Managing service innovation: firm-level dynamic capabilities and policy options

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Citation for published version (APA):
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Defining service innovation: the 4D-model and five innovation patterns

Managing Service Innovation
2.1 Introduction

For a long time services were simply seen as part of a much undifferentiated residual sector, a wide group of ‘non-manufacturing industries’. The issues of whether, to what extent, and how service firms and service organizations innovate, and how this differs from manufacturing industries were neither central research questions nor significant features of the (innovation) policy agenda. However, as the discussion on the knowledge-based society unfolds, the attention directed at services is increasing. Policy-makers and researchers alike seem to have discovered that services do matter. With large majorities of the workforce in some developed economies employed in service industries or for that matter in service occupations, and with ICT-based innovation a prominent feature of many service organizations, it is evident that a better appreciation and understanding of the role of services in innovation is indeed needed. This chapter aims to contribute to this understanding.

First some existing approaches in the services’ literature towards the question what it means to produce a service are briefly reviewed (section 2.2). Then a four dimensional model is presented aimed at improving the understanding of the interaction of technological and non-technological factors in service innovation (section 2.3). Then, still at a rather general level, a distinction is made between five basic service innovation patterns (section 2.4). In a final section we illustrate the practical usefulness of both the 4D service innovation model and the five service innovation patterns developed in sections 3 and 4 and present some concluding observations on both. The illustrations are based on five sectoral analyses of innovation behaviour in five service industries in the Netherlands56 (section 2.5).

2.2 What does it mean to produce a service?

Before entering into a discussion on service innovation and its modalities, it seems worthwhile to look into the question included in the title of this section. Gadrey et al. (1995), who raised this question, have formulated their answer as follows: “to produce a service [...] is to organise a solution to a problem (a treatment, an operation) which does not principally involve supplying goods. It is to place a bundle of capabilities and competencies (human, technological, organizational) at the disposal of a client and to organise a solution, which may be given to varying degrees of precision” (Gadrey et al., pp. 5-6).

This answer is appealing for various reasons. In the first place it makes clear that apart from technological capabilities, human and organizational capabilities are important

56 For retail, see den Hertog & Brouwer (2001); for technical engineering, Bilderbeek & Brouwer (2001); for ICT services, Broersma & Brouwer (2001); for financial services, Mulders & den Hertog (2003); and for logistics, Broersma & Segers (2003).
for providing services well. Secondly, it allows for a differentiation between highly standardized service products or service formulas with quasi good characteristics (for example the well known retail chains), and the more customized services that are much harder to pinpoint (such as the majority of the various new types of knowledge business services that emerged over the last decade). It is especially the latter category of services which is often based on more tacit forms of knowledge and knowledge exchange. What is characteristic about these services is, that not only the service itself, but also the innovation process underlying their constant renewal is often the result of a co-production between the actual service provider and its client. This makes many of the services that will be labelled as KIBS\textsuperscript{57} into important vectors of change and knowledge diffusion in innovation systems.

Many contributions in the past decades on the economic role of services start by telling a story of neglect and gross generalizations. Luckily this no longer seems to be the case. But it was not that long ago that as soon as innovation came into play, the majority of innovation scholars seemed to turn almost automatically to analysing technological innovation in manufacturing, reducing service firms to passive users of technological innovations originating from manufacturing industries. When Pavitt introduced in 1984 his by now well-known sectoral taxonomy of technological change, services industries were mainly labelled as supplier-dominated sectors.\textsuperscript{58} In a similar vein the important theoretical contributions of Barras on service innovation (1986; 1990) still portrays most service sectors as initially supplier-dominated, and as receiving an impetus from manufacturing in order to be able to embark on subsequent phases of the innovation process.

However, especially during the 1990s when the field of services innovation studies had been gradually expanding, two important changes occurred in the way services and innovation in services were perceived. First, the fact that services do play an often substantial role in innovation processes has been increasingly recognized. Services finally were not automatically portrayed as merely passive recipients of others’ innovations. Second, attention on non-technological elements in innovation and innovation processes started to grow, shifting attention to service innovation. Various lines of research such as the ones on the ‘peculiarities’ of services (Miles, 1993), on service management (Normann, 2002; Quinn, 1992), on the significance of interaction with clients (and of clients’ competencies; compare also Kline & Rosenberg, 1986), on the importance of recombination of existing elements in new services (Henderson & Clark, 1990) came to the fore. Gradually more general approaches towards innovation have been developing that could be equally used

\textsuperscript{57} Chapter 8 of this thesis is devoted to the role of KIBS as co-producers of innovation.

\textsuperscript{58} A helpful extension of the well-known Pavitt taxonomy is provided by Soete & Miozzo (1989). They differentiate between supplier dominated, scale intensive physical networks and information networks and specialised/science based services. However, also this taxonomy is largely technology-based (and sectoral).
for describing services as well manufacturing innovation. This is illustrated by the total of
six innovation models as discerned by Gallouj & Weinstein (1997). They distinguish between
radical innovation, improvement innovation, incremental innovation, ad hoc innovation,
re-combinative innovation and formalisation innovation.

