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REPORT

# Patterns and practices of innovation in Norwegian service firms

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## Patterns and practices of innovation in Norwegian service firms

**by**

**Per Egil Pedersen**

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**Are Branstad**

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## Preface

This report documents the studies conducted in workpackages 2 and 4 in the SNF-project "MISSING: Measuring innovation in service systems – indicators on new grounds". The project has been funded by the Research Council of Norway through the FORFI program. Primary data has been collected within the MISSING project, through the general funding of the Center for Service Innovation (CSI) at NHH as well as through the Reisepol project at Buskerud and Vestfold University College, all funded by the Research Council of Norway. Secondary data has kindly been provided by Statistics Norway. Sections 2.4 and 4.2.1 have been written by Tor Helge Aas, Section 2.5 by Are Branstad and Section 4.2.3 by Kristin Bentsen, and this report would not have materialized without their invaluable efforts. The rest of the report is in the writing of Per Egil Pedersen who should also be blamed for all faults and errors. Many of the considerable number of findings only briefly touched upon in this report are now in publication processes in other academic outlets.

## Table of Contents

Preface ..... i
Abstract ..... v
1. Introduction ..... 1
2. Theory ..... 7
2.1 Extending the resource-process framework ..... 7
2.2 Scale intensive network services – telecoms, banking and insurance ..... 10
2.3 Scale intensive physical infrastructure services - retail and wholesale trade ..... 12
2.4 Personal services – tourism ..... 14
2.5 Knowledge intensive services – engineering, consulting and ICT services ..... 15
3. Quantitative study ..... 20
3.1 Method ..... 20
3.2 Findings ..... 30
3.2.1 Patterns - innovation resources ..... 30
3.2.2 Patterns - innovation processes ..... 34
3.2.3 Patterns - innovation system ..... 41
3.2.4 Performance effects of innovation ..... 44
3.3 Summary of quantitative findings ..... 57
4. Qualitative study ..... 62
4.1 Method ..... 62
4.1.1 Sample and procedure ..... 62
4.1.2 Measures ..... 66
4.2 Findings ..... 67
4.2.1 Scale intensive network services ..... 67
4.2.2 Scale intensive physical infrastructure services - Retail and wholesale trade ..... 74
4.2.3 Personal services – tourism ..... 81
4.3 Summary of qualitative findings ..... 86
5. Conclusion and discussion ..... 89
6. Further research ..... 95
References ..... 97
Appendix A – Interview guide of the qualitative study (in Norwegian) ..... 105

## Abstract

This report documents the studies conducted in workpackages 2 and 4 in the SNF-project "MISSING: Measuring innovation in service systems – indicators on new grounds". It first presents the resource-process-system framework applied in the studies and also summarizes some of the relevant findings and gaps in the innovation studies and innovation management literatures on service innovation. Two empirical studies are reported. The first is founded in the innovation studies literature on innovation patterns but extends this tradition into the investigation of the performance effects of innovation patterns with particular focus on service sectors/systems. The study finds several unique innovation patterns of individual service sectors/systems and reveals the relationship between these patterns and three types of firm performance effects. The second study is founded in the innovation management literature on innovation practices and extends this literature by linking its selection of individual firms to service classification schemes offered in the innovation studies literature. The study finds more similarities between the innovation practices of service firms in different sectors/systems than differences. The report ends with summarizing the findings across the two studies and suggests managerial and policy implications of the findings.

## 1. Introduction

Building on the work of Pavitt (1984) on patterns of innovation in economic sectors, a number of empirically oriented researchers have investigated both the differences in patterns of innovation between service sectors and other sectors as well as between different service sectors (Soete and Miozzo, 1989, Evangelista, 2000, Hollenstein, 2003, Hipp and Grupp, 2005; Tether and Tajar, 2008, Trigo and Vence, 2012). As with Pavitt´s work, the idea is to develop taxonomies of *services* and/or taxonomies of service *innovation*. These two taxonomies do not necessarily correlate perfectly as the characteristics differentiating different service industries go beyond those characterizing innovation in these industries.

Two directions of research can be found in this field. One relies on a theoretical model or idea of what characterizes the "production" of the service outputs in a particular service industry. Already by 1999, the service operations/management literature had identified 39 different taxonomies of this kind (Cook, Goh and Chung, 1999), and since then, the number has certainly not decreased. Illustrating the weak link between the service operations/management and service innovation literature is the fact that the most widely applied taxonomy based on Pavitt (1984) - that of Soete and Miozzo (1989), is not among these 39 taxonomies. The other direction of research in this field is more empirically driven and typically applies survey data such as those of the Community Innovation Survey (CIS) to develop classification schemes or taxonomies of service industries.

While the empirical literature has searched for patterns of innovation differentiating services from manufacturing, some of the theoretical literature in the field has been more occupied with classifying different service industries than differentiating service industries from other sectors (e.g. Lovelock and Gummesson, 2004). Even though the theoretical literature on classifications or taxonomies of services could be based on a number of characteristics of services (Zeithaml et al., 1985) or unique characteristics of service innovation (Barras, 1986), the linkage between output-oriented industry classifications like the NACE-classification and the theoretical taxonomy is important. This mapping is not easy because the characteristics of service innovation do not always correlate perfectly with the characteristics of industry outputs. Still, applying the principles of Pavitt (1984), Soete and Miozzo (1989, Miozzo and

Soete, 2001) attempted to differentiate between supplier dominated, scale intensive, information network and specialized technology and science-based industries. The terms used reflect the main resources or drivers behind innovation in each of the different sectors.

The empirical literature is more inductive in the sense that survey data is used to develop or derive at a classification scheme or taxonomy. The methods applied include variants of factor-, cluster- and algorithmic classification techniques. The degree of inductiveness varies between more confirmatory, more exploratory and more descriptive empirical studies. The more confirmatory studies use empirical data to develop empirical classifications that, in the second phase of the studies, are compared to the theoretical schemes mentioned above. Examples are Evangelista and Savona (2003) and Hipp and Grupp (2005). This approach was also used by Chang, Linton and Chen (2012), but due to difficulties with replicating the Soete and Miozzo taxonomy, they introduced the term "service regimes" to describe differences in innovation between service industries. This study is also one of the few articles using non-European data (Taiwan). Another example of this category of studies is DeJong and Marsili (2006) who found that the Pavitt-taxonomy needed revision and extension when being applied to small and medium sized firms (SME´s). A major conclusion from these studies is that it is difficult to confirm the theoretical taxonomies using empirical data, but it also seems to be difficult to agree on an alternative unifying taxonomy that is supported empirically.

The more exploratory empirical studies are more inductive and try to develop new theoretical classifications based on the empirical findings alone. An example is Tether and Tajar (2008) who with a synthesis approach (Drejer, 2004), used data from all sectors in the clustering, and then identified patterns of innovation differentiating service industries from other industries. The term "innovation mode" is suggested as an alternative to innovation pattern and it is found that the innovation mode of most service industries is of the organization cooperation type. Another example sharing many characteristics with Tether and Tajar (2008), but focusing on differences between service sectors is Trigo and Vence (2012). They used latent class analysis of CIS data from Spain to derive at three different "profiles of innovation" in service firms mainly reflecting the flow of information and cooperation in innovation: Techno-scientific intensive, client intensive and lonely innovators. Even though the most often applied taxonomy builds on Soete and Miozzo´s (1989) inheritance from Pavitt (1984), the heterogeneity of the innovation patterns of different service industries is high and thus, it

is difficult to capture this heterogeneity using the idea of a unifying and agreed-upon taxonomy of patterns of innovation. Consequently, different taxonomies apply for different purposes, for example studying different modes of innovation (Tether and Tajar, 2008) or innovation collaboration patterns (Trigo and Vence, 2012). Also, more practical considerations may be of relevance for developing and applying a particular taxonomy, such as using the classification for policy development (Castellacci, 2008). Castellacci's (2008) classification has been tested on CIS data including Norwegian data and the included services are classified as KIBS (e.g. engineering/KIBS), network infrastructure services, (e.g. telecoms) physical infrastructure services (e.g. wholesale trade) and personal services (e.g. hotels and restaurants). A very similar classification was also developed from applying German CIS-like data (Keuster et al., 2013). It also identifies four clusters with industries classified in a similar way to Castelacci (2008) but is based on service industry data only. The four clusters are, however, named somewhat differently including innovative developers (e.g. engineering/KIBS), efficient developers (e.g. telecoms), interactive adopters (e.g. wholesale trade) and standardized adopters (e.g. retail trade, tourism). One of the implications of this research that is of particular relevance to this study is that analyses of the effects of innovation should not only control for industry sector such as primary, manufacturing and services, but should include controls for individual sub-sectors or industries as well.

Another important consideration when developing or choosing a particular taxonomy is that it should be possible to find theoretical models and empirical studies covering the categories of the taxonomy beyond the patterns of innovation literature. For example, a number of studies have been conducted on innovation in firms and network of firms in specific sectors. Three examples worth mentioning are tourism (see Hjalager, 2010 for a review), retail (see Quinn et al., 2013 for a review of small-scale retail) and KIBS (see Muller and Doloreux, 2009). Since we are particularly interested in the innovation practices of firms, our applied categorization(s) should also have been found relevant in the innovation management literature. Thus, categorizations should bridge the industrial patterns of innovation found in innovation studies and the firm level practices of innovation found in the innovation management literature.

Recent theories of service innovation imply that industry classification based on output oriented classifications like NACE may need to be replaced by more input or resource

oriented approaches (Vargo and Lusch, 2014). One example is the proposal of understanding service innovation through service ecosystems (Lusch and Nambisan, 2015; Vargo and Wieland, 2015) that implies boundaries of the system under investigation cross the boundaries of traditional industry categories. For example, in tourism this would mean understanding tourism as a service ecosystem rather than as a sector and that this service ecosystem involves not only firms, as in the industry classification, but also customers, regulatory authorities and other firms normally considered to belong to other, but related, NACE categories (e.g. selected firms in transport, hotels, restaurants and travel agents). Using terms like service systems or service ecosystems as the frame of reference also links classifications to the innovation systems literature (Nelson, 1993; Cooke et al., 1997). In this literature, systems based on sectorial boundaries have been treated as a specific category of innovation system (Malerba, 2002) and the bases for defining the boundary of the system have focused more on proximity and innovation sources with examples including national, regional or technological innovation systems. This illustrates the lack of connection between input-oriented categorizations of innovation systems (e.g. the knowledge base) and output-oriented categorizations of "production systems" like the NACE scheme. Against this background, service systems or service ecosystems models may unify input and output oriented categorizations into workable frameworks for describing and explaining both the existing value creation and new (changes in) value creation of services.

In the MISSING[1] project, we have identified four only moderately integrated literatures on service innovation policies, patterns and practices including the innovation systems literature; the patterns of innovation literature growing out of innovation studies field, the service dominant logic literature growing out of the marketing, particularly the service marketing field, and finally the innovation management literature related to services growing out of the innovation management field. The last of these literatures has only briefly been mentioned in this introduction as it will play a more significant role in the later parts of this report digging more deeply into the innovation and innovation management practices of firms in specific service industries and service systems (Section 4). An innovation management framework is also applied to organize both the theory and empirical results presented in this study, i.e. the

[1]Measuring innovation in service systems – indicators on new grounds. Funded by the FORFI-program of the Research Council of Norway.

resource-process framework applied by e.g. Frohle and Roth (2007) believed to be of particular relevance for service innovation.

In many ways, this report tries to bridge some of the gaps between the four literatures identified above. Our original aim with the MISSING project was to identify the parts of the innovation systems literature that seemed relevant to service innovation and integrate it with the service systems literature. Finding that the innovation systems literature, which is one of the main literatures guiding innovation policy, was so limited in its application to service innovation, we accepted that some of the more traditional literature in the innovation studies and innovation management traditions focusing service innovation had to be integrated into the study as well. If policy implications for service innovation were to be developed, a broader knowledge base had to be applied. Consequently, this also goes for the more empirical part of the project.

Thus, the MISSING project includes a study of the relationships between the innovation systems literature and the literature on service innovation (Branstad, Brekke and Pedersen, 2014). This report builds a broader foundation for developing a possible service innovation policy starting from the service innovation management and service innovation studies literature. Table 1.1 exemplifies some of the differences between the literatures that we try to bridge in this report. Instead of using a theoretical approach to the bridging of these literatures, we combine a theoretical and empirical approach. We apply a theoretical framework from innovation management literature to reveal both industry or system/sector level patterns of innovation as well as firm level practices of innovation. We then apply this framework in new analyses of CIS data and link these data with firm performance data of relevance from a firm level perspective. We then conduct a series of qualitative studies of firm level innovation practices and compare the results with those found in the more aggregate CIS data that most often provide the basis for innovation policy recommendations.

Table 1.1: Differences between literatures exemplified by dimensions

| | Service innovation systems | Service innovation patterns | Service innovation logic | Service innovation management |
|---|---|---|---|---|
| Perspective | Policy makers | Industries | Users/Customers | Managers/Firms |
| Original field | Innovation systems | Innovation studies | Marketing | Innovation management |
| Source of innovation | Actors in system | Industry specific sources | Norms | Firm(s) |
| Policy implications | Design innovation system | Search for industry specific policies | Facilitate resource integration and markets for value co-creation | Avoid failures that limit firm level innovation management |

The rest of the report is organized as follows. In Section 2, we introduce the resource-process framework used in the study and our modification of the framework into a resource-process-system framework. We also briefly review the extant literature on innovation patterns specific to each of the four service systems investigated. In Section 3 we present the results of a quantitative study of the patterns of innovation of firms in the four service systems and comparisons between these firms and manufacturing firms using data from the Norwegian Innovation Survey[2] combined with accounting data from the official Income Statements of the surveyed firms. In Section 4, we present qualitative studies of the innovation practices of firms in three of the four service systems using the resource-process-systems framework. Finally, in Sections 5 and 6, we summarize and discuss our findings at a more generic level and suggest further research.

[2] Norwegian version of the Community Innovation Survey (CIS), in this report abbreviated as NIS.

## 2. Theory

A relatively new research stream focusing on innovation practices in specific service industry contexts is emerging (Kuester et al., 2013), and recent contributions include analyses of innovation patterns (e.g., Chang et al., 2012) and success factors (Kuester et al., 2013) as well as the exploration of more detailed innovation practices in different service sectors such as experiential services (Zomerdijk and Voss, 2011), nonprofit services (Barczak, Kahn, and Moss, 2006) and production-intensive services (Aas et al., 2015). While these studies focus on "innovation management practices" in terms of the tactics or methods implemented by firms to carry out innovation activities (Dooley, Subra and Anderson, 2002), they share the perspective that these practices cover both the management of innovation processes and the management of the resources necessary to support those processes (Froehle and Roth, 2007). They, consequently share what we normally term a resource-process perspective on innovation practices. When aggregates across firms, shared practices turn into patterns of innovation.

### 2.1 Extending the resource-process framework

The resource-process framework for innovation practices was first applied to service innovation (new service development - NSD) by Frohle and Roth (2007), but it is well covered in the general innovation management literature (Tidd and Bessant, 2013) and has been applied in many general studies of the innovation practices (Barczak, Griffin and Kahn, 2009). While these more general applications of the framework still leans towards the process-side of the framework, Frohle and Roth (2007) provide a more balanced framework. Frohle and Roth (2007) suggest the bias in the direction of process practices is due to the fact that more generic studies focus more on manufacturing and new product development (NPD) processes whereas a service innovation framework requires a balance between resource oriented and process oriented practices. Still, Frohle and Roth (2007) also propose that this might be an equally important requirement of innovation management practices in manufacturing as these become continuously more servitized (Frohle and Roth, 2007, p. 184). The framework builds on Barney´s (1991) typology of resources for the resource practice part and a fairly simple four-stage process model for the process practices part of the framework

similar to that of Tidd and Bessant (2013). The framework has been applied in numerous empirical studies as shown above and it has also been used to structure reviews of the NSD and service innovation literature (e.g. DeJong and Vermeulen, 2003).

Using Barney's (1991) typology for the resource part of the framework and a fairly simple staged process model for the process part, the framework captures firm level and particularly company-specific practices. In Frohle and Roth's (2007) listing of empirically observed practices, the perspective of all practices is seen from the firm level. For example, there are no practices that cover co-creation with customers in the more contemporary sense of the term (Prahalad and Ramaswamy, 2004). Neither are there any practices focusing the systemic aspects of innovation underlined by innovation studies and innovation systems research (Fagerberg et al., 2005). For example, no practices related to development, engagement in or maintenance of regional innovation networks or on firm integration with national and regional public innovation policies are mentioned. To cover the more systemic innovation practices of firms, we suggest adding a system dimension to the resource-process framework, turning it into a resource-process-system framework as illustrated in Figure 2.1.

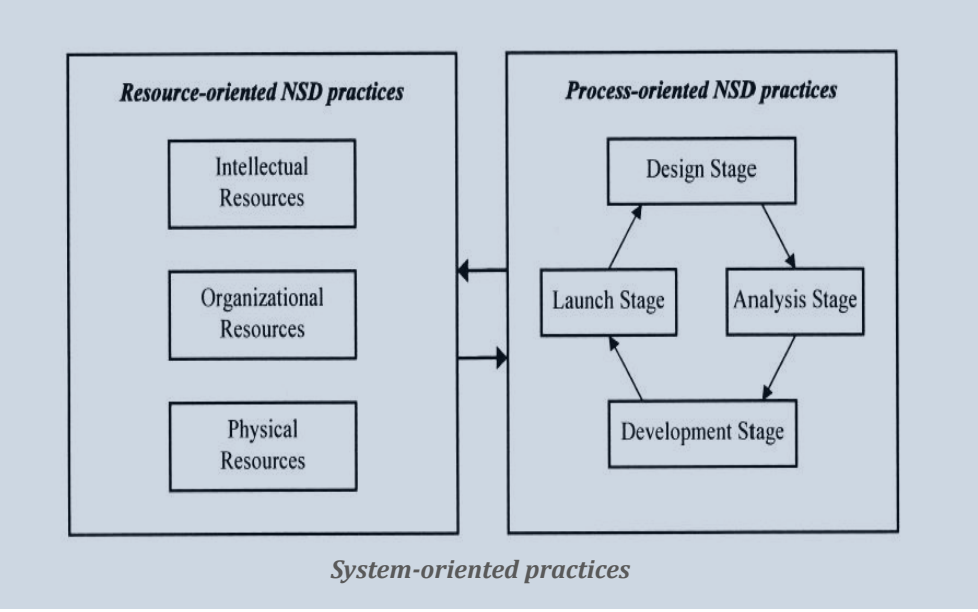



Figure 2.1: Resource-process-system framework (modified from Frohle and Roth, 2007)

As far as we know, no unified model of the service innovation system around which system oriented practices may be structured is found. However, several researchers have addressed systemic aspects of service innovation. For example Sundbo and Gallouj (2000) used the metaphor of a "loosely coupled system" whereas Tether and Metcalfe (2003) used a "problem/opportunity system" metaphor to describe their interpretations of what constitutes a service innovation system". Recently, more informal systems perspectives have also been applied in the service dominant logic (SDL) (Vargo and Lusch, 2004) theory of service to describe and explain innovation in service ecosystems (Lusch and Nambisan, 2015; Vargo and Wieland, 2015). None of the above theories have been found to fit easily into the innovation systems perspectives most often applied in innovation studies or have used the more formal components of innovation systems from the innovation studies literature (Edqvist, 2005) in their own developments. Edqvist (2005) suggest a generic innovation system may be described in terms of the following components: Constituents, activities, interactions, factors, institutions and boundaries (pp. 187-201). In this literature, the innovation system *activities* constitute the innovation practices and these practices are seen from the system perspective. Consequently, they are the joint practices of all constituents in the innovation system, including the firm, and are observed at the system level. Since our perspective on innovation practices is seen from the firm level, not all activities of the innovation system covered in this literature constitute firm level system oriented practices, but some certainly do. Using Borras and Edqvist (2013) as the point of departure, we suggest that firm level system oriented innovation practices include:

- systematic knowledge interactions with innovation system constituents (e.g. R&D, and competence building practices)
- systematic market defining activities (e.g. market formation, customer development, regulatory interaction and quality defining practices)
- systematic value system defining activities (e.g. value system restructuring and institutional change practices)
- systematic entrepreneurial activities (e.g. spin-offs and financial investments in start-ups, ventures and other entrepreneurial initiatives).

Of these system-oriented practices, the knowledge interaction practices have been most focused in innovation systems literature. In service firms, these system-oriented practices are

not expected to be very well developed, but by taking a broader perspective on these practices we may find more developed practices among service firms than if focusing only on systematic knowledge interactions. Still, existing studies have not covered these practices to any significant extent (e.g. Droege et al., 2009; Carlborg and Kindström, 2014; Djellal et al., 2013).

In the following four sections, the innovation practices of four categories of service firms are briefly reviewed using the resource-process-system framework developed above. The focus on the four services categories including scale intensive network services, scale intensive physical infrastructure services, personal services and knowledge intensive (business) services is based on our application of the combined Castellacci (2008) and Keuster et al., (2013) categorization of industries or rather, service systems, presented in Section 1.

### 2.2 Scale intensive network services – telecoms, banking and insurance

Standardized services that are dependent on ICT networks are often referred to as 'scale intensive network services' (de Jong et al., 2003). Examples include telecommunication services, bank services and insurance services. Typical characteristics of scale intensive network services include that 1) they are often produced at a large scale (Soete and Miozzo, 1989), 2) they are often subject to government regulations and legislation (e.g., Picot and Wernick, 2007) and 3) they are often offered by large firms (de Jong et al., 2003). It has often been argued that services in general are characterized by intangibility, heterogeneity, inseparability, perishability (Zeithaml, et al. 1985) and information intensity (Miles, 2005). Scale intensive network services, however, only comply with these general service characteristics to a limited degree. Digital scale intensive network services are for example usually prepared technologically at a particular time and then delivered to the customers via information systems at a later stage. Thus, they are not produced and consumed simultaneously, and consequently they are neither inseparable nor perishable in the traditional sense. In addition, scale intensive network services usually do not comply with the heterogeneity characteristic, since they are standardized per se. The two remaining traditional service characteristics, however, intangibility and information intensity are often relevant for scale intensive network services, since there is no transfer of ownership involved when

customers buy a scale intensive network service, and since information is often a part of the value proposition.

It is expected that these characteristics of scale intensive network services may affect the innovation practices at the firm level (de Jong et al., 2003). Due to the importance of regulations for scale intensive network services, we may for example, expect that the idea search strategies followed by firms delivering scale intensive network services are different from the search strategies followed by other service firms. Perhaps, for example, firms delivering scale intensive network services involve actors such as governmental institutions to a higher degree than other service firms in the early stages of their innovation processes. We may also expect that the relevance of involving front-line personnel in the innovation process is lower in typical scale intensive network service firms compared to other service firms since scale intensive network services arguably have a lower degree of inseparability. Perhaps technical experts, and not front-line employees, are among the most important actors when scale intensive network services firms innovate due to the firms' dependency on ICT-networks. Perhaps also the implementation of formal strategies and development processes could be expected to be more important in scale intensive network services firms when compared to other service firms due to their size and complexity. It may also be that other innovation types are typically relevant for scale intensive network services firms compared to other service firms. This was also suggested by Soete and Miozzo (1989) when they proposed that scale intensive network service firms typically focus on service simplification in their innovation efforts.

Scale intensive network services have often been included in quantitative survey based innovation management research (e.g., de Brentani, 1989; Martin and Horne, 1993; Frohle et al., 2000; Nijssen et al., 2006). However, previous in-depth comprehensive empirical qualitative and quantitative based research has only rarely investigated or discussed whether the distinguishing characteristics of scale intensive network services lead to differences in the innovation practices or systems between scale intensive network services compared to other services (Kuester et al., 2013).

### 2.3 Scale intensive physical infrastructure services - retail and wholesale trade

Scale intensive physical infrastructure services include retail and wholesale trade, but also sectors such as goods transportation and non-leisure and non-tourist related person transport. Originally, these services have been believed to be less innovative resulting, for example, in retail services not being included in national innovation surveys such as the CIS. Miozzo and Soete (2001) differentiated these services little from the scale intensive network services in 2.2, but looking at the IHIP characteristic, these services are characterized by more diversity across individual service types within the sector. They share the characteristics of partly lacking in inseparability and perishability with the networked services, but some of the service types in the sector are characterized by more heterogeneity and less intangibility than these services. They are also lower in information intensity. Looking at the characteristics of the service system of these services, they are also generally less heavily regulated than the networked services due to their less critical role in the day-to-day operations of society (except transport services).

Focusing on retail services since this service is the least explored type of scale intensive physical infrastructure services (Sundström and Reynolds, 2013), it is perhaps not so much the characteristics of the service offering that influences patterns of innovation in the sector as other characteristics, including market, competition, lack of regulation and firm size distribution (FSD). Consequently, retailers consider regulatory barriers to innovation as low, but competitive forces make innovation risky (Reynolds and Hristov, 2009). While supplier provided technology was believed to be the most important driver of innovation in this category of services in Miozzo and Soete (2001) and even in later work (Pantano, 2014), other early studies focused retailer innovation as a mapping of their suppliers' (i.e. manufacturers') product innovations (Davidson and Jonson, 1981). Customers are most often mentioned as the most important source in innovation surveys covering retail, suggesting that, after all, retailers are rather open innovators (Sundström and Reynolds, 2013).

The normal view is also that retail innovations are mainly incremental (Hristov and Reynolds, 2015; Sundström and Reynolds, 2013), but when looking at the different innovation types mentioned in surveys of retail innovations (e.g. Quinn et al., 2013), we find examples spanning from radical innovation types such as business model and retail format innovations

(Reynolds et al., 2007; Sorescu et al., 2011) to incremental innovations such as assortment, branding and pricing innovations (Grewal et al., 2011). Looking further into many of the more recent retail innovations (Sundström and Reynolds, 2013; Nygaard and Utgård, 2011), we find many that involve considerable institutional and also structural change involving Big-box and franchising retail formats, online retail and logistics innovations. Most of these are neither driven by customer ideation or supported by customer involvement in the innovation process but requires considerable institutional change among many actors (Sundström and Reynolds, 2013). Thus, many of the most interesting and radical retail innovations are simultaneous service, organization, marketing and institutional innovations implemented at the retail service ecosystem level (Vargo et al., 2015). As such they can be described as business model innovations where multiple service providers over time dynamically change their value propositions towards each other and that all actors involved in this service system, including customers adopt these new value propositions.

