specialist Design	2115	215	55	2385
B. Achieved interviews (survey data)				
Software & IT Services	68	75	48	191
Accountancy	90	63	42	195
Consultancy	81	82	63	226
Architectural Services	80	77	65	222
Specialist Design	54	11	3	68
				902
C. Weights				
Software & IT Services	157.1	29.5	25.6	74.0
Accountancy	78.0	13.7	10.0	42.6
Consultancy	101.2	12.3	8.3	43.1
Architectural Services	104.2	17.7	12.2	47.2
Specialist Design	39.2	19.5	18.3	35.1

ANNEX 2. FIRM SURVEY QUESTIONNAIRE

Professional Services Innovation Survey Questionnaire 2016

SAMPLE GROUPS

X3 - Software & IT Services

X6 - Specialist Design

X7 - Architectural services

X8 - Consultancy services

X9 - Accountancy services

SECTION A – INTRO/SCREENERS

ASK ALL

Could I please speak to <NAMED CONTACT**> or the member of the senior management team, or someone else, with responsibility for the development of new services and how these are delivered?**

Good morning/afternoon, my name is … and I am calling from OMB Research, an independent market research agency. The UK Commission for Employment and Skills have commissioned us to undertake a survey of professional service businesses.

The research will take around 15-20 minutes, depending on your answers. Is it convenient to speak to you now or would you prefer to make an appointment for another time?

EXPLAIN IF NECESSARY

- **We're conducting this study to look at how businesses go about developing or improving their services and how they deliver them and what influences these activities.**

- **UKCES will use the results from this study to inform the government on how best to improve the way they support skills development within businesses.**

- **It doesn't matter if your organisation doesn't do any new service development, we're still interested in your views.**

ADD IF NECESSARY

- **The research is being conducted under the Code of Practice of the Market Research Society, which means that all of the answers you give are strictly confidential and anonymous. Participation in this survey is voluntary.**

- **The aggregated results from this study will be included in a report that will be available later this year. As a thank you for taking part we can email you a link to the report once it is published.**

- **Your organisation was selected at random from a list of UK businesses held by a commercial list broker.**

- **If you wish to check that OMB Research is a bona fide market research agency, you can contact the Market Research Society on 0500 396999, or call Gemma Bird at OMB Research on 01732 220582 or Professor Stephen Roper at the Warwick Business school on 024 7652 2501.**

ASK ALL

A1 Can I just confirm that you are one of the people best qualified to talk about the development of new services or how you deliver these at < ORGANISATION NAME >**?**

INTERVIEWER NOTE: REFERRALS CAN BE TAKEN TO ANYONE IN THE FIRM THAT THE CONTACT FEELS IS BETTER PLACED TO ANSWER QUESTIONS ON THE AREAS OUTLINED.

Yes 1

No – taken referral and being transferred 2

No – taken referral and arranged call back 3

No – refused referral ..... 4 - CLOSE

SECTION B – BUSINESS PROFILE

READ OUT TO ALL

We'd like to start by getting information on the background to your business and the markets in which you operate.

ASK ALL

B5 Is the business at this site…?

READ OUT. SINGLE CODE

An independent single site organisation 1

The headquarters of a multi-site organisation..... 2

Or a subsidiary or associated firm 3

Other (specify) 4

(Don't know)..... 5

(Refused) 6

ASK ALL

B1 And is the business UK or foreign-owned?

SINGLE CODE ONLY

UK-owned 1

Foreign owned 2

Joint UK and foreign-owned 3

Don't know 4

READ OUT IF HQ (CODE 2 AT B5)

For the rest of this interview, when I ask about your business I'd like you to answer about your entire UK operation, <u>including</u> any other sites or subsidiaries that you have in the UK.

<u>READ OUT IF SUBSIDIARY (CODE 3 AT B5)</u>

For the rest of this interview, when I ask about your business I'd like you to answer just about the < IF FOREIGN OWNED (CODE 2-3 AT B1) **UK > subsidiary in which you work.**

<u>READ OUT IF NOT HQ/SUBSIDIARY BUT FOREIGN OWNED (CODES 1 OR 4-6 AT B5 & CODES 2-3 AT B1)</u>

For the rest of this interview, when I ask about your business I'd like you to answer just about your UK operation, so excluding any overseas sites or companies that are part of your business.

<u>ASK ALL</u>

A3a How long ago was your business established?

READ OUT AS NECESSARY

Within the last year .....1 - CLOSE

Over 1, up to 2 years ago .....2 - CLOSE

Over 2, up to 3 years ago 3

Over 3, up to 4 years ago 4

Over 4, up to 5 years ago 5

Over 5, up to 10 years ago 6

Over 10, up to 20 years ago 7

Over 20 years ago 8

(Not yet trading).....9 - CLOSE

(Don't know) 10

(Refused).....11

IF 2-3 YEARS (CODE 3 AT A3a)

A3b Can I just check, was the business established before or after January 2013?

Before January 2013 1

After January 2013 .....2 - CLOSE

(Don't know) .....3 - CLOSE

CLOSE SCREEN FOR A3a/b TO SAY

Thank you very much for your time. In fact on this occasion we are only looking to speak to companies which have been established for at least 3 years.

ASK ALL

C1a Please can you tell me how many people are currently employed by your business IN TOTAL? Please just give me your best estimate and include ALL senior managers and directors.

WRITE IN NUMBER: .....

(Don't know)

IF DON'T KNOW AT C1A

C1a2 If you had to estimate, approximately how many people are employed by your business IN TOTAL?

READ OUT

0-1.....1 – CLOSE

2-4 ..... 2 – CLOSE

5-10 3

11-19 4

20-49 5

50-99 6

100-199 7

200-249 8

250-499 9

500 or more 10

(Don't know) 11

(Refused) 12

CLOSE SCREEN IF LESS THAN 5 EMPLOYEES (C1A < 5 OR C1A2 = 1-2)

Thank you very much for your time. In fact on this occasion we are only looking to speak to larger companies with 5 or more employees.

ASK ALL

C1b And approximately how many people were employed IN TOTAL by your business three years ago?

AS NECESSARY: **Please just give me your best estimate of the number of employees you had three years ago.**

AS NECESSARY: **Please include ALL senior managers and directors.**

WRITE IN NUMBER: (ALLOW ZERO)

(Don't know)

IF DON'T KNOW AT C1B

C1b2 If you had to estimate, approximately how many people were employed IN TOTAL by your business three years ago?

READ OUT

0-1 1

2-4 2

5-10 3

11-19 4

20-49 5

50-99 6

100-199 7

200-249 8

250-499 9

500 or more 10

(Don't know) 11

(Refused) 12

ASK ALL

B6 Now thinking about the people who work in your business, approximately what proportion have a degree level or equivalent qualification?

READ OUT AS NECESSARY. SINGLE CODE

Up to 5% 1

6 - 10% 2

11 - 15% 3

16 – 20% 4

21 - 50% 5

More than 50% 6

(Don't know) 7

(Refused) 8

ASK ALL

B8 Approximately what proportion of your current turnover is accounted for by overseas sales?

READ OUT AS NECESSARY. SINGLE CODE

AS NECESSARY: **By overseas sales I mean where you sell to overseas customers directly**

None 1

1 - 5% 2

6 - 15% 3

16 - 25% 4

26 - 50% 5

51 - 75% 6

Over 75% 7

(Don't know) 8

(Refused) 9

ASK ALL

B9.1 Which of the following best describes the nature of the competition you face? Would you say you mainly compete with firms based…

READ OUT. SINGLE CODE.