A comprehensive model for understanding innovation that accommodates sensibly for
service innovation, however, is still lacking. There is a need for such a model as service
functions are abound in the economy. Service innovation can be said to be equally relevant
for manufacturing firms as these increasingly use innovation in service functions and
features to differentiate their products. Likewise, some business processes in service
firms resemble those in manufacturing, for example administrative processing in back
offices. Therefore, a continuum rather than a strict distinction between manufacturing
firms and service firms – and the innovation models used for them – seems appropriate
when discussing firm innovation. The heuristic model to be introduced in the next section
can be used for discussing service innovation in both manufacturing and service firms.

2.3 A four dimensional model of service innovation

Service innovation is seldom limited to a change in the characteristics of the service
product itself. Innovation often coincides with new patterns of product distribution, client
interaction, quality control and assurance and so on, though there are huge differences in
the specific patterns involved. What is important for introducing one new product onto
the market might be totally irrelevant for other products. Offering a completely new
service may differ considerably from offering an existing service using a new distribution
channel. In practice most innovations appear to be a mixture of major and minor changes
and adaptations of existing (service) products.

In order to discuss, map and analyse the diversity of innovations in greater detail and in a
structured way, a four dimensional model of service innovation is introduced (figure 2.1).
Although conceptual, it is concrete enough to map service innovation and discuss their
practical development. First the four dimensions are presented, before touching upon
the linkages between them.59

Dimension 1: the service concept

Manufactured products (and processes) are typically highly tangible and visible. This is often
not the case with services. Some service innovations are highly visible, especially where
delivery of the product is involved. However, frequently it is not so much a physical product

59 Although most examples provided below are taken from service industries, service innovation is equally
relevant for manufacturing industries.
but a much more intangible characteristic of a new service, like a new idea or concept of how to organise a solution to a problem. Although a particular service concept may already be familiar in other markets, the key thing is that it is novel in its application within a particular market. As usual in innovation research, there are thorny problems concerning when a product, function or concept is really new. Judgements can vary according to whether and when it is new to the providing firm, new to the client, to the regional, national or global market and whether it involves new logic or scientific knowledge.

Some examples of conceptual innovations are:

- Green or ‘ecologically sound’ banking products such as investment schemes aimed at environmentally friendly project or ‘green power’ as marketed by electricity manufacturers.

- Call centre services – these install, organise and recruit staff for their clients’ call centre – which have emerged from temporary staffing offices on the basis of their initial involvement with providing temporary labour for call centres.

- Environmental accounting as offered by accountants or intercultural management advice – these are types of new services offered by accountancy or consultancy firms which developed into completely new markets quite recently. Accountants help firms in reporting their efforts to run their business in a more environmentally friendly way.
Management consultants found out that misunderstanding deriving from differences in cultural backgrounds are quite common in increasingly internationalized firms and have developed it into a specialist consultancy area.

- Development of a particular style of shopping outlets, currently the rise of mono-brand stores to give the brand name its own character, to create a specific shopping environment that is recognizable for their clients.

Although not all service innovations have a strong novel conceptual element, conceptual innovations are much more likely to be found in service firms (or better service functions) than in pure manufacturing firms. Such innovations are usually highly intangible – meaning that while in some cases the service itself may have quite tangible elements, the new features have less to do with material artefacts.

**Dimension 2: the client interface**

A second element of service innovations is the design of the interface between the service provider and its clients. These interfaces are the focus of a good deal of service innovations, though innovation studies, with their focus on mass manufacturing, have tended to overlook the changes occurring in these interfaces. As a quite general phenomenon across a wide span of services, product offerings are increasingly marketed and even produced in a client-specific way (even with client-specific pricing) and delivered electronically as far as they have informational components.

In business services in particular, clients are often also part and parcel of the production of the service product. The way the service provider interacts with the client can itself be a source of innovation. Increasingly, there is no clearly identifiable point where the producer’s activity stops and the users’ activity begins. This is of course particularly true where the business service itself is offering support for innovation, for example in R&D and design services. With the high degree of co-design and co-production of service products, it may be difficult to locate the innovation within service supplier or client: it is not unusual, for instance, for service firms to site their staff within client organizations for periods of time.

Examples of client-interface innovations include:

- The large-scale introduction of account management systems in professional organizations such as economic consulting or IT firms can in some cases be interpreted as a renewal of the client interface.

- Internet has developed into a new distribution channel in quite a number of trades, be it retailing, banking or the travel industry. The major change is that clients for selected services do not interact any longer with individuals, but are guided by well
designed and self-explanatory graphical interfaces. Service innovations quite often are about new ways of interacting with clients and about their integration with other channels (multi-channeling).

**Dimension 3: the service delivery system/organization**

The third dimension – involving service delivery system and organization – is often directly related to the previously discussed dimension – the linkage between the service provider and its client (the client interface). The delivery is indeed one specific type of interaction across the client interface (others including financial transactions, design inputs, after sales, and so on). However, dimension 3 is different. It refers to the internal organizational arrangements that have to be managed to allow service workers to perform their job properly, and to develop and offer innovative services. It is closely related to the question of how to empower employees, to facilitate them so that they can perform their jobs and deliver service products adequately. On the one hand, new services may require new organizational forms, (inter)personal capabilities, and skills. On the other hand, an organization can be designed, and employees can be trained, so as to leave room for innovations and non-conventional solutions to practical problems.