Innovation processes in retail also seem to be rather informal as captured by Hristov and Reynolds (2015) and are suggested by Quinn et al. (2013) to be of an entrepreneurial character relying heavily on the owner-manager as a key resource particularly in small and medium sized retailing firms (Quinn et al., p. 89). Thus, it might be expected that innovation practices will differ considerably between the larger and the SME firms in retail (DeJong and Marsili, 2006).

Innovation outcomes in retail firms are proposed by Reynolds and Hristov (2015) to be of a non-financial character and are more seldom measured and managed using formal innovation management practices. These observations may however, be more due to the size of the studied retailing firms than a generic characteristic of all retail innovation outcomes (DeJong and Marsili, 2006). This is also pinpointed by Quinn et al (2013) as an observation easily made due to the FSD[3] of the retailing sector/ecosystem. Thus, it may be that a duality of innovation patterns may be observed in the sector, one characterized by incremental, customer driven, less formal, organizational innovations in SME retail firms leading to mainly qualitative effects (Quinn et al., 2013). The other is characterized more by radical, technology driven, more formal, institutional innovations in large retail firms leading to more quantitative effects, such as increasing productivity and profitability (Sorescu, 2011, Reynolds et al.,

[3] Firm Size Distribution

2007). This duality is also focused by Hristov and Reynolds (2015) by using the terms operational and strategic retail innovation (Hristov and Reynolds, 2015, p. 13).

In their study of barriers towards innovation in retail, Reynolds and Hristov (2009) observed the lack of interaction between retail firms and knowledge producers such as academic institution (see also Nygaard and Utgård, 2011). Thus, it seems that the innovation system of retailing, if existing, takes other forms than those typically found in the literature on national and regional innovation systems. Still, many of the innovations discussed in the retail innovation literature (e.g. Quinn et al., 2013; Sorescu et al., 2011) are innovations of a systemic character, but these are more typically found in larger retail firms.

### 2.4 Personal services - tourism

Tourism may be defined as "*the system involving the discretionary travel and temporary stay of persons away from their usual place of residence for one or more nights* (…)" (Leiper, 1979, p. 404). Although tourism firms often call their market offerings (such as a seat in an aircraft, a night in a hotel room, or a meal in an restaurant) for 'products' (Leiper, 1979), the majority of value propositions offered by tourism firms are by nature actually characterized by the traditional IHIP (intangibility, heterogeneity, inseparability, perishability) service characteristics. They are intangible because the ownership of a good is seldom transferred when customers buy tourism products, they are heterogeneous because it is often difficult to deliver exactly the same total quality experience to all customers and they are often characterized by inseparability and perishability because production and consumption happen simultaneously. To an increasing extent, traditional tourism firms nowadays also aim to differentiate themselves by adding a "*somehow comprehensive living adventure to the short time the tourist spends in his destination*" (Stamboulis and Skayannis, 2003, p. 38). When delivering experiences like this firms usually place the customer experience at the core of the offering and "*focus on the experience of customers when interacting with the organization rather than just the functional benefits following from the products and services delivered*" (Zomerdijk and Voss, 2011, p. 63). Thus, arguably these experiential based services often delivered by modern tourism firms increase the intangibility, heterogeneity, perishability and simultaneity of the total tourism offerings even more.

It is reasonable to expect that these characteristics of tourism services in general, and experiential tourism services in particular, affect innovation practices in tourism. This idea is not new. In 1989, Soete and Miozzo (1989) suggested that innovation processes in what they called supplier-dominated service sectors, which included tourism, would have a very incremental nature and that innovation processes would not be organized in a formal manner. This suggestion may be one reason why, until recently, tourism was seldom included in academic innovation research. In fact, when reviewing the innovation literature in 2003, De Jong et al. (2003) stated that "*it is not surprising that hardly any researchers have studied innovation in these sectors yet, because supplier-dominated sectors are considered to be less innovative*" (p. 24). However, perhaps driven by the fact that many tourism firms recently in practice have launched new and relatively radical offerings such as Disney's media-synergized theme parks, and business models such as Ryan Air's low cost concept, an increasing number of innovation researchers have started to include tourism in their studies.

Based on empirical findings, a majority of researchers studying innovation in tourism have suggested that innovation in tourism is mainly market driven (Hall and Williams, 2008) and for this reason it is suggested to be particularly important to involve customers, especially in the form of lead users, as well as front-line personnel in innovation processes (e.g. Stamboulis and Skayannis, 2003). To an increasing extent, however, also technological development, especially development of information and communication technology, is regarded as a driving force for innovation in tourism (e.g., Bowden, 2007). Traditional R&D, however, is found to be less relevant for tourism and tourism firms are rarely found to have R&D departments or other dedicated resources for innovation (Hjalager, 2010). Instead innovation is found to happen in a more emerging and ad hoc manner (Flikkema et al., 2007). However, according to a recent literature review (Hjalager, 2010) "*innovation research in tourism is a young phenomenon*" (p. 8) and "*there is an incomplete understanding of how innovation processes take place* (…)" (p. 9).

### 2.5 Knowledge intensive services – engineering, consulting and ICT services

Knowledge Intensive Services (KIS) are services in which professional or scientific knowledge is used or developed in the service process, for instance through expert consulting,

diagnosis, management support and research. Another related concept often used is Knowledge Intensive Service Activities (KISA), which is focusing on the activity of employing or developing knowledge as a main feature of the service regardless of whether the service is offered by a company internal agency or by an external firm. Lastly, there is the concept of Knowledge Intensive Business Services (KIBS), focusing on the agencies that provide knowledge intensive services on a commercial basis to business clients. KIBS involve "*economic activities which are intended to result in the creation, accumulation or dissemination of knowledge*" (Den Hertog, 2000, p. 505). Examples of KIS include management consultancy and accounting services (P-KIBS), technical engineering and IT-services (T-KIBS) as well as KIS and KISA's addressing both consumer and business customers such as architects or specialized medical and educational services (Miles, 2008).

Considering professional service types such as financial, legal, accounting, or some management consulting services, KIS are well suited for standardization through ICT and software. Thus the heterogeneity of KIS is not as high as some KIS-researchers often suggest (Lovelock and Gummeson, 2004, p. 31). However, there are segments of KIS that are specialized to individual customers such as technical engineering, design, software development or innovation consultancy that comply very much with the heterogeneity characteristic. KIS processes are more tangible than traditional wisdom about services assume because design, accounting, engineering and lab activities are organized in different stages in which it is more or less natural for the customer to be involved. Moreover, ownership rights to knowledge can often be transferred in the case of patents and licenses (Amara et al., 2008).

Drawing on Bateson's "mental intangibility", Kotler (2003) coined the term "*prepurchase uncertainty*" meaning that the customer cannot fully know the content of his or her purchase before the service is purchased (McDougall and Snetsinger, 1990). This feature is relevant of services such as engineering services, innovation input, architecture, design, and research services because they cannot be fully defined or described before the purchase. Such services develop over time and the outcome is very much affected by the clients' willingness and ability to share strategic information and learn interactively (Matinez-Fernandez and Miles 2006, p. 119; Sjøholt, 2001). In the KIS sector it is relatively common to see close interaction and "sparring relationships" (Todoir, 1994) between KIBS and their clients. The "sparring" relationship involves much more negotiation as to the nature of the problem addressed by the

service, and the service or solution to be provided than in scale intensive services. Considering specialized KIBS services one would therefore expect that KIS innovations would focus on managing customer relationships and information exchange.

The innovation practices of KIBS have been heavily investigated (Muller and Doloreux, 2009). The role of KIBS is to contribute to innovations in other companies, as well as to innovate in-house. The extant literature suggests that KIBS function as facilitator, carrier, and source of innovation. One role is to actively help clients manage innovation processes, but not taking part in innovation activity (facilitator of innovation), a second function is implementing the innovation for the client (carrier of innovations), and a third is engaging in innovation work with a client with the purpose of developing and implementing something new (source of innovation) (Den Hertog, 2000). Some studies have confirmed that the level of innovation in KIBS is positively related to the innovation intensity of their client companies (Muller and Zenker, 2001). Furthermore, extant literature suggest that KIBS firm innovation is driven by either the client's own need to innovate or by market competition.

Since KIS are *knowledge intensive*, they are by definition *information intensive*. In a study of KIBS knowledge flows between service providers and client firms, Den Hertog (2000) found tangible and intangible, human embodied and non-human embodied, explicit (codified) and tacit (non-codified) and contractual versus non-contractual knowledge. Tacitness and embodiment of knowledge means that many elements in KIS will perish and the innovation challenge will be related to explicating and storing tacit understandings in the KIBS firm. One would expect that a sizeable innovation management challenge is to interpret and transform customer input from tailored projects into more standard services packages. Thus KIBS employees will be central actors to finding scalable services, i.e. abducting generic value propositions from the idiosyncrasies of each service process turning knowledge activities into more standard offerings. Modularization of services may be one of the means to obtain scalability (Miozzo and Grimshaw, 2005).

Some KIBS are regional/local and others more national or even international. The degree of information intensity could cause KIBS firms and their customers to rely on geographical proximity for effective service provision (Bettiol, Di Maria and Grandinetti, 2011). However, codification and standardization might offset that effect (Antonelli, 1999). Innovation in

KIBS might be linked to the market strategies; whether they want and are able to extend their client base geographically. Their ability to spatially extend their markets was studied by Bettiol, Di Maria and Grandinetti (2011). The opposite approach, the market search by clients approach, was taken by Gallouj (1999) in a study of the ability of client firms to search, evaluate and select KIBS firms prior to contracting.

As indicated among the KIS industry examples above, KIBS may be categorized according to the level or specialization of the knowledge on which the service is based. While technology-KIBS (T-KIBS) are based on advanced science and technological knowledge. To supply intermediate products that are knowledge based" (Martinez-Fernandez and Miles, 2006, p. 118), professional-KIBS (P-KIBS) rests on skills defined by the professions. As a logical implication of the T-KIBS /P-KIBS distinction one may expect the innovation patterns within this sector to vary by mode of innovation, namely the science and technology mode (STI), the doing using and interacting mode (DUI) and the combined DUI/STI mode observed by Jensen et al. (2007, p. 688). Interacting with customers provides a major input to both the DUI and the combined DUI/STI modes of innovation.

The intensity of interaction between client and service provider is often staged rather than consistent throughout the service delivery process. Inseparability is thus not necessarily high in KIS considering the knowledge intensive work that can be done without the customer being present. Physical proximity is nevertheless a characteristic of interaction patterns in KIBS regionally (Muller and Zenker, 2001), indicating that the element of inseparability is still a critical element in the stages of problem identification (soft service stage) whereas later stages of the service activity, often involving knowledge production and application (hard service stage), may be more separable (Erramilli and Rao, 1990).

While the literature on these four service categories are much larger than what is briefly reviewed here, some of the differences we may expect in innovation patterns between the categories are indicated. We still like to approach the categorizations more exploratory. Thus, we raise two fundamental research questions. The first is how the resource, process and system oriented practices differ systematically through patterns of innovation in the categories when investigated using the innovation indicators typically applied in innovation studies. By investigating this research question we align with the general patterns of innovation literature

but also takes this approach one step further by linking practices to innovation and firm level effects. The second research question we raise is what resource, process and system oriented practices we may observe at the firm level without using the observational framework of innovation studies indicators. With this research question, we take the approach suggested by Kuester et al. (2013) in focusing more on the variations in innovation practices at the firm level. In the following two sections, the first research question is investigated using a quantitative approach applying innovation survey data. This study takes a synthesis approach in the sense that all practices are investigated using the patterns of innovation in manufacturing firms as a reference or benchmark (Drejer, 2004). The second question is investigated using a series of qualitative studies in firms representing each of the four service categories. This set of qualitative studies takes a more demarcation oriented approach (Coombs and Miles, 2000) focusing more directly on the innovation practices of service firms without other reference than previously published similar studies (e.g. Zomerdijk and Voss, 2010; Aas et al., 2015).

# 3. Quantitative study

To investigate the relationship between the firm level practices of innovation summarized by the literature in Section 2 and the industry or sector/system patterns of innovation summarized in Section 1, we conducted two studies applying Norwegian data. The first study, reported here in Section 3, applies the principles of the patterns of innovation studies to quantitative data from the Norwegian Innovation Survey. The second study applies the principles of the resource-process-system framework through a qualitative study based on primary data from 21 Norwegian service firms in three selected service sectors/systems. The latter study is reported in Section 4.

## 3.1 Method

Patterns of innovation include patterns in firms' innovation behavior from resource related practices through process- and outcome-related to systemic practices. Within the resource-process-system framework, we apply a simple input-output organization when organizing our findings on innovation patterns. Consequently, the description of both measures and findings in Section 3.2 starts with patterns of innovation resources, continues with process patterns organized by inputs, activities and outputs, then move to outcomes in the form of effects and ends with systemic patterns. As our analyses are based on the Norwegian version of the Community Innovation Survey (CIS) aggregated through the period 2008 through 2012, the patterns of innovation in our findings are restricted by the variables represented by the CIS as well as the other methodological design elements that characterize the CIS. In Section 3.1, these methodological characteristics are described, including the adaptations and modifications we have made by aggregating three waves of CIS data and linking them firm-by-firm to public accounting data. Thus, some of the method described is general to the Norwegian version of CIS, on which more information may be found in e.g. Wilhelmsen and Berrios (2015), and some of it is more specific to the way that this particular study has been designed and conducted.

**Data and sampling**

The Norwegian version of the Community Innovation Survey has been administered by Statistics Norway since 1992 following the Eurostat standards of the Oslo manual. A total of nine waves have been collected in the period between 1992 and 2014, originally each 4th year, more recently biannually. Statistics Norway has allowed us to use data from three of these waves including 2008, 2010 and 2012. The most recent 2014 data have still not been made public.

The unit of analysis as well as the unit of observation is the firm. A stratified sampling method is used in the Norwegian CIS with slight variations over time. Thus, all industries recommended in the Oslo manual/Eurostat recommendations are covered, but some years, additional industries are included. For example, additional tourism sectors were included in the 2010 survey. The usual sample is stratified to cover the industries shown with the Norwegian industry coding corresponding to the NACE coding in Figure 3.1 (Wilhelmsen and Berrios, 2015).

| SN 2007 | Næring[1] |
|---|---|
| A03 | Fiske, fangst og akvakultur* |
| B05-09 | Bergverksdrift og utvinning |
| C10-33 | Vareproduserende industri |
| D35 | Elektrisitets-, gass-, damp- og varmtvannsforsyning |
| E36-39 | Vannforsyning, avløps- og renovasjonsvirksomhet |
| F41-44 | Bygge- og anleggsvirksomhet* |
| G46 | Agentur- og engroshandel, unntatt med motorvogner |
| H49-53 | Transport og lagring |
| J58-63 | Informasjon og kommunikasjon |
| K64-66 | Finansierings- og forsikringsvirksomhet |
| M70 | Hovedkontortjenester, administrativ rådgivning* |
| M71 | Arkitekt- og teknisk konsulentvirksomhet, teknisk prøving og analyse |
| M72 | Forskning og utviklingsarbeid |
| M73 | Annonse- og reklamevirksomhet, markedsundersøkelser |
| M74.9 | Annen faglig, vitenskapelig og teknisk virksomhet* |
| N82.9 | Annen forretningsmessig tjenesteyting* |

Figure 3.1: Industries sampled in the Norwegian version of CIS (Wilhelmsen and Berrios, 2015)

The additional stratification plan implies that all companies with more than 50 employees in these industries are sampled. Furthermore, the strata are organized to also reflect smaller firms with specific predefined percentages per industry and size. The sampling plan also controls for economic regions so that companies from all over Norway are sampled appropriately. The complete stratification plan applied for the 2012 Norwegian CIS is

thoroughly presented in Wilhelmsen and Berrios (2015). A total sample size of around 6500 firms is included in each wave of the survey.

This sampling plan representing so called "core industries" in Eurostat has a long history based on ensuring that as many of the innovating firms using applying an STI-approach to innovation are sampled. When used to study innovation patterns of service firms several problems arise, partly due to distribution of the sample of the non-service forms and partly due to the sampling plan lacking representation of several service industries and individual (particularly SME) service firms. We did a separate investigation of these two issues looking at the distribution of firms in the Norwegian CIS when compared to the distribution of firms represented by their contribution to gross domestic product in the national accounts and when compared to the population of Norwegian firms with more than 5 employees based on their size and registered industry. The following observations could be made from our investigations:

- Agriculture is not represented. Many other countries include large agriculture companies. There are 672 such companies in Norway which all are deeply involved in the Norwegian innovation system (e.g. Innovation Norway).
- Petroleum-related companies are represented in CIS with 2 times the share of their revenues in the national account. This tendency of overrepresentation is present for almost all manufacturing industries. In total, the overrepresentation is 22.8% when measured by the number of firms participating in CIS.
- Services are heavily underrepresented. In total, the underrepresentation is 25.8% when measured by the number of firms. In addition there are large industry-wise differences in over- and underrepresentation due to some service industries being excluded. For example, retail is excluded altogether, differentiation the Norwegian CIS from e.g. the CIS in both Sweden and Denmark where large retail firms (highly innovative) are included.

It is not obvious how these representativeness issues affect the general results of the Norwegian CIS. However, as service firms continue to grow in innovativeness it is likely that the original purpose of ensuring that non-innovative firms were excluded from the sampling frame of CIS no longer can be met by applying this industry based sampling frame. Whether

the purpose is legitimate is beyond the scope of this report. It is, however, likely that for studies investigating patterns of innovation the bias in sampling frame is of somewhat less significance. It may be, however, that certain unique patterns of observation found in some of the excluded service firms may be missed as a consequence of the bias. For example, some of the more radical patterns of innovation that we find in retail, e.g. format innovations and vertical integration is difficult to capture without such firms in the CIS sample.

**Procedure**

The survey is administered under the Norwegian Statistics Act. Thus, firms have legal obligations to provide data to Statistics Norway and may be fined for not doing so. The survey is thus sent out with a time limit to respond. Due to these regulations, the response rate is close to 100% after a second reminder that if not responding, a fine will be effectuated. The survey is usually administered together with the Norwegian research and development survey regulated by the Frascati manual.

Respondents are encouraged to answer the survey online (99% did in 2012), but paper response is also possible. Two versions of the combined R&D and Innovation surveys are administered depending on the size of the company but there are no systematic differences in response patterns between the two versions. It is believed that the simultaneous administration of the R&D and innovation survey increases the focus on R&D oriented innovation because who is taking responsibility for reporting is influences by the joint administration. Statistics Norway tested this hypothesis in 2014 with a separate survey of innovation only, and results confirmed the hypothesis. This affects the share of innovative firms reported, but Statistics Norway believes that the relationships between variables are more or less unaffected by the procedure. Since we are mainly interested in relationships, this supports the proposition that for investigations of relationships – patterns of innovation, the data from the survey is both reliable and valid.

In addition to the Norwegian CIS data, we also use accounting data from the so-called Income Statement 1 (Næringsoppgave 1). This report is mandatory for all firms in Norway and is sent in to the Norwegian Tax Administration (Skatteetaten) as part of providing the firm's Annual Report. Possible bias in figures related to firm performance in this material is related to potential differences between tax-reported figures and company internal figures. It is believed

that these differences are insignificant over time and thus, that the data are both representative and valid.

For the purpose of this report, the data described above were further manipulated. First, data was collected from three two-year periods. Since the sampling frame of the innovation survey samples large companies in each wave, we have two and three observations for larger firms and typically one for smaller. This restricts the use of the data as time series data, but allows controlling for time. The data were thus organized as time stamped cross sectional data including data from all three periods and firms. The total number of observations was 18895, representing 11911 unique firms. Further, even though accounting data from Income Statement 1 in principle should be available for all firms, the data we have managed to collect includes Income Statements of limited companies only. Thus, we have 12466 representing 6660 unique firms. We have some accounting statement data from firms outside this set of 6660 firms for individual measures, but complete accounting statement measures are found for these 6660 firms only. The consequence is that in general, innovation pattern analyses are based on a sample of 11911 observations and innovation effect analyses are based on a sample of 6660 observations.

The linking of innovation data and accounting data was done in the following way: In principle, accounting data from the year immediately following the last year of the reporting period for the innovation were matched with innovation for all three periods. For example, innovation data from 2009-2010 is matched with accounting data from 2011. However, because accounting data from 2013 were not present at the time of the matching, 2012 accounting data was used. Similarly, analyses of the accounting data from 2009 showed significant effects of the financial crisis, particularly for sales figures. We consider this shock effect to be less relevant for the innovation patterns because these are believed to be more stable patterns over time. Also, in Norway, the financial crisis primarily had a short-term effect on sales in the 2008-2009 period. Thus, accounting data from 2010 are used for sales related data for the innovation data in the period 2006-2008 to reflect the longer term innovation effects sustaining through the financial crisis.

**Measures**

Using our extension of the Frohle and Roth (2007) resource-process framework that we term the resource-process-system framework we seek to identify and organize measures of innovation patterns in three groups: Resource related measures, process related measures and system practice related measures. In addition, we relate these patterns to innovation effects as our dependent variable. Consequently a fourth category of measures – innovation effects measures is identified. Finally, we have argued that since innovation patterns also are heterogeneous and vary by service sector or service system, a proxy controlling for these patterns may be added. Consequently we also identify ways to design this control variable along with the categorization scheme we use based on Castellaci (2008) and Kuester et al., (2013).

*Resource related measures*

Both the general innovation literature and the service innovation literature points to a number of innovation resources of importance to the innovation capabilities of firms. In general innovation management these are often termed determinants of innovation and include employee, cultural, leadership and management, networking, physical and financial, and technological resources (e.g. Crossan and Apaydin, 2010). In service innovation literature, particular focus has been put on employees, structure, networking, culture and leadership, strategy and external conditions and resources (DeJong et al., 2003). Still, the Norwegian Innovation Survey, as with the Community Innovation Survey founded in the Oslo Manual captures only a limited set of these conditions or resources for innovation. In fact, only three resources are captured at a regular basis and one on an irregular basis.

Personnel or *employee resources* are captured in one category only, that is, research oriented personnel. Two variables capture this by measuring the number of people involved in research and development and the number of man-years involved in research and development. Innovation strategy as a resource is only partly captured through the measure of the *purpose of innovation*. Here, the degree of importance of 10 different purposes is measured using a three point ordinal scale. Finally, the *network resource* is measured under a set of questions related to 9 types of collaboration patterns (9 types of partner and 7 locations). This variable partly covers networking (and the use of information sources in networks) as part of the innovation process (how firms collaborate in the innovation process) and as a resource (the

importance of collaborating with specific partners), but it is not obvious that respondents see this difference when they answer the questionnaire. Finally, individual resources of interest are captured on a more irregular basis. For example, in our dataset, the importance of 7 specific *competence resources* for innovation was measured in 2010. These competences ranged from technical and research competences to more market oriented competences.

*Process related measures*

There is a broader coverage of process related measures in the Norwegian Innovation Survey. These measures can be organized along a prototypical innovation process model (Cooper, 2008) with input-related, process-related and output-related measures similar to many recent instruments on service innovation (e.g. Hollanders, 2015). For innovation input, main variable is the variable reflecting the importance of 12 different *information sources of innovation*. This variable is measured as importance of the source rated on a three-point ordinal scale.

Among the process-related measures (throughput) is the variable reflecting *innovation collaboration* mentioned above. On a more irregular basis, the innovation methods being used have also been captured. For our data this measure was included in the 2010 survey. The category of process-related measures most broadly covered in the Innovation Survey, however, is the output-related category. In this category, we find the 5 variables capturing the *type of innovation* output: Product (goods), service, process, organizational and marketing innovation with the three last types of variables captured in several sub-categories. For example, in 2012, process innovation was captured in 3 sub-categories, organizational innovation in three sub-categories and marketing innovation in 4 sub-categories corresponding roughly with the standard 4P's of marketing tactics. In addition, we find variables reflecting the *degree of innovativeness* in product and service innovation, but these variables are of less relevance to our study. Another variable meant to capture innovation activities rather than outputs includes a nominal measure of 8 different *innovation activities* or outcomes. It duplicates some of the other innovation output variables but is more compact. Furthermore, an output-related variable reflecting the use of different *appropriation mechanisms* focusing mechanisms to protect innovation outputs is used. This variable captures the use, or as in 2012, the effectiveness of 7 different appropriation mechanisms. It is complicating when the scale used to measure such variables change over time as in this case.

*System related measures*

Among the system related measures, we find measures or proxy measures of *innovation intensity* in the form of variables measuring the share of revenue stemming from new products. We also find measures of *external (and internal) innovation climate* in the form of factors hindering innovation. This is in fact a reversed indicator of innovation climate and includes measures of the degree to which 11 different factors are important factors hindering innovation using an ordinal scale with three levels. A measure is also included that reflects what are the most *significant markets* identifying the degree of internationalization of the firm. Finally, in 2012 a measure was used to capture the interaction with *public sector procurement* as part of the innovation system of the firm.

*Effects measures*

There are no direct effect measures in the Norwegian Innovation Survey. In our study, effect measures are extracted from the Income Statement 1 as introduced above. Three measures are used. *Firm growth* is measured by percentage growth in revenue from the last year of the Norwegian Innovation Survey period to the following year. *Firm productivity* is measured as the labor productivity of the year after of the Norwegian Innovation Survey period. Finally, *firm profitability* is measured as return on assets in the same year as for the productivity variable. As mentioned in the procedure description there are some exceptions with respect to which period these effect measures are collected. These periods and lags are chosen partly due to the retrospective nature of the questions in the Innovation Survey asking respondents to look back on the last two years. Another reason is that even though innovation effects are lagged, a period of one year is believed to cover much of that lag. Also, since we have repeated measures for many of the firms in the Innovation Survey, we can control for potential lagged effects.

Even though the performance measures applied here are ratios (sales growth in percentage, productivity as sales/employees, return on assets as net income/total assets), their distributions are skewed. Thus, for all analyses, log transformations are applied. The log transformed performance variables were distributed much more closely to the normal distribution. Furthermore, even though these ratio variables are scaled to size, it is necessary to control for company size.

A limitation in our dataset is a fairly large number of so-called non-innovating firms with missing data on the Innovation Survey variables, but this limitation apply more frequently to sole proprietor companies for which we lack accounting data anyway.

