



ØKONOMI- OG ERHVERVSMINISTERIET



Innovation in Denmark

- how Danish enterprises convert
new ideas and knowledge into value

November 2008

Innovation in Denmark

– how Danish enterprises convert new ideas and knowledge into value

This version of the report is a translation of the original Danish report. As a result, the wording of some texts may deviate from the original English version of studies included in the report, e.g. Community Innovation Surveys.

Innovation in Denmark

– how Danish enterprises convert new ideas and knowledge into value

This publication can be ordered from:

Schultz Distribution

Herstedvang 10

DK-2620 Albertslund

Tel.: +45 4363 2300

E-mail: schultz@schultz.dk

This publication can also be downloaded from the website of the Danish Ministry of Economic and Business Affairs: www.oem.dk

Print run

2,000.

Price

This publication is free.

ISBN

Printed edition: 978-87-786-2291-4

Electronic edition: 978-786-2292-1

Design and printing

Schultz Grafisk

Printed in Denmark, November 2008.

Cover photo: colourbox.com

The Danish Ministry of Economic and Business Affairs

Slotsholmsgade 10-12

DK-1216 Copenhagen K

Tel.: +45 3392 3350

Fax: +45 3312 3778

www.oem.dk

The Danish Enterprise and Construction Authority

Dahlerups Pakhus

Langelinie Allé 17

DK-2100 Copenhagen Ø

Tel.: +45 3546 6000

ebst@ebst.dk

www.ebst.dk



Preface

Danish enterprises are increasingly encountering tougher global competition. To exploit the potential of global markets, it is essential for Danish enterprises to be able to create innovative new products, services and solutions that can be converted into commercial value.

This analysis focuses on how Danish enterprises convert new ideas and knowledge into value by working with new types of innovation, such as user-driven innovation and open innovation.

This analysis is the first time we have shown the potential economic benefits of systematically identifying user needs during the innovation process. The analysis also indicates that there is much to gain from becoming receptive to external knowledge, such as through participating in innovation partnerships with other enterprises. There is every indication that the innovation process is complex and that the way in which maximum value is generated in the innovation process will differ from one enterprise to another.

The analysis also shows that few enterprises systematically work with a focus on the user and draw on external knowledge. In addition, major challenges have to be overcome if the Danish Government's aim of making Danish enterprises the most innovative in the world is to be achieved.

The Government's Globalisation Strategy from 2006 was an important step towards ensuring that Danish enterprises have the best framework in which to create innovation and value.

To further reinforce these efforts, the Government initiated the drafting of a business-oriented innovation strategy that focuses on improving the framework conditions for enterprises' innovation activities through more knowledge about new types of innovation. This analysis will provide important input for drawing up the strategy, which will be available in the course of 2009.

Happy reading!



Lene Espersen
The Danish Minister for Economic and Business Affairs

Executive Summary

Globalisation presents Danish enterprises with new opportunities and new challenges. The opportunities include new market potential for Danish enterprises. Increasing access to countries that open their markets to the global economy and the growth of prosperity around the world generate steadily increasing numbers of consumers with considerable buying power for Danish products and services.

At the same time, however, many other foreign businesses want to have a share of this increased market potential. In order for Danish enterprises to be competitive, they must provide products and services that are attractive to Danish and foreign consumers alike.

One of the ways an enterprise can make products and services attractive is by being innovative, i.e. by converting ideas and knowledge into commercial value. Global competition within innovation is also intensifying, however, which steadily intensifies the requirements on Danish enterprises' capacity to develop unique new products and services.

Previous studies indicate that enterprises which invest in research and development achieve positive financial results.¹ This analysis focuses on the proliferation of other types of innovation, such as user-driven innovation, open innovation and the organisation of the innovation process, as well as on the effects of these types of innovation on Danish enterprises. The report shows that many Danish enterprises are not innovative and that more businesses could benefit from incorporating knowledge about customers and users into their innovation process and from opening up their innovation process to external input.

The report will provide input for the drafting of a business-oriented innovation strategy initiated by the Danish Government based on the Government Platform 2007 "Society of Opportunities". The innovation strategy should focus in particular on improving the framework conditions of enterprises' innovation activities by increasing rights protection and providing more knowledge about new types of innovation.

Potential for increasing innovation activities in Denmark's business community

Enterprises can launch various types of innovation relating to different aspects of their business models. This could involve new products (products and services), new processes (manufacturing processes, distribution processes and logistics), new organisational forms (changes to the managerial structure, the flow of information within the enterprise, collaboration with external partners, etc.), and new sales and marketing methods.

Previous studies show that enterprises which innovate in several areas of their business model have a higher level of productivity than other enterprises. At the same time, there is a correlation between the economic performance of the enterprises and their ability to launch innovations that are new to the enterprise's market.² This could indicate that being innovative across the entire business model can be advantageous.

Nevertheless, almost half of Denmark's enterprises did not launch an innovation process between 2004 and 2006, and only four out of ten have been innovative in more than one area at a time. The overall level of innovation activities has declined since 2002–2004. Only one-fourth of Denmark's enterprises have launched a new or significantly improved product, compared to one-third previously. The number of enterprises that launched a new process declined slightly as well. Compared to other EU Member States, Danish enterprises are in the median range in terms of innovation – behind countries like Germany, Ireland, Sweden and Belgium, but ahead of countries like Finland and the Netherlands. This shows a possible potential for increased innovation activities and thus perhaps increased growth in Denmark's business community, even if the dimensions of this potential are difficult to assess (see Chapter 1).

This negative trend is present in all sectors but particularly among small and medium-sized enterprises, whereas large enterprises are to a great extent just as innovative as before. Overall, many Danish enterprises did not develop new products, processes or marketing methods or carry out organisational changes between 2004 and 2006. A longitudinal study indicates that enterprises which specified costs as a major obstacle to innovation and enterprises that are uncertain about whether a market exists for their innovation processes are those that have stopped innovating in particular. Between 2004 and 2006, only four out of ten Danish enterprises innovated in more than one area at a time (see Chapter 1).

Innovation also involves drawing on and bringing in knowledge from outside the enterprise and incorporating knowledge about users and customer needs and wishes into the process

Focus has previously been brought to bear on research and development as a driving force in the development of new products and solutions. This is still important to the innovation process of enterprises, but global competition presents other, more stringent requirements for how enterprises develop new solutions.

First of all, the global competition in research and development is stiffening. Investments in research and development are being dispersed over more and more countries³ and enterprises⁴ and are no longer concentrated on a few global flagships.

1 Danish Ministry of Economic and Business Affairs (2005): "Vækstregørelse 05" [2005 Regional Growth Report].

2 Danish Ministry of Economic and Business Affairs (2005): "Vækstregørelse 05" [2005 Regional Growth Report].

3 OECD (2006): "The Internationalisation of Business Research".

4 Chesborough, Henry (2006): "New Puzzles and New Findings".

This could make it difficult to assume a leading position in a market solely on the basis of developing new technology. Also, there is a risk of low profits from technological innovation processes because an enterprise's competitors can launch similar or better solutions faster.

Secondly, the development of new business models based on new services, organisational forms, processes, sales and marketing methods, etc., requires enterprises to be capable of drawing on a wide variety of skills covering the various aspects of the innovation process.

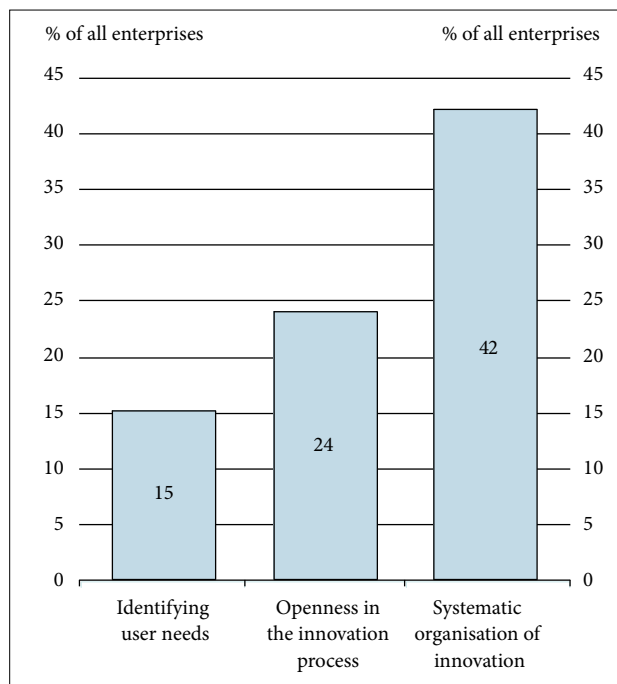
When enterprises innovate, they can take several different approaches in developing new solutions. Previously, particular focus has been brought to bear on how research and development contribute to generating innovation and growth. Studies have previously shown a positive correlation between research and development and the enterprises' financial results.⁵ In other words, this area is relatively well examined. There are other ways of working to produce innovation, however, but the proliferation and especially the effect of these methods has only been examined to a lesser extent.⁶ This analysis aims to provide an overarching view of the proliferation and effects of working with user-driven innovation, open innovation and of how enterprises organise the innovation process, etc., in Denmark's business community.