Examples of delivery system and organizational innovations include:

- The large-scale introduction of home shopping services – or consumer e-commerce – not only causes a substantial change in the ways in which service provider and client relate, but requires the redesign of the logistics, IT systems and skills required.
- Organizations promising customers an unusual fast service – being it a fast food meal ready in a few minutes or having tires changed within 20 minutes – mostly utilize innovative ways of workflow management and human resources management.
- In more traditional shopping environments, the lengthening of retailer opening hours may have serious consequences for the type of customers it attracts, the type of products on offer, the management of the workforce and so on.

**Dimension 4: technological options**

The fourth dimension is the centre of much analysis and debate, especially concerning the degree to which service firms themselves in practice are giving shape to technology development. Clearly, service innovation is possible without technological innovation; technology is not always a dimension. Nonetheless, in practice there is a wide range of relationships between ‘technology’ and ‘service innovation’. These vary from technology mainly playing a role as a facilitating or enabling factor, to something much closer to supply-push, technology-driven innovation.
Service firms also differ in their awareness of relevant available technological options, the degree to which they possess the necessary technology themselves or have access to the necessary knowledge and the degree to which they consequently can act as demanding customers and articulate their technological needs. Many innovations are driven by downstream service sectors and can surely be considered user-dominated. In fact, users may play a crucial role in developing and implementing new services, although some of the required technologies may come from suppliers.

Although ICT is certainly not the only relevant technology in service innovation, it is particularly pervasive. The numerous information processing tasks to which it may be applied, include many that are intrinsic to almost all economic activities. ICT is thus often perceived as the enabler of service innovation. Many commentators who recognise the profound implications of ICT for services still, however, consider this technology as typically supplier-dominated. It is true that many smaller and less innovative service firms are relatively less proactive where it comes to incorporating new ICT, though even here there is rarely the purely passive process of absorption implied by the term ‘diffusion’. However, in many larger and/or more advanced firms there is an extremely active process of technological development going on.

Examples of technological innovations include:

- automatic ordering systems in supermarkets to prevent empty shelves or scanning cash registers in large retail stores;
- tracking and tracing systems enable transport service providers to monitor the progress of their fleet and thus to manage their transport services more closely;
- handheld wireless devices as used in cafés and restaurants to efficiently take orders without running back and forth between kitchen and table.

These examples of ICT utilization illustrate that service firms are not necessarily supplier-dominated as some of these systems are developed (partly) in-house or require intense advanced user-producer linkages in their development phase. This is especially true in the case of ICT services themselves, like software houses. To a certain degree software firms have to adapt their activities to new products from hardware companies, for example new generations of chips. This involves near continual updating and – typically – expansion of software to exploit the facilities of new equipment. But the process of developing new applications, new functionality, new interfaces and so on is much more in the software firms’ hands. It is also evident that sectors with a long experience of ICT investment are major sources of innovation – in the shape of new configurations of hardware, new software and applications, new interfaces and so on. A good example is the financial sector, which is a huge employer of software and networking staff.

Service innovation is a multi-dimensional phenomenon. A complete new service usually
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means the introduction of a new service concept, new distribution channels or ways of interacting with clients, new service delivery systems in the form of new working routines, new organizational concepts or back office set up, the need for new generations of ICT or customized software packages and so on. Apart from the meaning of these four dimensions separately as discrete vectors of change, the linkages between these dimensions may be of even more significance.

Often these cross-linkages are forged in practice by those responsible for marketing, organization development and distribution. For instance, launching a new service concept (for existing or new clients) requires marketing expertise. Similarly, creating an adequate interface with clients, and adapting the service delivery system, requires knowledge of how services are distributed (both in terms of where they are produced and of how they are delivered). The decision as to whether to develop new services requires also organizational knowledge: can the current organization deliver the new service? What organizational changes might be needed?

The point is that a particular service innovation may be characterized by one dominant feature related to one of the above-mentioned dimensions; quite likely, this particular feature will prompt a set of changes in other dimensions, in order to bring about a successful innovation. Consider an example from the retail service sector. Intelligent cash registers and advanced data warehousing are widely used by large companies, and these are basically technological innovations (that is dimension 4). They allow for the creation of detailed client profiles and personalized product offerings. However, these applications cannot be bought from the shelf and simply be implemented. They need to be combined with the specific characteristics of the shop formula at hand (dimension 1), the way the retailer wants to communicate with its clients (dimension 2), the way the employees are trained (dimension 3), and so on.

In practice, it may be the combination of the four dimensions that ultimately characterizes each particular service innovation. The weight of the individual dimensions, and the importance of the various linkages between them, varies across individual services, innovations and firms. Similarly, the inputs required to link the dimensions in practice differ according to the type of service, and the extent to which the search and selection process (inherent in all innovation processes) is formalized. On the basis of the foregoing service innovation can be defined as: “a new or considerably changed service concept, client interaction channel, service delivery system or technological concept that individually, but most likely in combination leads to one or more (re)new(ed) service functions that are new to the firm and do change the service/good offered on the market and so require structurally new technological, human or organizational capabilities of the service organization” (van Ark et al., 2003, p. 16).