*Service categorization measures and other control variables*

Five sector categories or systems are designed to perform service sector or service system control of our analysis following the adapted categorization scheme based on Catsellaci (2008) and Kuester et al. (2013). These include manufacturing, scale intensive network services, scale intensive physical infrastructure services, personal services and knowledge intensive services. The operationalization of *manufacturing* is made through a manufacturing variable including all companies with Norwegian SIC-codes 43 and lower. Note that due to the sampling frame of the Norwegian Innovation Survey this excludes agriculture and some other primary sector industries but includes aquaculture, petroleum extraction and mining. Whether this category of industries should be termed manufacturing or something in the direction of baseline or non-service firms is open for discussion. For simplicity, we term the category manufacturing here. SIC-codes below 43 also include industries with services in the title. Examples are 03.213 Marine fish farming services. From a review of the purpose of the firms collected from the Norwegian Business Register done by the authors of this report[4], we could not find any difference in the purpose description of most of these firms registered under services from those registered under the production SIC-codes. For example, there were no differences between firms activity in petroleum extraction regardless of their registration with SIC-code "06.100 Extraction of crude petroleum" or with code "09.101 Drilling services for petroleum and natural gas extraction". They both drill for petroleum and extract it if they find it. Looking at the purpose description of these firms (149), 96 have registered purpose descriptions and only 19 of these were classified as services in our classification procedure. Consequently, we chose not to classify firms in these categories of the SIC scheme as, for example, knowledge intensive services. We are aware that this is sometimes done in service classifications, but we find it difficult to interpret the activities of these firms as different from the production firms they often are hired by.

[4] One author of this report manually read through 11990 purpose descriptions from the firms' registration in the Norwegian Business Register, classifying the purpose into one of three categories including manufacturing, services or both. Another of the authors classified 1000 companies in the same way. Cross-classifier correlation between the classifications was high with Kappa=0.926. According to Landis and Koch (1977) a Kappa higher than 0.8 is outstanding or what they term "almost perfect agreement."

*Scale intensive network services* are operationalized as telecommunication, banking and other financial services. Using Norwegian SIC-codes, firms with SIC-codes 61, 64, 65 and 66 were classified as scale intensive network services. In addition, firms with SIC-code 53.100 Postal activities under universal service obligation were placed in the same category.

*Scale intensive physical* infrastructure services are operationalized in this study as wholesale and retail trade. In principle, the Norwegian Innovation Survey excludes retail services from its sampling frame, but due to vertical integration some retail firms may also have been included due to the operationalization of these services as firms with Norwegian SIC-codes 45, 46 and 47. An operationalization of these services as a wholesale and retail service system rather than a sector suggests that additional firms should be included. Examples include management of real estate for commercial purpose and freight transport of wholesale- and retail-related goods by road. Such classifications are however, too detailed for the Norwegian SIC. A true service system categorization, however, would require such detailed SIC-classifications or that the information is obtained through other means.

*Personal services* are operationalized as the complete SIC-codes 55 and 56, hotels and restaurants. In addition, a number of tourism related personal services are added such as 49.392 charters and excursions bus services, 49.393 cableway transport and ski-lifts, 50.101 passenger ocean transport, 50.102 scheduled long distance passenger transport in coastal waters, 50.109 other passenger transport in coastal waters, 51.100 passenger air transport, 79 travel agency, tour operator and other reservation service and related activities, and finally 93.2 amusement and recreation activities. Thus, the operationalization of personal services as tourism is an operationalization based on the characteristics of the sampling frame of the Norwegian Innovation Survey. The reason is that most other personal services that are not knowledge intensive are left out in this sampling frame. The tourism service system is the closest sector or service system operationalization we can find using this sampling frame that corresponds with personal services as a category in the adapted Castellacci (2008) and Kuester et al. (2013) classifications.

*Knowledge intensive services* are operationalized as the other services in the sampling frame of the Norwegian Innovation Survey. This may seem as an odd rest category, but by investigating the sampling frame by industry illustrated in Figure 3.1, it is fairly obvious that

the less knowledge intensive services not represented in any of the other three categories are hardly represented in the sampling frame. The only exception to this is goods transport. It is an open question if these services should have been included in the sale intensive physical network services. Consequently, we will do some controls in the further analysis for this reclassification. Otherwise, most of the services not classified in one of the former three categories are knowledge intensive.

Finally, other controls are also, firm *size* being the most important. This is controlled using log number of employees.

### 3.2 Findings

Findings from the quantitative study are organized in the same way as the presentation of measures in Section 3.1. That means, first, results from analyses of patterns of innovation in variables reflecting innovation resources, innovation processes and system-related patterns of innovation practices are presented. Finally, the identified patterns are related to firm performance in separate analyses of the effects of particular innovation patterns on the three firm performance measures we have focused – growth, productivity and profitability.

#### 3.2.1 Patterns - innovation resources

As mentioned above, the innovation studies and the innovation management literatures point to a number of important innovation resources and resource related innovation practices (Crossan and Appaydin, 2010). Examples include culture (Dobni, 2008), employees (Hammond et al., 2011; Kesting and Ulhøi, 2010), customers or users (Oliveira and von Hippel, 2011), networks (Pittaway et al., 2004) and strategy (Teece, 2011) just to mention some. Of these potentially important innovation resources, the Norwegian Innovation Survey variables measure a limited set. This is mainly due to the process and output focus of the Norwegian Innovation Survey rather than a more balanced, and recent, resource-process focus.

*Personnel or employee resources* are measured as employees involved in research and innovation, but in the Norwegian Innovation Survey of 2010, a more extensive set of variables reflecting diverse areas of competence believed to be important for innovation was used.

Using the variables reflecting share of employees involved in research and development, we find the innovation patterns to reflect previous findings in the pattern of innovations literature. A summary is given in Table 3.1.

Table 3.1: Share of employees involved in research and development

| | N | Mean |
|---|---|---|
| **Number of employees** | | |
| Manufacturing | 1170 | 19.1 |
| Scale physical - trade | 138 | 20.4 |
| Personal - tourism | 14 | 14.8 |
| Scale intensive - TeFi | 82 | 21.9 |
| Other services - KIS | 873 | 43.0 |
| Total | 2277 | 28.4 |
| **Number of man-years** | | |
| Manufacturing | 1172 | 10.5 |
| Scale physical - trade | 138 | 11.1 |
| Personal - tourism | 14 | 4.4 |
| Scale intensive - TeFi | 81 | 14.9 |
| Other services - KIS | 872 | 27.9 |
| Total | 2277 | 17.3 |

The share of employees involved in research and innovation vary considerable across systems/sectors both when measured by share of employees and man-years per total number of employees. Analysis of variance is significant at $p<0.01$ for both variables ($F=90.0$ and $F=84.1$). The highest share is found in Other services - KIS, the lowest in Personal - tourism. Sale physical - trade, Scale intensive - TeFi services and Manufacturing have almost similar shares.

Looking at *particular innovation competences*, the variables that were specifically included in 2010, it is difficult to identify any specific pattern based on the original Norwegian Innovation Survey variables. However, it seems that Manufacturing and Other services - KIS are users of engineering competence. Mathematics competence, i.e. analytical competence, but not engineering was used by Scale intensive - TeFi and Other services - KIS companies. Scale intensive - TeFi service companies also stand out as the ones focusing marketing research competence. They also focus on IT programming competence but unlike Other services - KIS, who buy this competence, Scale intensive services try to develop this competence themselves. Patterns may be developed using cluster analysis of the competence variables. A solution with four clusters seems rather intuitive using K-means clustering. The analysis shows that the four clusters are the unfocused, the external buyers of competence, the analytically focused and the creativity competence focused clusters. Manufacturing firms are found in all clusters, but Scale physical - trade companies are found in the creativity cluster. This is also partly true for Personal services - tourism companies, but they are even more characterized by being unfocused in their competence use. Other services and also partly the Scale intensive - TeFi services are the external buyers of competence. Factor analysis of the patterns in competence focus shows two factors - one representing the engineering and mathematical competence areas and the other focusing the more creative competences. In Table 3.2, the mean scores for the creative/qualitative competences and the engineering/-quantitative competences are shown by sector/system.

Table 3.2: Mean score competence importance values across sectors

| | **Creative/qualitative competences** | **Engineering/quantitative competences** |
|---|---|---|
| Manufacturing | -0.24 | 0.11 |
| Scale physical - trade | 0,19 | -0.10 |
| Personal - tourism | 0.05 | -0.31 |
| Scale intensive - TeFi | 0.23 | 0.08 |
| Other services - KIS | 0.31 | 0.13 |
| **F-value** | 32.2** | 19.1** |

Significant differences shown in Table 3.2 between the sectors suggest that engineering and mathematics competences are completely unimportant in Scale physical - trade and Personal services - tourism but rather important in the other sectors, whereas the more creative and

qualitative competences are focused in the Scale intensive - TeFi and Other services - KIS. Thus, the competence base of innovation varies systematically both between manufacturing and services but also between different service systems/sectors. Whether these differences also systematically influences the effects of innovation is discussed in the innovation effects section.

Unfortunately, few other traditional innovation resources are measured in the Norwegian Innovation Survey. Strategy, however, is often interpreted as important on the resource side of the resource-process framework (Teece, 2011). The Norwegian Innovation Survey measures do not capture strategy directly, but it measures *innovation strategy* through the *purpose* of innovation. Looking at this by system/sector we find that the most important purpose of innovation is quality improvement. In Scale physical - trade, quality improvement is also important, but if we include the variable reflecting the purpose of increasing market shares that was introduced in 2012, this turns out to be the most important purpose in this system/sector. Looking at reaching new markets, this is prioritized very low by firms in all sectors/systems except Other services - KIS. For Personal services - tourism, very low scores are observed, so it seems they have no innovation strategy, or the purpose of their strategy is not covered by the Norwegian Innovation Survey variables. Even considering the low scores, the most important purpose for Personal services - tourist companies is increasing quality. For Scale intensive - TeFi companies as well as Other services - KIS, increase in quality is also most important, but this purpose is followed closely by increasing market share and reaching new markets. The variable with the largest variance is the purpose of adapting to standards. It is fairly important across most sectors/systems except Personal services - tourism, which shows absolutely no interest in pursuing this purpose as part of their innovation strategy. Factor analysis of the innovation purpose variables reveals a two-factor solution after rotation. The pattern differences are illustrated in Table 3.3.

Table 3.3: Mean score strategy values across sectors/systems

| | **Cost reduction/ productivity strategy (cost leadership)** | **Differentiation/growth strategy (differentiation)** |
|---|---|---|
| Manufacturing | 0.34 | -0.08 |
| Scale physical - trade | -0.23 | -0.07 |
| Personal - tourism | -0.13 | -0.50 |
| Scale intensive - TeFi | -0.44 | 0.16 |
| Other services - KIS | -0.35 | 0.33 |
| **F-value** | 179.9** | 97.9** |

Table 3.3 illustrates the cost reduction and productivity oriented purposes as the first factor and differentiation and growth purposes as the second. Thus, the pattern reflects roughly the generic strategies of Porter (1980). Analysis of the sectors/systems shows that the cost reduction and productivity purposes are significantly more important for Manufacturing firms whereas the differentiation and growth strategy characterize most of the service systems but innovation in Scale physical - trade and Personal - tourism seem to be unrelated to strategy. Consequently it is reasonable to conclude that there are systematic differences between the innovation pattern of manufacturing and service firms as well as between service firms when it comes to the particular strategy pursued through innovation. Whether these differences also systematically influences the effects of innovation is discussed in the innovation effects section.

### 3.2.2 Patterns - innovation processes

Following a traditional input-activity-output model for the process part of the resource-process framework, we start by investigating inputs to the innovation process. The *information sources* of innovation in our four service systems are characterized by differences in degree but similarities in kind. Thus, when looking at individual variables, Personal - tourism values most information sources low in importance, whereas Manufacturing companies value almost all sources as high in importance. Thus, by looking at average importance, one misses the *pattern* of importance that differentiates the sectors/systems. Factor analysis of the source variables using principal components analysis with varimax

rotation reveals 2 factors representing research and engineering sources on the one hand and internal, clients and community as the other. Analysis of variance of the two-factor solution shows that the systems use these sources systematically different. As expected, Manufacturing is the user of research sources, followed by Other services - KIS. On the opposite scale of using these sources are Personal - tourism, Scale physical - trade and Scale network - TeFi services. Scale network - TeFi followed by Other services - KIS are the users of the internal, client and community sources whereas Personal - tourism and Scale physical - trade turn out as users of none of the categories of sources. They seem more to be characterized by being passive innovators with respect to the listed information sources. Using the 2012 variables, the factor solution is a bit more complex with 4 factors including research sources, professional community sources, client/competitor sources and internal/-supplier sources of information. We term these sources science sources, professional community sources, downstream sources and upstream sources respectively. In Table 3.4, the factor score pattern of these sources is shown by sector/system.

Table 3.4: Mean score information source importance values across sectors/systems

| | **Science** | **Professional community** | **Downstream** | **Upstream** |
|---|---|---|---|---|
| Manufacturing | 0.17 | 0.05 | -0.15 | 0.09 |
| Scale physical - trade | -0.26 | -0.09 | 0.03 | -0.16 |
| Personal - tourism | -0.52 | -0.26 | 0.01 | -0.39 |
| Scale intensive - TeFi | -0.36 | 0.02 | 0.10 | -0.14 |
| Other services - KIS | -0.15 | -0.06 | 0.23 | -0.08 |
| **F-value** | 16.8** | 1.59 | 13.2** | 4.43** |

From Table 3.4 we see that there is a systematic pattern of innovation for three of the factors – science sources, downstream sources and upstream sources. Science sources and partly also upstream sources are typically used in Manufacturing whereas downstream sources are typically used in most service sectors/systems. Particularly Other services - KIS are heavy users of downstream sources. As in the two-factor solution, Personal - tourism stands out as a user of few sources, but here, the number of observations is too small to generalize. The performance effects of these systematic differences are reported below.

Regarding *innovation activities* in the process, the Norwegian Innovation Survey measures few variables. However, in 2010, innovation methods were measures and innovation collaboration is measured every year. The *collaboration* measure is fairly complex with a geographical and a client dimension, but a variable indicating most important collaborative partner is also used and this simplifies analysis somewhat. Another issue is that the collaboration variable has very few responses in the Norwegian Innovation Survey. For example, among a total of 11911 companies in our complete sample, only 1133 answered that they collaborated with innovation partners at all. Among these, collaboration was highest among Manufacturing (11.5 %) and Other services - KIS (13.5%) companies. Scale physical - trade (5.9%) and Scale network - TeFi (8.5%) companies collaborative somewhat less, but lowest was Personal - tourism with only 1.7% of the companies in the Norwegian Innovation Survey in 2011 collaborating with other partners for innovation. Thus, the collaboration variable is difficult to use to identify systematic and persistent innovation patterns. Also, in studies aggregating the CIS data across different countries, this variable is problematic due to the response bias in each country. Consequently, country aggregated studies using this variable aggregates national response biases weakening the external validity of the results. This issue is, however, seldom addressed, even in highly cited studies (Laursen and Salter, 2006).

In 2010, The Norwegian Innovation Survey also included a variable capturing *methods* used in innovation processes. Brainstorming (37.9%) and cross-functional teams (33.5%) were the most applied methods for stimulating innovation. Methods like financial and non-financial incentives along with creativity education averaged around only 15% use. Looking at the sectors/systems we see that brainstorming is significantly more used with success in the service sectors/systems, in particular Scale intensive - TeFi (33.7% successful use) and Other services - KIS (36.4% successful use). In Manufacturing only 21.7 used brainstorming with success. Here, even Scale physical - trade and Personal - tourism report more successful use of the method than Manufacturing. There are very similar results for cross sectional team use, but here successful use is somewhat higher for Manufacturing. All the other methods including work rotation, financial and non-financial incentives and creativity education are less often used and even less often used successfully in all sectors/systems.

Unfortunately, CIS does not measure other process variables, such as the use of stage gate or formal procedures, activities in the front end of the process, such as ideation, the use of team procedures, incentives and KPI's for innovation, prototyping, A/B-testing (which is often used in service companies), portfolio management and project management method use in innovation processes. All of these are well-established practices reflecting the firm's innovation management practices (Tidd and Bessant, 2013). Of these many of the practices have been documented to be different in service firms (see e.g. Carlborg et al., 2014 for a review). Consequently, many innovation process management practices found in service firms are not captured by the survey. Innovation outputs, on the other hand are much more strongly focused in the Norwegian Innovation Survey. The innovation output variable in the survey that lies closest to the innovation process is meant to capture *innovation activities*, but it actually measures the extent to which activities that are at the output end of the innovation process (implementation). Seven categories of activities are measured including own R&D, purchasing of R&D services, purchasing of equipment and software, purchasing of knowledge/competence, internal competence development, "marketing innovation activities" (the questionnaire text includes demand testing as mentioned above), design and other activities. Actually, these variables capture a mix of activities, outputs and types of innovations. Looking at the variables, however, a fairly interesting pattern of innovation is revealed. As expected, Other services - KIS and Manufacturing companies score high on own R&D. Manufacturing score highest on purchasing of R&D, but for purchasing of equipment and software, the five systems are almost similar in the level of this activity. The same is the case for buying external competence and for developing own competence even though the proportion developing is twice as high as that for buying competence. This means that even though the companies report little collaboration with external partners on innovation they have contractual innovation relationships with them. The most interesting finding is for "marketing innovation activities", where the scale intensive services report significantly higher activities than Manufacturing and also Personal - tourism. This is somewhat surprising for Personal - tourism, indicating a very low degree of systematic innovation activities. As reported under creativity competence above, design activities seem most frequent in Other services - KIS, and somewhat frequent in Manufacturing. Dropping the variable for "other activities", the pattern of innovation shows three types of innovation activities that we may term R&D, investment and development. In Table 3.5, the mean scores of these pattern factors are illustrated.

Table 3.5: Mean score innovation activity values across sectors/systems

| | **R&D** | **Investment** | **Development** |
|---|---|---|---|
| Manufacturing | 0.15 | 0.07 | -0.03 |
| Scale physical - trade | -0.54 | -0.07 | -0.07 |
| Personal - tourism | -0.74 | 0.12 | -0.29 |
| Scale intensive - TeFi | -0.24 | -0.02 | 0.05 |
| Other services - KIS | 0.01 | -0.11 | 0.08 |
| **F-value** | 34.1** | 4.1** | 3.1** |

From Table 3.5 we see that the pattern of innovation activities varies systematically between manufacturing and service sectors/systems. We also see that it varies systematically within service sectors/systems. Manufacturing is the main user of R&D whereas Personal - tourism is the main user of innovation investments. For the first time we are able to identify a particular pattern of innovation in tourism – the investment in externally supplied knowledge services, systems and equipment. Development is more typical among Scale intensive - TeFi and Other services - KIS. The last finding fits well with previous research on patterns of innovation in these sectors/systems (Miles, 2005).

Turning to the more traditional output variables in the Norwegian Innovation Survey, *types of innovation* are focused. These include product innovation, service innovation (goods versus services), process innovation, organizational innovation and marketing innovation. A number of subtypes are covered within the last three types. Process innovation and organizational innovation are not covered by an overall variable, but only by three subtypes each. This is also similar for marketing innovations where four variables representing the 4P dimensions are measured. The product innovation (goods and services) variables have been coded somewhat differently over the years. We have chosen to consider the No-answer (coded sometimes as 0 and sometimes as missing) as missing and focus on the proportion of companies who have answered yes to one of the product innovation questions. In our aggregated analysis we find that *product innovation* is most typical in Manufacturing (15%) and Scale physical - trade (16.8%) This means Scale physical - trade considers trade in new goods as product innovation even though they are not producers of these goods. Contrary, service innovation is most typical in Scale network - TeFi (15.2%) and Other services - KIS (15.4%). Thus, companies in these sectors/systems consider innovations in the form of new

services as product innovation. Thus, the understanding of even this simple term varies systematically between service systems. For Personal - tourism, the proportion of innovating firms is extremely low (only 5.7% innovating companies). *Process innovation* is slightly less frequent than product innovation, but if interpreting process innovation as any of the three variants of process innovation measured in the Norwegian Innovation Survey, process innovation is reported by 18.1% of Other services - KIS, 14.6% of Scale network - TeFi and 13% of Manufacturing companies. Again, a lower frequency is found among Scale physical - trade (9.3%) and Personal - tourism (6.0%). Looking at the three variants of process innovation, production process innovation is most frequent in Manufacturing (9.9%) whereas support process innovation is most frequent in Scale network - TeFi (9.1%) and Other services - KIS (10.6%) and as low as only 4.5% in Manufacturing (Scale physical - trade is 4.8%). Distribution process innovation is only rarely focused.

*Organizational innovation* is measured by three variables in CIS reflecting new business procedures and practices (procedures), new organization and decision making practices (structure) and new ways to organize external relations (governance). A combined measure of all these variables show that organizational innovation is most common among Scale network - TeFi (18.3%), Other services - KIS (17.8%) and Manufacturing (16,9%), but also in Scale physical - trade and Personal - tourism, this type of innovation is fairly common (11.5% and 9.9%). This pattern is reflected in all three variables, but with significantly lower frequencies for the variable reflecting organizational innovations in external relations. In the Norwegian Innovation Survey, *marketing innovation* is measured by using the 4P framework used in marketing since its introduction by McCarthy in 1964 (McCarthy, 1964). Designing a variable representing any of these innovation types, marketing innovation is reported by 19.7% of the companies. Thus, marketing innovation is the most common type of all innovations in the survey. The differences between sectors/systems are rather small, but it is interesting to note that the frequency order for this variable is opposite that for product innovation because the type of innovation is most frequent for Scale network - TeFi companies (24.4%), then follows Other services - KIS (22.6%), Scale physical - trade (21.7%), Personal - tourism (17.6%) and finally, Manufacturing (17.4%). The pattern is fairly similar for the individual marketing innovation variables with design and promotion innovation as slightly more frequent than distribution and pricing innovations. Personal services - tourism stands out as a frequent user of pricing (8.7%) and promotion (14.1%) innovations.

Using all innovation type variables, factor analysis was applied to investigate *patterns of innovation types*. Since there are five types of innovation measured one would expect a 5-factor solution. However, exploratory analysis extracts four factors. They correspond nicely to organizational innovation and marketing innovation as the first two dimensions. Rather surprisingly, the next two dimensions are first a combination of service innovation and innovations in distribution and support processes. The last is a combination of product (goods) innovation and production process innovation. Trying confirmatory analysis with 5 factors, the dimensions still do not factor between goods, service and process innovations but the patterns described above are sustained. Considering this from a more empirical point of view, the finding is rather intuitive. Goods innovations require simultaneous innovations in production processes. Rather surprising though is that service innovations may require simultaneous process innovations in distribution and support operations. Using cluster analysis, the five systems we investigate here are not distributed uniformly in five clusters. The mean scores of the four factors are shown in Table 3.6.

Table 3.6: Mean score innovation type values across sectors/systems

| | **Organizational innovation** | **Marketing innovation** | **Service/ support** | **Product/ production** |
|---|---|---|---|---|
| Manufacturing | 0.04 | -0.09 | -0.14 | 0.12 |
| Scale physical - trade | -0.13 | 0.08 | -0.14 | 0.04 |
| Personal - tourism | -0.15 | 0.14 | -0.04 | -0.36 |
| Scale intensive - TeFi | 0.03 | 0.16 | 0.30 | -0.35 |
| Other services - KIS | 0.01 | 0.07 | 0.29 | -0.10 |
| **F-value** | 13.0** | 25.6** | 119.5** | 71.0** |

Looking at the means of the four-factor model per sector/system, we find that Marketing innovation is focused in Personal - tourism and Scale intensive companies. There are no extremely high frequencies for organizational innovation. Instead this is characterized by very low values in Scale physical - trade and Personal - tourism. The service and support process innovation firms are mainly found among the Scale network - TeFi and Other services - KIS, and finally, the product and production process innovation companies are most frequent in the Manufacturing sector/system. Somewhat oversimplified this means that Personal - tourism is characterized by doing marketing innovation and by not doing organizational innovation. This last characteristic is also typical for Scale physical - trade, whereas the real service and

service support innovators are the Scale network - TeFi and Other service - KIS companies. Finally, the traditional product and production process innovation companies are the Manufacturing companies. Again, very distinct patterns of innovation are found differentiating service sectors/systems from manufacturing and differentiating different service sectors/systems from each other. The performance effects of these systematic patterns are reported below.

A final variable that relates to innovation outputs is the *appropriation or protection mechanisms* used to capture excess returns from innovation. The measure has changed in 2012 from an assessment of use to an assessment of effectiveness of the appropriation mechanisms, also changing the scale of the variable. We have recoded the variable to the original form by coding any use, whether effective or not, as use. The analyses of individual variables reveal few interesting patterns besides variation in the general use of protection mechanisms across sectors/systems. Thus, Personal - tourism uses all mechanisms the least (no mechanism) and Manufacturing and Other services - KIS use the protection mechanisms the most. This is also confirmed in an exploratory factor analysis revealing only one factor. However, the eigenvalue of the second factor is 0.83 and a scree plot would suggest two factors could be included in the analysis. This analysis reveals one factor corresponding to formal protection mechanisms like patent, design and trademark protection and the other factor corresponding to the informal protection mechanisms. Looking at the differences between sectors/systems for these dimensions of protection, formal protection is most used by Manufacturing and Scale physical - trade and informal is most used by Manufacturing and Other services - KIS, so there seem to be a pattern of innovation in the appropriation mechanisms that is not well captured by sector/system. Understanding this would require further research beyond what is reasonable within the limits of the MISSING project. The innovation performance effects of these appropriation mechanisms, however, are of relevance and are reported below.