- User-driven innovation where new products and processes are developed based on a knowledge of recognised and unrecognised needs among users and in markets.
- Openness in the innovation process where an enterprise uses external knowledge by, for instance, purchasing knowledge and/or collaborating with other relevant enterprises and knowledge institutions to develop new solutions that the enterprise cannot develop alone.
- The management and organisation of the innovation process where the enterprise develops its innovation capability by systematically involving employees, strategically embedding the innovation process and introducing project-management models.

The innovation process of many enterprises entails several approaches to innovation at the same time. Innovation can be based on research and development to a greater or lesser extent. At the same time, it can be more or less open and more or less user-driven. In other words, the various approaches are not mutually exclusive, and results indicate that many enterprises combine the various methods of working with innovation. Almost 20% of Danish enterprises combine research and development, open innovation and/or user-driven innovation, while a similar percentage either work with user-driven

innovation or open innovation and research and development without combining this with other approaches to innovation (see Chapter 3).

Enterprises' various approaches to innovation efforts



Note: The figure shows the dispersion of methods for identifying user needs and openness in the innovation processes of Danish enterprises for the 2004–2006 period and the systematic organisation of innovation in the 2003–2005 period respectively.

Source: Own calculations based on Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005], CIS2006 and the Virksomhedsdatabasen [company database].

A successful innovation process draws on several different ways of working with innovation

This report presents a wide range of various analyses of correlations between the enterprises' innovation practices and the enterprises' economic results where innovation practice and the enterprises' added value have been tested in various ways. The results indicate that the enterprises' innovation processes are complex and that the way in which value is created in the innovation process differs from one enterprise to another. Overall, it is not possible to establish a correlation between a specific innovation practice and the enterprises' financial results that applies to all enterprises. Most of the correlations identified between the enterprises' innovation practices and their creation of value are insignificant in the

5 See e.g. Danish Ministry of Economic and Business Affairs (2005): "Vækstredogørelse 05" [2005 Regional Growth Report].

6 However, see e.g. the VISION ERA-NET report "Open Innovation and Globalisation: Theory, Evidence and Implications" by Herstad, Sverre J., Bloch, Carter; Ebersberger, Bernd and van der Velde, Els (April 2008).

general scheme of things. This is closely related to the fact that the effects will vary and depend on factors like the enterprises' product portfolio, competitive situation, sector, etc.

Yet the results show that some enterprises can benefit economically from an innovation model that draws on knowledge of customers and users and/or is open to obtaining knowledge from external sources and working together with other enterprises. This is demonstrated by the presence of a higher level of value creation on average from 2004 to 2005 among enterprises that worked with user-driven and open innovation from 2002 to 2005, while there were only a few instances of negative effects (see Chapter 4).

The correlation between innovation practices and the enterprises' financial results varies from one enterprise to another and from one sector to another. In this respect, the results indicate that the aspect of openness and knowledge of users and customers capable of generating positive results varies within the different sectors. These differences can be due to the fact that enterprises' product portfolios, competitive situation, technology utilisation and user requirements differ (see Chapter 4).

The results as they apply to the individual sectors should be read with some reservation. But at an overall sector level, the results indicate that it can be advantageous for some enterprises to link research and development to user-driven innovation and openness in the innovation process, including collaborating with other parties to innovate and buy external knowledge. A positive effect on financial results is suggested in the Manufacturing in particular from linking research and development to knowledge of customers and markets and to collaborating with external parties. This could be because of that fact that in this sector technological development is crucial for the development of new products and services (see Chapter 4).

In the service sectors, some enterprises can reap positive gains from working with user-driven innovation or collaborating with other enterprises on innovation without necessarily linking these efforts to research and development. This applies to enterprises that draw on knowledge about the needs and potential of users and in markets or which link an enterprise's core expertise and products to other enterprises' products and expertise. This could be related to the fact that these enterprises are developing new solutions and concepts that are either intangible or are based on existing technology (see Chapter 4).

It is not necessarily a foregone conclusion that all Danish enterprises will be able to achieve the same benefits from developing new solutions based on knowledge about market needs or from opening their innovation process to external input. Even so, many enterprises do not make use of these opportunities. Only one-fifth of all Danish enterprises collaborate with other parties on innovation and less than one-sixth of all Danish enterprises have identified recognised or unrecognised needs in users and customers which have been

very significant to their innovation process as a result of such efforts. Thus it cannot be ruled out that some of these enterprises may have the potential to grow, but this will depend on the specific situation of each enterprise, and some enterprises may actively reject this option for commercial reasons.

Basic data

The report's basic data uses register-based data from the Danish Ministry of Economic and Business Affairs' Virksomhedsdatabasen [company database] and questionnaire-based data from the two surveys "Community Innovation Survey (CIS)" and "Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005]". Via company VAT numbers, it is possible to link the Virksomhedsdatabasen [company database] (containing information about the enterprises' financial situation) to the questionnaire surveys (containing information about the enterprises' innovation activities). Further details are available in Appendix 1: Basic Data of the Report (Rapportens datagrundlag), in Danish.

Virksomhedsdatabasen [company database]

Statistics Denmark has built up a comprehensive Virksomhedsdatabasen [company database] for the Ministry of Economic and Business Affairs containing information about all Danish enterprises (companies, i.e. the legal entity) and their employees covering the period from 1999 to 2005, on the basis of the company statistics and the Integrated Database for Labour Market Statistics (IDA). The database is continuously being enlarged to include new information and the addition of new years. The database makes it possible to follow the developments and transactions of the enterprises over a period of time, which makes this a useful tool for analyses of structural policy and business economics. The Virksomhedsdatabasen [company database] contains information about some 300,000 enterprises, broken down by more than 200 variables.

Community Innovation Survey 2002–2004 (CIS4) and 2004–2006 (CIS2006):

The CIS surveys were conducted as a standardised questionnaire survey in the EU and in a number of other OECD countries, making comparison possible across the different Member States. The purpose of the CIS4 was to study the scope of innovation activity in Denmark's business community between 2002 and 2004. CIS4 is based on responses from 2,097 private-sector enterprises with at least six employees (in some sectors with as few as two and in others with more, however). The enterprises were selected on a stratified basis to ensure representation from all sectors and size categories. Data were subsequently weighted so the results reflect Denmark's business structure whilst also remaining representative.

CIS2006 further develops the same principles as CIS4, but some of the questions are worded differently. CIS2006 is based on responses from 2,307 private-sector enterprises. The coverage of Denmark's business community was expanded to include more small enterprises in more sectors than previously.

Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005]:

Accessible quantitative knowledge of how enterprises organise the innovation process primarily originates from the survey “Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005]” conducted by Statistics Denmark. The purpose of the survey was to review the performance and growth conditions of the Danish business community in a regional perspective. The survey was conducted as a questionnaire sent to a representative selection of enterprises in Denmark. The survey was carried out in the autumn of 2005 and the spring of 2006 and covers a total of 1,552 enterprises. The questionnaire was sent to 4,877 enterprises and the response rate was 31.8%. This response rate means that some enterprise categories may be difficult to comment on. The breakdown is even in terms of enterprise size and region. In terms of sectors, the response rates were especially low in the retail trade (15%), and hotels and restaurants (12%), while the rate of other sectors was between 31% and 41%.⁷ This means that the descriptive statistics for these two sectors in particular are somewhat less reliable than that of other sectors.

Uncertainty relating to data and methodology

The report's conclusions are subject to some uncertainty in terms of methodology and basic data. Questionnaire surveys generally involve a number of uncertain factors relating to how the respondents understand the questions and the respondents' knowledge of the corporate factors being asked about in the survey. In this respect, the efforts involving the CIS surveys are based on thorough quality control as stipulated by Eurostat, which includes close contact with the respondents for the purpose of getting valid responses.⁸

In other words, the conclusions are subject to the uncertainty that relates to the method of collection. Similarly, the conclusions relating to the financial effects are subject to uncertainty related to the fact that it is not possible to control or take into consideration all the enterprise-specific factors and the fact that it is only possible to identify the short-term effects on value creation. Also, interdependent factors between the variables studied could influence the survey results. Additional method-related factors are described in the appendices.