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60 This definition was originally not included in den Hertog (2002) on which this chapter is based. It was introduced for the first time by den Hertog in van Ark et al. (2003, p. 16).
By way of illustration innovation in retailing is given in a stylised way in table 2.1 below using the four dimensions introduced above. From this table it is hard to judge which of the four dimensions is most important for innovation as most innovations appear to be combinations of conceptual, technological and organizational innovations, often combined with new ways of relating to the consumer. It does however illustrate that innovation in retailing is much more than just technological innovation.

2.4 Patterns of service innovation

The four dimensional model as described in the preceding section sketches out the various ingredients of service innovations. It is most suited for mapping service innovation in a particular firm (micro-level) or industry (sectoral level). At a somewhat more aggregated level and focusing more on the role of services and service firms in innovation processes there still is a need to reflect on the supposed supplier dominated character of much service innovation. This section considers different patterns of service innovation. It is argued that although supplier dominated innovation is characteristic for some service firms and some service industries, there are many more roles of service firms in innovation processes than just passive users of (technological) innovations stemming from capital good industries. This is much more likely of course if we are prepared to include non-technological aspects of innovation in our analysis. Some services, can even be said to function as co-producer of innovation in the operations of their clients.\(^\text{61}\) First, a typology\(^\text{62}\) of innovation patterns will be presented. The typology demonstrates the wide variety of roles of service firms in innovation processes. A central variable is the way suppliers of inputs (equipment, capital, human resources, and so on), service firms and clients (end consumer or intermediate user) interact. Each of the five patterns discerned, displays a different mix of linkages between these three types of actors. The influence of the client firm or final consumer exerts on the innovation process, gradually increases going from pattern 1 to 4. Pattern 5 represents a somewhat different situation as all actors in the value system contribute to a particular innovation or are forced to accommodate it.

**Pattern 1: Supplier-dominated innovation**

Services innovations have traditionally been depicted as following this pattern where innovations (as a rule technological innovations in the form of new technical equipment) are largely based on basically technological innovations as supplied by hardware manufacturers. These innovations from external suppliers are disseminated and implemented by service industry

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\(^{61}\) See chapter 8 of this thesis.

\(^{62}\) This is to be considered a mapping device: quite possibly more patterns can be found.
### Table 2.1 Innovations in retailing using the 4D-model (den Hertog & Brouwer, 2000, p. 11)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Innovations</th>
</tr>
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</table>
| 1. New service concept | - Mono brand stores (MEXX, Vanilla, GAP, Nikeworld)  
- Out of town retailing (e.g. factory outlets) or non-store retailing (E-commerce)  
- New Shop formulas on new locations with specific product assortment and opening hours (e.g. shops in railway stations, revamped local supermarkets or other new formulas aimed at e.g. cash rich/time poor consumers)  
- Mixtures of shopping, entertainment and restaurants aimed at increasing the duration of visits (e.g. in floral centres, specialized shopping malls)  
- Combinations of retailers and non-retailers (bank counters in supermarkets; travel insurance offered in travel agencies and outdoor centres)  
- Life ‘experiences’ in stores (climbing wall in outdoor equipment shop, cooking lessons offered by supermarkets)  
- New services based on brand name (e.g. credit cards issued by supermarkets)  
- Packages adapted to smaller households or products aimed at the elderly (smaller portions, special diet food, etc.)  
- Green products |
| 2. New client interface | - Smart routing in stores (e.g. discount corridor, convenience corners etc.)  
- E-commerce e.g. electronic purchasing and delivery of information  
- Semi-standardized (personalized) list of groceries or suggested reading or music on the basis of your personal preferences  
- User-friendly interactive retailing and virtual client interfaces (how is the interface of e-shops and e-malls shaped?)  
- Client-specific product offerings on the basis of loyalty programmes and client cards (personalized product offerings send home)  
- Home delivery services and development of ‘pick up centres’ (e.g. pick up your ordered products at the petrol station)  
- Self-scanning check outs |
| 3. New service delivery system | - Innovations in logistical chain (JIT, replenishment, status information, etc.) as rate of circulation increases and stocks are kept to a minimum  
- Self-scanning check outs  
- Click and mortar strategies (combinations of virtual and physical retailing e.g. extra after sales services, extra product information)  
- Various forms of self-service (weighing, scanning, payment)  
- More personal advice on products  
- Home based services and home delivery (e.g. goods ordered electronically)  
- Additional services (transport, installation, instruction, etc.) |
| 4. Technological options | - Inventory control systems/replenishment systems for stock management  
- Intelligent packaging, tagging and scanning  
- Scanning cash registers  
- Authentication and access technology, electronic payment systems  
- Client profiling (allowing one-to-one marketing) and data-mining  
- Data navigation products and electronic interfaces  
- Multimedia hard and software for e-commerce/m-commerce as well as specific applications e.g. 3D models for trying clothes, one click buying technology  
- E-shops, e-malls and platforms for e-procurement |
users, who in their turn satisfy the needs of their clients. Examples of this pattern include:

- microwave ovens in catering, whose introduction has greatly extended the possibilities for food preparation (and re-heating) in cafes and restaurants;
- cash registers and mobile phones have been assimilated into many small firms that otherwise use little new technology;
- introduction of interactive TV.