### 3.2.3 Patterns - innovation system

The traditional innovation systems literature suggests a number of functions and components of an innovation system. For example, Borras and Edquist (2013) suggest 10 functions or

activities including market creation, knowledge dissemination, institutional change and financing. According to Edquist (2006), the components of an innovation system include organizations, institutions and relations. Thus, to cover the complete picture of functions and components of an innovation system seems quite comprehensive. The Norwegian Innovation Survey only covers a few measures capturing some of these issues. For example, the *environmental innovation climate* may be characterized by the innovation intensity of the market of the companies as well as factors preventing innovation in the companies' environments. The share of revenue coming from new products is one such innovation intensity measure, but it confounds innovation intensity with innovativeness of the company. The variable is between 18% and 20% for Manufacturing, Scale physical - trade and Personal - tourism and as high as 30% in Other services - KIS. Besides from Other services - KIS, there are no indications of systematic differences in innovation intensity between Manufacturing and the service sectors/systems investigated here. Looking at factors preventing innovation, factor analysis suggests these variables should be considered as one construct. Forcing more complex factorization one may identify one dimension reflecting financial factors and the other representing all other elements. Three factors may also be defended using scree plots, revealing financial factors, recruitment and information factors and demand side factors. Analyzing the original variables we find that costs are the most important preventing factors in all systems. The pattern is fairly similar across all the systems when it comes to the importance of the different preventing factors. Using the three-factor solution, few differences occur, but financial factors seem most important in Manufacturing and Other services - KIS and demand factors seem more important in Scale network - TeFi services relative to the other systems. A surprising finding is that Personal - tourism companies see few preventing factors. Thus, investigation of the two variables reflecting need to innovate contradicts this finding as Personal - tourism services score lowest on the need to innovate variables. This may suggest that the variables may be misunderstood or misinterpreted by the respondents, or that the answers are more affected by careless response than one would like.

Even though it is not a traditional characteristic of the innovation system as such, a characteristic of the company environment is its degree of internationalization. This is measured with a variable indicating the most significant market for the company. This variable suggests Other services - KIS and Manufacturing have the most internationalized

markets, whereas Personal - tourism focuses the "most" domestic market. Again, this is somewhat surprising considering the origins of the tourists, but again, the answers are probably interpreted with internationalization, not as something affected by the international character of the customer as such but whether the company operates in geographically distant markets. This is also partly reflected in the way the variables are measured and illustrates a goods dominant perspective on internationalization, not as something resulting from services offered to international customers, but as something resulting from the geophysical location of parts of the companies physical premises.

Two variable groups in the Norwegian Innovation Survey, information sources and collaboration patterns also reflect the pattern of actors involved in the innovation system of the companies. We discussed these variables as we considered them to reflect the way innovation processes are organized with respect to process inputs and suggested there were four patterns of actor involvement – science actor, professional actor, upstream actor and downstream actor involvement. We also showed how these patterns of actor involvement differed systematically between different service sectors/systems.

Another set of variables that reflect actor related innovation patterns are the collaboration variables. These variables are fairly complex and the problem with them is a very low response rate. In addition, they have become increasingly complex over the years and thus, more and more difficult to apply in formal analyses. The Norwegian Innovation Survey, however, duplicated some of the aspects of actor collaboration in another variable set in 2012. This relates individually to product, service and process innovation and has rather few responses. Still, analysis of its pattern was conducted. This pattern revealed five factors. The first is a product versus service innovation dimension, the second reflects that all innovation types were mainly developed by others, the third that they were developed within the same enterprise organization, the fourth that they were the result of collaboration with other companies and institutions (R&D mentioned in questionnaire text), and the fifth that the innovations were mainly copies or modifications of internal/existing products/services/-processes. The number of observations for this variable is, however, too low to allow any analysis across systems/sectors. Thus, for more formal and quantitative analysis to be conducted on the Norwegian Innovation Survey data set, the collaboration pattern variables need to be simplified. It may be that these variables are more suitable for analysis when

aggregated over all Eurostat members, but two important aspects should not be neglected when seen from the point of departure of an individual small member country: First, the national and also sometimes regional pattern of innovation reflecting actors involved in the companies innovation system is of interest to policy design in each country and thus, the variables should be designed to endure validity in such analyses. Second, aggregating responses in a variable with so many measurement problems in each (small) membership country leads to aggregation of national bias across nations and thus to biased results at the aggregate level also. In such aggregations, bias is aggregated, it is not cancelled out as in regular randomization procedures.

The importance of public procurement was investigated in 2012, but the number of companies in the complete dataset that reported innovation as part of a public procurement project was only 176. This represents 1.5% of the companies in the data set and this fraction is so low that it is difficult to use this variable extensively. More or less for fun and control we included the variable into the regression models of innovation effects but none of the models showed any significant effects of public procurement on any performance variables. This result should not be interpreted as if public procurement has no role in innovation policy and the innovation system of companies. Literature, on the contrary, indicates that such is certainly the case (Edler and Georghiou, 2007). The validity of the Norwegian Innovation Survey data, however, is not sufficiently high to quantify any of these effects. Again, it is important to design important measures in the survey so that valid responses are obtained considering the sampling frame and response bias of the survey.

In general, based on our attempts at capturing system related practices from the Norwegian Innovation Survey, surprisingly few variables are relevant despite the fact that the origins of this study is found within the innovation studies and innovation research fields, paying considerable attention to system related practices in their theoretical works.

### 3.2.4 Performance effects of innovation

Innovation outputs differ from innovation outcomes. Some would consider innovation outputs and outcomes to be more or less overlapping (e.g. Laursen and Salter, 2006), but here

outcomes relate more directly to the effects of innovation outputs. Since our analysis is mainly conducted at the firm level, these effects are firm level innovation effects. These effects, however, are believed to be complex, and both direct and indirect (Aas and Pedersen, 2011). An effect hierarchy may be assumed (Aas and Pedersen, 2010), but in the end, effects are suggested to end up in firm performance effects. Examples of such effects include growth, productivity, efficiency, effectiveness, profitability and market value. The Norwegian Innovation Survey measures none of these effects. Connecting the Norwegian Innovation Survey data to accounting data, however, it is possible to investigate some of these effects. Here we focus on growth, productivity and profitability. The measures where thoroughly presented in Section 3.1, but here a brief recap is given. Growth is measured by percentage growth in revenue from the last year of the CIS period to the following year. Productivity is measured as the labor productivity of the year after of the CIS period and profitability is measured as return on assets in the same year. Even though the performance measures applied here are ratios (sales growth in percentage, productivity as sales/employees, return on assets as net income/total assets), their distributions are skewed. Thus, for all analyses, log transformations are applied. The log transformed performance variables were distributed much more closely to the normal distribution. Furthermore, even though these ratio variables are scaled to size, it is necessary to control for company size.

In the analysis of performance effects, we first report general effects of innovation on the three performance measures. We then analyze the relationship between innovation patterns identified and reported above and performance. This main part of our analysis is organized by innovation patterns, so that effects of particular resource related, process-related and system-related practices are reported separately, and in that order.

*General performance effects of innovation*

Our first main model uses innovation as the main independent variable. Innovation is operationalized with all types of innovation including product or service innovation, all process innovations, all organizational innovations and all marketing innovations. The main model controlling for size only explained 1.4% of the variance in sales growth. Size affected sales growth negatively, and the only significant innovation variable was distribution process innovations (-). It explained 2.7% of the variance in productivity, with size, product innovation (+), service innovation (-), production process innovation (-) and organizational

practices innovation (+) as significant. The directions are shown in parentheses, and may be surprising at first glance. However, that service innovation affects performance negatively is not new and particularly, the "servitization paradox" literature has focused on this effect (Neely, 2008; Kastalli and Van Looy, 2013). It is also not unlikely that new production processes affects performance negatively in the short run. Finally, the model explained 1.9% of the variance on return on assets with size (-) and innovations in organizational relationships (-). Thus, innovation has limited effects on performance, and often, the effects in the relatively short run that we measure here were found to be negative. Some of the reasons behind these effects, or lack thereof, may be due to moderating factors that must be controlled for, such as sector/system.

Thus, in addition to size, we are interested in controlling for system/sector. Using a dummy control variable and retaining the models presented above, we observe that the model now explains 2.9% of the variance in sales growth. The effects from the main model are the same but sales growth is significantly lower in Scale physical - trade, Personal - tourism and Other services - KIS. Manufacturing is now used as the basis (benchmark) model. Furthermore, the model explains 15.6% of the variance in productivity with all effects of the previous main model except the positive effect of organizational practices innovation becoming non-significant. Consequently, there is significant variation in productivity between sectors/systems with significantly lower productivity in Personal - tourism and Other services - KIS and significantly higher productivity in Scale physical - trade and Scale intensive - TeFi services when compared to Manufacturing. These findings are in accordance with investigations of productivity in Norwegian industries/sectors (Produktivitetskommisjonen, 2015). Finally, the model explained 2.3% of the variance in profitability with the negative effect of the organizational relationship variable retained and significantly positive effects of Scale physical - trade, Personal - tourism and Other services - KIS when compared to Manufacturing. This finding for Personal - tourism is a bit surprising, but it is important to remember that when seen from the perspective of the sector/system, the model controls for size and innovativeness.

As using all innovation type variables complicates any search for and test of interaction effects, we have to simplify the model. For example, keeping the innovation type variables, the number of sector/system interaction effects is as high as 60 two-way interactions. By

using the innovation variable coded as *any* kind of innovation, the model becomes much more simple. Using this model controlling for system and size we find that we can explain 2.6% of the variance in sales growth and that size (-) and innovation (+) affects sales growth in addition to Scale physical - trade (-), Personal - tourism (-) and Other services - KIS (-) using Manufacturing as the basic (benchmark) model. For productivity, we can explain 15.8% of the variance and innovation and size both positively affects productivity. In addition, productivity is significantly higher than Manufacturing for Scale physical - trade and Scale network - TeFi services, and lower for Personal - tourism and Other services - KIS. Finally, it explains 2% of the variance in profitability with only size and system being significant in the same way as in the model above. Thus, in the simpler model, innovation does not affect profitability, but it affects sales growth and productivity positively. Thus, there seem to be a negative relationship between the revenue side and the investment side of innovation at least in the short run that prevents positive profitability effects to develop. Also, one should note that the explained variance in profitability is very low and the regression coefficient for innovation is positive, it is however, not significantly positive. It is also obvious from these results that when investigating innovation effects, one must control for both size and sector/system differences.

Turning to interaction effects, we need to retain the simpler model. In this model, only two-way interactions between innovation and system are included. For sales growth, the model now explains 3.1% of the variance. Recall that innovation has a positive effect on sales growth. In addition, we now find that there is a significant interaction effect for Personal - tourism and Other services - KIS. They, consequently get more positive effects of innovation on sales growth than the other sectors/systems, including Manufacturing. Thus, if sales growth is the objective, it pays more off to stimulate innovation in Personal - tourism and Other services - KIS than for example, in Manufacturing. The model explains 16% of the variance in productivity and there are four significant interaction effects for Manufacturing, Scale physical - trade, Personal - tourism and Other services - KIS. Only for Scale network - TeFi services there are no proofs that innovation contributes significantly to productivity beyond its general industry independent effect. Finally, for profitability, explained variance is 2.1%, and if we recall that the general industry effect was insignificant, we now observe that there are few interactions as well. However, for Other services - KIS, there is a significant

positive interaction effect of innovation. This is consequently the only system/sector that gets significant profitability effects out of innovation based on our data.

To summarize, innovation has a positive effect on sales growth and productivity. No main effect on profitability is observed. However, when looking at specific sectors/systems, the positive effect of innovation on sales growth is significantly higher for Personal - tourism and Other services - KIS. For productivity it is significantly higher in all sectors/systems except Scale network - TeFi services, and finally, we find that even though innovation does in general not affect profitability significantly, it does so in Other services - KIS. The findings are summarized in Table 3.7.

Table 3.7: Summary of innovation effects and interaction effects

| | Sales growth | Productivity | Profitability |
|---|---|---|---|
| Size | Negative | Positive | Negative |
| Innovation | Positive | Positive | None |
| Industry/System (Manufacturing base model) | Trade negative<br>Tourism negative<br><br>Other services negative | Trade positive<br>Tourism negative<br>Scale positive<br>Other services negative | Trade positive<br>Tourism positive<br><br>Other services positive |
| Innovation/system interactions (Manufacturing*innovation base model) | <br><br>Tourism positive<br><br>Other services positive | Manuf. positive<br>Trade positive<br>Tourism positive<br><br>Other services positive | <br><br><br><br>Other services positive |
| $R^2$ | 3.1% | 16.0% | 2.1% |

From Table 3.7 we see that services are unique when it comes to most of the performance effects we have investigated. They are all affected by the generally positive effect of innovation, but all except Scale network - TeFi services, are extra positively affected when it comes to productivity. Some unique service Sector/system characteristics may be identified in Personal - tourism and Other services - KIS. The last of these is uniquely affected by innovation for all effects variables whereas innovation is particularly important for sales

growth in Personal - tourism. The findings have implications for innovation policy beyond what may be implied by only studying the patterns of innovation in these sectors/systems. For example, the effect studies shows that while some innovation patterns may be characteristic for some sectors/systems, these patterns may not necessarily be optimal for that sector/system, suggesting that policy may be directed more towards the use of innovation for specific effects rather than to support an innovation pattern typical for a sector/system only. These contrasts are further explored in the following sections were we link innovation patterns directly to specific innovation effects. The patterns that we investigate are characteristic of individual service and manufacturing sectors/systems, but they do not necessarily represent optimal patterns of behavior in each sector/system, something that the following analysis will reveal.

*Effects of patterns of innovation in resource related practices*

The first pattern of innovation we identified above that varied systematically by sector/system was the competence pattern, that is whether the firms tended to rely on more quantitative types of competence such as research or more qualitative types of competence, such as design and marketing. The effects on firm performance of these two competence patterns are shown in Table 3.8.

Table 3.8: Effects of competence pattern. *, ** and *** indicate p<0.1, 0,05 and 0,01 respectively

| | **Sales growth** | **Productivity** | **Profitability** |
|---|---|---|---|
| Size | -0.05 | 0.02 | -0.07** |
| Quantitative comp. | 0.00 | 0.08*** | 0.00 |
| Qualitative comp. | 0.06* | 0.04* | 0.02 |
| Scale physical - trade | -0.11*** | 0.28*** | 0.11*** |
| Personal - tourism | -0.17*** | -0.31*** | 0.12*** |
| Scale intensive - TeFi | 0.01 | 0.03 | 0.05 |
| Other services - KIS | -0.08** | -0.14*** | 0.06* |
| **R-square** | 4.1% | 23.2% | 2.1% |

From Table 3.8 we find the same differences between sectors/systems as in the main model of innovation effects tested above. Size, however, seem to be a less important control in this model. For simplicity, however, we focus on the effects of the patterns of innovation here, and keep size and sector/system only as controls because we know that the competence

patterns vary systematically by sector/system. We find that even though the level of significance is not very high (using $p<0.1$ as the lowest level here), we find that a qualitative competence pattern increases sales growth, and to a limited extent, productivity, a quantitative competence pattern most significantly increases productivity. We find no significant effects on profitability. These findings seem to reflect face validity primarily when it comes to the effects of quantitative competence for productivity effects. The effect of qualitative competence on growth is also rather intuitive, but the positive effect of qualitative competence also on productivity is more surprising.

Comparing these results to the results in innovation patterns we may conclude that Manufacturing uses a relevant competence pattern as long as the purpose of innovation is increasing productivity, whereas the service sectors/systems as a whole to a less extent do. Still, the positive effects of a qualitative competence pattern on both growth and productivity defends the innovation pattern of many service sectors/systems as a more universal competence pattern than that of Manufacturing. The lesson learned may be more of an underutilization of qualitative competence patterns in Manufacturing firms than that of a dysfunctional competence pattern in service sectors/systems.

We have previously identified a pattern of innovation reflecting whether firms pursue a cost leadership or a differentiation/growth strategy through their innovation practices. The performance effects of these strategy patterns are shown in Table 3.9.

Table 3.9: Effects of strategy pattern. *, ** and *** indicate p<0.1, 0,05 and 0,01 respectively

| | **Sales growth** | **Productivity** | **Profitability** |
|---|---|---|---|
| Size | -0.14*** | 0.19*** | -0.12*** |
| Cost reduction / productivity (cost leadership) | -0.02 | 0.05*** | -0.03 |
| Differentiation/ growth (differentiation) | 0.04* | 0.05*** | 0.04** |
| Scale physical - trade | -0.09*** | 0.25*** | 0.05** |
| Personal - tourism | -0.08*** | -0.22*** | 0.06*** |
| Scale intensive - TeFi | 0.01 | 0.01 | 0.01 |
| Other services - KIS | -0.01 | -0.15*** | 0.09*** |
| **R-square** | 3.5% | 18.8% | 2.7% |

As seen from Table 3.9, the controls for size and sector show the expected pattern similar to that of the main model of innovation effects presented above. Thus, concentrating on the strategy pattern effects, we find the expected pattern that a differentiation/growth innovation strategy affects sales growth, but a cost leadership strategy does not significantly affect growth negatively. Further, we find that any strategy pattern affects productivity positively. Finally, profitability is positively affected by a differentiation/growth strategy, and even though the coefficient for the effect of a cost leadership strategy is negative, the effect is not significant.

Recalling the findings from the innovation pattern section, we found that cost leadership was more typical for Manufacturing firms and differentiation/growth was more typical in service sectors/systems, even though there was considerable variance across the service sectors/-systems. A general conclusion regarding the effects of strategy patterns it seem that the effects of the strategic purpose of innovation reflects the purpose but that the effects are rather small. A differentiation/growth innovation strategy seems more universal in its effect than a cost leadership strategy, which leads to more specific effects on productivity only.

*Effects of patterns of innovation in process related practices*

Three patterns of innovation in process related practices were identified that differentiated service sectors/systems from manufacturing or differentiated between different service sectors/systems; patterns in information sources for innovation, patterns of innovation types

and patterns of appropriation mechanisms. In the following, we report our findings on the effects of these patterns.

Effects of patterns in information sources were investigated using the factor variables representing the four unique innovation patterns developed from the information source variable in the Norwegian Innovation Survey. Recall, however, that this variable is filled out for innovating companies only. The model is similar to the ones reported above, but here we include the four information pattern variables reflecting the use of information sources from, respectively, scientific and research sources (typically universities), professional communities (typically professional organizations and exhibitions), downstream sources (typically clients and competitors) and upstream sources (typically internal and supplier sources). The results for the three models for sales growth, productivity and profitability are shown in Table 3.10.

Table 3.10: Effects of information source pattern. *, ** and *** indicate p<0.1, 0,05 and 0,01 respectively

| | **Sales growth** | **Productivity** | **Profitability** |
|---|---|---|---|
| Size | -0.16*** | 0.26*** | -0.10*** |
| Science | 0.03 | 0.09*** | -0.04 |
| Professional communities | -0.04 | -0.01 | -0.01 |
| Downstream | -0.03 | -0.03 | 0.08** |
| Upstream | 0.03 | 0.03 | -0.07* |
| Scale physical - trade | -0.02 | 0.20*** | 0.03 |
| Personal - tourism | 0.02 | 0.05 | -0.01 |
| Scale intensive - TeFi | 0.00 | 0.04 | -0.01 |
| Other services - KIS | 0.04 | -0.21*** | 0.04 |
| **R-square** | 3.2% | 20.7% | 3.1% |

As seen from Table 3.10, size affects all performance variables but with different directions. System/sector affects productivity, but not sales growth and profitability in this model. Thus, the value of controlling for sector/system varies between models. With this model, results are fairly universal indicated by the lack of sector/system-specific coefficients in the model. Finally, the information source patterns suggest that using particular sources of innovation information is not important to obtain sales growth, which is almost exclusively explained by form size. Using scientific sources of information is important to obtain productivity, and

here, it is important to control for sector/system. Finally, using science sources do not, however, affect profitability positively. Instead, if profitability is the goal, downstream sources of information should be used and upstream sources of information avoided. At first glance this pattern may seem somewhat surprising. It is not surprising that using customers as an information source of innovation strengthens profitability, but it is somewhat surprising that sales growth is not affected by it. The most surprising, however, may be the significantly negative effect on profitability of upstream sources of information for innovation. This is particularly alarming for many of the service sectors/systems that has been characterized in previous categorizations of innovation patterns as "supplier driven" (Pavitt, 1984). Thus, while much previous research has established a positive relationship between supplier involvement and innovation performance (Nieto and Santamaria, 2007), the relationship between supplier involvement in innovation and firm performance, particularly profitability, may be much less obvious. This is, however, a case for further research based on the findings of our study, particularly, what moderating effects may be explaining the positive/negative effect pattern of the two sources of information in innovation (customers/competitors versus suppliers).

We identified three patterns of innovation activities. These were termed innovation as research and development, innovation as investment and innovation as development. The effects of these patterns on firm performance are illustrated in Table 3.11.

Table 3.11: Effects of innovation activity pattern. *, ** and *** indicate p<0.1, 0,05 and 0,01 respectively

| | **Sales growth** | **Productivity** | **Profitability** |
|---|---|---|---|
| Size | -0,15*** | 0,24*** | -0,08** |
| R&D | 0,00 | 0,05* | -0,03 |
| Investment | -0,02 | -0,04 | -0,03 |
| Development | -0,07* | 0,04 | 0,05 |
| Scale physical - trade | -0,04 | 0,23*** | 0,07** |
| Personal - tourism | -0,02 | -0,08*** | -0,03 |
| Scale intensive - TeFi | 0,00 | 0,04 | -0,01 |
| Other services - KIS | 0,03 | -0,20*** | 0,07** |
| **R-square** | 3.3% | 18.5% | 2.5% |

From Table 3.11, we again see the usual relationship between size, sector/system and firm performance. However, only two of the innovation activity patterns affect firm performance, and development pattern affects sales growth negatively. Research and development pattern affects productivity positively as expected. We can conclude that pattern of innovation activity, even though it discriminates service sectors/systems from manufacturing and from each other, has little effect on firm performance. It may still be that interactions exist so that the pattern is particularly more effective in specific sectors/systems, but this cannot be implied from our findings.

The pattern we identified in innovation types was rather interesting comprising organizational innovation, marketing innovation, product/process innovation and service/support system innovations as the four patterns. In general, the two first types are possible in all firms even if the tendency to pursue them varies, but the last two are rather unique to manufacturing on the one hand and service sector/system firms on the other. The effects of the four innovation patterns are illustrated in Table 3.12.

Table 3.12: Effects of innovation type pattern. *, ** and *** indicate p<0.1, 0,05 and 0,01 respectively

| | **Sales growth** | **Productivity** | **Profitability** |
|---|---|---|---|
| Size | -0.10*** | 0.17*** | -0.12*** |
| Organizational | 0.02 | 0.02** | -0.02 |
| Marketing | 0.03** | 0.02** | 0.01 |
| Product/process | -0.02 | 0.02* | 0.02* |
| Service/support | 0.00 | 0.01 | 0.00 |
| Scale physical - trade | -0.10*** | 0.26*** | 0.03** |
| Personal - tourism | -0.10*** | -0.17*** | 0.04*** |
| Scale intensive - TeFi | -0.01 | 0.04*** | 0.01 |
| Other services - KIS | -0.05*** | -0.14*** | 0.06*** |
| **R-square** | 2.6% | 15.7% | 2.1% |

Again, we see the typical pattern for the control of firm size and we also see that it is important to control for sector/system. Thus, analyzing the effects of innovation type pattern, one must control for sector/system. Turning to the innovation type pattern itself, we see that marketing innovation is the only innovation type affecting sales growth. It is not very surprising that this innovation type is important for sales growth, it is perhaps more interesting that the other three types are not. Next, we see that marketing, organizational and product/process innovation types are important for productivity. Recall here, that product/process innovation is a combined innovation type, making it easier to understand the productivity effect. Still, it is surprising at first that both marketing and organizational innovation are so important. Organizational innovation often reflect outsourcing, downsizing and other forms of structural change that leads to productivity effects, but the effect of marketing innovation may be less obvious. However, marketing innovation involves innovations in pricing, promotion and distribution, and when recalling productivity as sales or revenue per work hour, we see the reason behind the effect which corresponds to the effect of marketing innovation on sales growth – it is reflected in the nominator of the productivity ratio, not the denominator. Finally, we see that product/process innovation is the only innovation type affecting profitability. As for innovation effects on profitability in general, the effect is rather weak.

We identified a fairly simple pattern of innovation in appropriation mechanisms consisting of formal versus informal mechanisms. By formal mechanisms we mean mechanisms regulated by legislation, such as patenting, whereas informal mechanisms are unregulated or institutionalized mechanisms, such as informal secrecy. The effects of the two different patterns of innovation are illustrated in Table 3.13.

Table 3.13: Effects of innovation appropriation pattern. *, ** and *** indicate p<0.1, 0,05 and 0,01 respectively

| | **Sales growth** | **Productivity** | **Profitability** |
|---|---|---|---|
| Size | -0.10*** | 0.16*** | -0.14*** |
| Formal appropriation | 0.01 | 0.03** | 0.03* |
| Informal appropriation | -0.01 | 0.06*** | 0.04*** |
| Scale physical - trade | -0.10*** | 0.26*** | 0.04** |
| Personal - tourism | -0.10*** | -0.16*** | 0.05*** |
| Scale intensive - TeFi | 0.00 | 0.04*** | 0.01 |
| Other services - KIS | -0.05*** | -0.14*** | 0.05*** |
| **R-square** | 2.5% | 15.9% | 2.2% |

As seen from Table 3.13, size and sector/system are important controls to include in the model of appropriation pattern effects. Regarding the appropriation pattern itself, we see that sales growth is unaffected by appropriation pattern. Productivity and profitability on the other hand are highly influenced by appropriation mechanisms However, both mechanisms pint in the same direction meaning that using any kind of appropriation mechanism is positive for firm performance. In addition, it seems that informal appropriation mechanisms are more effective than formal mechanisms. Still, it is difficult to characterize the patterns by their effectiveness or relevance to individual innovation objectives. Instead it is reasonable to conclude that any kind of appropriation mechanism affects firm performance positively.

*Effects of patterns of innovation in systems oriented practices*

Finally, very few patterns of innovation were identified for the system related practices. Surprisingly few variables from the Norwegian Innovation Survey could be used to derive such patterns, and consequently few pattern effects may be investigated. The collaboration variable was used to investigate what effects collaboration with outside partners, thus an external innovation system, had on sales growth, productivity and profitability. However, no

effects were found by including this variable into models similar to the regressions presented above. Thus we found no general effects of innovation collaboration on firm performance. This strongly contrasts most findings in the innovation literature, but most of the studies identifying such effects have used more robust data on the relationship than what is provided by the Norwegian Innovation Survey.

### 3.3 Summary of quantitative findings

The quantitative study provided us with three sets of findings; one related to experience with the methodology of the Norwegian Innovation Survey, one on the innovation patterns of firms in different sectors/systems and one on the effects of these innovation patterns on firm performance.