Overview and structure

Chapter 1 deals with innovation activity in Denmark's business community, defined as the outcome of the innovation activity, i.e. the results of the enterprises' innovation processes. The chapter provides an overview of the percentage of Danish enterprises that have introduced new products, processes, marketing methods or organisational changes in different sizes of groups, sectors, etc. The chapter is based on data from the Danish version of the Community Innovation Surveys 2002–2004 and 2004–2006.

Chapter 2 clarifies the underlying concepts of various approaches to the innovation process, i.e. how enterprises innovate, with particular focus on open innovation, user-driven innovation and the organisation of the innovation process.

Chapter 3 provides a general view of the proliferation of open and user-driven innovation, and of how enterprises organise the innovation process in the business community in general, in sectors, in terms of size categories, etc. The chapter is based on data from the Danish edition of the Community Innovation Survey 2004–2006 and *Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005]*.

Chapter 4 presents the results of a number of statistical analyses of the correlation between enterprises' efforts involving open and user-driven innovation and the organisation of the innovation process and enterprises' value creation when tested in terms of a wide range of background variables such as sector, size, market position, etc. The analyses are based on data from the Danish edition of the Community Innovation Survey 2004–2006, *Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005]* and the Virksomhedsdatabasen [company database] of the Danish Ministry of Economic and Business Affairs.

Appendix 1 (in Danish) explains the methodology and data underlying the analysis results.

Appendix 2 (in Danish) contains panel data on the innovation activities of the enterprises included in both Community Innovation Surveys, i.e. 2002–2004 and 2004–2006.

Appendix 3 (in Danish) includes the specific results of the econometric analyses underlying the analyses of the correlations between innovation practice and value creation.

⁷ Statistics Denmark (2006): “Metoderapport – undersøgelse vedr. den regionale konkurrenceevne” [Methodology Report: A Study of Regional Competitiveness].

⁸ Danish Centre for Studies in Research and Research Policy (2008): *Innovation i dansk erhvervsliv – Innovationsstatistik 2004-2006 – metode og datagrundlag [Innovation in Denmark's Business Community – Innovation Statistics 2004–2006 – methodology and basic data]*.

Table of Contents

Preface	3
Executive Summary	5
Contents	9
Chapter 1: The Innovation Activities of Danish Enterprises	11
1.1 Introduction and summary	11
1.2 Enterprises can innovate across the entire business model	11
1.3 Innovation can pay off	13
1.4 Declining innovation activity in Denmark's business community	14
1.5 Declining innovation activity, especially among small enterprises	16
1.6 Most innovative sector: Finance and Business Services	19
1.7 Which enterprises drop out of innovation activities?	21
1.8 Potential for increased innovation activity in Denmark's business community	24
Chapter 2: Many Paths to Innovation	25
2.1 Introduction and summary	25
2.2 Several types of innovation in global knowledge-based competition	25
2.3 User-driven innovation	26
2.4 Openness in the innovation process	28
2.5 Organising the innovation process	29
2.6 Correlation between the types of innovation	31
Chapter 3: How Danish Enterprises Innovate	33
3.1 Introduction and summary	33
3.2 Dispersion of types of innovation in Danish enterprises	34
Enterprises' identification of recognised and unrecognised user needs	35
Dispersion of openness in the innovation process	35
Correlation between openness in the innovation process and the innovation activity	36
Supporting innovation using the enterprise's organisation and culture	37
3.3 Large enterprises use more types of innovation than small enterprises	38
Organisational support of innovation across the enterprise size categories	41
3.4 Sector differences in the use of different types of innovation	41
Enterprises in Finance and Business Services and in Manufacturing focus most on user-innovation potential and open innovation	41
Enterprises in Finance and Business Services and in Retail are more frequently involved with the organisation of the innovation process	45
Chapter 4: The Effects of Working with Innovation	47
4.1 Introduction and summary	47
4.2 Innovation activities can contribute to creating value	48
4.3 User-driven innovation creates value for enterprises	48
4.4 Opening up the innovation process to external input pays off	50
4.5 Organising the innovation process	52
Appendix 1: Rapportens datagrundlag (Basic Data Used in the Report)	55
Appendix 2: Særkørsler vedr. PP-innovationsaktiviteter (Special Runs: PP Innovation Activities)	59
Appendix 3: Analyseresultater (Analysis Results)	61

Chapter 1 The Innovation Activities of Danish Enterprises

1.1 Introduction and summary

Danish enterprises face competition from other enterprises in Denmark and abroad. To cope with the competitive situation, the enterprises can strengthen their competitiveness through measures such as converting innovation into commercial value, i.e. by innovating. Innovation involves converting ideas into new products and services in demand by customers and consumers, and developing more efficient and reliable manufacturing or distribution processes.

One issue entails what the enterprises innovate, while another deals with how the enterprises work with the innovation process. This chapter looks at the outcome of the innovation process and the trends in what the enterprises innovated in the periods 2002–2004 and 2004–2006.

The central conclusions of the chapter:

- Innovation involves more than the launch of new products. Innovation also entails the development of the entire business model, which also includes the implementation of processes, new types of organisation and new marketing methods (see Section 1.2).
- Denmark's business community became less innovative between the 2002–2004 and 2004–2006 periods. In particular, the percentage of Danish enterprises launching new or significantly improved products or services declined. At the same time, the percentage of enterprises launching a new manufacturing process, distribution method or similar declined (see Section 1.4.).
- The decline applies to Denmark's business community in general, but particularly to small and, to a lesser extent, medium-sized enterprises. The enterprises that stopped are especially those that experience high costs when they innovate and are uncertain about the demand for new products – typical concerns of small and medium-sized enterprises in particular (Section 1.4 and Section 1.5).
- Previous studies show that enterprises which are innovative across their entire business model generate better financial results than other enterprises.⁹ Four out of ten Danish enterprises are innovative in more than one area at a time. For large enterprises, more than one in five have not been innovative in any of the areas. In the sectors Finance and Business Services and Manufacturing, almost half did not launch any type of innovation in the period (Section 1.6).
- Half of all Danish enterprises did not introduce new products, processes, marketing methods or organisational changes in the period. Innovation activities in Denmark's business community put Denmark in the median range, compared to other EU Member States, ahead of countries like Finland, Norway and the Netherlands, but after countries like Sweden, Belgium and Germany. This indicates a possible overall potential for increased innovation activity in Denmark, but this is difficult to assess, just as the scope of this potential is also difficult to assess (Section 1.8).

1.2 Enterprises can innovate across the entire business model

Innovation involves converting innovative thinking into commercial value in the form of new solutions, products, processes, etc.

The outcome of an innovation process can vary greatly in nature. Overall, it involves the development of new solutions that enable enterprises to improve their earnings.¹⁰ This could be new products that generate a profit by increasing sales here and now or that give the enterprise a new and better market position by enabling it to get ahead of its competitors or enter brand-new markets it has never accessed before. Yet innovation can also comprise the development of brand-new manufacturing processes that reduce manufacturing costs or distribution processes that make the delivery of goods and products more efficient and reliable.

In other words, an innovation process can have many different types of outcome. The OECD and the EU define innovation as “*the implementation of a new or significantly improved product (good or service), or process, a new marketing method or a new organisational method in business practices, workplace organisation or external relations.*”¹¹ This leads to four different types of outcome of the innovation process that cover a range of subcategories (see Table 1.1).

9 Danish Ministry of Economic and Business Affairs (2005): “Vækstredogørelse 05” [2005 Regional Growth Report].

10 Danish Ministry of Economic and Business Affairs (2005): “Vækstredogørelse 05” [2005 Regional Growth Report], Department of Trade and Industry (2003).

11 OECD-Eurostat (2005): “Oslo Manual, Guidelines for Collecting and Interpreting Innovation Data”, 3rd Edition, Paris.

Table 1.1: Four types of outcome of the innovation process

Product innovation		Process innovation			Organisational innovation				Marketing innovation						
Products	Services	Manufacturing processes	Logistics, delivery, distribution	Auxiliary functions for enterprise's processes	Business procedures	Knowledge management systems	Organisation of product development	Workplace organisation	External relationships	Design	Packaging	Promotional techniques	Marketing strategies	Sales channels and product placement	Pricing methods

Source: Danish Centre for Studies in Research and Research Policy (2006): Research and Innovation in the Business Community 2006.

Product innovation deals with introducing new or significantly improved products and services. This could be commercial goods or new concepts and solutions for services. It can be relevant to differentiate between products that are new to the enterprise's market or new solely for the enterprise.

Both instances, however, will involve an attempt to generate commercial value from ideas that have not been used by the enterprise previously and which could improve the enterprise's market position.