Locally 1

Regionally 2

Nationally (i.e. throughout the UK) 3

Or, internationally 4

(We have no competitors) 7

(Don't know) 5

(Refused) 6

ASK ALL

B10.1 Does your firm have any of the following…?

A. A training plan that specifies in advance the level and type of training your employees will need in the coming year?

B. A written business plan?

C. A budget for training expenditure?

Yes 1

No 2

(Don't know) 3

(Refused) 4

SECTION C – INNOVATION & BUSINESS PERFORMANCE

ASK ALL

C4a Please can you tell me what your turnover was in the last financial year?

AS NECESSARY: **Please just give me your best estimate.**

INTERVIEWER NOTE: IT IS REALLY IMPORTANT TO GET A FIGURE HERE, EVEN IF IT'S JUST THEIR BEST ESTIMATE

Write in amount (£ ALLOW ZERO)

(Don't know)

(Refused)

CATI TO VALIDATE AMOUNT ENTERED USING BANDED RANGES

IF DON'T KNOW OR REFUSED AT C4A

C4a2 If you had to estimate your turnover, into which of the following bands would you put it?

READ OUT AS NECESSARY

More than £0 but less than £50,000 1

£50,000 but less than £100,000..... 2

£100,000 but less than £200,000..... 3

£200,000 but less than £500,000..... 4

£500,000 but less than £1 million 5

£1 million but less than £2 million 6

£2 million but less than£10 million 7

£10million but less than £25million 8

£25million but less than £50million 9

£50million but less than £250million 10

£250million but less than £500million 11

£500million or more 12

(Not yet trading/do not have any sales/£0)..... 13

(Don't know) 14

(Refused)..... 15

ASK ALL

C4b And approximately what was your turnover three years ago? >

AS NECESSARY: **Please just give me your best estimate of your turnover in the financial year ending in 2013.**

INTERVIEWER NOTE: IT IS REALLY IMPORTANT TO GET A FIGURE HERE, EVEN IF IT'S JUST THEIR BEST ESTIMATE

Write in amount (£ - ALLOW ZERO)

(Don't know)

(Refused)

CATI TO VALIDATE AMOUNT ENTERED USING BANDED RANGES

IF DON'T KNOW OR REFUSED AT C4B

C4b2 If you had to estimate your turnover three years ago, into which of the following bands would you put it?

READ OUT AS NECESSARY

More than £0 but less than £50,000 1

£50,000 but less than £100,000..... 2

£100,000 but less than £200,000..... 3

£200,000 but less than £500,00000..... 4

£500,000 but less than £1 million 5

£1 million but less than £2 million 6

£2 million but less than £10 million 7

£10million but less than £25million 8

£25million but less than £50million 9

£50million but less than £250million 10

£250million but less than £500million 11

£500million or more 12

(Not yet trading/do not have any sales/£0)..... 13

(Don't know) 14

(Refused)..... 15

ASK ALL

Now we would like to ask you a series of questions about the development of new and improved services in your firm. We ask you to make a distinction between the development of new or improved services and the delivery of services.

For now, please answer the following questions in regards to the development of services – in other words the generation and

implementation of a new service. We will ask separately later about how you deliver those services to clients.

ASK ALL

C6a Over the last three years, have you introduced any new or significantly improved services to clients?

AS NECESSARY: **By new or significantly improved I mean you are providing a service to clients that you weren't previously offering**

Yes.....1

No.....2

(Don't know).....3

(Refused).....4

RANDOMISE 1 IN 4 AND ASK IF INTRODUCED NEW/IMPROVED SERVICES (C6A = 1)

C6a2 Can you please describe briefly the main new or improved service you have developed over the last three years?

PROBE AS NECESSARY

.....

.....

.....

ASK IF INTRODUCED NEW/IMPROVED SERVICES (C6A=1)

C6b Thinking again about the new service development activity that you've undertaken over the last three years, were any of these services new to your market, by which I mean you introduced them before your competitors?

AS NECESSARY: **Are you the first firm to introduce this service?**

Yes 1

No 2

(Don't know) 3

(Refused) 4

ASK IF INTRODUCED NEW/IMPROVED SERVICES (C6A = 1)

C8 Roughly what percentage of your current turnover comes from services that you have introduced or improved over the last three years?

PROBE FOR BEST ESTIMATE

Write in percentage (ALLOW ZERO)

(Refused)

(Don't know)

ASK IF DON'T KNOW OR REFUSED AT C8

C8a If you had to estimate, would you say that this percentage is…?

READ OUT. SINGLE CODE.

Zero 1

1-9 per cent 2

10-19 per cent 3

20-29 per cent 4

30-49 per cent 5

50-69 per cent 6

70 per cent or more 7

(Don't know) 8

(Refused)..... 9

ASK ALL

C24a. Thinking about your current sales, roughly what proportion of your turnover comes from services which are unique to your firm?

PROBE FOR BEST ESTIMATE

Write in percentage (ALLOW ZERO)

(Refused)

(Don't know)

ASK IF DON'T KNOW OR REFUSED AT C24A

C24b If you had to estimate, would you say that this percentage is…?

READ OUT. SINGLE CODE.

Zero 1

1-9 per cent 2

10-19 per cent 3

20-29 per cent 4

30-49 per cent 5

50-69 per cent 6

70 per cent or more 7

(Don't know) 8

(Refused).....9

C24b. DELETED

G8 DELETED

ASK IF INTRODUCED NEW/IMPROVED SERVICES (C6A = 1)

C7 Thinking about the new service development activity that you've undertaken over the last three years, has this…?

READ OUT. RANDOMISE.

A. Extended the range of services you offer

B. Improved the speed of delivery of your services

C. Reduced the costs of delivery of the services you provide

D. Improved the quality of the services you offer

E. Enabled you to attract new clients

F. Increased your revenue from existing clients

G. Involved tailoring services to meet individual client needs

H. Reduced environmental impacts

Yes.....1

No.....2

(Don't know) 3

(Refused).....4

ASK ALL

So far we have discussed the development of new and improved services. Now I'd like to move on to focus on how you deliver your services to clients.

ASK ALL

C11 Over the last three years, have you made any significant changes to the way you deliver services in your business?

Yes.....1

No.....2

(Don't know).....3

(Refused).....4

RANDOMISE 1 IN 4 AND ASK IF CHANGED DELIVERY OF SERVICES (C11 = 1)

C11_1a Can you please describe briefly the main change you have made over the last three years to how you deliver services to your clients?

PROBE AS NECESSARY

.....

.....

.....

G11_2 DELETED

ASK IF CHANGED DELIVERY OF SERVICES (C11=1)

C11a Thinking about developments you have made in how you deliver services over the last three years, were any of these new to

your market, by which I mean you introduced them before your competitors?

Yes.....1

No.....2

(Don't know).....3

ASK IF CHANGED DELIVERY OF SERVICES (C11 = 1)

C11b. And have these changes in the way you deliver services helped your business to…?

READ OUT. RANDOMISE

A. Reduce the costs of service delivery

B. Reduce the time taken to deliver services

C. Increase the quality or reliability of the services you deliver

E. Be more responsive to clients needs

F. Increase profitability

H. Make strategy decisions or changes

Yes.....1

No.....2

(Don't know).....3

(Refused).....4

ASK ALL

C15 Have you done any of the following in the last three years...?