There are many similar examples, with a clear ‘technology push’. Typical for this pattern is, at least initially, little scope for user industries to influence the actual product supplied by the supplier. The adopting firm often has to bring about some organizational changes in order to be able to use the innovation – to adapt its organization, train its employees and so on – and to offer more efficient and higher quality services as a result.

**Pattern 2: Innovation within services**

Here the actual innovation and implementation is initiated and takes place in the service firm itself. Such innovations may be technological, non-technological, or (as in many cases) a combination of the two. Typical examples of this pattern involve a new product, product bundle, or delivery system, that is thought up in the service firm itself (e.g. by a new business team), and implemented throughout the organization, possibly with ‘innovation support’ from outside. Examples of this pattern are:

- introduction of new shop formulas by retailers;
- new pension and saving schemes as introduced by financial service providers;
- new tools for assessing applicants looking for a temporary job in staffing agencies.

These are the sort of innovations that have been overlooked for a long time as typically they have quite often a more conceptual character.

**Pattern 3: Client-led innovation**

In this case the service firm is responding to needs clearly articulated by its clients. While, in a sense, every successful innovation is a reaction to a perceived market need, for some service innovations this is more clear-cut than for others. Some examples:

- door-to-door public transport services aimed at the business traveller, a clear answer to the often heard complaint ‘we would like to use public transport (the train) more often, but that pre- and post train transport is too time consuming’;
- green banking services, to appeal to a growing number of individuals that want to invest their (saved) money in a ‘socially responsible’ way.
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In these cases the demands are expressed by segments of mass markets. In many other cases the influence may come from a single client, which is often the case in business services. A client e.g. may propose that a training firm back up its face-to-face sessions with computer-based aids.

Pattern 4: Innovation through services

In this more complicated pattern, service firms influence the innovation process taking place within the client firm. The provider of intermediate services may provide knowledge resources that support the innovation process in various ways, such as:

- providing an expert project manager with the necessary skills to implement an innovation;
- providing an innovative tailor-made software package;
- providing training or written advice regarding product selection and implementation;
- an engineering consulting firm supporting an oil and gas company wanting to drill and explore in a ‘protected’ area by helping them to find new operational methods to meet the strict environment protection rules, by reviewing existing practice, proposing new operations, designing new methods, and so on eventually facilitating the innovation process at the client firm (see Hofman et al., 1998).

Pattern 5: Paradigmatic innovations

When complex and pervasive innovations affecting all actors in a value chain profoundly are involved one might phrase these as paradigmatic innovations. When driven by fundamentally new technologies these can be labelled technological revolutions or new technology systems (Perez & Freeman, 1998). But they may also be driven by regulations, resource constraints, and other dramatic changes that require innovation to take place across many elements of the value chain, implying completely new infrastructures, new types of knowledge and adaptation on the part of intermediate and final users. For example:

- If in a very densely populated area the regular transport of goods is no longer possible and the decision to switch to underground transport was taken, parties across the value chain would have to innovate and change practices. Manufacturers of transport equipment would have to provide completely new transport equipment; transport companies would have to change their service offerings, retrain their personnel, market their product in different ways; users would have to change their behaviour and use of transport facilities;
• Similarly, the switch from a few public TV channels towards multi-channel pay-per-view regimes require innovations and change of behaviour on many fronts;
• The large-scale introduction of multi-functional chipcards would be another example of a paradigmatic innovation. 

The five innovation patterns identified are depicted schematically in figure 2.2.

The typology demonstrates the wide variety of roles of service firms in innovation processes. Since the way service providers and client firms interact is central to the process of service innovation, both factors have to be taken into account. One such factor might be the role of government as a trigger for innovation, a role that can be quite important – as when innovation is promoted by R&D funding and/or procurement decisions, or through new regulations (e.g. those fostering environmental innovation). Another variable may be the degree to which end-users are given the opportunity (or are forced) to co-produce particular services: the shift to “self-servicing” is an important aspect of services innovation. Many variations on these innovation patterns can be found in practice. Sometimes, for example, innovation takes place in individual service functions (irrespective of whether it is a service or manufacturing firm), that might or might not be subsequently outsourced to specialized service firms.

Two such situations suggest additional patterns of service innovation. First, innovation in a firm’s internalised service function is quite a common pattern. All firms engage in a range of service activities – and sometimes this involves innovation. A capital goods manufacturer may have an innovative leasing scheme, dealer organization, after sales service or training sessions. Increasingly manufacturing firms realise that the package of services offered around the actual good may be crucial to competitiveness. Quite frequently, the value-added realised with these services is much higher than the margins realised on the capital goods.