Case Study: Product Innovation

Product innovation can involve the launch of both products and services. Scania, a Swedish manufacturer of lorries, buses and engines, has a rising turnover in services, comprising garage services, IT support for transport planning, loan financing and insurance solutions. Scania has 35,000 employees around the world in its product divisions and 20,000 employees in its autonomous service enterprises. DynaMate was established in 1993 as an internal service and process-optimisation department. To utilise the department's core expertise, the department was reorganised in 2001 into an autonomous subsidiary in a brand-new business area within the Scania Group, marketing technical manufacturing support and operational reliability for external customers. Specific services include improving the efficiency of manufacturing systems, machinery renovation and maintenance, operational surveillance, design work and construction management of manufacturing facilities, installation of manufacturing equipment, truck leasing and furniture management. Today, DynaMate generates DKK 2 billion in turnover and has 1,400 employees and 4 subsidiaries.

Case Study: Process Innovation

KiMs, of Denmark, makes, markets and distributes snacks and chips and generated a turnover of DKK 545 million in 2007. It is crucial for the company's continued growth that the products in demand can be delivered to the right place at the right time. This makes demands on the company's ability to coordinate its flow of orders and stocks between its main warehouse, 10 storage facilities and 36 sales vehicles. After entering into development collaboration with Microsoft, each of KiMs' sales representatives is now equipped with a Mobile Sales Assistant that can put the sales rep in contact with the company's other systems. This means the sales reps always have an up-to-date overview of the products in stock, delivery possibilities and volume of orders. This has improved the management of sales and stocks, reduced costs and increased productivity across a wide range of corporate functions. For Microsoft, the collaboration generated product innovation, as the Mobile Sales Assistant sparked the interest of a number of other customers in developing their logistics processes.

Source: ReD Associates (2008): User-driven Innovation: a Study of Innovation Practices and User Involvement at 15 Leading Companies in Denmark.

Source: www.scania.se and www.dynamate.se

Process innovation is the implementation of a new or significantly improved manufacturing process or distribution method for products or services, including auxiliary functions for company processes. This involves enabling the enterprise to manufacture and distribute products faster and more efficiently by implementing new or significantly improved manufacturing processes, logistics, delivery or distribution methods, etc. It can also involve new or significantly improved auxiliary processes such as systems and procedures relating to procurement, maintenance, book-keeping or IT processes.

Organisational innovation involves the implementation of significant changes in business procedures and the organisational or corporate structure of the enterprise, changes which aim to improve the enterprise's innovative capacity and modus operandi. This could include measures like the introduction of new knowledge-management systems – by changing the way in which business processes or procedures are organised as a result of supply chain management, lean production, quality management, etc. – with a view to sharing and utilising knowledge or changing the way in which relationships with other enterprises and/or public institutions are organised through outsourcing, partnerships, etc.

Case Study: Organisational Innovation

Coloplast, which develops medical products and assistive devices, reorganised the company's innovation and development in 2007. The purpose was to ensure that all new development was based on market needs. The enterprise now has three global departments: Global Marketing, Global R&D and Global Operations. Global Marketing is more actively involved in relation to innovation, as it is responsible for identifying and assessing market needs and the subsequent choice and prioritisation of innovation projects. Global R&D is responsible for closely cooperating with customers and users to develop solutions that can address the needs identified.

Source: ReD Associates (2008): User-driven Innovation: a Study of Innovation Practices and User Involvement at 15 Leading Companies in Denmark.

Marketing innovation is exemplified by significant changes in packaging or appearance; the use of new communication channels relating to promotion; new promotion techniques; introducing brand-new marketing strategies; utilising new sales channels and product placement; or brand-new sales and pricing methods, e.g. the implementation of Internet-based sales, franchising or distribution licences.

Case Study: Marketing Innovation

When PFA, a Danish pension company, wanted to improve its services and proximity to its customers, it launched a new and improved customer portal in 2004 that brings particular focus to bear on the people administering company pension schemes. Whereas PFA had expected that the administrators would use the portal frequently and be familiar with it, observation studies showed that the actual duration of use was only about ten minutes once or twice a month. Consequently, this not only affected the design of the customer portal but also PFA's general communications relating to users and customers. PFA changed things like its communication material and set up a team as the primary contacts for the administrators. This led to closer contacts with customers, directly reflected in the customer satisfaction surveys.

Source: ReD Associates (2008): User-driven Innovation: a Study of Innovation Practices and User Involvement at 15 Leading Companies in Denmark.

1.3. Innovation can pay off

Innovation can encompass several different elements of an enterprise's business model. This means that innovation can be relevant both to enterprises which market products globally or otherwise compete directly with foreign enterprises and to enterprises that have yet to be involved in international competition. In this respect, previous studies of how innovation is correlated to the enterprises' financial results show that innovative enterprises perform better than others,¹² because innovation can help to increase efficiency and lower manufacturing costs and because innovation can make it possible for the enterprise to charge more for its products. Yet also because innovation can improve an enterprise's ability to enter new markets.

At the same time, enterprises currently cut off from international competition can risk exposure to global competition in the long term. An enterprise could become vulnerable by failing to develop its business model or offers to customers. The sale and distribution of music via the Internet, for example, competes with both Danish and foreign companies that were not in the Danish market previously. Similarly, other service sectors can be subjected to competition from foreign enterprises if an enterprise fails to develop new business concepts.

12 Danish Ministry of Economic and Business Affairs (2005): "Vækstredogelse 05" [2005 Regional Growth Report]; Boston Consulting Group (2007): Innovation.

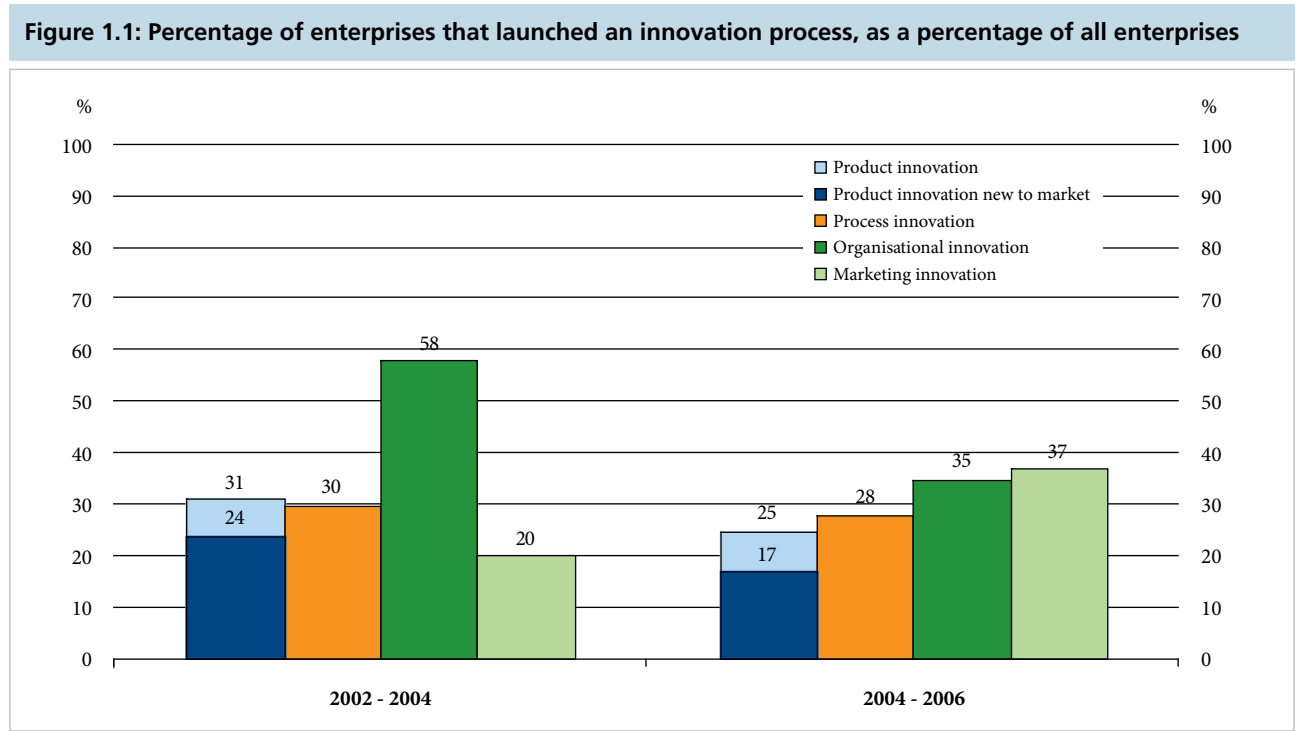
In practice, the various types of innovation will often overlap. When an enterprise develops a brand-new product, this could mean that the enterprise changes its business processes, manufacturing methods or relationships with external parties at the same time. Also, as exemplified in the case of KiM's new Mobile Sales Assistant, a process innovation in one context can be a product innovation in another. Thus, innovation should not be regarded only as the development of a new product or a new manufacturing apparatus.