READ OUT. RANDOMISE

A. Implemented a new or significantly changed corporate strategy

B. Implemented any advanced management techniques such as knowledge management systems, Investors in People

C. Implemented major changes to your organisational structure

(AS NECESSARY: **Such as the introduction of team-working or outsourcing of major business functions)**

D. Implemented changes in marketing strategies or channels

Yes.....1

No.....2

(Don't know).....3

ASK ALL

D4a Has your business purchased any new or improved software or computer networks over the last year?

AS NECESSARY: **This can include any investment in new or improved IT i.e. from a new PC to an upgraded network**

Yes.....1

No.....2

(Don't know).....3

IF YES AT D4a

D4b And roughly how much have you spent on software and computer networks over the last year?

AS NECESSARY: **Please just give me your best estimate.**

INTERVIEWER NOTE: CLARIFY THAT WE WANT SPENDING IN THE LAST YEAR

Write in amount (£ - ALLOW ZERO)

(Don't know)

(Refused)

CATI TO VALIDATE AMOUNT ENTERED USING BANDED RANGES

IF DK/REF AT D4B

D4c Please could you estimate how much you have spent on software and computer networks over the last year?

READ OUT AS NECESSARY

Up to £1,000.....1

£1,001 to £5,000 2

£5,001 to £10,000.....3

£10,001 to £20,000 4

£20,001 to £50,000.....5

More than £50,000 6

(Don't know) 7

(Refused).....8

ASK ALL

C17 Have you received any public or government support to help you develop or improve new services?

Yes.....1

No.....2

(Don't know).....3

ASK IF C17=1

C16 And did this public or government support…?

READ OUT. DO NOT RANDOMISE

a. Help you acquire and generate the ideas and information needed to develop new or improved services or ways of delivering new services.

b. Help you use this knowledge to create new or improved services or ways of delivering new services

c. Help you sell these new or improved services?

Yes.....1

No.....2

(Don't know).....3

SECTION D – KNOWLEDGE GATHERING

READ OUT IF INTRODUCED NEW SERVICES OR DELIVERY APPROACHES (CODE 1 AT C6A OR CODE 1 AT C11)

Now I'd like to ask you some questions about how your firm comes up with or obtains the ideas and information needed to develop new or improved services or ways of delivering them.

ASK IF INTRODUCED NEW SERVICES OR DELIVERY APPROACHES (CODE 1 AT C6A OR CODE 1 AT C11)

D14 Who in the business is involved in obtaining the ideas and information needed to develop new or improved services or how you deliver them? Is it…? READ OUT. CODE ALL THAT APPLY

Directors, partners or senior managers..... 1

Function managers (e.g. HR, marketing) 2

Client facing staff involved in service delivery 3

Administrative support staff 4

Technical or IT support staff 5

Marketing staff / bid managers..... 7

(Don't know) 8

(None of these)..... 9

ASK IF INTRODUCED NEW SERVICES OR DELIVERY APPROACHES (CODE 1 AT C6A OR CODE 1 AT C11)

D16a Do you ever get the ideas and information needed to develop new or improved services or how to deliver them from any external organisations, such as clients, competitors or consultants?

Yes..... 1

No.....2

(Don't know) 3

ASK IF USE EXTERNAL SOURCES (CODE 1 AT D16A)

D16 Which of the following external organisations have you used as a source for ideas and information...?

READ OUT. RANDOMISE ORDER

PROMPT AS NECESSARY: **Have you used any of the following as a source of the ideas and information needed for developing new or improved services or how you deliver them?**

So firstly…?

1. Suppliers

2. Clients

3. Competitors

4. Business or management consultants

5. Universities

6. Professional and trade associations

7. SHOW IF B5 = 3 **Other companies in the group**

8. Regulatory bodies

9. Technology providers

Yes.....1

No.....2

(Don't know) 3

IF CODE 1 AT D16.1 – D16.9

D16B In the last three years, how many < CATI TO INSERT ORG TYPE FROM D16.1 – D16.9**> have you got ideas or information from?**

1 - 2 1

3 - 4 2

5 or more 3

(Don't know) 4

ASK IF GET IDEAS FROM EXTERNAL SOURCES (D16A=1)

D2 Roughly what proportion of your new services typically come from ideas that initially came from outside your firm?

READ OUT AS NECESSARY. SINGLE CODE.

AS NECESSARY: **Such as ideas from clients, competitors, suppliers, consultants, etc**

None 1

1-9 per cent 2

10-19 per cent 3

20-29 per cent 4

30-49 per cent 5

50-69 per cent 6

70 per cent or more 7

(Don't know) 8

(Refused) 9

ASK ALL

D5a Over the last year, to help develop new services, improve existing ones or to improve the way you deliver services, has your firm….

A. Carried out any in-house research

B. Commissioned any external research

C. Used existing research available (e.g. from trade associations)

Yes.....1

No 2

(Don't know) 3

(Refused).....4

IF YES AT ANY D5A

D5b Roughly how much have you spent on this research activity over the last year? Please include expenditure on salaries, wages and staff time as well as equipment and any 'bought in' research services.

ADD AS NECESSARY**: Please just give me your best estimate in £**

INTERVIEWER NOTE: IF RANGE IS GIVEN PLEASE ENTER THE MIDPOINT

Write in figure in £ (ALLOW ZERO)

(Refused)

(Don't know)

IF DK/REF AT D5B

D5c Please could you estimate how much you have spent on this research activity over the last year?

READ OUT AS NECESSARY

ADD AS NECESSARY**: Please include expenditure on salaries, wages and staff time as well as equipment and any 'bought in' research services.**

Up to £1,000 1

£1,001 to £5,000 2

£5,001 to £10,000 3

£10,001 to £20,000 4

£20,001 to £50,000 5

More than £50,000 6

(Don't know) 7

(Refused) 8

ASK ALL

D7a <IF DONE R&D (CODE 1 AT ANY D5A) **And aside from the research you've just mentioned,> Has your firm invested in the design of new or improved services over the last year?**

AS NECESSARY: **By design I mean redefining or reshaping of your service**

Yes 1

No 2

(Don't know) 3

IF YES AT D7A

D7b Roughly how much have you spent on the design of new or improved services over the last year? Please include expenditure on salaries, wages and staff time as well as equipment and any 'bought in' services.

<IF CODE 1 AT ANY D5A **Please exclude the spend on R&D that you mentioned earlier**>

AS NECESSARY: **Please just give me your best estimate.**

INTERVIEWER NOTE: CLARIFY THAT WE WANT SPENDING IN THE LAST YEAR

Write in amount (£ - ALLOW ZERO)

(Don't know)

(Refused)

CATI TO VALIDATE AMOUNT ENTERED USING BANDED RANGES (FROM D7C)

IF DON'T KNOW AT D7b

D7c If you had to estimate the amount spent on the design of new or improved services in the last year, into which of the following bands would you put it? READ OUT

Zero/nothing 1

Up to £100,000 2

£100,001 - £500,000 3

£500,001 - £2million 4

£2,000,001 - £10 million 5

£10,000,001 - £50 million 6

More than £50million 7

(Don't know) 8

(Refused)..... 9

ASK IF INTRODUCED NEW SERVICES OR DELIVERY APPROACHES (CODE 1 AT C6A OR CODE 1 AT C11)

D17j Have you obtained the ideas and information needed to develop new or improved services or how you deliver them from any of the following?