A second case is innovation in an outsourced service function, such as facilities management, catering and cleaning, or even more strategic functions (e.g. temporary sales, management, R&D). In most cases more specialised service firms take over these functions. In many outsourcing relationships, activities may be precisely specified and cost competition may be intense; in such cases, innovation is less likely. But in other cases, there is sufficient level of specialization and scope for economies of scale to provide incentives for innovative solutions. For instance, companies increasingly hire temporary labour, and increasingly the

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63 The remainder of this section was included in den Hertog (2000, p. 503-504), but not in den Hertog (2002).
64 Figure 2.2, introduced at first in den Hertog et al. 1998 and codified in den Hertog (2000, p. 501) is reproduced with the permission of Imperial College Press.
65 This pattern resembles the previous one but it goes a step further. In this case the client firm influences the innovation taking place in the outsourced service function.
### Figure 2.2 Patterns of services innovation

<table>
<thead>
<tr>
<th>Role of:</th>
<th>Innovation pattern</th>
<th>Supplier</th>
<th>Service firm</th>
<th>Client firm (service or manufacturing)</th>
<th>Example</th>
</tr>
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<tbody>
<tr>
<td><strong>Supplier-dominated Innovation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Introduction of interactive TV equipment; IT goods; medical robots, tomography</td>
</tr>
<tr>
<td><strong>Innovation in services</strong></td>
<td></td>
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<td></td>
<td>Introduction of new shop formula, new pension and saving schemes</td>
</tr>
<tr>
<td><strong>Client-led innovation</strong></td>
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<td></td>
<td>Green banking services, door-to-door transport services</td>
</tr>
<tr>
<td><strong>Innovation through services</strong></td>
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<td></td>
<td></td>
<td>Engineering services helping oil &amp; gas firms in designing new oil rigs, etc.</td>
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<tr>
<td><strong>Paradigmatic innovation</strong></td>
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<td>Multifunctional chip cards, sub-soil transport services</td>
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<tr>
<td>![Inputs for service product] (push)</td>
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<td>![Locus of innovation activity] (pull)</td>
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*Figure 2.2 Patterns of services innovation*
troublesome task of managing these temporary workers and the associated paperwork can be outsourced to a temporary employment agency. In their turn, such agencies increasingly understand the type of human resources required by particular client firms, and may even offer to completely take over the human resources management function, training and hiring personnel, helping displaced staff to find new jobs and so on.

2.5 A sectoral perspective on the 4D-innovation model and service innovation patterns

As indicated in the introduction we will illustrate the practical usefulness of both the 4D service innovation model and the five service innovation pattern and present some concluding observations on both. The illustrations are derived from five sectoral analyses of innovation behaviour in five service industries in the Netherlands.\(^{66}\) We analysed dimensions of service innovation and innovation patterns in retailing, technical engineering, road transport and wholesale trade (which together form the “logistics” industry), financial services (with emphasis on retail banking) and ICT services. The studies were based on analysis of secondary (statistical) sources for each industry, interviews with specialists in each sector, and an analysis of micro (firm) level information from the official statistics on production and innovation in each industry.

Using the 4D-innovation model, table 2.2 summarizes the major service innovations in each of the five sectors. The following observations can be drawn from this overview.

1. **Non-technological or organizational innovations in services are important.** Table 2.2 illustrates that the three non-technological dimensions shape services innovation to a large extent. Service design is particularly important in services aimed at final consumers and is essentially about how a service is perceived.\(^{67}\) If services are provided electronically, such as in banking or in logistic services, the innovations regarding the shaping of client interfaces are relatively important. New service delivery systems seem to be less important as drivers of service innovations, but have a major impact on tasks and responsibilities of service workers. More employees have client contacts, ICT skills are mandatory in most service jobs and commercial/advisory skills are needed as well.

2. **Multidimensionality is the rule in service innovation.** Service innovations are mostly combinations of renewals in two or more of the dimensions discerned. The starting point for a sequence of innovations is difficult to pinpoint, but in principle it can be any of the four dimensions. New technological capabilities – mostly ICT – create new service

\(^{66}\) See footnote 56.

\(^{67}\) In an increasing number of cases the experience surrounding the actual purchase is more important than the actual purchase itself, often referred to as the “experience economy” (Gilmore & Pine, 1999).
### Table 2.2  Mapping service innovation in five industries using the 4D-model

<table>
<thead>
<tr>
<th>Innovation dimension/ Service industry</th>
<th>Service concept</th>
<th>Client interface</th>
<th>Service delivery system</th>
<th>Technological options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retailing</td>
<td>New formulas and brands (e.g. monobrand stores), new locations (e.g. outlet stores), new combinations of formulas, new assortments aimed at specific groups of clients</td>
<td>Changed interaction between client and retailer i.e. forms of ‘dehumanisation’ &amp; ‘humanisation’, shaping of virtual or interactive retailing, new electronic interfaces and self-service concepts</td>
<td>Intra- and extra organisational changes and new skills needed to supply (re-) new(ed) retailing services. Allow clients to co-produce services or add more personal service.</td>
<td>New ICT systems allow for optimisation of logistics, consumer profiling, self-service devices &amp; development of (personalised) e-commerce applications</td>
</tr>
<tr>
<td>Transport &amp; logistics services</td>
<td>Contract logistics, fourth party logistics service provider, synchronized production</td>
<td>Forward picking location/points of fit, cross docking and supply chain directors</td>
<td>E-auction/e-commerce, tracking and tracing by clients, on board computers (client signatures)</td>
<td>Containerisation (i.e. new scanning technology), on-board computer (navigation, motor-management), E-commerce</td>
</tr>
<tr>
<td>Financial services</td>
<td>Services dedicated to specific target group or stages in life aimed at creating life-time relationship, customer loyalty and integrated financial services</td>
<td>New automated distribution channels (ATM, internet, voice response, mobile). Self service in combination with personalized services and adding advisory element e.g. electronic banking, mobile banking</td>
<td>Customer Relation Management and Multi-Channel Management in combination with self-service. Redefinition of the role of bank offices and strict division between back office and front office operations</td>
<td>ICT is the major enabler for upstream information and transaction processing and downstream interfacing with clients and multi-channelling</td>
</tr>
<tr>
<td>IT services</td>
<td>Application Service Providers, data hotels/hosting, virtual (outsourced) helpdesks</td>
<td>Dedicated contract managers, electronic distribution of software and updates and so on</td>
<td>Mixed project teams (with client personnel), on line help functions, virtual teamworking, advanced intranet-based knowledge management systems.</td>
<td>New generation of packaged and dedicated software e.g. CRM, ERP, supply chain software and so on</td>
</tr>
<tr>
<td>Technical engineering</td>
<td>Integrated ‘one stop shopping’ TE services and new contractual forms e.g. build, operate and transfer and other forms of outsourcing TE-functions</td>
<td>Closer ties with client through mixed project teams, account management systems and offices at client premises</td>
<td>Advanced competence &amp; knowledge management systems and more flexible employability-based labour conditions</td>
<td>Tele-(co-) operations e.g. tele-maintenance, virtual project-teams, advanced project management systems and sharing of knowledge bases</td>
</tr>
</tbody>
</table>