Previous studies show a close correlation between the innovative quality of enterprise innovation and an enterprise's financial results. Thus, enterprises that launch innovation with a high novelty value and/or are innovative across the entire business model have substantially better financial results than other enterprises. Value is created especially when efforts to link the different types of innovation succeed. This especially applies to enterprises that link organisational innovation to other types, as the productivity of these enterprises is higher than that of non-innovative enterprises.¹³

This could indicate that gains are not only achieved by developing brand-new concepts or solutions encompassing an enterprise's existing products but by developing other aspects of the enterprise's business model.

1.4 Declining innovation activity in Denmark's business community

The percentage of Danish enterprises that launched a new product, process or organisational innovation declined between 2002–2004 and 2004–2006. From 2004 to 2006, one in four Danish enterprises introduced a new product, whereas one in three had done so previously. The decline applies to innovations new to the market and new to the enterprise alone. The fluctuation is marginal in terms of those that have launched a process innovation. By contrast, there are great fluctuations in terms of the percentage of innovative enterprises that are innovative organisationally or in terms of marketing. The percentage of organisationally innovative enterprises declined from 58% in 2002–2004 to 35% in 2004–2006. By contrast, the number of enterprises that launched marketing-based innovation almost doubled (see Figure 1.1).



Note: 2002–2004 and 2004–2006. The fluctuation for marketing innovation and organisational innovation is largely due to the rewording of questions between the 2002–2004 and 2004–2006 surveys. The questions relating to process and product innovation were not reworded, however.

Source: Own calculations based on CIS4, CIS2006 and the Virksomhedsdatabasen [company database].

13 Danish Ministry of Economic and Business Affairs (2005): "Vækstregørelse 05" [2005 Regional Growth Report]; Boston Consulting Group (2007): Innovation.

Table 1.2: Dispersion of specific innovation processes in Denmark's business community

		2002-2004	2004-2006
Product innovation	Goods	24 %	19 %
	Services	16 %	13 %
Process innovation	Manufacturing process	18 %	17 %
	Logistics, delivery, distribution	13 %	12 %
	Auxiliary functions	22 %	22 %
Organisational innovation	Business procedures	38 %	20 %
	Organisational change	35 %	-
	Knowledge management	-	17 %
	Product development	-	12 %
	Workplace organisation	-	23 %
Marketing innovation	External relationships	24 %	14 %
	Sales methods, etc.	16 %	-
	Modified appearance, etc.	8 %	-
	Design	-	13 %
	Packaging	-	8 %
	Promotional activities	-	14 %
	Marketing strategy	-	24 %
Pricing method	-	16 %	

Source: Own calculations based on CIS4 and CIS2006. The table is specified as a percentage of all enterprises.

The big changes in organisational and marketing-related innovation are presumably because the questions identifying these types of innovation were significantly edited between the two surveys. The questions concerning organisational innovation were both reworded and specified into more narrowly defined questions. Whereas changes in management structure or business procedures were relatively broadly phrased previously, they have become more specific, which makes greater demands on the specific types of innovations implemented by the enterprises. The opposite is true of marketing-related innovation, where more and significantly broader response categories were added. This did not apply to product or process innovation, however, which were identical in the two periods. Product innovation in particular declined (see Table 1.2).

Overall, the percentage of enterprises that launched a new product or service was lower in 2004–2006 than in 2002–2004. This decline is also seen in other specifications.

For instance, the business community's R&D investments as a percentage of GDP declined from 2003 to 2006. Apparently, however, the absolute R&D expenditure is rising, yet because it does not keep pace with the general level of activity in Denmark's business community, its share of the GDP is less.¹⁴ Also, there was also an absolute rise in innovation expenditure of 15% in current prices from 2004 to 2006, covering a slightly larger number of different expenses than R&D investments, but here, too, the rate of the increase is less than the turnover growth in the Danish business community. No change occurred in the percentage of enterprises with innovation expenses, however.¹⁵

In terms of output, the growth in the number of patent applications received from Danish enterprises corresponds to the growth in the percentage of enterprises that are innovative, as the number of patent applications per million per capita declined from 2004 to 2006. A declining number of national patent applications was only partly offset by a rise in patent applications submitted to international patent organisations.¹⁶

14 Danish Government (2008): "Konkurrenceevneredegeørelse 2008" [2008 Competitiveness Statement].

15 Statistics Denmark (2008): "Innovation i dansk erhvervsliv - Innovationsstatistik 2004-2006" [Innovation in Denmark's Business Community - Innovation Statistics 2004-2006].

There is some indication that a fixed group of enterprises continuously invest more in innovation in terms of input and that the enterprises' investments in innovation activities are continuously rising, but that this is not matched by a corresponding rise in output as a percentage of those that launched an innovation.

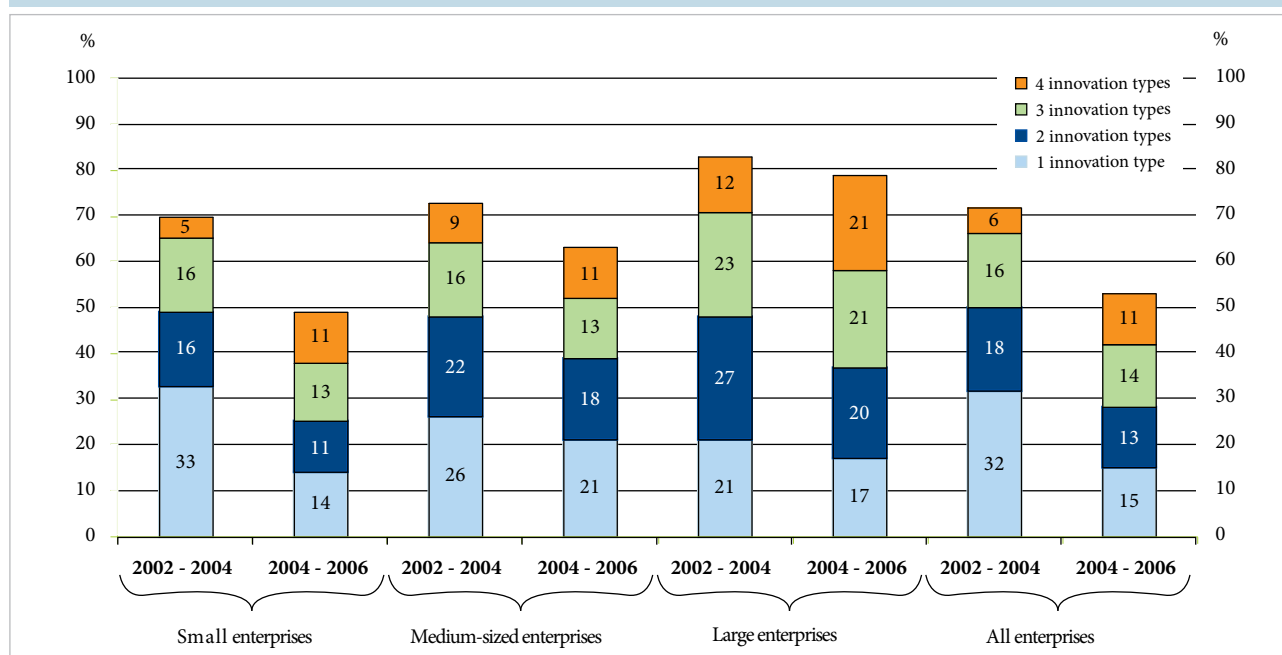
1.5 Declining innovation activity, especially among small enterprises

The percentage of enterprises that are not innovative in any of the four types of innovation rose from 2002–2004 to 2004–2006. In 2002–2004, three out of ten enterprises were not innovative in any of the areas, while the same was true of every second enterprise in 2004–2006. The percentage of enterprises that launched one type of innovation fell from 32% to 15%, while the share that launched two or three types of innovation fell from 35% to 27%. The percentage innova-

tive in all four areas at the same time rose from 6% to 11%. Thus, 62% of the enterprises do not benefit from the potential gain from introducing more than one type of innovation.

The decline in innovation activity is particularly evident in the percentage of small enterprises that launched one type of innovation, while it is less pronounced for the percentage of the medium-sized and large enterprises that launched one type of innovation. This partly involves a dimensional distortion. A larger percentage of the large enterprises are innovative in two, three or four areas than is the case among the small and medium-sized enterprises, while the difference between small and medium-sized enterprises is 7%. Only 21% of the large enterprises did not introduce innovation, while the same applies to 51% of the small enterprises and 37% of the medium-sized enterprises (see Figure 1.2).