From our experience with applying a combination of Norwegian Innovation Survey data and archival financial accounting data we identified a number of challenges of relevance to understanding the characteristics of both service innovation and innovation in general in Norway. First, the bias in the sampling frame of the Norwegian Innovation Survey when compared both to the distribution of firms or their representative distribution of value creation makes manufacturing firms systematically overrepresented and systematically underrepresent service firms in innovation statistics. Whether this affects the level of innovativeness reported in a positive or negative direction is not clear, but given that patterns of innovation varies between these major sectors, some patterns are overrepresented and some are under-represented in these data. Within each of these major sectors there are also systematic biases in the sampling frame when it comes to the representativeness of individual subsectors/-sectors/systems of firms. The heritage from the Community Innovation Survey down to the Frascati manual represents a bias in the sampling frame towards specific patterns of innovation being overrepresented and others underrepresented. It is fair to say that more traditional, research driven patterns are overrepresented whereas more modern, customer driven patterns are likely to be underrepresented. This involves both drivers of innovation, innovation process characteristics, innovation types and innovation outcomes. For the purpose of identifying characteristics of service innovation as a sector independent type of innovation, our experiment with using company purpose descriptions as an alternative classification

scheme to the one applied in the sampling frame of the Norwegian Innovation Survey (NACE equivalent) also made us question the basis for the sector/system classifications in the sampling frame.

Furthermore, the variables included in the Norwegian Innovation Survey are colored by some of the same sources of bias. For example, variables covering resource related innovation practices (Frohle and Roth, 2007) are underrepresented and certain process variables are relatively overrepresented. Rather surprising is that despite the survey originated from within the innovation studies community (Fagerberg et al., 2012), variables reflecting more recent aspects of innovation systems and system related practices are also underrepresented. Finally, changes in scale and wording over time as well as the generally untraditional scales used to capture many of the items limits the applicability of the survey data for more sophisticated statistical analysis. It is difficult to identify any consistent conceptual, measurement and structural models underlying the variable set. This also undermines the applicability of the data in both regional and national policy guidelines as well as aggregated policy development across countries.

We organized the investigation of patterns of innovation based on our framework of resource-process-system oriented practices. We reported three patterns of innovation in resource related practices; the pattern of employees involved in research and development, patterns of innovation competences and patterns of innovation strategy. We found that the relative number of employees involved in research and development varied systematically by sector/system. We identified two patterns of innovation competences; one using mainly creative or qualitative competences versus one using engineering and quantitative (mathematical) competences. The relevance of these two patterns varied systematically between manufacturing and service firms and between different service sectors/systems. Finally, we identified two patterns of innovation strategy reflecting Porter's (1980) separation between a cost leadership strategy and a differentiation/growth strategy also reflecting the aims of innovation activities. Again, these patterns varied systematically in manufacturing firms being significantly more cost leadership oriented versus most service sectors/systems being more differentiation/growth oriented. Still, variation was found between service sectors/systems as well, particularly in the relevance of pursuing a differentiation/growth oriented innovation strategy.

Investigating patterns of process-related innovation practices we reported four patterns. First, we found four information source patterns reflecting the use of science sources of information, professional communities, downstream (customers and competitors) and upstream (supplier) sources. For innovation activities, we identified three patterns including innovation as research and development, innovation as investment and innovation as development. For innovation types, we also identified four patterns of innovation reflecting organizational innovation, marketing innovation, combined product production process and combined service/support process innovations. Finally, appropriation patterns could be differentiated between formal and informal appropriation practices. Again, all these patterns varied systematically between manufacturing and service sector/system firms as well as between service sectors/system firms.

For the system-related practices, we were unable to identify any systematic patterns of innovation of the differentiating kind listed above. This was mainly due to the lack or quality of the variables measuring such practices in the Norwegian Innovation Survey.

With the biases identified in the sampling frame and the variable sets, it is still surprising that we were able to identify so many patterns of innovation reflecting systematic differences between service and manufacturing sector firms as well as between different service sector/system firms. A summary table of the most important patterns of innovation by sector/system is presented in Table 3.14.

Table 3.14: Summary of 6 patterns of innovation by sector/system

| | **Competence pattern** | **Strategy pattern** | **Source pattern** |
|---|---|---|---|
| Manufacturing | Engineering+<br>Creative- | Cost leadership+ | Science+<br>Downstream- |
| Scale physical - trade | Creative+<br>Engineering- | Cost leadership- | Science- |
| Personal - tourism | Engineering- | No strategy | No sources |
| Scale intensive - TeFi | Creative+ | Cost leadership-<br>Differentiation+ | Science-<br>Downstream+<br>Upstream- |
| Other services - KIS | Engineering+<br>Creative+ | Cost leadership-<br>Differentiation+ | Science-<br>Downstream+ |
| | **Activity pattern** | **Type pattern** | **Appropriation pattern** |
| Manufacturing | R&D+ | Prod/Prod+<br>Serv/Supp- | Formal+<br>Informal+ |
| Scale physical - trade | R&D- | Marketing+<br>Organization- | Formal+<br>Informal- |
| Personal - tourism | Investment+ | Marketing+<br>Organization-<br>Prod/Prod- | Formal-<br>Informal- |
| Scale intensive - TeFi | R&D-<br>Development+ | Marketing+<br>Serv/Supp+<br>Prod/Prod- | Formal- |
| Other services - KIS | Investment-<br>Development+ | Serv/Supp+<br>Prod/Prod- | Informal+ |

We see from Table 3.14 that most of the patterns differentiate both manufacturing from service sector/system firms but also the four different service sector/system firm categories from each other. However, there is also an example where two service sectors/systems (e.g. innovation type) share the same pattern, but this is an exception from the main principle of differentiated patterns of innovation.

Before summarizing the findings on the effects of innovation patterns, we point out that we found positive direct effects of innovation on sales growth and productivity but not on

profitability. However, we found moderated positive effects on all three types of performance when using size and sector/system as moderators. Consequently, all models investigating the effects of patterns of innovation on firm performance controlled for size and sector/system.

We found that qualitative competence patterns affected sales growth and productivity positively and that quantitative competence patterns only affected productivity. We found that a differentiation/growth strategy pattern affected all kinds of firm performance positively, whereas cost leadership only affected productivity positively. Furthermore, we found that science sourcing affected productivity positively and that using downstream information sources affected profitability positively. Using upstream information sources of innovation, however, affected profitability negatively. Innovation activity patterns had little effect on firm performance. The patterns of innovation reflecting innovation types, on the other hand showed several interesting effects. Marketing innovation affected both sales growth and productivity. Organizational innovation affected only productivity, and simultaneous product and production process innovation affected both productivity and profitability. Simultaneous service and support process innovation showed no effect on firm performance. Finally, we found that both formal and informal appropriation patterns affected productivity and profitability, but not sales growth. The most universally effective pattern of appropriation was informal appropriation.

Due to the lack of measures and quality of measures in system-related practices in the Norwegian Innovation Survey, we were unable to identify any systematic and significant effects of such patterns in innovation practices and firm performance.

# 4. Qualitative study

Quantitative studies focus on specific variables that require that the patterns of innovation mapped in these variables reflect the practices of firm level innovation. It might be possible, however, that firm level practices are not captured through these variables. Using the resource-process-system framework and having the identified patterns of innovation as a background, we set out to identify the innovation practices of 21 Norwegian service firms representing three sub-sectors or sub-systems of the service sector using a more exploratory qualitative method. The results from this investigation are presented here with a summary of the method applied in Section 4.1 and the detailed findings organized by the applied framework in Section 4.2. In Section 4.3, we offer a summary of findings.

## 4.1 Method

Using a more exploratory approach to firm level innovation practices, this study still follows a somewhat structured method. For example it applies a semi-structured interview as the data collection method. It also applies the same framework of investigation as the quantitative study. Thus, the areas of practice that we *search for* correspond to those of the quantitative study. The approach is, however, more open and allows us to capture innovation practices and systematic similarities between practices that constitute patterns of innovation that have not been covered in the quantitative study. As such, it elaborates and expands our perspective of what constitute the patterns of innovation in service firms beyond what is covered in quantitative studies of the type reported in Section 3. First, the method of the study is presented.

### 4.1.1 Sample and procedure

*Scale intensive network services – Telecommunication and financial services*

We purposely selected five large Scandinavian scale intensive network services providers as case organizations. The five firms provided different types of scale intensive network services, both in the business-to-business market and in the business-to-consumer market. One firm provided telecommunications services, one firm provided insurance services, two

firms provided both banking and insurance services, and one firm provided post services. All firms were successful in the market, as evidenced by the fact that most of them had expanded beyond the national border to several countries. All firms were also involved in innovation projects in part funded by the Research Council of Norway, indicating their focus on innovation.

The method of data collection was in-depth interviews with employees involved with innovation in the case organizations. To reflect the innovation practices, informants with different roles and from different firm levels were interviewed in each firm. The sample included top-level business managers and line managers with an overall responsibility for innovation, as well as managers on lower levels with an explicit responsibility for innovation. We also interviewed specialists in areas such as IT and service design. In each firm, we began by interviewing one top/line manager, and he/she helped select other relevant informants. We continued interviewing until a level of saturation was reached. As a result, between three and seven employees were interviewed in each firm. In total, 21 interviews were conducted. Table 4.1 lists some characteristics of the sample.

Table 4.1: The sub-sample of scale intensive network service firms

| **Firm no.** | **Number of employees** | **Type of services provided** | **Annual turnover (2010)** | **Informants** |
|---|---|---|---|---|
| A | 30 000 | Telecom | NOK* 94.8 billions | Top/Line/Unit managers: 4<br>Innovation managers: 2<br>Project managers/Experts: 1 |
| B | 13 500 | Financial, banking, insurance | NOK* 39.6 billions | Top/Line/Unit managers: 1<br>Innovation managers: 1<br>Project managers/Experts: 2 |
| C | 2 221 | Financial, banking, insurance | NOK* 48.2 billions | Top/Line/Unit managers: 1<br>Innovation managers: 1<br>Project managers/Experts: 1 |
| D | 20 000 | Post | NOK* 22.5 billions | Top/Line/Unit managers: 1<br>Innovation managers: 1<br>Project managers/Experts: 1 |
| E | 4 300 | Insurance | DKK** 19.5 billions | Top/Line/Unit managers: 2<br>Innovation managers: 1<br>Project managers/Experts: 1 |

* NOK – Norwegian kroner, the Norwegian currency

** DKK – Danish kroner, the Danish currency

*Scale intensive physical infrastructure services – Retail and wholesale trade*

We selected 9 firms/units based on two criteria. First, we summarized retail innovations mentioned in the literature (e.g. Quinn et al., 2013; Reynolds et al., 2007) as well as national reports (e.g. Nygaard and Utgård, 2011) and used these to ask experts which Norwegian retail firms or entrepreneurs had introduced innovations of the kinds mentioned in these reports. Examples include retail format innovations like vertically integrated grocery retail chains and online retail, logistics innovations and experiential retail innovations. We sought to interview the individuals and firms behind these innovations and used them as a source of further recruitment. The second criterion was thus, that other firms and individuals were identified by the first respondents we started to interview because they were either suggested for their engagement or insight into specific types of retail innovations or they represented firms and units that was believed by the first respondents to be important parts of the retail innovation system that we set out to identify.

In total, 9 interviews were conducted. Table 4.2 shows an overview of the characteristics of the sample including firms/units as well as the informants representing these institutions.

As seen from Table 4.2, the firms vary from large, global corporations to small start-ups. The respondents also reflect entrepreneurs and CEO's as well as senior managers and directors with responsibility for innovation within a firm. The sample is by no means designed to be representative of retail firms or actors in the retail innovation system, but it is believed to represent the breadth of innovation types and innovation system actors involved in many recent retail innovations.

Table 4.2: The sub-sample of scale intensive physical infrastructure service firms

| Firm/ unit no. | Number of employees | Type of services provided | Annual turnover (2014) | Informants |
|---|---|---|---|---|
| A | 164000 | Global retail chain | €** 30 bill | Chief Development Officer |
| B | 3400 | Municipality development services | NOK* 2.4 bill. | Chief Development Officer |
| C | 250 | Integrated shopping/street mall | NOK* 350 mill | CEO and founder |
| D | 10 | Integrated online/offline retail | NOK* 30 mill | CEO |
| E | 3400 | Municipal services | NOK* 2.4 bill | Head of regulatory and development division |
| F | 24 | Experiential retail | NOK* 10 mill | CEO and founder |
| G | 420 | Online retail | NOK* 4 bill | Former CEO and founder |
| H | 580 | Regional retail chain | NOK* 1.4 bill | Chairman of the board and founder |
| I | 25000 | National retail chain | NOK* 70 bill | Chief Innovation Officer |

* NOK – Norwegian kroner, the Norwegian currency
** € - Euro

*Personal services - tourism*

We purposely selected seven providers of personal services as case organizations. The seven firms provided different types of personal services. Five firms provided accommodation and food services, one firm provided transportation services, and one firm provided experiential services. All firms were successful in the market, as evidenced by the fact that most of them had grown considerably in recent years.

The method of data collection was in-depth interviews with employees involved with innovation in the case organizations. To reflect the innovation practices, informants with different roles and from different firm levels were interviewed in each firm. The sample included top-level business managers as well as managers on lower levels. In each firm, we began by interviewing one top/line manager, and he/she helped select other relevant informants. We continued interviewing until a level of saturation was reached. As a result, between one and three employees were interviewed in each firm. In total, nine interviews were conducted. Table 4.3 lists some characteristics of the sample.

Table 4.3 The sub-sample of personal service firms

| Firm no. | Number of employees | Type of services provided | Annual turnover (2013) | Informants |
|---|---|---|---|---|
| A | 3000 | Transportation | NOK 5.7 bill (*) | Chief Innovation Officer |
| B | 1000 | Experiential services | SEK 1.7 bill (*) | Chief Technology Officer |
| C | 14000 | Accommodation and food | SEK 10.8 bill (**) | CEO, CMO and Revenue Manager for the Norwegian subsidiary |
| D | 3000 | Accommodation and food | NOK 3.1 bill (*) | CMO and the deputy CMO |
| E | 12000 | Accommodation and food | NOK 4.6 bill (*) | CMO |
| F | 13000 | Accommodation and food | NOK 2.2 bill (*) | General Manager for one hotel |
| G | 85000 | Accommodation and food | $ 37.6 bill (***) | General Managers for three hotels |

* NOK – Norwegian kroner, the Norwegian currency
** SEK – Swedish kroner, the Swedish currency
*** $ - US dollar

### 4.1.2 Measures

We followed a semi-structured interview guide (see Appendix A) that reflected the dimensions of innovation practices in our extension of the Frohle and Roth (2007) resource-process framework: innovation processes, innovation resources and innovation systems (see Figure 2.1). To obtain concrete and specific answers about the innovation practices, informants were given the opportunity to select one or two innovation projects that had been carried out in the firm, and they were asked open questions about the practices in the three aforementioned dimensions. To obtain a more in-depth and complete understanding of the practices of each firm, several follow-up questions were also asked, such as those related to whether specific tools or measures were used (see Appendix A for more examples on follow-up questions). We also asked whether the practices for the examples were representative of the firm's normal practices and whether the informant believed the practices were successful. In most interviews, at two researchers participated but some interviews were also conducted with only one researcher participating if the respondent required so for non-disclosure reasons. Each interview lasted about 1.5 hours. The interviews were recorded and transcribed

while keeping both firm and respondent anonymous. The data were coded and mapped onto the aforementioned three innovation practices dimensions.

### 4.2 Findings

In this section, we present our findings in each of the three sectors/systems investigated. Each section is organized by first presenting the innovations that have been focused, next, the process and resource related practices, and finally, the systemic practices observed in each set of cases. Citations from informants are organized to present both centrality – what is typical, and variation – deviations from typical practices. In Section 4.3, we present a summary of the findings including what are common practices across the three sectors/systems. These common or shared practices are most comparable to what we have termed innovation patterns in the quantitative study.

#### 4.2.1 Scale intensive network services

*Innovation processes*

New service ideas in the interviewed scale intensive network services firms came from a variety of "soft" sources, including insight in the needs of customers, monitoring of the activities of competitors and government regulations. We also identified some examples of cooperation with business partners in the early stages of the innovation process that resulted in new innovation ideas. For example, an informant from Firm A explained: "*We have cooperated with a Swedish firm [anonymized] from 2008. We started an online music store where customers could buy music by downloading mp3 files together with this firm in 2008. In 2009, we got the idea that we could establish a new store where customers could stream music instead of downloading. The idea came from [anonymized]. I am not sure where they got the idea, but I guess they were inspired by the Swedish competitor Spotify.*"

In general, however, the informants only very infrequently mentioned business partners as the source of an idea. Some informants even stated that it was difficult to cooperate with business partners early in the innovation process due to contractual issues, as explained by another

informant from Firm A: "*We have a supplier policy in our firm. This policy states that suppliers are not allowed to be involved early in the innovation process. The reason is that we do not want to give a particular supplier advantage in the subsequent contractual competition…*"

Few informants mentioned more "hard" sources of innovation ideas, such as R&D. One informant explained: "*Some years ago, we believed that all ideas come from our own R&D activities. We no longer believe this, however. A few ideas come from this source, but I think a lot of the ideas that end up as innovations are driven by the industry as a whole. Firms share innovations and inspire each other and influence […] each other… It is almost like the ideas come a little bit randomly.*"

Several informants from all firms highlighted the importance of managing the front end of innovation carefully to ensure that the most valuable ideas emerge. One informant in Firm B suggested: "*In many large companies, they have so-called suggestion boxes, or something similar, where employees are allowed to drop ideas on how the firm may be improved. In my view, this is not a clever way to do it. Perhaps you get 2000 ideas, and for obvious reasons it is impossible to follow-up on all of these ideas, and when the employees see that there is no follow-up, they lose interest. So, this is not the best way to get ideas… In my opinion, you must start on a higher level. Create knowledge and choose a few challenging areas you want to improve… Start by answering where we want to go and why, and discover what we need… Now, it may sound as if I'm very negative towards ideas and in a way I am, but I think the ideas are really important, but in proper form…*"

All of the informants reported that the number of innovation ideas was much higher than the available resources for innovation activities. Thus, in all case organizations, the prioritizing process was considered to be difficult. Decisions to invest in innovation ideas were considered by steering committees, consisting of managers at different levels, including top managers in the case organizations. Ideas were prioritized on the basis of various financial and nonfinancial criteria in the case organizations. During the interviews we received a few examples on ideas that had been funded due to an expectation of long-term effects such as customer satisfaction, but the majority of informants claimed that short-term financial criteria were the most important. The following statement from an informant in Firm C illustrates this

practice: "*The innovation projects that are selected have to be able to be financially beneficial after a short time… We have to be able to demonstrate in the business case that the investment will have a payback time of less than 1 year… We often also describe other nonfinancial effects in our business cases, but my impression is that the steering committee does not value these effects to any significant extent.*"

Nevertheless, we may state that our observations indicate that both potential short-term financial effects, as well as more intangible, often long-term, nonfinancial qualitative effects, may give an innovation idea high priority at the investigated firms. However, the firms had only established a structured predefined procedure to find the value of the tangible financial effects; the intangible effects were valued on a more ad-hoc and case-to-case basis, without any predefined rules. Strikingly, none of the firms deployed any form of scoring model, checklist, or other explicit tool in any structured manner to find the value of potential intangible effects. Some informants even compared the process of convincing the steering committee of the importance of intangible effects with an election campaign. One informant in Firm A explained: "*We got the project approved by the steering committee at last, but the work we had to do before we got the approval was like running an election campaign. I have been participating in this lobbying quite a few times now, and every time I get surprised [by] how much nonsense it is…*"

After deciding to invest in an innovation idea all of the studied firms had a defined formal process for new service development, either for the entire process from idea specification to launch or for selected parts of this process. These formal processes were inspired by the stage-gate methodology, and they all consisted of stages with activities and decision gates. All of the firms had defined who the decision makers were at the different gates and what part of the organization had responsibility for the activities in different stages.

However, the level of detail to which the firms had described the formal process varied among the five firms. At the detailed end of this continuum was the formal process of Firm A. This process had five gates and covered the entire process from idea to launch. The activities in the stages and the criteria to be met at the gates were explicitly defined. One informant from Firm A explained: "*All projects have to deliver the required documentation to be allowed to pass decision gate 1, 2, 3, and so forth.*" The predefined formal process was not as well detailed in the other studied firms. The gate evaluations were to a higher degree done on

a case-by-case basis. In Firm D, for example, one informant expressed: "*I will say that our innovation process is a bit ambiguous. There are always some small and detailed decisions to be made. It is a bit ad hoc and chaotic… But, nevertheless, we do have some main stages and a balance between chaos and structure.*"

In all case organizations, including Firm A, the actual innovation process often deviated from the predefined process. One informant from Firm A gave an example of a project that did not follow the predefined process: "*The project was not run like a standard project. Since this project was more like a cooperation project than a traditional internal development project, it was decided not to follow the normal process… So, the project was not evaluated at specific gates like other projects. But, of course, the project was described in annual reports, etc. So, in a way, it has been evaluated by the management regularly.*"

Another example is from Firm B. An informant from this firm explained how she was allowed to work in a particular project she managed: "*It is not like I draw up a process and follow this from A to Z. It is more like I use my intuition. But I am very strict in every meeting, so I know exactly what I want and where I am heading. So, I have always thought carefully about every step, but it is not like I make a huge project plan or something.*"

How the studied firms measured the outcomes of their innovation activities varied. Some firms had a relatively unsystematic and simplistic approach to evaluating results, whereas others followed a more complex approach. At the unstructured and simplistic end of this continuum were Firms C and E. Some informants from these firms stated that they usually did not evaluate the results of their innovation projects or their portfolio of projects.

The informants from Firms A, B, and D reported that they did expend some efforts to evaluate results. The measures chosen were solely on the project level, and they were very project-specific. The following statement from an informant in Firm A illustrates the practice: "*Early in the process, we describe the key performance indicators for the particular project, and we set the project targets… After we have launched the new service, we measure if the targets are achieved.*"

None of the studied firms had implemented measures to evaluate the performance of innovation activities on the business-unit level. Overall, the practices of the studied firms in this area were relatively simplistic. Several informants stated that their firms would benefit from improving their ex-post evaluation practices. For example, an informant in Firm C stated: "*It is in this area that we may gain the most from improvement. We need to be more structured: set targets for the innovation area, measure, and follow up.*"

*Innovation resources*

To carry out innovation activities, the case organizations employed intellectual internal resources in at least four domains: 1) professional innovation managers, who managed, guided, facilitated, and controlled the innovation process; 2) top managers or line managers, who made decisions; 3) experts, who managed selected parts of the innovation process and specified, designed, developed, and implemented solutions; and 4) front-line employees, who gave advice, especially related to service design. The studied firms also involved external intellectual resources, in particular, potential customers and marketing research agencies, in their innovation processes.

All case organizations had a pool of innovation managers. In some firms, these pools were organized in a separate department; in other firms, they were part of the line organization. The role of the professional innovation managers was to guide, facilitate, manage, and control specific stages of the innovation process. Innovation managers often were responsible for innovation within a certain area, either alone or most commonly together with a team. Progress in the innovation activities depended on actions from the person with this role because this person guided the project through the stages and gates. The role may be illustrated with the following statement from an innovation manager in Firm B: "*It is a lot about process methodology, building projects, and making people talk together….I have obtained a whole lot, since people do want to collaborate when we manage to have a nice framing. And I let people go in front. I have no need of putting my own name on things, as I really think I will get a lot done over time if those who are supposed to do the job are put in front… So, mainly, it is about walking around, talking to people, and making them talk together…*"

Top and line managers in the studied firms acted as the developers of the firms' strategic ambitions, the decision makers at the gates in the innovation process, and the sponsors and supporters of the innovation managers. One informant in Firm E explained the role of top managers as follows: "*Which innovation activities… are given priority depends on who is in the corporate management. Our change of corporate governance has really changed what we prioritize.*"

Our findings indicate that the studied firms involved internal experts, particularly in IT and service design but also in other fields, to manage selected parts of the innovation process and to specify, design, develop, and implement solutions. An informant from Firm B explained the importance of involving experts from the firm's IT department in the innovation process: "*The new digital services we develop have to be integrated with our IT systems… Then, I depend on [anonymized] from the IT department do this integration job, and this is a very complex task in our firm.*"

The firms frequently involved front-line employees when new services were developed. This category of personnel was involved for two reasons: 1) they often had detailed insight into customer needs, and 2) they often were the intended providers of the new service, and their commitment was very important for the new service's success. An informant from Firm B explained the importance of this commitment in the following way: "*The trick is not to forget involving the staff. My firm is very big, and we use a lot of money on external marketing to create commitment externally. And sometimes, we are perhaps a little bad at creating the internal commitment. So, I am very keen not to make that mistake. So, all the way I involve the front-line employees.*"

*Innovation systems*

The innovation systems literature suggests that an innovation system has a number of components and firm level system oriented innovation practices include 1) systematic knowledge interactions with innovation system constituents, 2) systematic market defining activities, 3) systematic value-system defining activities and 4) systematic entrepreneurial activities (developed from Borras and Edqvist, 2013, see Section 2). In addition the innovation climate may be understood as an overarching innovation system dimension.