READ OUT. CODE ALL THAT APPLY. RANDOMISE

Internal knowledge libraries or other in-house sources 1

Patent documentation or other registered intellectual property..... 2

Industry or trade publications or scientific journals..... 3

Regulatory documentation or standards documentation ... 4

Suppliers' directories or catalogues 5

Conferences, trade fairs or exhibitions..... 6

Internet based research..... 7

(Don't know) 8

(None of these)..... 9

SECTION E – SERVICE AND DELIVERY DEVELOPMENT

ASK IF INTRODUCED NEW SERVICES OR DELIVERY APPROACHES (CODE 1 AT C6A OR CODE 1 AT C11)

I'd now like to move on to how your business actually develops new or improved services or makes changes to how you deliver your services. So here we're asking about how the idea for something new is actually turned into a new service or method of delivery.

ASK IF INTRODUCED NEW SERVICES OR DELIVERY APPROACHES (CODE 1 AT C6A OR CODE 1 AT C11)

E9 Who in the business is involved in the process of actually developing new or improved services or how they are delivered? Is it…?

READ OUT. CODE ALL THAT APPLY

Directors, partners or senior managers..... 1

Function managers (e.g. HR, marketing) 2

Client facing staff involved in service delivery 3

Administrative support staff 4

Technical or IT support staff 5

Marketing staff / bid managers..... 7

(Don't know) 8

(None of these)..... 9

ASK IF INTRODUCED NEW SERVICES OR DELIVERY APPROACHES (CODE 1 AT C6A OR CODE 1 AT C11)

E11a Does your business set up teams to develop new or improved services or ways of delivering them?

Yes 1

No..... 2

(Don't know) 3

ASK IF SET UP TEAMS (CODE 1 AT E11A)

E11b Thinking about these teams, do you agree or disagree with the following statements?

READ OUT RANDOMISE

A. Team-working plays a major role in the development of new services and how we deliver them

B. Our development teams are cross-functional and involve people from different parts of the firm

C. Teams operate very independently and are left to get on with solving the problem

D. Our business invests in training in team working

E. Our teams often involve clients or suppliers

Agree..... 1

Neither agree nor disagree 2

Disagree..... 3

(Don't know) 4

ASK IF INTRODUCED NEW SERVICES OR DELIVERY APPROACHES (CODE 1 AT C6A OR CODE 1 AT C11)

E13a Does your firm involve any external organisations in the actual development of new services or how you deliver them?

Yes 1

No 2

(Don't know) 3

ASK IF USE EXTERNAL SOURCES (CODE 1 AT E13a)

E13b Which of the following external organisations have you used to help you develop your new or improved services or how you deliver them?

So firstly…? READ OUT. RANDOMISE ORDER

1. Suppliers

2. Clients

3. Competitors

4. Business or management consultants

5. Universities

6. Professional and trade associations

7. SHOW IF B5 = 3 **Other companies in the group**

8. Regulatory bodies

9. Technology providers

Yes 1

No 2

(Don't know) 3

IF CODE 1 AT E13B.1 - E13B.9

E13C In the last three years, how many <CATI TO INSERT ORG TYPE FROM E13B.1 - E13B.9**> have you used to develop new or improved services or how you deliver them?**

1 - 2 1

3 - 4 2

5 or more 3

(Don't know) 4

SECTION F – MARKETING NEW PRODUCTS & SERVICES

ASK ALL

I'd now like to move on to how your business goes about generating revenue from your services.

ASK ALL

F2 Thinking about how your business works with your clients, do you…?

READ OUT. CODE ALL THAT APPLY. RANDOMISE.

Involve clients in service evaluation 1

Monitor client feedback to shape new service development 2

Hold regular client review meetings 4

(None of these) 6

(Don't know) 7

ASK ALL

F3a Has your business invested in improving your reputation and branding over the last year, including spending on advertising, PR, etc?

Yes 1

No 2

(Don't know) 3

IF YES AT F3A

F3b Roughly how much have you spent on improving your reputation and branding over the last year?

ADD AS NECESSARY**: Please just give me your best estimate in £**

INTERVIEWER NOTE: IF RANGE IS GIVEN PLEASE ENTER THE MIDPOINT

Write in figure in £ (ALLOW ZERO)

(Refused)

(Don't know)

IF DK/REF AT F3B

F3c Please could you estimate how much have you spent on reputation and branding over the last year?

READ OUT AS NECESSARY

Up to £1,000.....1

£1,001 to £5,000 2

£5,001 to £10,000.....3

£10,001 to £20,000 4

£20,001 to £50,000.....5

More than £50,000 6

(Don't know) 7

(Refused).....8

ASK IF INTRODUCED NEW SERVICES OR DELIVERY APPROACHES (CODE 1 AT C6A OR CODE 1 AT C11)

F9 Who in the business is involved in marketing new or improved services?

MULTICODE

Directors, partners or senior managers 1

Function managers (e.g. HR, marketing) 2

Client facing staff involved in service delivery 3

Administrative support staff 4

Technical or IT support staff 5

Marketing staff / bid managers..... 7

(Don't know) 8

(None of these)..... 9

ASK IF INTRODUCED NEW SERVICES OR DELIVERY APPROACHES (CODE 1 AT C6a OR CODE 1 AT C11)

F12 Does your firm work with any external organisations to help you in marketing your new or improved services?

Yes..... 1

No..... 2

(Don't know) 3

ASK IF USE EXTERNAL SOURCES (CODE 1 AT F12)

F13 Which of the following external organisations have you used to help you to market your new or improved services...?

READ OUT. RANDOMISE ORDER

1. Suppliers

2. Clients

3. Competitors

4. Business or management consultants

5. Universities

6. Professional and trade associations

7. SHOW IF B5 = 3 **Other companies in the group**

8. Regulatory bodies

9. Technology providers

10. Market research companies

11. Advertising agencies

Yes 1

No 2

(Don't know) 4

IF CODE 1 AT F13.1 - F13.11 FOLLOW IMMEDIATELY FOR EACH

F13A In the last three years, how many <CATI TO INSERT ORG TYPE FROM F13.1 - F13.11**> have you got help from to market new or improved services?**

1 - 2 1

3 - 4 2

5 or more 3

(Don't know) 4

ASK ALL

F10a. Do you use any form of intellectual property protection, such as trademarks, patents, confidentiality agreements?

Yes.....1

No.....2

(Don't know).....3

ASK IF YES (CODE 1) AT F10a

F10. Which of the following types of intellectual property protection does your firm use?

READ OUT - CODE ALL THAT APPLY

1. Registered designs

2. Trademarks

3. Patent protection

4. Copyrights

5. Confidentiality agreements

6. Employee non-disclosure agreements

Yes.....1

No.....2

(Don't know).....3

SECTION G – ORGANISATION CULTURE

ASK ALL

We're now going to ask a few general questions about the culture and leadership of your firm.

ASK ALL

G99 Thinking about the development of new services and delivery approaches in your firm, do you have...

READ OUT - RANDOMISE - KEEP 2 AND 5 TOGETHER

1. Written strategies or policies to support the introduction of new ideas

2. A culture that supports the introduction of new ideas

3. Structured processes to support the introduction of new ideas

4. Offer staff rewards or incentives for valuable new ideas

5. A leadership team that supports new ideas

Yes 1

No 2

(Don't know) 3

ASK ALL

D20. Do you agree or disagree with the following statements?

READ OUT. RANDOMISE

1. We routinely store newly acquired knowledge for future reference

2. We quickly recognise the value of new external knowledge.

3. We have an open culture and staff share practical experiences

4. We work hard to grasp opportunities presented by new external knowledge

5. We regularly evaluate competitors' services

Agree.....1

Neither agree nor disagree 2

Disagree.....3

(Don't know) 4

ASK ALL

G5 Does your firm….

RANDOMISE.