Figure 1.2: Number of innovation types broken down by enterprise size



Note: 2002–2004 and 2004–2006 as a percentage of all enterprises.

Small enterprises (n = 1,883 in 2002–2004): Enterprises which do not exceed two of the following limits in two consecutive financial years: a balance sheet total of DKK 29 million, a net turnover of DKK 58 million or an average of 50 full-time employees during the financial year.

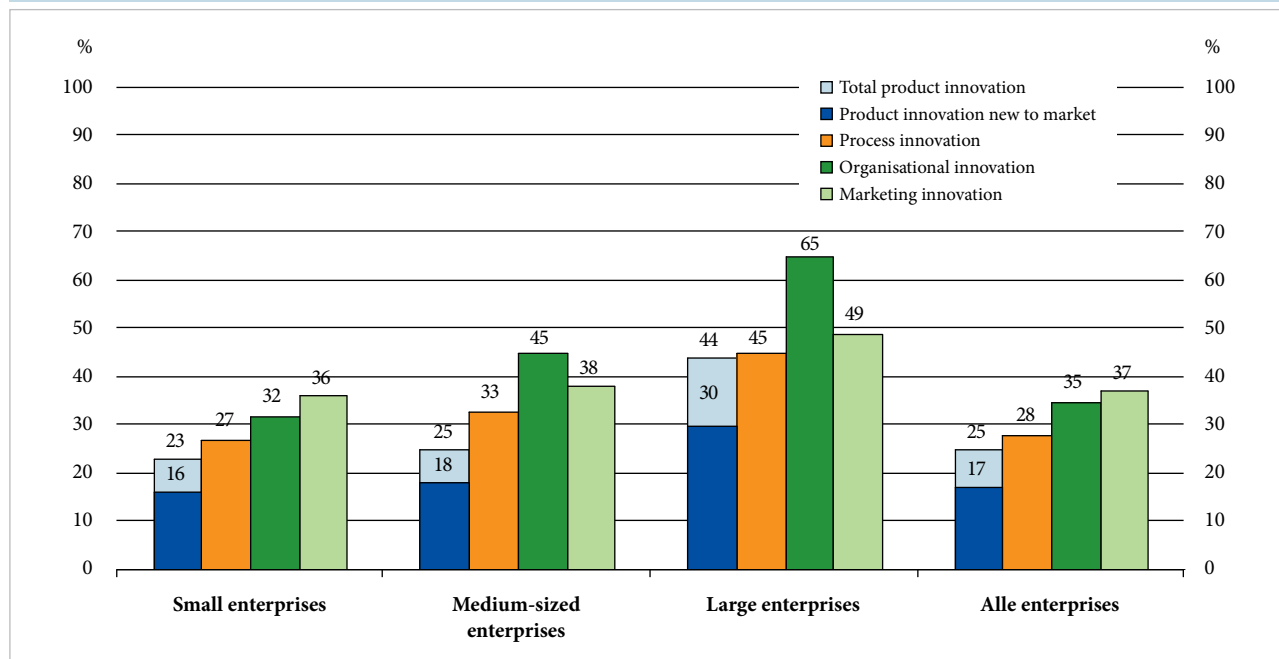
Medium-sized enterprises (n = 1,002 in 2002–2004): Enterprises which are not small enterprises and which do not exceed two of the following limits in two consecutive financial years: a balance sheet total of DKK 119 million, a net turnover of DKK 238 million or an average of 250 full-time employees during the financial year.

Large enterprises (n = 685 in 2002–2004): Enterprises that are neither small nor medium-sized. The random sample is based on a stratified extract for the purpose of ensuring respondents in all size categories. Data are subsequently selected to reflect Denmark's business structure.

The innovation indicator is compiled on the basis of the types of innovation introduced by the enterprise. A maximum value of four is achievable if the enterprise introduced all of the following: product, process, organisational and marketing innovation.

Source: CIS2006 and own runs in the Virksomhedsdatabasen [company database].

Figure 1.3: Types of innovation broken down by enterprise size



Note: 2004–2006. Descriptions of size: see Figure 1.2. The figure is specified as a percentage of all enterprises.

Source: Own calculations. CIS2006 and the Virksomhedsdatabasen [company database].

In general, larger enterprises are more inclined to have launched the individual type of innovation than smaller enterprises. Organisational innovation is the most widespread type of innovation among medium-sized and large enterprises. Two-thirds of the large enterprises implemented organisational innovations over a three-year period, while only one-third of the small enterprises implemented organisational innovation.

A product or service new to the enterprise's market was launched by 16% of small enterprises and 18% of medium-sized enterprises, while 30% of the large enterprises did so. When enterprises that launched products or services new to the enterprise only are included, 25% of Denmark's enterprises were product-innovative during the survey timeframe. This is also true of small and medium-sized enterprises, while almost 50% of the large enterprises launched a new product.

The same trend exists in terms of process innovations and marketing-related innovations, although marketing-related innovations in particular are significantly more widespread among small and medium-sized enterprises than product and process innovation (see Figure 1.3).

Not surprisingly, large enterprises are more inclined to be innovative than small enterprises. The very fact that large enterprises, all other things being equal, will have more products in the market means that more large enterprises will have launched an innovation in a given timeframe. Similarly, large enterprises have more departments and manufacturing facilities, which increases the probability that they will have implemented new manufacturing processes or carried out restructuring measures.

For this reason, it helps to look at the proportion of innovation activities in terms of the enterprise's total level of activity. In this respect there are evidently a group of small enterprises that are very innovative compared to large enterprises, while another group of small enterprises are less innovative than large enterprises.

Among innovative enterprises, the percentage of turnover invested by enterprises in innovation is indeed significantly greater for small enterprises than large. While investments in innovation amount to 3% of the turnover of enterprises with more than 50 employees, they amount to more than 8% among innovative enterprises with fewer than 10 employees and almost 5% of the turnover of enterprises with 10 to 49 employees.¹⁷ The budget of small innovative enterprises is thus relatively more strained by innovation expenditures.

16. Danish Government (2008): "Konkurrencevneredegeørelse 2008" [2008 Competitiveness Statement].

17. Statistics Denmark (2008): "Innovation i dansk erhvervsliv, Innovationsstatistik 2004-2006" [Innovation in Denmark's Business Community, Innovation Statistics 2004-2006]; Danish Centre for Studies in Research and Research Policy: "Innovation i dansk erhvervsliv - Innovationsstatistik 2002-2004" [Innovation in Denmark's Business Community - Innovation Statistics, 2002-2004].

In this context, previous studies have pointed out how small enterprises especially state that costs are an obstacle to working with innovation.

In conformity with the decline in the percentage of innovation-active enterprises, a decline occurred in percentage of turnover generated by new products and services in proportion to the overall turnover between 2002–2004 and 2004–2006. With the exception of large enterprises more than five years old, this applies to all size categories. Turnover generated by new products and services especially declined among small newly founded enterprises. The only enterprise category unaffected by the decline comprises large enterprises more than five years old (see Table 1.3).

The decline is primarily because a smaller percentage of the enterprises launched an innovation process in the period concerned, especially among small and medium-sized enterprises. The general decline in innovation activities among small and medium-sized enterprises could be due to the fact that they are more sensitive to market fluctuations than large enterprises. Which in turn could be explained by the fact that small enterprises are more inclined to capitalise on previous innovations and utilise a boom to sell existing products, and accordingly did not deem it necessary to launch new innovations during the period. In this situation, large enterprises with a separate development department will continuously be developing new products and services.

Looking solely at enterprises that launched an innovation, small enterprises base the largest part of their business on innovation. Thus, almost 40% of the turnover of the smallest newly established enterprises in particular is generated by new products and services. It is presumably quite natural for products launched within a three-year timeframe to account for a relatively larger percentage in enterprises less than five years old. Medium-sized and large enterprises under five years old, however, base much less of their business on newly-developed innovative products than small, young enterprises. And less innovative enterprises base less of their business than older enterprises in the same size category. This could be due to the fact that these enterprises grew quickly as a result of a successful product launched when the enterprise commenced its activities. For this reason, there could be less focus on developing brand-new solutions and alternatives in subsequent years while the enterprise's core product is still attractive and competitive (see Figure 1.4).

Overall, this indicates that small enterprises which have launched an innovation invest a significantly larger percentage of their turnover in innovation activities and base a significantly larger percentage of their business on selling new products and services.