The innovation climate in the studied firms seemed to be characterized by a general unwillingness to take risks. Instead the organizational culture was generally characterized by professionalism, conservatism, and strong traditions. The following statement from one manager in Firm C illustrates this climate: "*I think that the culture in our firm is driven by the insurance discipline itself. We are very keen to do things correctly and thoroughly. We do not want to experiment. We are very concerned about getting approval, both internally and from our customers, before we try something new. We dare not just… try. In my view, this culture is problematic from an innovation point of view. Innovation is not impossible, but the innovation process is hard and expensive.*" Likewise, an informant from Firm E stated: "*We have a low-risk culture. The employees who are avoiding risks are rewarded. Since there always is a risk related to innovation, the low-risk projects that we see that our competitors have had success with are often given priority. This culture is a huge challenge from an innovation point of view. I think this is not only a problem in our firm, but a general problem in this industry. However, there are also internal cultural differences in our firm. For example, the business development division is more willing to take risks than other parts of the firm.*"

Although this general innovation climate certainly seemed to affect the innovation activities in the studied firms by preventing more radical innovation initiatives, the firms seemed to make little use of innovation policy instruments to reduce the risk. In fact very few of the innovation examples discussed during the interviews had, according to the informants, received support from the national government. Likewise the findings suggested that the studied firms had few systematic knowledge interactions with innovation system constituents. Interactions with R&D organizations were for example hardly found in the examples provided by the informants. Instead the most important systematic knowledge interaction in the studied firms was found to be with customers. Most informants mentioned the importance of customer involvement, and the findings suggested that customer involvement was relevant in all stages of the innovation process. An innovation manager in Firm E explained: "*It is now unthinkable that we would do anything without involving the customer. From being a number in an IT system, they are now people with flesh and blood.*" Another manager from Firm D explained how deeply their customers were involved during the service innovation process: "*Customers are enrolled as users for the development team… We work with addressers, who*

*are customers, people that we trust. For instance, a bank that we work with has different end users, so we collect different users who provide us with important input.*"

Innovation system practices in the form of systematic market defining activities were also relevant for the studied firms, especially in the form of regulatory interaction. This may be exemplified by the following statement from one of the informants from Firm C: "*The incentive for the innovation was that the government implemented a new law. We responded with a good and innovative solution."*

Examples of innovation system practices in the form of systematic value-system defining activities (e.g. value-system restructuring and institutional change practices) and systematic entrepreneurial activities (e.g. spin-offs and financial investments in start-ups, ventures and other entrepreneurial initiatives) were not found in the interviews with informants from the sampled scale intensive network services firms.

*Summary of findings*

Our findings suggest that dominating sources of innovation ideas in scale intensive network services firms were soft sources, such as clients, customers and business partners. Idea prioritization was an important innovation management task in the studied firms due to the fact that they had more ideas than the available resources for innovation activities. All studied firms had defined formal innovation processes, but the processes implemented in practice often deviated from the formal descriptions. Different types of resources were needed to carry out the innovation processes, including top/line managers, innovation managers, experts and front-line employees. In addition the findings suggested that systematic knowledge interactions with customers were important during innovation processes in the studied firms.

### 4.2.2 Scale intensive physical infrastructure services – Retail and wholesale trade

Based on a compiled list of potential retail innovations, we identified firms/ entrepreneurs and respondents of the qualitative study, but the respondents were free to use an innovation of their preference as the basis for the interview. To ensure variety, the interviewers also asked respondents to contrast the innovation with other innovations or innovation projects they had

experience from. The innovations most respondents used as a basis for their reflections were *retail format* innovations. Examples include online retail, combined online/offline retail and store format innovations: *"Online retail is something we seriously started with one and a half year ago. We look at it as a new wing in our store, it is only that we can extend the tent plugs rather far geographically" (*Firm D*).* Some deviations from this kind of innovations were also found as some choose market(ing) innovations (segments) and experiential innovations (value proposition) as illustrated by the informant from Firm F: *"Yes we have tried a lot, we have had quiz-night and Christmas markets for kids, trying to make it feel like home when customers come."*

Common to all selected innovations, however, is that they are opportunity-based*: "It was something termed the retailers association, I met a person thinking completely different saying that you have to continuously utilize opportunities in retail together with other retailers. This changed my way of thinking completely"* (Firm C). None of the identified innovations are problem-based or originate from challenges threatening the offering or position of the established firms interviewed.

*Innovation processes*

It is often claimed that the main source of innovation in services is customers, but in our qualitative material we found few examples that customers were mentioned as the front end of the innovation processes. In some cases, data from customers were: *"We do a post-number based survey 3 times each year, so we have very good consumer data showing us exactly were to be present"* (Firm A). These examples were more represented by the larger firms. In most of the innovations, we found the entrepreneur or intrapreneur to be the source of innovation: *"I had been around for 8 years and when I returned to town, there was something I felt the town missed, so I just established what I missed in town"* (Firm F). We also have examples of more or less random events or opportunities representing the source of innovation, some internal: *"She wanted to go to Paris but continue working in the firm, so we though that online shopping can be administered equally well from Paris and Oslo"* (Firm D) and other external: *"A guy came by and he was extremely interested in computers and wanted to sell us a solution for online shopping that he hadn't developed yet. This made us start thinking"* (Firm G). Based on these findings, we suggest that the source of innovation among our cases at best may be characterized as broad and heterogeneous.

From the idea to implementation most innovations we have identified are supported by some kind of project or project organization, but the entrepreneur (s) or intrapreneur (s) is still critical in this organization: *"No, I work as the manager of both design and construction, previously I usually also did much construction work myself during the summer"* (Firm C), and *"When we started here we were 4 or 5 in the beginning and we find our places immediately, no discussions of who should do what, it is just being done"* (Firm G). Further, this implementation organization is very informal in most of our cases: *"We are very focused on having a small, informal and effective implementation organization and do not like to expand that part"* (Firm H). As a contrast, only one firm used a very formal implementation organization: *"So we have a property manager, with and organization including a project manager and a construction manager with further project managers below. Parallel to that, we have the retail development organization which is rather large"* (Firm A). The same pattern was found with respect to the use of innovation metrics: *"No, we only report on the status and progress of the project, not on formal metrics"* (Firm I), contrasted with the big international retail chain: *"three months after there is a store design and follow up evaluation where architects and designers use several days for a formal assessment"* (Firm A). As for the use of metrics, the use of formal tools for innovation is also extremely limited. When asked specifically about it, one of the respondents replied: *"None, we are too small"* (Firm G). And that is even if the company is not particularly small. So it seems they find the use of tools something for the larger companies. That is also reflected in our findings were the global retail chain uses a number of innovation tools: *"Then we apply a mosaic tool which also includes local demographics and retail patterns including local home visits"* (Firm A).

Regarding the relationship between strategy and innovation, most respondents mention innovation as a means of growth and no respondents mention innovation for cost efficiency: *"So we developed a growth strategy for the company and made some acquisitions…"* (Firm H). Even in a company operating in a stagnating market, growth is the strategy used to defend innovation investments: *"Organic growth is what we have to life on for the future. Then it is important that we innovate to offer a broader value proposition and captures more of the consumer's total wallet"* (Firm I).

*Innovation resources*

Many of the companies have considerable financial resources and the freedom this gives for innovation is often mentioned: "*After we sold out most of us have rather strong financials, naturally, that helps*" (Firm G). Another observation is that the importance of physical resources is often mentioned by public retail service systems representatives "*That area was meant to ensure retail in the city center, and when that didn´t materialize business was kind of paralyzed*" (Firm E), whereas intellectual resources are considered far more important by most private retail service system representatives: *"This is an innovative business were have to capture changes in consumer behavior quickly, being able to do that is the most important resource"* (Firm D). This citation also illustrates that the respondents do not consider the customers as a resource in itself, it is the employees and managers ability to develop their own insight into customers' behavior that is the important innovation resource: *"In 2000 we decided all employee purchases must go through the system, and then they showed up after 2 minutes telling us how the interface was hopeless, so if its hopeless for them it is hopeless for the customers"* (Firm G).

All respondents focused on culture as a very important (innovation) resource. This includes the regional culture: *"Then there is the business or entrepreneurship culture, here our neighboring municipality is very different from ours"* (Firm B), the local culture: *"That's the culture or service orientation we are trying to spread across all firms located here at this local center"* (Firm C) and the corporate culture: *"It is the culture. I don't have to be there, people just know what we want and should do. We are kind of a cult or sect, in a positive way I hope"* (Firm G), and *"No, I think I can be as immodest as this and say that it is our culture that has influenced innovation in the company, not the culture of the merging firm"* (Firm H). Related to this, there is also a value or orientation shared by most firms that focus on the importance of individuals and small groups: *"We have our values, we believe that every individual is a blessing"* (Firm D) and *"We believe that if there are more people involved than those who can share a pizza, it's too big"* (Firm G). There is also a deep respect for the importance of the operational resources in innovation, even in the largest of the companies: "*Our founder never visits staff locations, he only visits retail locations. That is the core business, that's why*" (Firm A) and *"The individual merchants have an extremely high standing, the company as a whole always listens to them"* (Firm I).

*Innovation systems*

In most of the organizations, the knowledge source of innovation is not only internal, but it is also restricted to an inner circle of internal members or participants in what we could term an internal innovation system. To take an extreme example, the informant in Firm C states: "*I have my kids, one is involved directly in the management of one of the stores, but the others are involved in the development of the area we control through the investment company. I discuss development with them everyday, but we have no external discussants or consultants involved in things like that.*" Another informant states something fairly similar: "*We involve very few external people into our innovation decisions, we use some consultants for executing when we lack competence, but we don't involve them in the innovation decisions*" (Firm H). Also, the collaboration between innovating firms and public institutions that are often discussed in the literature on national and regional innovation systems is lacking. One informant said: "*No, we have never had an innovation project that received public funding or where we collaborated with public institutions, I am sure we could have, but we haven't*" (Firm H). Of all informants, only one mentioned funding from public innovation policy tools: "*We received public funding of one of our projects once, and that gave me a really bad feeling. We did it to get money but the project would have been done without that funding, we only isolated some of the activities so that we got tax reductions, I didn't feel comfortable with that at all*." (Firm G).

This does not, however, mean that there are no innovation systems in the sense that innovation processes cross firm boundaries or that these firms are not involved in systemic innovation practices. There are several examples of firms mentioning networking for innovation across firm boundaries. For example, through professional organizations: "*Yes, we participate in standardization projects through our employers' association*" (Firm H) or by collaborating with competitors: "*We own that company together with our main competitor, and as a consequence we have developed and implemented the a common information systems and platform. We also collaborate with non-competing companies in markets that we have not entered for joint knowledge building, for example in Denmark*" (Firm I). These practices, however, do not resemble those described in the national and regional innovation systems literature and to a limited or no extent involve public institutions, research- and educational institutions and organizations with only "related variety" to the knowledge base of the firms studied.

Again, however, this does not mean that the firms are not involved in systemic innovation practices like market development or joint regulation. For example, the informant from Firm I said: "*We work closely with the competitive authorities regarding both competition and privacy in the project.*" Regarding market development, systemic practices and systemic thinking is inherent in some of the entrepreneur's way of thinking: "*I wanted it to develop, so I bought the land and developed the property, but it was impossible for me personally to use all that property so it was let out for a low price or in lease and buy contracts to make the community around grow and develop*" (Firm C).

This behavior is typical of all the smaller and medium sized companies. The only difference is in the size of the system that their systemic practices affect – the smaller firms are involved in systemic practices affecting their closest network or geographical area, whereas the medium-sized engage in more industry wide or regional practices. In fact, it was in the large global retail chain we interviewed that the systemic practices were most difficult to identify. This may be due to their internal innovation system being so extensive that it was difficult to but uncover the systemic practices or that it was difficult to get in touch with informants involved in such practices. When asked specifically about this, an informant from the large retail chain (Firm A) said: "*There is an obvious lack of competence of retail in many regulatory agencies. Retail is treated without consistency and seriousness – that is, locally, regionally and nationally. That makes it difficult to develop innovation systems around it – look at the area around Alna, it is obvious that this functions much as a retail cluster, but it is never recognized as one*" (Firm A). It seems that the firm has taken what they consider the consequences of this lack of respect for retail competence and designed their innovation system as a company internal system. Only very few companies however, are sufficiently large to take this kind of action.

Representatives from the regulatory side of the retail service system also recognized the lack of competence among regulatory institutions in general: "*We lack competence of retailing. That is obvious, but we are not sure what kind of competence and we don't know how to develop or get access to it*" (Firm E). Furthermore, a consequence of this lack of competence is a number of regulatory decisions that the representatives of the regulatory authorities are not satisfied with themselves: "*What has happened here is not good, we have made some regulatory decisions but the consequence of these are that we have weakened the basis for the*

*growth in retail, particularly in the city center – what makes the city a thriving one*" (Firm E). Many of the firm informants also comment on similar retail service system related and institutional issues where the lack of a coherent and well developed service system of collaborating actors also represents a barrier to the development of an innovation system in retail: "*You have the property owners who are not linked to the retailers, and they all act individualistically and more or less without any considerations for the totality of the attractiveness of the retail service system. In the city center for example, you sometimes "streets" and districts fighting each other instead of working to increase the innovativeness and attractiveness of retail in the city center in total*" (Firm D). Sometimes, fierce competition among actors in the retail service system is a barrier to the development of more collaborative forms of retail innovation systems: "*Sometimes we say, why not just invite relevant actors for a meeting at a restaurant or pub over a beer at regular hours to get it going, but then people immediately start asking, who should I send, what are they up to know inviting for that kind of events?"* (Firm G). Thus, there seem to be a lack of trust and respect for the roles of different actors in the retail service system among its participants that makes it difficult to initiate this kind of competence exchanging activities. As a consequence, we find few systemic competence building practices in the sector/system.

*Summary of findings*

Most of the innovations our informants choose to focus on were retail format innovations. Examples include online retail, combined online/offline retail, retail chain development and experiential shopping. Common to all innovations are that they are opportunity based. Even in stagnating markets, innovations are interpreted as tools for growth. Innovation to defend positions or solve problems is not a mode of innovation found in retail. Innovation processes are strongly driven by internal human resources and customers are used as the source of innovation only after customers' behaviors or desires have been reinterpreted by internal intrapreneurs and entrepreneurs. Individual entrepreneurs play an important role in most innovations we have investigated and the main resources behind innovation are individuals, like the entrepreneurs, and organizational culture. Very few of the innovation resources are found outside the firms' boundaries and the innovation system, if that term can be used, is company internal. Innovations take place within a service system that crosses firm boundaries and many practices are systemic practices that relate to this service system, but this service system differs in the role of actors and institutions significantly from those described in the

traditional innovation systems literature. These systemic practices are not considered to be innovation practices by the informants. There seem to be a lack of competence on innovation in this service system and few of the systemic practices are directed at developing such competence.

### 4.2.3 Personal services - tourism

In Personal services - tourism, the samples showed an explicit tendency towards an incremental degree of innovation, more so, than a radical degree of innovation. Innovation and product development was driven from within organizations, and out, with small margins, indicating a focus towards incrementality, as opposed to a radical focus.

Incremental innovations, within the samples, were improvement of the customer experience in the hotels; such as healthier lunches, a choice of pillows, using the mobile phone as a room key and being able to eat local food. Within the samples shown, one radical innovation idea that came from the employees was the possibility to choose how to check out of the hotels – through customer self-service.

*Innovation processes*

Findings indicate that new service ideas mainly come from within the organizations. In general, insights into the need for understanding customers, and the competition, were named "soft" sources for new ideas. The organizations were seen to encourage employees, to come forward with their ideas. As explained by one of the informants from organization G: *"ideas almost always come from the "bottom". What is crucial is that the "top" have their antennas screwed on correctly, so that the ideas aren't killed before they see the light of day."*

A tendency is shown, in that trends, anchored in health, are the source of much of the innovative activity. As another informant explained; *"The whole program is built on the assumption that we reach out to the co-workers, and ask what they suggest we should do for the environment. We got over 5000 suggestions, with about 1500 unique ideas. What we could se, was, that the ideas mainly concerned water and energy*" (Firm C).

Just one case study mentioned “hard” sources of innovation ideas, such as research done on the «experience economy». *“You know; just a couple of years ago, we used reports from a university in Sweden, that had done research on tourism”* (Firm B).

In general, all the case organizations stated that although employees are invited to come up with new ideas, the “top” evaluates and decides which of the ideas to go forward with. This indicates an implicit tendency towards power proximity, as explained by one informant from firm A: *“(...) you as an employee talk to the right person, which happens to have a sum of money, that thinks the idea is good, and thus so it is.”*

When going through with an investment in an innovation idea, all the companies lacked defined formal processes regarding new service development. Some had formal stages when it came to activities and decisions making, in improvement of conference services, food concepts, new infrastructures, and new layouts of hotel rooms. However, when it came to implementing new services, within the companies, it appeared to be relatively unsystematic in how this was done: *“When it comes to new projects, it is up to yourself to implement this, in the best way possible, in your hotel”* (Firm G). Another informant gave an example, of a project that was, as the informant saw it, anchored in a good idea, but failed for the lack of a formal process in the implementation phase: *“It was up to each hotel. We are quite small and don’t have a lot of personnel, and nobody told us to do “this” or “that”, they left too much up to the hotels. (...) some of the hotels have bigger space, so everybody did different things”* (Firm F).

This can be perceived as an illustration of a tendency in Personal services - tourism, that innovation is perceived as a strategy-enabler, as opposed to a strategy that emerges out of the innovation project. However, one of the companies (Firm A) differed in the way that they managed the innovation process, utilizing a project-driven methodology, which followed a project plan that was reviewed and formalized.

The measurement of the outcome of the organizations innovative activities, varied between quantitative and qualitative measurements, but although the organizations were under the illusion that they were customer-driven, it was seldom that they conducted any extended analysis, and evaluation of, the “softer” kinds of outcomes of innovation activities, such as

customer satisfaction. As an informant from organization C put it: *"We don't measure that, but we can feel it (...) what we measure is that the customer grows".* (Firm C). Another informant, from organization G, stated that; *"We do get feedback and such. Some customers haven't always been satisfied.(...) But we don't have customer surveys, so we don't have any results to measure."*

The tendency, amongst all of the companies, was that the measurements made were on a project level, and as one of the informants, in company D, put it: *"It all comes down to the results. How many conferences did we actually sell, and how many actually bought because of the conference? That is what we measure"* (Firm D).

*Innovation resources*

All of the firms have internal training, which is a core building block of the organizational culture. As one of the informants, in firm C, put it: *"It is important to show that you can grow. Get all the big positions from in-house.(...) They know the system and everything goes 10 times faster."*

Our findings indicate a tendency, to employ intellectual resources from within the firms. They shared a general skepticism towards tourism education from schools in Norway, although some firms valued education from abroad: *"I hire people who have studied abroad, because the schools are better. I have been struggling with the travel industry for years because they are inept in adjusting the studies to what is relevant out there. (...) When I get an application from candidate educated by a school in Norway, I throw it in the garbage"* (Firm C).

The findings also suggested, that all case companies lacked innovation managers. The teams working with the innovative activities were all chosen, from the management level, for each pilot project, as illustrated through informant in firm F: *"We are hand-picked from the top, compared to whom they think have the best resources for the project; the most eager, outward and innovative – there is no democracy."*

Skills, such as disciplinary and functional oriented ones, were preferred in the ideation phase. Motivational and leadership related skills, were chosen in the implementation phase, resulting in the use of external actors, brought in to oversee some pilot projects.

Strikingly, in Personal services - tourism, the innovative activity is driven from within the organizations, with small margins. It seems as although the different informants reflect upon the challenges this industry has ahead, few act on it.

Our findings indicate, that the companies frequently involve front-line employees in the search for new ideas for personal services. However, in the development stage, lacking a system that ensured the implementing phase, the decisions had a tendency to fall onto the ones at the top of the hierarchy, thus resulting in them becoming an obstacle to innovation, rather than a possible catalyst.

Our findings indicate an explicit tendency towards difficulties in ensuring the safeguarding of intellectual resources. Although most members of the top management groups have worked their way up, it seems as though this is about to change. As an informant in Firm G put it: *"There is no either/ or answer. But there are more demands today, and ironically fewer are working their way up. A trained chef would much rather work in a five star restaurant (...) Most of the people working today aren't very concerned with climbing the corporate ladder. They are on their way to a different job, or studies. They want to go to work, have fun, and collect their paycheck."*

The organizational culture anchored in the case companies, showed a tendency towards hierarchy. This, illustrated through one of the informants in organization B; *"We have distinct professional areas, we don't mix and match; we are a classic organization"*. Concerning who gets their ideas forward, the same informant said: *"it is a power struggle; always trying to get your opinion through in the best possible way"* (Firm B).

However, one firm broke the pattern of hierarchical thought; *"(...) we have to allow those closest to the problem at hand to advance themselves. This is a prerequisite to innovation. (...) With all due respect for myself; I'm awfully far away from the customer. I sit in a corner office looking at trains"* (Firm C).

Case company C also differed in the perception of an organization culture, as something static and hierarchical. *"The problem in this business, are the many top leaders that are old and have never seen things like state of the art revenue management. A traditional hotelier, in the*

*wrong position, can be very destructive – if we don't bring in new impulses"*. Also, stating that one of the greatest obstacles in the tourism industry, that has to be overcome, is the lack of courage to try new things: *"It's trying and failing, a lot more complex than what meets the eye. We train too much on the traditional stuff, and not enough on the complex stuff. Thus resulting in the traditional failing in the complex, and that is this industry's weakness*."

*Innovation systems*

As our adaptation of Borras and Edquist (2013) suggests; the components and firm level system oriented innovation practices that innovation systems are anchored in are:

1) Systematic knowledge interactions with innovation system constituents
2) Systematic market defining activities
3) Systematic value system defining activities
4) Systematic entrepreneurial activities

The finding suggests, that the most important systematic knowledge interactions in the studied companies, were observed to be with the employees, and some times the customers: *"We tried the concept on some of our guests, and then we invited colleagues from another firm. (…) So we got feedback from both our customers and our co-workers. From there we put our concept together*" (Firm G).

Systemic marked defining activities, such as taking initiative towards innovative activity, with local actors, were seen in most of the case studies. As study case 11 put it: *"We have to be innovative, professional and always ahead."*

The findings show, that the degree of innovative activity is implicitly dependent on the type of person in charge. Internal power struggles anchored in conservative thoughts on how to run the firms was also perceived as impeding to innovation in this sector. Furthermore, salaries in the Nordic countries were perceived as impeding to innovative activities, by some of the firms: "*Due to the fact that the pay is so high in the Nordic countries, I sincerely doubt, that we will try to come up with a new solution to the problem, ourselves"* (Firm G).

Our findings show a tendency towards the use of external actors, such as local partners. Although they were perceived as important for most of the case studies, they had little or

nothing to do with development of the projects. One informant in firm D illustrates this by stating: *"To call a spade a spade, I think it was to a high degree, a customer supplier relationship. They were never present at the meetings."*

Strikingly, only one of the case studies, case study B, stated that they took advantage of the policy implementation system, to advance innovative activity. *"We actually could not have done the project without Innovation Norway."*

*Summary of findings*

Our findings show a tendency towards soft sources, such as employees and clients, being the source of innovation ideas, in personal services, tourism companies. Also, the findings indicated that ideas *"*were mainly anchored in current trends, such as health and environment.

The degree of encouragement towards the employees, innovative activity, and how the ideas were administrated, depended on the persona in charge. Internal power struggles anchored in a hierarchical, and somewhat conservative industry, implicated that power proximity was an important factor concerning which new service ideas were chosen. Projects were staffed on a case-to-case basis and there were no findings indicating formal processes regarding the implementation phase of the projects, thus resulting in impeding effects on the different innovative activities.

Within the industry, much of the innovation and product development is driven outwards, from within, with small margins, and are therefore more incremental than radically change-oriented. Thus, many see the dramatic changes facing the industry, but few react on it.

### 4.3 Summary of qualitative findings

The qualitative study of made us dig more deeply into the practices at the firm level behind many of the patterns identified in Section 3. Corresponding to the summary table in Section 3.3 we summarize the qualitative findings in Table 4.4.

Table 4.4: Summary of qualitative findings

| Sector/system | Innovations | Process practices | Resource practices | Systemic practices |
|---|---|---|---|---|
| Scale intensive network services | Both radical and incremental. Opportunity based | Variety of "soft" sources, internal individuals, customers, regulations. Overflow of ideas, more formal processes after ideation, but deviations. Few metrix, particularly of outcomes and relatively few tools | Internal intellectual resources main innovation resource including innovation managers and front-end employees, and area experts (e.g. IT) | Few systematic knowledge interactions with traditional innovation system constituents including public funding. Some systemic practices related to service system development, but few with innovation system development |
| Scale intensive physical infrastructure services | Mostly incremental. Opportunity based | "Soft" - internal individual source primary, customers secondary indirect source. Informal, firm internal processes, few metrics and tools except in the large retail chain | Individual humans and organizational culture main innovation resource. Innovation interpreted as part of a growth strategy | Many systemic practices related to service system, but very few related to this system as an innovation system. Lack of retail competence in the service system. No practices related to public innovation system |
| Personal services | Incremental innovations. Mostly improvements | "Soft" - internal individuals, customers and trends source. Only "hard" source is "experience economy". Informal, firm internal processes, some metrics and few or no tools besides project management tools | Internal, intellectual resources, but not innovation managers. Internal training to develop cultural resources – work your way up | Partly service system practices, but almost no innovation system practices. Only one example of using public policy support tools. Challenges observed, but few firms react individually |
| Common findings | Incremental. Opportunity or improvement | "Soft", internal sources. Formality varies systematically. Few metrics and tools | Internal, intellectual and cultural resources. Customer resources surprisingly indirect | Systemic practices unrelated to innovation system. Underdeveloped knowledge and innovation system. Few relations with public policy instruments |

As seen from Table 4.4, there are relatively fewer systematic differences in the observed practices when compared to the quantitative analysis of innovation patterns. Many practices are similar across sectors/systems, such as the focus on incremental and opportunity-oriented innovation. Similarly, the importance of “soft” versus “hard“ sources of innovation is also typical. The degree of formality of the innovation process varies, mainly by more formality among the larger scale intensive network firms. Internal, intellectual resources are most important, and it is somewhat surprising that even though quantitative studies of these firms reveal customers as an important resource, this resource is only used indirectly through the knowledge of customer demand built up by company employees. Corporate culture is also an important innovation resource. Most strikingly, we find systemic practices but these practices relate more to the service system than the innovation system, systemic practices are not innovation practices. As found from quantitative studies, almost no interaction exists with what we traditionally consider as national and regional innovation systems, and even less with the public representatives of it. There are some, individual firm exceptions to this indicating that there is considerable improvement potential in developing such interactions further on a more systematic basis.

## 5. Conclusion and discussion

This report documents the results from two empirical studies of innovation practices and patterns in service firms and service sectors/systems. In this section, we summarize some of these results along with our findings based on the experience from using Norwegian secondary and primary data on innovation. We also summarize some of the findings that are consistent as well as diverging across the two studies. We discuss how our study contributes to the research community as well as its limitations and strengths. We next turn to some of the implications of this research including managerial and policy implications.