Source: van Ark et al. (2003).
concepts, client interfaces and service delivery organisations can be realized. The renewal in these organisational dimensions may also pose new opportunities for technological applications. The use of on-board computers in transport and logistics can be depicted as a pure technological innovation. However, it also changes the client interface (through the use of advanced tracking and tracing services), it requires changes in the service delivery system (truck drivers as front office workers, improvement of fleet management) and new service concepts can be realized (e.g. new sorts of contract logistics, synchronized production). Similarly the use of advanced web-based knowledge management systems in technical engineering offers project teams the possibility of working virtually together and co-innovating with the client firms (e.g. on the basis of shared information).

3. Existing dimensions are often renewed in other sectors through new combinations. The traditional view on innovation is biased towards mostly radical technological products and processes stemming from manufacturing. In services a new combination of service innovations that already exists on their own can still emerge as an innovation elsewhere.\(^{68}\) “Do it yourself” is a well known concept in supermarkets, but applying it to financial services using electronic platforms is an important service innovation. Similarly, leasing a software package through Application Service Providers (ASPs) is an innovation. Simple dichotomies like product and process or radical and incremental innovations do not suffice to understand service innovation.

4. The weights of four dimensions in service innovation may change over time. More substantial innovations need to mature and require adaptations in other dimensions. Over time a shift in weight of each of the four dimensions may occur. In financial services, the introduction of a new service concept is often followed by the establishment of new communication channels and the restructuring of the service delivery system. In retailing, substantial investments are being made in scanning registers, but it takes years before these result in new customized services being offered to individual clients. This makes it sometimes difficult to precisely identify and categorize industries according to the importance of these various dimensions.

5. Although the role of ICT in facilitating service innovation is paramount, ICT is neither a sufficient nor a necessary condition. ICT adds intelligence to almost all service operations. The sheer fact that more information becomes available allows for further innovation in service functions. However, investing in ICT is not a sufficient condition for service innovation. It needs to be combined with substantial investments in new ways of working and new organisational structures to result in better performance. Presenting ICT as a necessary condition for innovation in services is also not corroborated by the facts. Especially conceptual innovations are often entirely of a non-technological nature. Mono-brand stores,

\(^{68}\) Notions such as architectural innovation (Henderson & Clark, 1990) and re-combinative innovation (Gallouj & Weinstein, 1997) also point in this direction.
a new type of mortgage, the idea of adding light manufacturing to the wholesale and transport function are all examples of innovations that are in principle non-technological.

6. **Different firm strategies give rise to different service innovation strategies.** Although there are dominant innovation patterns for innovation strategies at the level of each industry, the implementation of such strategies can still highly differ between individual firms. For example, in professional services, like technical engineering, there are trade-offs between specialization versus one-stop shopping. In logistics, innovation depends on a choice for a strategy towards customisation versus standardisation. And in retailing, price strategies versus value added or quality strategies impact innovation.

7. **The rise of specialized service functions fosters service innovation.** As the process of specialization in the value chain proceeds, the room for innovation in service functions increases, irrespective of whether they are insourced or outsourced by a firm. On the one hand, part of the client interface can be outsourced to a dedicated call centre, transport can be taken care of by a specialist logistic service provider, ICT systems are implemented and maintained by ICT specialists, the HRM function may be outsourced to HRM specialists and so on. On the other hand, large service firms often combine the strengths of various service innovations through insourcing, a picture that becomes more established in manufacturing (for example, in the car manufacturing industry).

8. **Innovation in service firms goes across firm and industry boundaries.** A logical complement to the foregoing point is that innovation in service firms is not limited to an individual firm. Along the value chain the borders between firms get blurred through outsourcing of service functions, through the use of networks of service professionals, and through mixed project teams in which client and contracting service firm co-produce solutions to problems. Technical engineering firms and ICT service firms mostly work jointly with clients to co-produce and sometimes co-innovate. Some service firms even have a reputation for a particular service function that is not directly seen as their core activity. For example, some competitive retailers are especially good at organising the logistics in the value chain, some banks are known for their ICT capabilities and some IT service companies are known for their innovative approach towards human resources management.