1. Give employees information about the financial position of the establishment

2. Create teams of people, who don't usually work together, to work on a specific project

3. Have teams of people that solve specific problems or discuss aspects of work performance? AS NECESSARY: **These are sometimes known as "problem solving groups" or "continuous improvement groups"**

4. Have an equal opportunities policy

5. Have formal procedures in place for employee consultation AS NECESSARY: **such as a staff association, employee forum or trade union consultation**

6. Currently hold any of the ISO 9000 Standards

7. Have a formal procedure for dealing with discipline and dismissals for non-managerial employees

Yes.....1

No.....2

(Don't know) 3

G5a DELETED

ASK ALL

G5b Which of the following methods do you use to communicate or share information in the workplace?

1. Annual staff surveys

2. Formal staff suggestion schemes

3. Scheduled team meetings

4. Intranet

5. Newsletters

6. Employee forum or works council

Yes.....1

No.....2

(Don't know) 3

ASK ALL

G5c To what extent would you say employees at your establishment…

READ OUT FOR EACH. SINGLE CODE.

1. Have variety in their work

2. Have access to flexible working

3. Have discretion over how they do their work

To a large extent..... 1

To some extent..... 2

Not much 3

Not at all 4

(Don't know) 5

ASK ALL

G3 And thinking about any future development of your workforce, how important is it to your firm that....

READ OUT RANDOMISE

1. You recruit people with experience outside your sector

2. You recruit people with experience working in other firms in your sector

3. You develop your staffs' professional skills

4. You train staff on how to develop ideas for new services

Very important 1

Fairly important.....2

Not important.....3

(Don't know) 4

(Refused).....5

ASK ALL

G4A Has your business used social media at all over the last year?

Yes.....1

No.....2

(Don't know) 3

ASK IF USE SOCIAL MEDIA (CODE 1 AT G4A)

G4B Does your business use social media to do any of the following...?

RANDOMISE

1. Provide services to clients

2. Advertise services to potential clients

3. Provide service updates and other types of free information

4. Interact with other firms and share information

5. DELETED

Yes 1

No 2

(Don't know) 3

SECTION H – EXTERNAL ENVIRONMENT

ASK ALL

Q49 I'm now going to read out a list of possible barriers that may have constrained your new service development over the last three years.

Please tell me whether each of the following has been a significant constraint, a small constraint or no constraint at all.

READ OUT RANDOMISE

1. Attitudinal or expertise barriers to change in your business

2. Attitudinal barriers to change among your clients

3. Lack of necessary finance

4. Limited market opportunities for new services

5. Regulatory or legislative factors

6. DELETED

7. Lack of collaborators for developing new services

8. DELETED

9. The intensity of competition

10. Your business's ability to recruit new staff or talent

11. Lack of ideas for new services from your customers

No constraint at all.....1

A small constraint.....2

A significant constraint.....3

(Don't know) 4

RANDOMISE 1 IN 4 AND ASK ALL

Q49a Could you tell me, in your own words, what the main constraint on the development of new services or delivery methods has been in the last three years?

PROBE AS NECESSARY

.....

.....

.....

ASK ALL

G1 **Thinking about the regulatory and legal environment within which your business operates, do you agree or disagree with the following…?** READ OUT. RANDOMISE

a. DELETED

b. New legislation has created new opportunities for us

c. Employment legislation is a real problem for innovation

d. We find it difficult to keep up with changing legislative and regulatory requirements

Agree.....1

Neither agree nor disagree 2

Disagree.....3

(Don't know) 4

ASK ALL

G2 **Now thinking specifically about environmental legislation, do you agree or disagree that…?** READ OUT. RANDOMISE

1. DELETED

2. DELETED

3. Environmental legislation is a major barrier to innovation

4. Environmental legislation has created new opportunities for us

Agree.....1

Neither agree nor disagree 2

Disagree 3

(Don't know) 4

RANDOMISE 1 IN 4 AND ASK ALL

C25 Finally, thinking about the services you provide and how you provide them, what major changes, if any, do you anticipate occurring in the next few years?

AS NECESSARY: **What are the big ideas in the provision and delivery of your business' services?**

PROBE FULLY & RECORD IN DETAIL

.....

.....

.....

SECTION I – WRAP UP

READ OUT TO ALL

That's the end of the interview, thank you very much for your time. Before you go I just need to check a couple of things.

ASK ALL

H1 Firstly, would you be willing to take part in any future research on the topics we have covered conducted on behalf of the UK Commission of Employment and Skills?

AS NECESSARY: **If you agree and are contacted you can always refuse if it's not convenient or you are no longer willing to participate**

Yes.....1

No.....2

(Don't know).....3

(Refused).....4

ASK ALL

H2 We are working with academic researchers who would like to be able to analyse the answers you have provided us alongside data you may provide to central Government, such as through Companies House. We can assure you that your answers will still remain confidential and will only be presented in the form of statistical summaries. Would this be OK?

INTERVIEWER NOTE: READ OUT EXACTLY AS SCRIPTED

AS NECESSARY: **This will allow the researchers to 'look up' other data held on your business by central Government, which will in turn**

allow them to conduct a fuller and more meaningful analysis of this survey data.

Yes 1

No 2

(Don't know) 3

ASK ALL

H5 Would you like to be emailed a copy of the research report once it has been published?

Yes - RECORD EMAIL ADDRESS 1

No 2

(Don't know) 3

ASK ALL

H3 Finally, can I just check that your business postcode is…?

CATI TO DISPLAY POSTCODE IF AVAILABLE – AMEND IF MISSING OR INCORRECT

ASK ALL

H4 And may I take a note of your name?

WRITE IN

STANDARD THANK & CLOSE

ANNEX 3. ECONOMETRIC ANALYSIS AND TABLES

Descriptive statistics and correlations of all the dependent and independent variables used in the analysis are presented in Tables A3.1 and A3.2 respectively.

Tobit models of the percentage of new service ideas from outside the firm are presented in Table A3.3. A baseline model (Model 1) includes resource indicator variables, as well as variables capturing internal knowledge investment and external knowledge seeking for accessing knowledge. These explanatory variables are all included in subsequent models, in addition to the HR culture variable in Model 2, the HR practices variable in Model 3 and the HR recruitment and training variable in Model 4. Asterisks are used to indicate where these effects are statistically significant.

Tables A3.4, A3.5 and A3.6 present the econometric analysis examining the intermediate stage of the innovation value chain. Tobit models of innovative sales and the diversity of innovation are presented in tables A3.4 and A3.5, and Probit models of the probability of being a service innovator are presented in Table A3.6. Baseline models (Model 1) include firm resources variable, in addition to internal knowledge and external knowledge seeking for building innovation variables. Again, the HR culture variable is added to Model 2, the HR practice variable to Model 3 and the HR recruitment and training variable to Model 4.

Tables A3.7 and A3.8 presented the results with respect to the final stage of the innovation value change. Here, commercialising innovation is measured as turnover growth and productivity growth. In the baseline OLS models (Model 1), explanatory variables include firm characteristics, turnover from innovation sales, and internal and external knowledge seeking for commercially exploiting innovation. Taking the same approach again, HR metrics are added to subsequent models.

A symbolic summary of the relationship of the HR variables to innovation across the different stages of the innovation process are presented in Table 5.2.