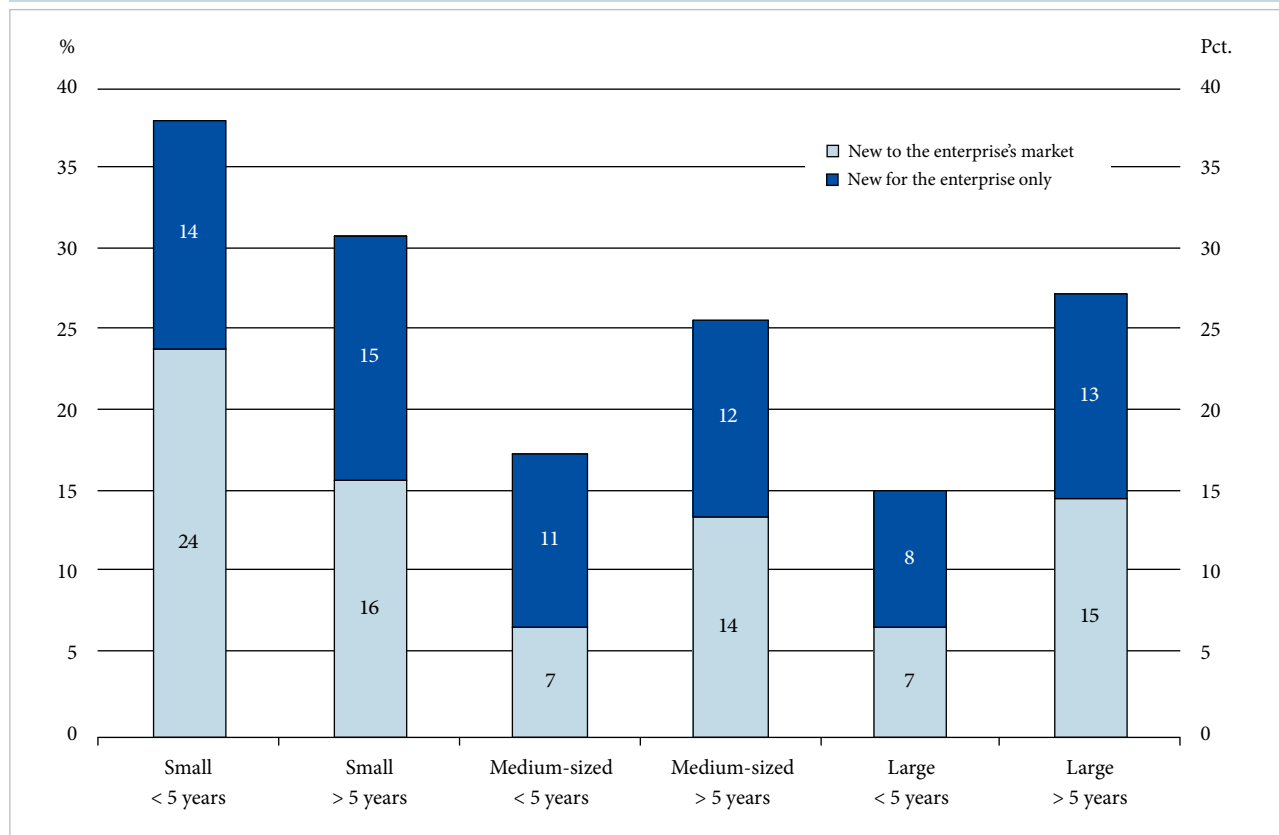
Table 1.3: Percentage of turnover from new products and services among all enterprises

		Small enterprises		Medium-sized enterprises		Large enterprises	
		Less than 5 years old	More than 5 years old	Less than 5 years old	More than 5 years old	Less than 5 years old	More than 5 years old
2002-2004	New to the enterprise	5.3 %	3.8 %	4.3 %	4.3 %	6.6 %	4.8 %
	New to the enterprise's market	9.9 %	3.8 %	1.8 %	3.7 %	3.9 %	4.7 %
2004-2006	New to the enterprise	2.0 %	1.8 %	1.1 %	2.3 %	2.4 %	4.9 %
	New to the enterprise's market	3.5 %	2.0 %	0.7 %	2.5 %	1.9 %	5.8 %

Note: 2002–2004 and 2004–2006. Descriptions of size: see Figure 1.2. The figure is specified as a percentage of all enterprises.

Source: CIS2006 and own calculations based on the Virksomhedsdatabasen [company database].

Figure 1.4: Percentage of turnover from new products and services among innovative enterprises



Note: 2004–2006. Descriptions of size: see Figure 1.2. The figure is specified as a percentage of all innovative enterprises. The enterprise's age is calculated as the enterprise's age in 2006.

Source: CIS2006 and own runs in the Virksomhedsdatabasen [company database].

1.6 Most innovative sector: Finance and Business Services

Enterprises in various sectors operate in different markets and have different product portfolios. This means that differences in the innovation activities of the different sectors should be expected. Both because the nature of the enterprise's products varies and because enterprises in different sectors are in different competitive situations.

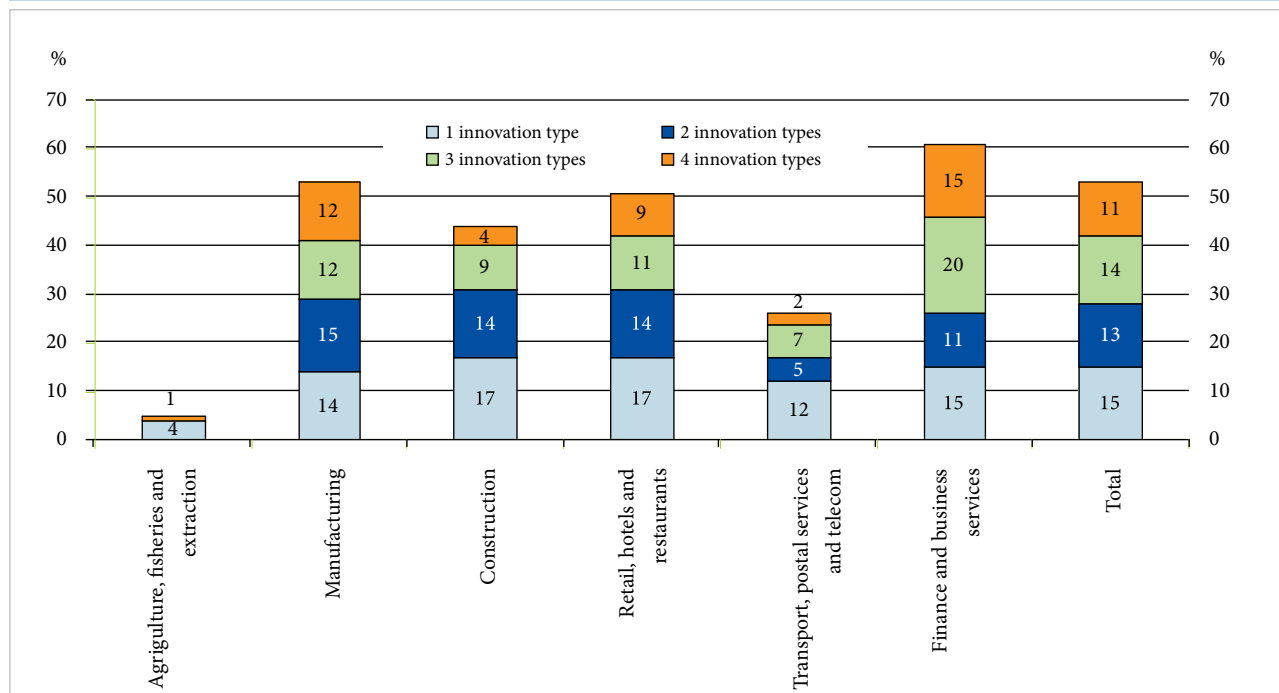
The sector category including Agriculture, Fisheries and Extraction is followed by Transport, Postal Services and Telecom as the sectors where the fewest enterprises have launched innovation. In these categories, 95% and 74% of the enterprises respectively did not launch an innovation during the period. In the other sectors, between 40% and 60% of the enterprises did not launch any type of innovation from 2004 to 2006. Finance and Business Services, followed by Manufacturing, is the sector where the most enterprises have launched at least one innovation. Finance and Business Services is distinguished by being the sector in which the

most enterprises have launched three or four types of innovation, and almost half have launched two or more types of innovation. This is followed by Manufacturing, where 39% introduced two or more types of innovation and Retail, Hotels and Restaurants where 34% are involved (see Figure 1.5).

In most sectors, organisational innovations and marketing-related innovation are the most prevalent. In general, there appears to be a certain correlation between the specific innovations and the general activities of the sectors.