9. **De- and re-regulation can trigger innovation in service industries.** In many service industries de- and re-regulation can trigger the scope for innovation. In retailing the liberalization of closing hours of shops in combination with changes in the spatial planning regime has given rise to new types of shopping outlets at new locations. In financial services various legal changes and liberalization of markets made it possible for banks and insurance firms to merge and develop new product mixes. Re-regulation can also support innovation. For example, stiff environmental regulations have triggered innovations by technical engineering firms which specialize on ‘greening industry’, and financial service providers which offer green financial products.
Table 2.3 provides examples of typical innovation patterns in the five service sectors examined here. Again, several conclusions can be drawn from this overview.

1. **Supplier-dominated innovation is not the most important source of innovation in services.** In annex 1 (table A.1) where we allocated service innovation patterns to individual industries and hence develop and alternative industry classification we show that supplier-dominated innovations account for only a small part of service innovation.\(^69\) Even in the two service industries (retailing and telecommunication) that were labelled as mainly supplier-dominated, other innovation patterns are crucial as well. For example, the introduction of ICT in retailing has gone together with the introduction of new shop formulas (‘innovation in services’), new products (‘client led innovation’) and the introduction of e-commerce (‘innovation through services’).

2. **In many service industries innovations originate from the firms themselves.** In many industries, service firms are the main source of innovation. This is especially so for those cases where non-technological innovations are dominant (for example in the finance sector). But even then some of the technological innovations are still brought about by other service firms, such as technical engineering firms, IT services, and private research firms.

3. **Sophistication in consumer demand supports client-led innovation.** In general service functions, such as communications, marketing, sales and after sales services require a strong interaction with clients. This implies that signals about client needs are picked up and translated into service innovations. Environmentally friendly or ‘social responsible’ products that are offered by retail banks and retailers illustrate this point. Complete financial service packages (instead of very diverse portfolios spread over numerous financial service providers), home delivery services, hassle-free ICT services (e.g. home installation of fast internet), and neutral platforms with product information are other examples of service innovations triggered by demand.

4. **Knowledge intensive business services (KIBS) play a major role in the innovation processes of client firms.** Typical proof of the fact that service firms can be important innovators appears from the role of knowledge intensive business services (KIBS). They help client firms in finding solutions to particular problems that can be either unique or more standard. On some occasions this involves the co-production of innovations at the client firm.\(^70\) IT services may facilitate ICT-based innovations at their clients’ premises. Engineering firms most often interact with their clients to co-innovate when searching for solutions to particular (mostly technology-related) problems such as developing energy efficient production processes, new forms of integrated water management or smart ways of construction oil rigs in deep water.

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\(^69\) This sentence was adapted as in den Hertog et al. (2003), the current annex 1 was included in the main text.

\(^70\) See, for example, Miles et al. (1995) and den Hertog (2000).
### Table 2.3 Innovation patterns in five service industries

<table>
<thead>
<tr>
<th>Typical innovation patterns</th>
<th>Supplier dominated innovation</th>
<th>Innovation in services</th>
<th>Client-led innovation</th>
<th>Innovation through services</th>
<th>Paradigmatic innovations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retailing</td>
<td>Scanning registers/Stock replenishment systems</td>
<td>New shop formula’s / New franchise schemes</td>
<td>Green or ‘organic’ products/Home deliveries</td>
<td>Retail consultants that help introducing new formulas or marketing strategies</td>
<td>E-commerce</td>
</tr>
<tr>
<td>Transport &amp; logistics services</td>
<td>On board computers</td>
<td>New logistic concepts mostly streamlining value chains and adding information.</td>
<td>Outsourcing of transport and ‘light’ production/assembly</td>
<td>Shippers offering clients tracking and tracing facil-ties order-based production</td>
<td>Containerization, E-commerce</td>
</tr>
<tr>
<td>Financial services</td>
<td>New distribution channels (SMS alerts, new mobile devices), back office automation</td>
<td>New (customised) financial service concepts, multi channel management</td>
<td>Green banking, products covering various stages in life e.g. starters mortgage or estate planning</td>
<td>Financial constructions, e.g. sale and lease back</td>
<td>Multifunctional smart cards (including non-financial functions)</td>
</tr>
<tr>
<td>IT services</td>
<td>Use and customization of new packaged software</td>
<td>Development innovative soft-ware e.g. in packaged software, SMS software, gaming software, learning environments etc.</td>
<td>Recovery or trouble shooting firms, user friendly interfaces</td>
<td>New/customized software allowing for more efficient organization of business processes, e.g. groupware software, electronic ordering, client profiling.</td>
<td>ERP software (sometimes driving organisational design)</td>
</tr>
<tr>
<td>Technical engineering</td>
<td>Installation and operation of new (to the client firm) technical equipment, e.g. in process industry</td>
<td>New business methods for construction management</td>
<td>Development of ‘green services’ in reaction to client needs</td>
<td>Innovative solutions to specific problems of a client e.g. new drilling techniques for an oil company</td>
<td>Public private partnerships in spatial planning</td>
</tr>
</tbody>
</table>