Table A3.1: Descriptives

	Mean	Std. Dev.
Performance Indicators		
New Service Ideas from outside the firm	11.60138	20.91958
Diversity of Innovation Activity	46.32499	29.347
Innovative Sales (%)	16.65848	24.24722
Service Innovator (1/0)	0.650397	0.477115
Turnover Growth (Log, per annum)	0.101105	0.204338
Productivity Growth (Log)	0.281372	0.577224
Resource Indicators		
Firm Size (employment)	87.42697	393.3326
Firm Size - squared (employment)	162180.2	1859179
Firm age	20.17353	9.665936
Workforce with degree (%)	54.70439	27.15075
Exporting Firm (> 5% of sales)	0.355161	0.478828
Competition - Local	0.202883	0.402369
Competition - National	0.172949	0.378413
Competition - Regional	0.447894	0.497553
Competition - International	0.162971	0.369544
Internal knowledge		
IT investment (0/1)	0.655017	0.475631
R&D investment (0/1)	0.674058	0.468986
Design investment (0/1)	0.480044	0.499879
Branding investment (0/1)	0.696231	0.460139
Government Funding		
Sourcing Knowledge	0.080931	0.272881
Building Innovation	0.085366	0.27958
Commercialising Innovation	0.063193	0.243445
Multifunctionality		
Sourcing Knowledge	39.87435	35.95442
Building Innovation	37.13969	34.83907
Commercialising Innovation	32.74487	31.09099
External Links		
Sourcing Knowledge	23.94678	27.86571
Building Innovation	12.04268	21.89275
Commercialising Innovation	8.259424	15.92042
Teamwork Index	31.37931	39.77707
IP protection index	31.49068	32.63764
Customer Modes	77.93791	29.79496

Table A3.2: Correlation matrix

Table A3.2: Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	External_ideas	1.00														
2	Diversity_innov	0.30	1.00													
3	Innov_sales	0.30	0.43	1.00												
4	Service_innovator	0.36	0.58	0.52	1.00											
5	Turnover_growth	0.02	0.11	0.20	0.06	1.00										
6	Productivity_growth	0.03	0.11	0.21	0.06	0.98	1.00									
7	Firm size (employ)	0.06	0.06	-0.06	0.04	0.07	0.07	1.00								
8	Firm age	-0.06	-0.13	-0.23	-0.04	-0.21	-0.19	0.07	1.00							
9	Workforce with degree	0.04	0.03	0.01	0.00	-0.06	-0.05	0.01	0.01	1.00						
10	Exporting firm	0.07	0.10	0.14	0.10	0.00	-0.02	0.10	-0.05	0.12	1.00					
11	Competition: Local	-0.05	-0.17	-0.15	-0.08	-0.04	-0.04	-0.06	0.09	-0.08	-0.24	1.00				
12	Competition: Reg	-0.05	-0.13	-0.11	-0.13	-0.02	-0.01	-0.04	0.04	-0.03	-0.22	-0.26	1.00			
13	Competition: Nat	0.03	0.19	0.10	0.11	0.08	0.07	0.04	-0.08	-0.02	0.02	-0.48	-0.42	1.00		
14	Competition: Int	0.06	0.07	0.14	0.07	-0.04	-0.04	0.06	-0.02	0.16	0.49	-0.22	-0.19	-0.35	1.00	
15	IT investment	0.03	0.19	0.08	0.11	0.08	0.09	-0.06	-0.01	0.06	-0.02	-0.08	0.01	0.11	-0.06	1.00
16	R&D Investment	0.18	0.36	0.18	0.29	0.02	0.03	0.07	-0.06	0.11	0.12	-0.14	-0.02	0.08	0.08	0.15
17	Design Investment	0.21	0.47	0.36	0.36	0.08	0.09	-0.01	-0.07	0.10	0.15	-0.24	-0.10	0.20	0.10	0.13
18	Branding Investment	0.04	0.30	0.09	0.20	0.05	0.05	0.04	0.03	0.13	0.06	-0.06	-0.06	0.06	0.07	0.14
19	Govt Support: sourcing k	0.01	0.15	0.13	0.09	0.00	0.02	-0.03	-0.11	0.10	0.13	-0.13	0.01	0.02	0.10	0.05
20	Govt Support: building innov	0.04	0.14	0.13	0.09	0.02	0.04	-0.03	-0.11	0.09	0.15	-0.12	0.01	-0.01	0.14	0.04
21	Govt Support: comm innov	0.02	0.10	0.11	0.04	-0.01	-0.01	-0.03	-0.04	0.06	0.11	-0.10	-0.01	0.02	0.12	0.00
22	Multif: sourcing k	0.29	0.52	0.33	0.60	0.02	0.01	0.07	-0.04	0.02	0.14	-0.15	-0.08	0.13	0.07	0.16
23	Multif: building innov	0.30	0.50	0.34	0.59	0.02	0.02	0.09	-0.04	0.03	0.17	-0.17	-0.09	0.14	0.08	0.12
24	Multif: Comm innov	0.32	0.51	0.33	0.59	0.04	0.04	0.17	-0.06	0.00	0.14	-0.14	-0.07	0.13	0.05	0.12
25	Ext_K: sourcing k	0.47	0.47	0.23	0.49	0.01	0.00	0.05	-0.02	0.03	0.07	-0.05	-0.06	0.09	0.01	0.15
26	Ext_K: building innov	0.16	0.35	0.18	0.33	0.08	0.09	0.02	0.02	-0.01	0.01	-0.08	-0.02	0.13	-0.07	0.10
27	Ext_K: comm innov	0.20	0.34	0.20	0.31	0.06	0.06	0.10	0.01	0.00	0.03	-0.04	-0.10	0.09	0.03	0.04
28	Teamwork	0.21	0.49	0.29	0.44	0.00	0.01	0.10	-0.06	0.07	0.16	-0.14	-0.08	0.12	0.07	0.14
29	IP protection	0.06	0.23	0.15	0.13	0.05	0.04	0.09	-0.07	0.23	0.29	-0.29	-0.07	0.15	0.21	0.08
30	Customermodes	0.14	0.30	0.17	0.21	0.02	0.02	0.08	-0.03	0.11	0.15	-0.19	-0.01	0.08	0.11	0.03

Table A3.2: Correlation matrix-Continued

		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16	R&D Investment	1.00														
17	Design Investment	0.28	1.00													
18	Branding Investment	0.19	0.22	1.00												
19	Govt Support: sourcing k	0.08	0.17	0.11	1.00											
20	Govt Support: building innov	0.09	0.18	0.09	0.81	1.00										
21	Govt Support: comm innov	0.06	0.18	0.11	0.69	0.66	1.00									
22	Multif: sourcing k	0.33	0.30	0.18	0.06	0.05	0.05	1.00								
23	Multif: building innov	0.36	0.33	0.19	0.08	0.06	0.03	0.82	1.00							
24	Multif: Comm innov	0.35	0.30	0.29	0.05	0.04	0.02	0.72	0.75	1.00						
25	Ext_K: sourcing k	0.33	0.33	0.19	0.10	0.08	0.07	0.55	0.51	0.54	1.00					
26	Ext_K: building innov	0.24	0.30	0.17	0.12	0.10	0.09	0.39	0.39	0.37	0.44	1.00				
27	Ext_K: comm innov	0.21	0.21	0.25	0.02	0.03	0.04	0.31	0.34	0.37	0.39	0.37	1.00			
28	Teamwork	0.31	0.36	0.21	0.13	0.12	0.11	0.50	0.48	0.51	0.43	0.42	0.33	1.00		
29	IP protection	0.23	0.19	0.13	0.09	0.13	0.09	0.21	0.21	0.19	0.16	0.14	0.14	0.19	1.00	
30	Customermodes	0.24	0.21	0.23	0.11	0.08	0.05	0.27	0.27	0.24	0.24	0.19	0.17	0.28	0.26	1.00