We identified a number of challenges of relevance to understanding the characteristics of both service innovation and innovation in general in Norway when using the Norwegian Innovation Survey data. There is a bias in the sampling frame of the study that limits generalization of any findings based on the data. The variables included in the study are not based on a common theoretical model, and even though they are collected and psychometric data, no established scaling methodology is applied. Also, the variables focus specific aspects of innovation practices that do not cover the complete set of process, resource-based and systemic practices discussed in standard innovation management literature (e.g. Tidd and Bessant, 2013). Continuity and revision are usually opposing considerations in longitudinal surveys, but in the case of NIS, none of the edges of the sword are particularly sharp since continued variables change in wording and variables themselves are only infrequently updated.

In the quantitative study, we identified two sets of findings; one on the innovation patterns of firms in different sectors/systems and one on the effects of these innovation patterns on firm performance. To summarize, we identified six distinct patterns of innovation summarized in Table 3.14. All these patterns varied systematically between manufacturing and service sectors/systems. This means that innovation must be understood as a set of innovation patterns and practices, it is not a discrete activity or outcome. Next, we found that effects of these patterns varied systematically between service sectors/systems and depended on the performance measures applied. This means that the performance effects of innovation depend on the innovation pattern or practice and on the objectives of pursuing these patterns. Furthermore, the effects vary between service sectors/systems. To exemplify, one pattern of

innovation may be optimal for one objective in one service sector/system, whereas it may be less relevant for the same objective in another sector/system. On the other hand, it may still be optimal for another purpose in the same sector/system. This implies that it is difficult to develop a general innovation policy for service sectors/systems for all innovation objectives. Managerial and policy implications are, however, further discussed below.

In the qualitative study we found fewer systematic differences in the observed practices when compared to the quantitative analysis of innovation patterns. Many practices are similar across service sectors/systems, such as the focus on incremental and opportunity-oriented innovation, the use of "soft" innovation sources, the low degree of process formality (which varies more by size of the firm than sector/system) and the importance of intellectual resources and culture. This is rather surprising given that we found many systematic differences between service sectors/systems in the quantitative study. Similarly to the quantitative study, however, the qualitative study found almost no interaction with what we traditionally consider as national and regional innovation systems, and even less with the public representatives of these systems. This last finding also has significant implications for service innovation policy.

Our findings contribute to a more differentiated understanding of innovation in general and service innovation in particular. Identifying patterns and practices of innovation that varies systematically by sector/system and objective of innovation links the patterns of innovation literature more closely with the innovation management literature. Rather than seeing innovation as a discrete outcome variable affecting performance, this report contributes significantly to a more nuanced understanding of the relationship between innovation as an activity or practice and different types of performance measures as well as how objectives of innovation moderate these relationships.

A number of validity issues have been discussed in Section 3 such as the challenges from the sampling frame and variable selection in the Norwegian Innovation Survey. The first of these issues mainly challenge external validity whereas the second challenges internal validity. The internal validity of our findings, however, is strengthened by the inclusion of the qualitative study reported in Section 4. With the combined use of qualitative and quantitative methods we are fairly confident that the internal validity of our results is strong. Thus, the findings we

have reported reflect the innovation patterns and practices of Norwegian service firms. Whether these patterns and practices occur with the same extent and frequency that we have found in the population of Norwegian service firms is, however, an unresolved issue of external validity. External validity is on the other hand not so critical in our study as it is for the Norwegian Innovation Survey with its original purpose of capturing the degree and representative types of innovation among Norwegian firms. The same may be said about our study of the performance effects of innovation patterns and practices. We are not so concerned with the frequency with which these effects occur as we are with identifying the relationships themselves. An issue of relevance to the validity of our study of performance effects is the relatively moderate explained variance in our models. We have a considerable number of observations making even small shares of explained variance significant in the models. The relatively moderate explained variance means there are a number of factors outside our control that contribute to firm performance besides patterns and practices of innovation. While we control for size and sector/system, other explanatory variables outside our control contribute significantly, and these are also likely to vary considerably for example in other periods of time or research settings (e.g. countries). By pooling data over three periods of the Norwegian Innovation Survey, however, we to some extent, control for the time dependent factors outside direct control. Despite the validity issues discussed above, our findings are rather consistent when it comes to the following conclusions and implications:

1. Innovation in general and service innovation in particular must be understood as a series of activities and processes at the organizational, network and society level rather than as discrete outcomes of such activities and processes.
2. These activities and processes vary systematically between sectors/systems and as a consequence of formulated or implicit innovation objectives at the levels indicated in 1.
3. The performance effects of innovation must be understood in light of the innovation objectives at the levels indicated in 1.
4. The performance effects of innovation depend on the objectives of innovation as well as on sectors/systems so that no pattern or practice of innovation is universally optimal across sectors/systems and innovation objectives.
5. The implication of 4 is that no universal service innovation policy is optimal. Instead specific service innovation policies should be designed to match the innovation

patterns and practices of individual service sectors/systems as well as be adapted to the objectives of innovation at the relevant levels indicated in 1.

Our findings have both managerial and innovation policy implications. The first managerial implication reflects conclusion number 5 in the list above and suggests that there are no generic innovation pattern or practice that is universally optimal independent of the objective of innovation. This suggests that knowledge of alternative innovation practices are important and that these practices have to be developed both specifically to the context of the firm (service and innovation system), dynamically over time, and specifically to the objective of innovation. In general, this suggests that firms need repertoires of innovation practices similar to those reflected by the innovation patterns we have identified in this study and they need to develop the ability to switch between these patterns depending on the objective of innovation. This implication is also good news for supporters of the importance of innovation strategy (Teece, 2010) where innovation is conditionally adapted to the context of the firm and its innovation objectives. This is rather obvious considering the difference between the required innovation practices of a new firm in a growing service industry versus an incumbent in an established service industry. Our results, however, provides some guidelines for how this conditionality works. As an example, consider the difference we have identified in the effectiveness of innovation sourcing and collaboration upstream versus downstream depending on the objective of innovation summarized in Table 3.10.

The policy implications from conclusion number 5 in the list above suggest that service innovation policy must follow the principles of an innovation policy mix of the kind suggested by Borras and Edquist (2013). They suggest that: "*innovation policy instruments must be designed and combined into mixes in ways that address the problems of the innovation system*" (p. 1513). This transfers to all types of innovation systems, including, national, regional, sectoral and intra-, and inter-firm systems. "Problems" in Borras and Edquist (2013) may also be transferred into objectives of innovation, which not always correspond to "solving problems" – a mode of innovation that is rather unfamiliar in most service sectors/systems. Still, the consequences for policy are the same: Service innovation policy consists of a policy mix of complex instruments adapted to individual service sectors/systems to solve problems and utilize opportunities within their respective innovation systems to obtain specific goals. Both the policy itself and the instruments will have a rather

high level of complexity and be applied using a rather complex contingency model with a specification that extends beyond the purpose of this report. Some indications of contingency, however, may be given along the lines of horizontal versus vertical as well as demand versus supply side policies.

For services, a tendency towards preferring horizontal policy tools has developed in Norway. Two examples are the SkatteFunn and BiA instruments. They differ considerably, but they are both horizontal in the sense that they are available to all sectors/systems. This does not mean that they are available for all kinds of innovation practices and objectives, but that the supported practices and objectives are implicit in the instrument and thus, priorities to specific practices and objectives are left to the administrative rather than political policy makers. Vertical instruments are most often organized with a sectoral orientation, but verticality could be implemented with an orientation towards both specific service systems (e.g. retail service system spanning traditional private sectors like retail and transport as well as public sectors member of the system, such as municipalities) and particular innovation patterns or practices (e.g. the use of particular innovation sources of innovation beyond private firm and university project collaborations). Such vertical instruments will, however, have to be designed for specific innovation objectives, such as for example growth, and consequently they may have to support rather different innovation practices than the traditional innovation project practices required by most current instruments. One example exemplified from findings in workpackage 3 of the MISSING project could be vertical policy instruments facilitating the early takeover of growing firms by private equity firms or similar portfolio companies in specific service systems.

Another dimension of innovation policy is the focus on demand versus supply side instruments. A broad set of instruments is applied at the demand side, many of the regulatory or soft kind rather than the financial kind (Borras and Edguist, 2013). Some of the regulatory tools are also applied at the supply side, but here, financial tools are more frequently used, particularly in the form of project support of the kinds discussed above. Typically, market failure is more often addressed from the supply side than from the demand side. However, some of our findings indicate that demand side instruments may be underutilized to stimulate positive outcomes from service innovation. In the opportunity-oriented mode of innovation that we have discovered, well-developed markets are extremely important. Public

procurement is the demand side instrument that is most often mentioned in innovation policy, but still rather seldom is taken into active use to facilitate innovation. In Norway, reports have been written and analyses made to document that public procurement may very well be used within current regulations, but applications have focused rather limited areas of service innovation such as service design and digital service development. Norway also has an industry structure that has resulted in a biased distribution of innovation competence. For example, the consumer market competence we have found to be so important for service innovation is low. This may be seen from comparing the low or nonexistent number of international consumer brands in Norway compared to e.g. Sweden. However, demand side corrective actions to stimulate competence development in consumer oriented services is so far off from current innovation policy that it would be completely unrealistic to suggest the implementation of such instruments in Norway. Still, the example indicates the degree of radicalness that politicians need to be prepared for if taking the full register of possible innovation policies for service innovation seriously. In brief, there is a long way to go from an innovation policy adapted to an engineering oriented, commodity based economy to one adapted to a consumer oriented, service based economy with high instrument complexity. The first step on this journey is to accept some of the complexity of innovation practices, patterns and objectives of service sectors/systems and firms that have been revealed in this report.

## 6. Further research

The quantitative study of this report continues in the tradition of the patterns of innovation literature. It extends this literature, though, in linking patterns of innovation to firm performance. Due to the characteristics of the dataset, the number of patterns that are investigated for performance effects is limited (6). Also, the relationships between patterns and performance that is possible to investigate in our report are limited by the data available in the Norwegian Innovation Survey. Two extensions could be made in further research, one empirical and one other theoretical. The theoretical is primary, and we suggest that innovation patterns may be identified in existing theory of innovation and innovation management. For example, there is a rich literature on patterns of exploration and exploitation, the so-called ambidexterity literature (Gibson and Birkinshaw, 2004), and on their effects on performance (He and Wong, 2004). Innovation study data like the Norwegian Innovation Survey, however, is not based on this kind of theory. Another example from the innovation management literature is the recent set of theories on dynamic capabilities (Teece, 2007), and on their measurement and effects on firms' innovation performance (Pavlou and El Sawy, 2011). This kind of theoretical development could be used to defend revisions of innovation study surveys like the Norwegian Innovation Survey. Results could then provide more guidance to both innovation management and innovation policy because a theoretical model validated empirically would have been used as an explanatory basis for recommendations. The empirical extension would follow from the theoretical in that revisions of sampling frames and measurement would follow from the underlying theoretical model or frameworks. Such developments would free the sampling frame of the heritage of the "Frascati" perspective on innovation and require more representative sampling frames to be applied. Also, measurement would be based on research and scale theory so that there would be a closer connection between accepted measurement scales applied in innovation management and the more empirical variables focused in innovation studies. This would further bridge the two research fields so that they would not be as separated as that indicated in Fagerberg et al. (2012).

The qualitative study fits well within a recently established tradition of innovation practice studies focusing on detailed studies within particular types of service firms (Zomerdijk and Voss, 2011; Aas et al., 2015) and service systems (Perks et al., 2012; McColl-Kennedy at al., 2012). This tradition continues in covering an increasingly larger set of such firms and

systems. As the number of detailed studies increase, however, there is a need to start integrating these qualitative results into a more consistent framework or model of the comparative differences between findings. As we have seen from our own results, we find a number of contingencies in our quantitative study, but these contingencies are more difficult to identify in the qualitative study where commonalities rather than differences stand out. Developing a contingency framework for these evolving qualitative studies in the innovation management literature would take this recently established research path one step further and improve its relevance in terms of managerial implications.

**References**

Aas, T. H., & Pedersen, P. E. (2010). The firm-level effects of service innovation: a literature review. *International Journal of Innovation Management*, *14*(05), 759-794.

Aas, T. H., & Pedersen, P. E. (2011). The impact of service innovation on firm-level financial performance. *The Service Industries Journal*, *31*(13), 2071-2090.

Aas, T. H., Breunig, K. J., Hydle, K. M., & Pedersen, P. E. (2015). Innovation Management Practices in Production-Intensive Service Firms. *International Journal of Innovation Management*, 1550055.

Amara, N., Landry, R., & Traoré, N. (2008). Managing the protection of innovations in knowledge-intensive business services. *Research policy*, *37*(9), 1530-1547.

Antonelli, C. (1999). The evolution of the industrial organisation of the production of knowledge. *Cambridge journal of economics*, *23*(2), 243-260.

Barczak, G., Griffin, A., & Kahn, K. B. (2009). Perspective: trends and drivers of success in NPD practices: results of the 2003 PDMA best practices study. *Journal of product innovation management*, *26*(1), 3-23.

Barczak, G., Kahn, K. B., & Moss, R. (2006). An Exploratory Investigation of NPD Practices in Nonprofit Organizations. *Journal of Product Innovation Management*, *23*(6), 512-527.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, *17*(1), 99-120.

Barras, R. (1986). Towards a theory of innovation in services. *Research policy*, 15(4), 161-173.

Bettiol, M., Di Maria, E., & Grandinetti, R. (2011). Market extension and knowledge management strategies of knowledge-intensive business services. *Knowledge Management Research & Practice*, *9*(4), 305-314.

Borrás, S., & Edquist, C. (2013). The choice of innovation policy instruments. *Technological Forecasting and Social Change*, *80*(8), 1513-1522.

Bowden, J. (2007). The rise of the ICT-dependent home-based travel agents: mass tourism to mass travel entrepreneurship. *Information Technology & Tourism*, *9*(2), 79-97.

Branstad, A., Brekke, T. and Pedersen, P. E. (2014). *Exploring the innovation systems of service innovation: A literature review and guidelines for service innovation policies*. Paper presented at RIP 2014 - 9th Regional Innovation Policies Conference, Stavanger, Norway, October, 16-17.

Brentani, U. (1989). Success and failure in new industrial services. *Journal of Product Innovation Management*, *6*(4), 239-258.

Carlborg, P., Kindström, D., & Kowalkowski, C. (2014). The evolution of service innovation research: a critical review and synthesis. *The Service Industries Journal*, 34(5), 373-398.

Castellacci, F. (2008). Technological paradigms, regimes and trajectories: Manufacturing and service industries in a new taxonomy of sectoral patterns of innovation. *Research Policy*, *37*(6), 978-994.

Chang, Y. C., Linton, J. D., & Chen, M. N. (2012). Service regime: An empirical analysis of innovation patterns in service firms. *Technological forecasting and social change*, *79*(9), 1569-1582.

Cooke, P., Uranga, M. G., & Etxebarria, G. (1997). Regional innovation systems: Institutional and organisational dimensions. *Research policy*, *26*(4), 475-491.

Cook, D. P., Goh, C. H., & Chung, C. H. (1999). Service typologies: a state of the art survey. *Production and Operations Management*, *8*(3), 318-338.

Coombs, R., Miles, I., (2000). Innovation, measurement and services: the new problematic. In: Metcalfe, J.S., Miles, I. (Eds.), *Innovation Systems in the Service Economy. Measurement and Case Study Analysis*. Kluwer Academic Publishers, Boston, pp. 85-103.

Cooper, R. G. (2008). Perspective: The Stage-Gate® Idea-to-Launch Process-Update, What's New, and NexGen Systems. *Journal of Product Innovation Management*, *25*(3), 213-232.

Crossan, M. M., & Apaydin, M. (2010). A multi‐dimensional framework of organizational innovation: A systematic review of the literature. *Journal of management studies*, 47(6), 1154-1191.

Davidson, W. R. and Johnson, N. E. (1981). Portfolio theory and the retail life cycle. In Stampfl, R. W. and Hirschman, E. C. (Eds), *Theory in Retailing: Traditional and Non-traditional Sources*, American Marketing Association, Chicago, IL, pp. 51-63.

Hertog, P. D. (2000). Knowledge-intensive business services as co-producers of innovation. *International Journal of Innovation Management*, *4*(04), 491-528.

De Jong, J. P., & Marsili, O. (2006). The fruit flies of innovations: A taxonomy of innovative small firms. *Research policy*, *35*(2), 213-229.

De Jong, J. P., & Vermeulen, P. A. (2003). Organizing successful new service development: a literature review. *Management decision*, *41*(9), 844-858.

De Jong, J. P., Bruins, A., Dolfsma, W., & Meijaard, J. (2003). Innovation in service firms explored: what, how and why. *EIM Business Policy Research, Strategic Study B200205*, 18.

Djellal, F., Gallouj, F., & Miles, I. (2013). Two decades of research on innovation in services: Which place for public services? *Structural Change and Economic Dynamics*, *27*, 98-117.

Dobni, C. B. (2008). Measuring innovation culture in organizations: The development of a generalized innovation culture construct using exploratory factor analysis. *European Journal of Innovation Management*, *11*(4), 539-559.

Dooley, K. J., Subra, A., & Anderson, J. (2002). Adoption rates and patterns of best practices in new product development. *International Journal of Innovation Management*, *6*(01), 85-103.

Drejer, I. (2004). Identifying innovation in surveys of services: a Schumpeterian perspective. *Research policy*, *33*(3), 551-562.

Droege, H., Hildebrand, D., & Heras Forcada, M. A. (2009). Innovation in services: present findings, and future pathways. *Journal of Service Management*, *20*(2), 131-155.

Edler, J., & Georghiou, L. (2007). Public procurement and innovation—Resurrecting the demand side. *Research policy*, *36*(7), 949-963.

Edquist, C. (2005). Systems of innovation. In Fagerberg, J., Mowery, D. C., & Nelson, R. R. (2006). *The Oxford handbook of innovation*.

Chaminade, C., & Edquist, C. (2006). From theory to practice. The use of the systems of innovation approach in innovation policy. *Innovation, Learning and Institutions.* Eds. J. Hage, M. de Meeus. Oxford: Oxford University Press.

Erramilli, M. K., & Rao, C. P. (1990). Choice of foreign market entry modes by service firms: role of market knowledge. *MIR: Management International Review*, 135-150.

Evangelista, R. (2000). Sectoral patterns of technological change in services. *Economics of innovation and new technology*, *9*(3), 183-222.

Evangelista, R., & Savona, M. (2003). Innovation, employment and skills in services. Firm and sectoral evidence. *Structural Change and Economic Dynamics*, *14*(4), 449-474.

Fagerberg, J., Mowery, D. C., & Nelson, R. R. (2005). *The Oxford handbook of innovation*.

Fagerberg, J., Fosaas, M., & Sapprasert, K. (2012). Innovation: Exploring the knowledge base. *Research policy*, *41*(7), 1132-1153.

Flikkema, M., Jansen, P., & Van Der Sluis, L. (2007). Identifying neo-Schumpeterian innovation in service firms: A conceptual essay with a novel classification. *Economics of Innovation and New Technology*, *16*(7), 541-558.

Froehle, C. M., & Roth, A. V. (2007). A resource-process framework of new service development. *Production and Operations Management*, *16*(2), 169.

Froehle, C. M., Roth, A. V., Chase, R. B., & Voss, C. A. (2000). Antecedents of new service development effectiveness an exploratory examination of strategic operations choices. *Journal of Service Research*, *3*(1), 3-17.

Gallouj, F. (1999). Les trajectoires de l'innovation dans les services: vers un enrichissement des taxonomies évolutionnistes. *Economies et Sociétés, EGS*, *1*(5), 143-169.

Gibson, C. B., & Birkinshaw, J. (2004). The antecedents, consequences, and mediating role of organizational ambidexterity. *Academy of management Journal*, *47*(2), 209-226.

Grewal, D., Ailawadi, K. L., Gauri, D., Hall, K., Kopalle, P., & Robertson, J. R. (2011). Innovations in retail pricing and promotions. *Journal of Retailing*, *87*, S43-S52.

Hall, M. C., & Allan, W. (2008). *Tourism and innovation*. Routledge.

Hammond, M. M., Neff, N. L., Farr, J. L., Schwall, A. R., & Zhao, X. (2011). Predictors of individual-level innovation at work: A meta-analysis. *Psychology of Aesthetics, Creativity, and the Arts*, 5(1), 90.

He, Z. L., & Wong, P. K. (2004). Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organization science*, *15*(4), 481-494.

Hipp, C., & Grupp, H. (2005). Innovation in the service sector: The demand for service-specific innovation measurement concepts and typologies. *Research policy*, *34*(4), 517-535.

Hjalager, A. M. (2010). A review of innovation research in tourism. *Tourism management*, *31*(1), 1-12.

Hollanders, H. (2015). *2015 European Service Innovation Scoreboard (ESIS) – Key findings*. Report. European Service Innovation Centre, January.

Hollenstein, H. (2003). Innovation modes in the Swiss service sector: a cluster analysis based on firm-level data. *Research policy*, 32(5), 845-863.

Hristov, L., & Reynolds, J. (2015). Perceptions and practices of innovation in retailing: Challenges of definition and measurement. *International Journal of Retail & Distribution Management*, *43*(2), 126-147.

Jensen, M. B., Johnson, B., Lorenz, E., & Lundvall, B. Å. (2007). Forms of knowledge and modes of innovation. *Research policy*, 36(5), 680-693.

Kastalli, I. V., & Van Looy, B. (2013). Servitization: Disentangling the impact of service business model innovation on manufacturing firm performance. *Journal of Operations Management*, *31*(4), 169-180.

Kesting, P., & Parm Ulhøi, J. (2010). Employee-driven innovation: extending the license to foster innovation. *Management Decision*, *48*(1), 65-84.

Carlborg, P., Kindström, D., & Kowalkowski, C. (2014). The evolution of service innovation research: a critical review and synthesis. *The Service Industries Journal*, *34*(5), 373-398.

Kotler, P. (2003). *Marketing management*. Prentice-Hall. New Jersey.

Kuester, S., Schuhmacher, M. C., Gast, B., & Worgul, A. (2013). Sectoral Heterogeneity in New Service Development: An Exploratory Study of Service Types and Success Factors. *Journal of Product Innovation Management*, *30*(3), 533-544.

Laursen, K., & Salter, A. (2006). Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms. *Strategic management journal*, *27*(2), 131-150.

Leiper, N. (1979). The framework of tourism: Towards a definition of tourism, tourist, and the tourist industry. *Annals of tourism research*, *6*(4), 390-407.

Lovelock, C., & Gummesson, E. (2004). Whither services marketing? In search of a new paradigm and fresh perspectives. *Journal of service research*, *7*(1), 20-41.

Lusch, R. F., & Nambisan, S. (2015). Service innovation: A service-dominant logic perspective. *Mis Quarterly*, *39*(1), 155-175.

Malerba, F. (2002). Sectoral systems of innovation and production. *Research policy*, *31*(2), 247-264.

Martin Jr, C. R., & Horne, D. A. (1993). Services innovation: successful versus unsuccessful firms. *International Journal of Service Industry Management*, 4(1), 49-65.

Martinez-Fernandez, M. C., & Miles, I. (2006). Inside the software firm: co-production of knowledge and KISA in the innovation process. *International Journal of Services Technology and Management*, *7*(2), 115-125.

McCarthy, E. J. (1964). *Basic Marketing.* IL: Richard D. Irwin.

McColl-Kennedy, J. R., Vargo, S. L., Dagger, T. S., Sweeney, J. C., & van Kasteren, Y. (2012). Health care customer value cocreation practice styles. *Journal of Service Research*, 15(4), 370-389.

McDougall, G. H., & Snetsinger, D. W. (1990). The intangibility of services: measurement and competitive perspectives. *Journal of Services Marketing*, *4*(4), 27-40.

Miles, I. (2005). Innovation in services. *The Oxford handbook of innovation*, *16*, 433-458.

Miozzo, M., & Grimshaw, D. (2005). Modularity and innovation in knowledge-intensive business services: IT outsourcing in Germany and the UK. *Research policy*, *34*(9), 1419-1439.

Miozzo, M., & Soete, L. (2001). Internationalization of services: a technological perspective. *Technological Forecasting and Social Change*, *67*(2), 159-185.

Muller, E., & Doloreux, D. (2009). What we should know about knowledge-intensive business services. *Technology in Society*, *31*(1), 64-72.

Muller, E., & Zenker, A. (2001). Business services as actors of knowledge transformation: the role of KIBS in regional and national innovation systems. *Research policy*, *30*(9), 1501-1516.

Neely, A. (2008). Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research*, *1*(2), 103-118.

Nelson, R. R. (Ed.) (1993). *National innovation systems: a comparative analysis*. Oxford University Press.

Nieto, M. J., & Santamaría, L. (2007). The importance of diverse collaborative networks for the novelty of product innovation. *Technovation*, *27*(6), 367-377.

Nijssen, E. J., Hillebrand, B., Vermeulen, P. A., & Kemp, R. G. (2006). Exploring product and service innovation similarities and differences. *International Journal of Research in Marketing*, *23*(3), 241-251.

Nygaard, A., & Utgård, J. (2011). *En kunnskapsbasert varehandel*. Oslo, BI.

Oliveira, P., & von Hippel, E. (2011). Users as service innovators: The case of banking services. *Research policy*, *40*(6), 806-818.

Pantano, E. (2014). Innovation drivers in retail industry. *International Journal of Information Management*, *34*(3), 344-350.

Pavitt, K. (1984). Sectoral patterns of technical change: towards a taxonomy and a theory. *Research policy*, *13*(6), 343-373.

Pavlou, P. A., & El Sawy, O. A. (2011). Understanding the elusive black box of dynamic capabilities. *Decision Sciences*, *42*(1), 239-273.

Perks, H., Gruber, T., & Edvardsson, B. (2012). Co‐creation in radical service innovation: a systematic analysis of microlevel processes. *Journal of Product Innovation Management*, 29(6), 935-951.

Picot, A., & Wernick, C. (2007). The role of government in broadband access. *Telecommunications Policy*, 31(10), 660-674.

Pittaway, L., Robertson, M., Munir, K., Denyer, D., & Neely, A. (2004). Networking and innovation: a systematic review of the evidence. *International Journal of Management Reviews*, 5(3‐4), 137-168.

Porter, M. E. (1980). *Competitive strategy: Techniques for analyzing industries and competition.* NY, The Free Press.

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of interactive marketing*, *18*(3), 5-14.

Quinn, B., McKitterick, L., McAdam, R., & Brennan, M. (2013). Innovation in small-scale retailing: a future research agenda. *The International Journal of Entrepreneurship and Innovation*, *14*(2), 81-93.