Table A3.3 Sourcing knowledge: Tobit models of the share of new service ideas from outside the firm

	Model 1	Model 2	Model 3	Model 4
Resource Indicators				
Firm size (employment)	0.000	0.000	0.000	0.000
	(-0.003)	(-0.003)	(-0.003)	(-0.003)
Firm age (years)	0.032	0.036	0.036	0.047
	(-0.181)	(-0.182)	(-0.182)	(-0.180)
Workforce with degree (%)	-0.054	-0.054	-0.05	-0.059
	(-0.064)	(-0.066)	(-0.065)	(-0.063)
Exporting Firm	0.067	-0.391	1.039	0.068
	(-4.807)	(-4.798)	(-4.895)	(-4.803)
Competition - regional	-1.652	-1.065	-1.347	-1.687
	(-5.730)	(-5.803)	(-5.683)	(-5.745)
Competition - national	-3.399	-3	-4.388	-3.092
	(-4.593)	(-4.654)	(-4.571)	(-4.67)
Competition – international	-0.578	-0.504	-1.279	0.07
	(-7.085)	(-7.129)	(-7.179)	(-7.105)
Govt. Support: sourcing knowledge	-12.249**	-12.591**	-12.245**	-12.379**
	(-6.062)	(-6.083)	(-5.972)	(-6.073)
Multi-functionality: sourcing k	0.076	0.072	0.089	0.071
	(-0.062)	(-0.062)	(-0.062)	(-0.061)
Internal & External Knowledge Seeking				
IT investment (0/1)	-9.822**	-10.227***	-10.057***	-9.816**
	(-3.809)	(-3.842)	(-3.850)	(-3.805)
R&D investment(0/1)	2.237	2.405	1.887	2.159
	(-4.047)	(-4.170)	(-4.026)	(-4.093)
Design investment (0/1)	5.962*	5.614	5.509	5.528
	(-3.611)	(-3.737)	(-3.697)	(-3.753)
External Knowledge Seeking	2.615***	2.623***	2.569***	2.611***
	(-0.227)	(-0.225)	(-0.228)	(-0.227)
External Knowledge Seeking squared	-0.022***	-0.022***	-0.021***	-0.022***
	(-0.003)	(-0.003)	(-0.003)	(-0.003)
HR processes				
HR culture		0.082		
		(-1.530)		
HR practices			-0.755	
			(-0.960)	
HR recruitment and training				0.986
				(-1.677)
Number of observations	834	808	814	824
P	0	0	0	0
Pseudo-R^2	0.147	0.145	0.146	0.146

Source: HRIPS 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 A3.4 Transforming Knowledge: Tobit Models of Innovative Sales

	Model 1	Model 2	Model 3	Model 4
Resource Indicators				
Firm size (employment)	-0.024***	-0.028***	-0.029***	-0.026***
	(-0.009)	(-0.009)	(-0.009)	(-0.009)
Firm size squared (employment)	0.000**	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm age (years)	-0.640***	-0.649***	-0.645***	-0.585***
	(-0.203)	(-0.203)	(-0.198)	(-0.202)
Govt. support: building innovation	4.971	4.611	6.180	5.587
	(-6.761)	(-6.894)	(-6.685)	(-6.715)
Workforce with degree (%)	-0.002	-0.016	0.023	-0.03
	(-0.073)	(-0.075)	(-0.072)	(-0.074)
Exporting firm	3.5	2.723	3.608	2.453
	(-4.183)	(-4.186)	(-4.057)	(-4.154)
Competition - regional	0.906	0.485	-0.117	-0.011
	(-4.866)	(-5.001)	(-4.889)	(-4.807)
Competition - national	4.521	4.713	3.082	4.658
	(-4.846)	(-4.862)	(-4.74)	(-4.985)
Competition - international	5.546	6.197	4.432	6.187
	(-6.403)	(-6.394)	(-6.259)	(-6.412)
Multifunctionality: building innovation	1.818***	1.833***	1.867***	1.912***
	(-0.192)	(-0.193)	(-0.195)	(-0.193)
Multifunctionality: building innovation (squared)	-0.014***	-0.014***	-0.015***	-0.015***
	(-0.002)	(-0.002)	(-0.002)	(-0.002)
Team-working index	0.049	0.037	0.037	0.023
	(-0.051)	(-0.050)	(-0.050)	(-0.050)
Internal knowledge & external connectivity				
IT investment (0/1)	4.855	4.067	3.304	4.507
	(-3.977)	(-3.992)	(-3.917)	(-3.994)
R&D investment(0/1)	-2.788	-3.471	-4.613	-2.063
	(-3.960)	(-3.933)	(-3.919)	(-4.040)
Design investment (0/1)	16.144***	16.179***	15.454***	15.273***
	(-4.273)	(-4.368)	(-4.253)	(-4.357)
Externally sourced ideas	0.202**	0.200**	0.176**	0.189**
	(-0.083)	(-0.082)	(-0.080)	(-0.081)
External connectivity: building innovation	0.131	0.171	0.007	0.113
	(-0.281)	(-0.284)	(-0.276)	(-0.275)

External connectivity: building innovation (squared)	-0.002	-0.003	0.000	-0.001
	(-0.004)	(-0.004)	(-0.004)	(-0.004)
HR processes				
HR culture		2.392		
		(-1.483)		
HR practices			2.523***	
			(-0.96)	
HR recruitment and training				5.077***
				(-1.486)
Number of observations	764	744	747	756
P	0.000	0.000	0.000	0.000
Pseudo-R^2	0.100	0.100	0.102	0.103

Source: HRIPS 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 A3.5 Transforming Knowledge: Tobit Models of Innovation Diversity

	Model 1	Model 2	Model 3	Model 4
Resource Indicators				
Firm size (employment)	0.014***	0.011*	0.011**	0.012**
	(-0.005)	(-0.005)	(-0.005)	(-0.005)
Firm size squared (employment)	-0.000***	-0.000**	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm age (years)	-0.395***	-0.393***	-0.391***	-0.351***
	(-0.099)	(-0.098)	(-0.098)	(-0.097)
Govt. support: building innovation	-0.006	-0.018	-0.017	-0.026
	(-0.037)	(-0.037)	(-0.037)	(-0.037)
Workforce with degree (%)	-5.009**	-4.991**	-5.570**	-5.387**
	(-2.367)	(-2.352)	(-2.431)	(-2.338)
Exporting firm	-2.921	-3.683	-3.375	-3.577
	(-2.891)	(-2.847)	(-2.913)	(-2.883)
Competition - regional	-1.116	-2.092	-1.309	-0.824
	(-2.596)	(-2.659)	(-2.597)	(-2.591)
Competition - national	2.085	1.267	1.652	2.244
	(-3.309)	(-3.322)	(-3.333)	(-3.312)
Competition - international	0.014***	0.011*	0.011**	0.012**
	(-0.005)	(-0.005)	(-0.005)	(-0.005)
Multifunctionality: building innovation	0.982***	0.978***	0.985***	1.007***
	(-0.103)	(-0.103)	(-0.103)	(-0.102)
Multifunctionality: building innovation (squared)	-0.008***	-0.008***	-0.008***	-0.008***
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
Team-working index	0.113***	0.103***	0.099***	0.096***
	(-0.028)	(-0.029)	(-0.029)	(-0.029)
Internal knowledge & external connectivity				
IT investment (0/1)	4.047**	3.275	3.762*	3.908*
	(-2.057)	(-2.045)	(-2.064)	(-2.019)
R&D investment(0/1)	3.461	2.73	2.4	3.680*
	(-2.225)	(-2.203)	(-2.213)	(-2.179)
Design investment (0/1)	10.502***	9.890***	10.509***	9.412***
	(-2.088)	(-2.063)	(-2.081)	(-2.112)
Externally sourced ideas	0.085**	0.083**	0.094**	0.078*
	(-0.041)	(-0.041)	(-0.042)	(-0.040)
External connectivity: building innovation	0.174	0.199	0.190	0.155
	(-0.126)	(-0.126)	(-0.126)	(-0.123)
External connectivity: building innovation (squared)	-0.001	-0.001	-0.001	0.000
	(-0.002)	(-0.002)	(-0.002)	(-0.002)
HR processes				
HR culture		2.102***		

		(-0.762)		
HR practices			1.654***	
			(-0.574)	
HR recruitment and training				3.282***
				(-0.872)
Number of observations	792	774	777	783
P	0.000	0.000	0.000	0.000
Pseudo-R^2	0.13	0.13	0.131	0.132

Source: HRIPS 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 A3.6 Transforming Knowledge: Probit Models of Service Innovator

	Model 1	Model 2	Model 3	Model 4
Resource Indicators				
Firm size (employment)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Firm size squared (employment)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Firm age (years)	-0.003	-0.003	-0.003	-0.003
	(-0.003)	(-0.003)	(-0.003)	(-0.003)
Govt. support: building innovation	-0.126	-0.115	-0.12	-0.122
	(-0.123)	(-0.123)	(-0.134)	(-0.121)
Workforce with degree (%)	-0.001	-0.001	-0.001	-0.001
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
Exporting firm	0.139**	0.145***	0.143***	0.129**
	(-0.055)	(-0.056)	(-0.055)	(-0.056)
Competition - regional	0.055	0.017	0.036	0.05
	(-0.078)	(-0.083)	(-0.079)	(-0.078)
Competition - national	0.044	0.03	0.024	0.027
	(-0.077)	(-0.078)	(-0.077)	(-0.079)
Competition - international	-0.05	-0.07	-0.077	-0.049
	(-0.100)	(-0.101)	(-0.103)	(-0.100)
Multifunctionality: building innovation	0.040***	0.039***	0.040***	0.039***
	(-0.003)	(-0.003)	(-0.003)	(-0.003)
Multifunctionality: building innovation (squared)	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Team-working index	0.001	0.000	0.001	0.001
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
Internal knowledge & external connectivity				
IT investment (0/1)	-0.003	0.004	-0.014	-0.005
	(-0.060)	(-0.061)	(-0.060)	(-0.060)
R&D investment(0/1)	0.006	-0.005	-0.023	0.003
	(-0.059)	(-0.058)	(-0.061)	(-0.060)
Design investment (0/1)	0.192***	0.199***	0.182***	0.197***
	(-0.058)	(-0.059)	(-0.059)	(-0.059)
Externally sourced ideas	0.006***	0.006***	0.006***	0.006***
	(-0.002)	(-0.002)	(-0.002)	(-0.002)
External connectivity: building innovation	-0.003	-0.003	-0.003	-0.002
	(0.005)	(-0.005)	(-0.005)	(-0.005)
External connectivity: building innovation (squared)	0.000	0.000	0.000	0.000
	(-0.003)	(-0.003)	(-0.003)	(-0.002)
HR processes				
HR culture		0.012		

		(-0.023)		
HR practices			0.039***	
			(-0.015)	
HR recruitment and training				0.007
				(-0.026)
Number of observations	811	789	794	801
P	0	0	0	0
Pseudo-R^2	0.617	0.615	0.621	0.618

Source: HRIPS 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 A3.7 Commercialising Innovation: OLS models of turnover growth

	Model 1	Model 2	Model 3	Model 4
Resource Indicators				
Firm size (employment)	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Firm size squared (employment)	0.000	0.000	0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Firm age (years)	-0.002***	-0.003***	-0.002***	-0.003***
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
Govt. support: commercialising innovation	-0.075	-0.077	-0.077	-0.076
	(-0.072)	(-0.073)	(-0.073)	(-0.072)
Workforce with degree (%)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Exporting firm	-0.027	-0.025	-0.029	-0.026
	(-0.03)	(-0.030)	(-0.030)	(-0.030)
Competition - regional	0.017	0.014	0.016	0.02
	(-0.019)	(-0.020)	(-0.020)	(-0.020)
Competition - national	-0.040*	-0.042*	-0.041*	-0.044*
	-0.022	-0.023	-0.023	-0.023
Competition - international	(-0.014)	(-0.011)	(-0.014)	(-0.014)
	-0.038	-0.039	-0.038	-0.038
Multifunctionality: commercialising innovation	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
IP protection index	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Customer modes	-0.000*	-0.001**	-0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Internal knowledge & external connectivity				
Branding investment (0/1)	0.002	-0.002	0.004	0.003
	(-0.022)	(-0.022)	(0.022)	(-0.021)
External connectivity: commercialising innovation	0.001	0	0.001	0.001
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
Innovation output				
Innovative sales	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
HR processes				
HR culture		0.01		
		(-0.009)		
HR practices			0	
			(-0.005)	
HR recruitment and training				-0.011
				(-0.008)

Number of observations	616	604	606	610
P	0	0.001	0	0
R^2	0.126	0.13	0.131	0.135

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

Table A3.8 Commercialising Innovation: OLS models of productivity growth

	Model 1	Model 2	Model 3	Model 4
Resource Indicators				
Firm size (employment)	0.000*	0.000**	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Firm size squared (employment)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Firm age (years)	-0.009***	-0.009***	-0.009**	-0.010***
	(-0.004)	(-0.004)	(-0.004)	(-0.004)
Govt. support: commercialising innovation	-0.142	-0.136	-0.157	-0.146
	(-0.229)	(-0.234)	(-0.230)	(-0.229)
Workforce with degree (%)	-0.002	-0.002	-0.002	-0.002
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
Exporting firm	-0.104	-0.105	-0.108	-0.1
	(-0.105)	(-0.105)	(-0.104)	(-0.106)
Competition - regional	0.033	0.016	0.032	0.041
	(-0.073)	(-0.075)	(-0.074)	(-0.074)
Competition - national	-0.135*	-0.142*	-0.130*	-0.144*
	(-0.077)	(-0.078)	(-0.077)	(-0.077)
Competition - international	-0.09	-0.095	-0.089	-0.091
	(-0.132)	(-0.135)	(-0.132)	(-0.132)
Multifunctionality: commercialising innovation	0.000	0.000	0.000	0.000
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
IP protection index	0.002**	0.002**	0.002**	0.002*
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
Customer modes	-0.001	-0.001	-0.001	-0.001
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
Internal knowledge & external connectivity				
Branding investment (0/1)	0.017	0.022	0.029	0.02
	(-0.073)	(-0.074)	(-0.073)	(-0.073)
External connectivity: commercialising innovation	0.003	0.003	0.003	0.003
	(-0.002)	(-0.003)	(-0.002)	(-0.002)
Innovation output				
Innovative sales	0.006***	0.006***	0.006***	0.006***
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
HR processes				
HR culture		-0.021		
		(-0.032)		
HR practices			-0.012	
			(-0.018)	
HR recruitment and training				-0.037
				(-0.027)

Number of observations	629	617	619	623
P	0.000	0.000	0.000	0.000
R^2	0.140	0.141	0.149	0.144

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

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