Reynolds, J., & Hristov, L. (2009). Are there barriers to innovation in retailing? *The International Review of Retail, Distribution and Consumer Research*, *19*(4), 317-330.

Reynolds, J., Howard, E., Cuthbertson, C., & Hristov, L. (2007). Perspectives on retail format innovation: relating theory and practice. *International Journal of Retail & Distribution Management*, *35*(8), 647-660.

Sjøholt, P. (2001). *Transfer of managerial knowledge by business related services*. Presented at RESER 11. Grenoble, France, October, 25-26.

Soete, L., & Miozzo, M. (1989). *Trade and Development in Services: A Technical Perspective*. Maastricht Economic Research Institute on Innovation and Technology.

Sorescu, A., Frambach, R. T., Singh, J., Rangaswamy, A., & Bridges, C. (2011). Innovations in retail business models. *Journal of Retailing*, *87*, S3-S16.

Stamboulis, Y., & Skayannis, P. (2003). Innovation strategies and technology for experience-based tourism. *Tourism management*, *24*(1), 35-43.

Sundbo, J., & Gallouj, F. (2000). Innovation as a loosely coupled system in services. *International Journal of Services Technology and Management*, *1*(1), 15-36.

Sundström, M., & Reynolds, J. (2014). Final Report from the Expert Group on Retail Sector Innovation.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic management journal*, *28*(13), 1319-1350.

Teece, D. J. (2010). Business models, business strategy and innovation. *Long range planning*, *43*(2), 172-194.

Teece, D. J. (2011). Dynamic Capabilities: A guide for managers. *Ivey Business Journal*, *75*(2), 29-32.

Tether, B., & Metcalfe, J. S. (2003). *Services and 'Systems of Innovation'*. Centre for Research on Innovation and Competition, University of Manchester.

Tether, B. S., & Tajar, A. (2008). The organisational-cooperation mode of innovation and its prominence amongst European service firms. *Research policy*, 37(4), 720-739.

Tidd, J. B., & Bessant, J. (2013). *Managing Innovation: Integrating Technological, Market and Organizational Change*. Chicester: John Wiley.

Tordoir, P. P. (1994). Transactions of professional business services and spatial systems. *Tijdschrift voor economische en sociale geografie*, *85*(4), 322-332.

Trigo, A., & Vence, X. (2012). Scope and patterns of innovation cooperation in Spanish service enterprises. *Research Policy*, *41*(3), 602-613.

Vargo, S.L. and Lusch, R.F. (2014). Inversions of service-dominant logic. *Marketing Theory*, 14(3), 239-248.

Vargo, S. L., Wieland, H., & Akaka, M. A. (2015). Innovation through institutionalization: A service ecosystems perspective. *Industrial Marketing Management*, *44*, 63-72.

Wilhelmsen, L. and Berrios, C. (2015). *Innovasjon i norsk næringsliv 2010-1012*. Rapport 2015/6. Oslo: Statistisk sentralbyrå.

Zeithaml, V. A., Parasuraman, A., & Berry, L. L. (1985). Problems and strategies in services marketing. *The Journal of Marketing*, 33-46.

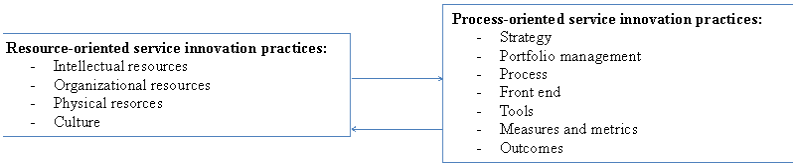
Zomerdijk, L. G., & Voss, C. A. (2011). NSD processes and practices in experiential services. *Journal of product innovation management*, *28*(1), 63-80.

## Appendix A – Interview guide of the qualitative study (in Norwegian)

| **Intervjuguide** | | |
|---|---|---|
| • Kort presentasjon av prosjektet og intervjuene vi gjør<br>• Taushetserklæring og bruk av intervjuet | | |
| **Person** | **Individ** | • Navn<br>• Funksjon<br>• Sted<br>• Selskap |
| | **Bakgrunn (option)** | • Kan du fortelle litt om deg selv? |
| | **Funksjon (option)** | • Kan du fortelle om organisasjonen du evt arbeider for/i, hva din rolle er i den? |

**Innovasjonen – Først tenkte jeg å snakke litt om selve innovasjonen…**

| **Dimensjon** | **Spørsmål** | **Oppfølgingsspørsmål** |
|---|---|---|
| **Innovasjonen** | • Hva består denne innovasjonen av?<br>• Hva er bakgrunnen og historien til innovasjonen? | • Angi hva innovasjonens kjerne er<br>• Få en gjennomgang av historien, bli kjent |
| **Innovasjonens karakter** | • Hva er hovedelementet i innovasjonen, produkt, tjeneste, prosess, teknologi, forretningsmodell, organisasjon, marked, merke, konsept?<br>• Består denne innovasjonen av flere deler, f. eks. har utviklet seg i flere deler? | • Hovedelementet<br>• Probe med innovasjonstype<br>• Probe med utviklingen, deler og kompleksitet |




**Så fortsetter vi med innovasjonen og tar for oss selve innovasjonsprosessen…**

| **Dimensjon: Prosess** | **Spørsmål** | **Oppfølgingsspørsmål** |
|---|---|---|
| | | |
| **Process – Front end** | • Hvor kom innovasjonsideen fra?<br>• Er det typisk at ideene om nye tjenester/innovasjoner kommer på denne måten?<br>• Vil du si innovasjonen kommer fra et problem/utfordring eller en mulighet? | • Var ideen…<br>• … et resultat av en formell «ideskapingsprosess» i bedriften (brainstorming, trendanalyse, markedsundersøkelser, FoU etc.)? Dersom markedsundersøkelser ble brukt, hva slags «markedsundersøkelseteknikk» ble brukt (kvalitativ/kvantitativ kundeobservasjon, markeds/kundesegmentering, swot analyser, prisanalyser, fokusgrupper, etnografi, lead user analyse,…)<br>• … et resultat av en mer uformell «ideskapingsprosess» i bedriften (kanskje gjennom at ansatte får avsatt tid til å komme med ideer)<br>• Hadde ideen sin opprinnelse utenfor bedriften? I tilfelle fra hvor (kunder, leverandører, konkurrenter, FoU miljøer, konsulentmiljøer…) og hvordan ble i så fall ideen fanget opp av bedriften? Ble det for eksempel brukt noen spesielle former for sosiale media for å fange opp ideen? (blog, twitter, youtube, diskusjonsforum…)<br>• Problemorientert eller mulighetsorientert innovasjon. Probe Edqvist (2010): Teknologiske mulighet/problem, Markedsmulighet/problem, |

| | | Institusjonell eller organisatorisk problem/mulighet |
|---|---|---|
| **Process – Implementation and portfolio management** | • Hvordan ble ideen fulgt opp og implementert videre?<br>• Hva var bakgrunnen for at dere valgte å investere i ideen?<br>• Var innovasjonsbeslutningen isolert til organisasjonen eller skjedde den i et nettverk?<br>• Ble investeringsbeslutningen revurdert i gjennomføringsfasen av prosjektet?<br>• Er det denne prosedyren bedriften typisk benytter når den tar innovasjonsbeslutninger? | • Oppfølgingsspørsmål knyttet til innovasjonsbeslutningen(e):<br>• Ble det brukt noen bestemte metodikker for å anslå verdien av ideen før dere valgte å investere i den for eksempel:<br>• finansielle metoder (for eksempel PP, ROI, nåverdimetode, monte carlo, real option etc...)<br>• Ble det vurdert faktorer som at det kan være viktig å ha en fornuftig balanse av prosjekter (feks en miks av høyrisiko vs lavrisiko), og et fornuftig antall prosjekter, før investeringsbeslutningen ble tatt?<br>• Ble grunnlaget for investeringsbeslutningen benyttet til noe annet enn å ta selve investeringsbeslutningen? (prioritere, fastsette prosjektmål, lage prosjektplaner etc.)<br>• Hvem (hvilken funksjon i bedriften) lagde grunnlaget for investeringsbeslutningen?<br>• Hvem (hvilken funksjon i bedriften) tok investeringsbeslutningen?<br>• Dersom investeringsbeslutningen ble revurdert i gjennomføringsfasen, hvilke metodikker ble da benyttet? (samme som ex-ante, eller noen andre?) Og ble prosjektet målt/vurdert opp mot andre innovasjonsaktiviteter, eller kanskje mot helt andre områder i bedriften?<br><br>• Oppfølgingsspørsmål knyttet til om prosedyren er «typisk»:<br>- Følges den samme prosedyren for alle typer tjenesteinnovasjonsprosjekter (eller er det en forskjellig evalueringsprosedyre for eksempel på bakgrunn av antatt prosjektstørrelse, tjenestetype, eller annet)<br>- Er det tilfredshet i bedriften knyttet til hvordan investeringsbeslutninger innen tjenesteinnovasjonsfeltet tas?<br>- Hvor stor andel av ideene blir besluttet å gjennomføre? |
| **Process - Organization** | • Hvordan er utviklingsarbeidet organisert?<br>• Hvordan er sammenhengen mellom innovasjonsarbeidet og løpende produksjon/levering organisert? | • Som prosjekt eller som egen organisasjonsenhet, del av linjeansvaret eller hva?<br>• Parallell organisert, prosjekter, isolering, integrering?<br>• Hvem ledet utviklingsprosessen? Ble det pekt ut en formell prosjektleder? I så fall; var dette en «profesjonell» prosjektleder som har som eneste oppgave å lede innovasjonsprosjekter, eller var det en prosjektleder som også har andre oppgaver?<br>• Har bedriften en egen «innovasjons- eller utviklingsavdeling» som ledet/gjennomførte prosessen, eller var det andre avdelinger, i tilfelle hvilke? Var det for eksempel markedsavdelingen/tilsv. eller teknisk avdeling som ledet?<br>• Var det ulike funksjoner i bedriften/utenfor bedriften som var involvert i forskjellige deler av prosessen? (var det for eksempel slik at en avdeling gjennomførte et steg, så overtok neste avdeling etc., var det eksterne aktører involvert i deler av prosessen, i tilfelle; i hvilke deler av prosessen var eksterne involvert, og hvilken type aktører var involvert, f.eks. leverandører/kunder/konkurrenter/ konsulenter/FoU miljøer etc.)<br>• Ble det etablert et prosjektteam? Hva slags insentiver/belønninger ble brukt for å bedre ytelsen til prosjektteamet? |
| **Process – (Development) Process & Tools** | • Beskriv hvordan prosessen for å utvikle den nye tjenesten var, altså hvilke steg ble gjennomført fra dere besluttet å utvikle tjenesten til den ble kommersialisert?<br>• Ble det brukt noen bestemte utviklingsverktøy/-metodikker i løpet av utviklingsprosessen?<br>• Er det slik utviklingsprosessen vanligvis ser ut? | • Var det definert såkalte «decision gates» underveis i prosessen, der gjennomføring av prosjektet ble revurdert? I så fall, var disse «gatene» forhåndsbestemt? Hva var det som gjorde at disse beslutningspunktene ble definert? Hva skulle til for å «komme gjennom» et beslutningspunkt? Er beslutningspunktene bare «go/no go», eller er det andre former for beslutninger som kan tas i gatene (for eksempel endring av «kurs»)? Hvem tar beslutninger? Hvor vanlig er det at prosjekter som er i gjennomføringsfasen stanses? Hvor i prosessen stanses de vanligvis?<br>• Er det en standardprosess som følges? Eller er prosessen forskjellig fra gang til gang, eller er den forskjellig for forskjellige innovasjonstyper (radikale vs inkrementelle, forskjellige tjenestetyper)<br>• Er prosessen formell eller uformell. Hvis den er formell, hvor ofte blir den redesignet? Hva er bakgrunnen for å redesigne prosessen? Hvem designer prosessen?<br>• Hvilke utviklingsverktøy/-metodikker ble benyttet, f.eks: Alpha testing (tidlig test på brukere), Pilot-test, Online focus grupper, Six Sigma, Triz, Portfolio management SW, Project management software, Simuleringssystemer, Etc…<br>• Hva er årsaken til at ikke flere verktøy/metodikker benyttes? |

| | | |
|---|---|---|
| | | (f.eks. manglende finansiering, vanskelig å beregne ROI, for vanskelig å implementere, krever for mye trening, vanskelig å finne verktøy som egner seg, har ikke kjennskap til at det finnes verktøy, dårlige erfaringer med verktøy, verktøyene som brukes dekker behovene etc…) |
| **Process - Innovasjonsmål** | • Hva var eller er målet med innovasjonen?<br>• Hva er forventede effekter hvis dere ikke har noe uttrykt overordnet mål?<br>• Måler dere om dette målet er nådd spesielt? | • Mål og effekter– Lønnsomhet, markedsandel/markedsmakt, konkurransefortrinn, strategisk posisjon, erstatte produkter eller tjenester, endre merkeopplevelsen, gå inn i nye markeder, forbedre kvalitet, øke kapasitet, forbedre HMS, oppfylle krav…. |
| **Process – metrics & measures** | • Hvordan gikk dere frem for å evaluere/måle måloppnåelse og gevinstrealisering av dette prosjektet (etter gjennomføring)? (Med andre ord; hva er grunnlaget for at du mener prosjektet var vellykket?) | • Brukes det et forhåndsdefinert rammeverk eller verktøy (for eksempel BSC) for å bestemme hva som bør/skal måles?<br>• Er ex post målingen en måling som gjøres like etter prosjektavslutning eller gjøres det målinger også lenge etter prosjektavslutning? Hvordan måles typiske svært langsiktige effekter (for eksempel økt konkurransestyrke, forbedret omdømme, læringseffekter etc.)?<br>• Hvorfor måler bedriften prosjektytelse etter at prosjekter er gjennomført? Er det noen typiske handlinger som iverksettes etter slike målinger (for eksempel oppstart av nye prosjekter, kompetansebygging, endring av strategi/mål etc.)<br>• Hvem er det som gjennomfører ex-post evalueringen? (er det samme gruppen som gjennomførte prosjektet eller er det en annen "ekstern" gruppe?) |
| **Process - Strategy** | • Hva er bedriftens innovasjonsstrategi, dvs. hva er det overordnede målet med bedriftens innovasjonsaktiviteter?<br>• Hvordan måler dere om de strategiske innovasjonsmålene er oppnådd?<br>• Har dere noen bestemt strategi for å beskytte innovasjonen, merke, patent, hemmelighold, forsprang, eller annet? | • Hvilken type innovasjonsstrategi (prospector, analyser, defender eller reactor) samsvarer mest med bedriftens innovasjonsstrategi?<br>• Hva er sammenhengen mellom bedriftens overordnede strategi og innovasjonsstrategien? Hvor viktig er (tjeneste)innovasjon for å nå bedriftens langsiktige (strategiske) mål. Er det definert at en bestemt andel av inntektene skal komme fra nye tjenester?<br>• Hvor store ressurser (midler/årsverk etc.) bruker bedriften på innovasjonsaktiviteter?<br>• Hvordan har bedriften gått frem for å fastsette disse strategiske målene? Hvor ofte revideres målene? Er det noen spesiell hendelse som skal til for at målene revideres? Kan for eksempel nye ideer føre til at strategien endres? Eller må nye ideer alltid tilpasses strategien? Hvem beslutter at målene må revideres?<br>• Er det stor enighet om innovasjonsstrategien i bedriften?<br>• Hvem har ansvaret for at de strategiske innovasjonsmålene nås?<br>• Hvordan måles oppnåelse av strategiske innovasjonsmål?<br>• Benyttes et bestemt målesystem/-verktøy/-metodikk for å måle strategisk måloppnåelse, for eksempel BSC (balanced scorecard), eller noe tilsvarende?<br>• Hvor ofte måles/evalueres strategisk måloppnåelse?<br>• Hvem gjennomfører målinger/evalueringer av strategisk måloppnåelse?<br>• Hva er typiske tiltak som iverksettes som resultat av slike målinger/evalueringer (endring av strategi, etc.)? |

**Ressursene, hva som skulle til hos entreprenøren og i entreprenørorganisasjonen (corporate system and resources)**

| **Dimensjon: Ressurs** | **Spørsmål** | **Oppfølgingsspørsmål** |
|---|---|---|
| **Resource - Intellectual resources** | • Forutsetter innovasjonen bestemte kunnskapsressurser? I såfall hvilke?<br>• Er det spesialisert eller tverrfaglig kunnskap som er relevant?<br>• Finnes alle kunnskapsresurser innenfor organisasjonen, hvor utenfor i så fall (kommer tilbake til dette)?<br>• Hvordan går dere frem for å fremskaffe den nødvendige kunnskapen/ferdighetene for å nå (tjeneste) | • Hva slags type kompetanse/kunnskap, er det STI eller DUI type kunnskap,<br>• Hva vektlegges når nye ansatte rekrutteres?<br>• Hvilke tiltak gjennomføres for å øke/vedlikeholde de ansattes kunnskaper/ferdigheter? Retter tiltakene seg mot alle ansatte eller er det spesielle grupper som prioriteres i forbindelse med kompetanseheving innen innovasjonsområdet?<br>• Hvordan går bedriften frem for å måle/evaluere om den har ansatte med «riktig» kompetanse?<br>• På hvilken måte brukes kompetanse på utsiden av bedriften i forbindelse med tjenesteinnovasjonsaktiviteter?<br>• Gjennomfører bedriften såkalte systemiske innovasjoner (innovasjoner i hele verdinettverket) og hvordan fremskaffes/vedlikeholdes i så fall kunnskap for dette?<br>• Hvordan fremskaffes/vedlikeholdes kunnskap om regulatoriske betingelser for innovasjon i bedriften? |

| | | |
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| | innovasjonsmålene? | |
| **Resource - Organizational resources** | • Forutsetter innovasjonen eller implementeringen av den bestemte organisasjonsressurser?<br>• Kan innovasjonen bare realiseres gjennom en organisasjon?<br>• Er organisasjonsressursen isolert til virksomheten eller er det en nettverksressurs?<br>• Hvilken rolle spiller ulike ledere og enheter for innovasjonens implementering?<br>• Hvordan er forholdet mellom leveransesystemet for tjenesten og innovasjonssystemet, det som endrer det?<br>• Hvordan går dere frem for å etablere/vedlikeholde en organisasjon som fremmer (tjeneste)innovasjon? | • Dynamiske kapabiliteter: Fange muligheter og trusler og forme disse, utnytte muligheter (Hvordan er bedriftens organisasjonsstruktur (er den for eksempel hierarkisk eller mer team-basert matrise etc..)? Hvordan er roller og ansvar spesifisert? Hvordan er rapporteringslinjene?<br>• Hvilke deler av organisasjonen involveres i innovasjonsaktiviteter, og på hvilken måte? Hva med ansatte i front-line, blir de involvert, og eventuelt hvordan? Er de som leverer tjenesten til daglig også ansvarlig for å forbedre den? Er det en egen avdeling eller noe tilsvarende som har ansvar for innovasjon? Hvordan er samarbeidet mellom avdelingene?<br>• Involveres andre organisasjoner i innovasjonsaktivitetene? I tilfelle hvordan?<br>• Hvordan har bedriften gått frem for å lage denne organisasjonsstrukturen? Har det vært vektlagt at det er viktig at organisasjonsstrukturen legger til rette for oppnåelse av innovasjonsmålene?<br>• Er det vanlig at personer jobber på samme sted i organisasjonsstrukturen over lang tid, eller er det en rotasjon?<br>• I hvilken grad og på hvilken måte involverer ledelsen seg i saker som omhandler innovasjon?<br>• Hvordan går bedriften frem for å bestemme hvilke prosesser/prosedyrer (fortrinnsvis innen innovasjonsområdet) som trenger en formell beskrivelse?<br>• Hvilke insentivsystemer er etablert, og hva er bakgrunnen?<br>• Hvordan går dere frem for å evaluere om organisasjonen og strukturen legger til rette for oppnåelse av innovasjonsmålene? |
| **Resources – Physical resources** | • Hvilke fysiske ressurser var avgjørende for innovasjonen?<br>• Hvordan går dere frem for å etablere/vedlikeholde de fysiske ressurser (utforming av kontorer, lokalisering av kontorer, IKT, finansielle midler etc.) som fremmer (tjeneste)innovasjon? | • Fysiske ressurser: kontorer, lokalitet, teknologi, finansielle ressurser, markedsadgang/nærhet, Hvilke IKT systemer har bedriften, og brukes disse bevisst til innovasjonsformål? Hva gjør bedriften for at ansatte skal få full nytte av IKT systemene?<br>• Har det vært viktig for bedriften å utforme kontorer og kontorlandskapet på en slik måte at det skal fremme innovasjon, i tilfelle hvordan?<br>• Har lokaliseringen av bedriften vært viktig i et innovasjonsperspektiv? I tilfelle hvordan? Har for eksempel nærhet til samarbeidspartnere vært viktig?<br>• Hva gjør bedriften for å få tilstrekkelig finansielle ressurser avsatt til innovasjon? Er finansielle ressurser ofte et hinder for innovasjon i virksomheten?<br>• Hvordan går dere frem for å evaluere om de fysiske ressursene legger til rette for oppnåelse av innovasjonsmålene? |
| **Resources - Culture** | • Hva kjennetegner kulturen i selskapet, og hvordan fremmer eller hemmer kulturen innovasjon, og hvordan går dere frem for å vedlikeholde/endre kulturen? | • I hvilken grad er dere åpne for at konflikter kan forekomme i innovasjonsarbeidet?<br>• Blir det å gjøre feil sett på som en naturlig del av innovasjonsprosessen?<br>• Er det å delta i innovasjon, og det å være villig til å ta risiko i den forbindelse, sett på som karrierefremmende?<br>• Blir innovasjonspotensial vurdert i forbindelse med rekrutteringer?<br>• Definerer ledelsen klare innovasjonsmål?<br>• Involverer ledelsen seg i innovasjonsaktivitetene?<br>• Blir målene fulgt opp med målinger?<br>• Kan organisasjonen karakteriseres som en lærende organisasjon?<br>• Er det vanlig at team settes sammen med personer som har forskjellige egenskaper/kompetanse?<br>• Hvordan går dere frem for å evaluere om kulturen legger til rette for oppnåelse av innovasjonsmålene? |

**Systemet og nettverket – Da skal vi snakke litt om alt som ligger rundt denne innovasjonen….**

| **Dimensjon** | **Spørsmål** | **Oppfølgingsspørsmål** |
|---|---|---|
| **Aktører** | • Hva er de viktigste aktørene eller samarbeidspartnerne i denne innovasjonen?<br>• Kan du skille mellom aktører som er viktige men som ikke kan betraktes som samarbeidspartnere og samarbeidspartnere, hva | • Tegne aktørkart<br>• Finne kunder, samarbeidspartnere, leverandører, konkurrenter, offentlige myndigheter, finansinstitusjoner, eiendomsaktører, teknologileverandører, næringsorganisasjoner, virkemiddelapparat, konsulenter og rådgivere<br>• Teknologileverandører…<br>• Konsulenter/kompetansemiljøer?<br>• Samarbeider dere med andre nå enn tidligere? Hvorfor? |

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| | med kunden eller offentlige myndigheter?<br>• Hvordan har ulike aktører betydning i ulike deler av innovasjonsprosessen, er noen viktigere i startfasen og andre i realiseringsfasen?<br>• Er det forskjeller mellom aktørene i det daglige leveransesystemet og de aktørene som er involvert eller dere samarbeider med om innovasjon (innovasjonssystemet)? | • Har kunderelasjoner endret seg (kun hvis direkte kontakt med kunder)? Hvordan? Hvorfor? |
| **Viktige roller eller funksjoner** | • Hvilke av disse aktørene var avgjørende for innovasjonen?<br>• Hvilke roller eller funksjoner har/hadde de? | • Hvilke funksjoner eller aktiviteter utfører de ulike aktørene?<br>• Probe Edqvist/Johnson: Finne mulighet eller problem, skape kunnskap, innovasjonsincentiver/støtte, levere ressurser, rette søk etter informasjon, identifisere vekstpotensialet, utveksle informasjon, etablere/skape markeder, redusere usikkerhet, motarbeide motstand mot forandring |
| **Normer, verdier og reguleringer (institutions)** | • Er det normer, verdier eller reguleringer som har vært avgjørende for eller hindre mot innovasjonen | • Normer, roller og maktforhold?<br>• Reguleringer….<br>• Normer og verdier, er det f. eks. systemsvikt noen steder, at folk kjenner hverandre for godt eller dårlig, lukkede nettverk, markedssvikt, måten markeder fungerer eller ikke fungerer på som hemmer eller fremmer innovasjonen. |
| **Hemmende og fremmende forhold** | • Hvilke forhold har virket spesielt gunstig på innovasjonen?<br>• Hva har vært suksessfaktorene slik du ser dem?<br>• Hvilke forhold har virket hemmende på innovasjonen? | • Fremmende: Nettverk, miljø, samarbeid, kontakter, finansiering, mulighetsrom/tidsrom, press og konkurranse<br>• Suksessfaktorer: Tidsvindu, markedsmulighet, kompetansefortrinn, kriseforståelse (burning platform), entreprenørskap og engasjement, kundeatferd, teknologiutvikling….<br>• Hemmende: Kostnader, finansiering, personell, teknologimangel, markedsinformasjonsmangel, samarbeidspartnermangel, markedsdominans, risiko, etterspørselsrisiko, |

This report documents the studies conducted in workpackages 2 and 4 in the SNF-project "MISSING: Measuring innovation in service systems – indicators on new grounds". It first presents the resource-process-system framework applied in the studies and also summarizes some of the relevant findings and gaps in the innovation studies and innovation management literatures on service innovation.

Two empirical studies are reported. The first is founded in the innovation studies literature on innovation patterns but extends this tradition into the investigation of the performance effects of innovation patterns with particular focus on service sectors/systems. The study finds several unique innovation patterns of individual service sectors/systems and reveals the relationship between these patterns and three types of firm performance effects. The second study is founded in the innovation management literature on innovation practices and extends this literature by linking its selection of individual firms to service classification schemes offered in the innovation studies literature. The study finds more similarities between the innovation practices of service firms in different sectors/systems than differences. The report ends with summarizing the findings across the two studies and suggests managerial and policy implications of the findings.

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