For instance, enterprises in Manufacturing in particular launched new products, but only a few launched new services. The Finance and Business Services sector is where most enterprises launched new services during the period. In addition, Finance and Business Services is typified by being the sector where the most enterprises launched new auxiliary functions (i.e. in accounting, IT, procurement, etc.), new knowledge management systems and new business procedures. In other words, it is especially this sector's core area that stands out as the most innovative in the period.

Figure 1.5: Number of innovation types broken down by sector



Note: Observations in sectors from left to right, 2004–2006: 11, 1,177, 176, 788, 331, 1,053. The random sample is based on a stratified extract for the purpose of ensuring respondents in all size categories. Data are subsequently selected to reflect Denmark’s business structure. See Figure 1.2 for a description of innovation indicators. The figure is specified as a percentage of all enterprises. The sector categorisation is based on a standard nine-sector categorisation. The number of respondents (n) means that further data breakdown is not possible.

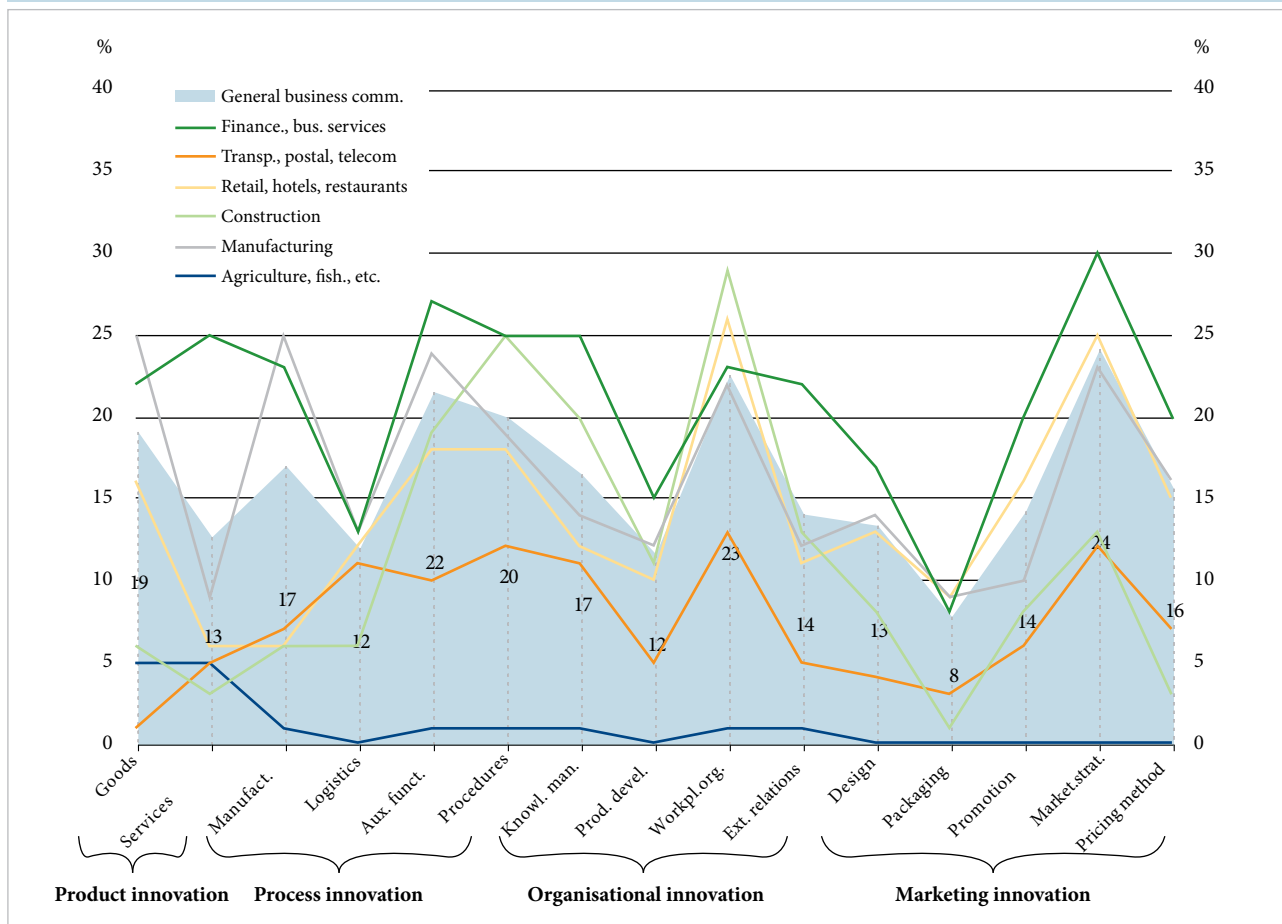
Source: CIS2006 and the Virksomhedsdatabasen [company database].

In a sector like Transport, Postal Services and Telecom, relatively few enterprises are innovative according to most parameters, except within the sector’s core product (logistics, distribution, delivery, etc.) where it is at a level with other sectors. Even so, only slightly more than 10% of the enterpri-

ses in this sector launched new methods for distribution, delivery, etc., over a three-year period (see Figure 1.6).

Consequently, there is a certain correlation between the enterprises’ general activities and the areas in which they are innovative.

Figure 1.6: Specific innovation processes broken down by sector as a percentage of all enterprises



Note: 2002–2004. See Figure 1.5 for the number of respondents in the different sectors. The figure is specified as a percentage of all enterprises. The sector categorisation is based on a standard nine-sector categorisation. The number of respondents (*n*) means that further data breakdown is not possible.

Source: Own calculations based on CIS2006 and the Virksomhedsdatabasen [company database].

1.7 Which enterprises drop out of innovation activities?

Information about the innovation activities in Denmark is based on a survey where some of the respondents are members of the same panel used in both 2002–2004 and 2004–2006. This group of enterprises especially includes enterprises in high-tech and intermediate technological manufacturing, enterprises in retail and a certain number of enterprises in

Finance and Business Services that were innovative in 2002–2004, but which were not innovative in the 2004–2006 survey. It is true of all sectors that some enterprises which were not innovative in the first period became innovative in the second. The percentage of enterprises that was innovative in the first period but which stopped in the second exceeds the percentage that became innovative in the second period (see Table 1.4).

Table 1.4: Change in percentage of product and/or process-innovative enterprises in sectors, measured from 2002–2004 to 2004–2006

Sector	Index, pp innovation activity (2004 = 100)
Manufacturing	90
Retail	77
Transport, postal services and telecom	97
Finance and business services	89
All enterprises	89

Note: Table 1.4, Table 1.5 and Table 1.6 are based on panel data from enterprises participating in the CIS survey in both 2002–2004 and 2004–2006. The above are calculated as follows: All enterprises that carried out pp innovation in 2006/All enterprises that carried out pp innovation in 2004. I.e. a value below 100 shows that fewer enterprises in the category performed pp innovation in 2006 compared to 2004. The basis of the calculation is shown in Appendix 1. The sector categorisation is based on a standard nine-sector categorisation. The number of respondents (*n*) means that further data breakdown is not possible.

Source: Special run performed by the Danish Centre for Studies in Research and Research Policy.

Table 1.5: Change in percentage of product and/or process-innovative enterprises in size categories, measured from 2002–2004 to 2004–2006

No. of employees	Index, pp innovation activity (2004 = 100)
2–9	72
10–49	74
50–249	97
> 250	101
All enterprises	89

Note: See note for Table 1.4.

Source: Special run performed by the Danish Centre for Studies in Research and Research Policy.

It appears that small enterprises especially stopped being innovative between the two periods. More than 25% of this group of enterprises stopped launching innovation. Although this is because many stopped innovating, virtually none of the enterprises in these size categories that were not innovative in 2002–2004 launched an innovation in the subsequent period. Some of the enterprises with more than 50 employees also stopped being innovative. By contrast, a corresponding percentage of large enterprises became innovative in the intermediate period, explaining why the innovation level for this type of enterprise is more or less status quo (see Table 1.5).

There may be different reasons to explain why enterprises did not launch innovations between the two survey periods. For instance, innovation is cost-intensive for some enterprises, while a lack of the knowledge and expertise required could constrain other enterprises.

In this respect it is possible to compare the innovation-activity trend for the periods 2002–2004 and 2004–2006 in enter-

prises that encountered specific obstacles with that for enterprises that did not encounter specific obstacles. The survey seems to indicate that innovative enterprises which responded that they encountered obstacles relating to the innovation process in the 2002–2004 period had a greater tendency not to be innovative in the subsequent period than innovative enterprises that did not encounter obstacles relating to the innovation process. In particular, many of the enterprises indicating insufficient external sources of financing for innovation, excessive innovation costs and uncertain demand for new and improved products and services as obstacles to the innovation process are the same enterprises that are no longer innovative. By contrast, those enterprises that did not encounter the same obstacles do not show the same proportional change in the level of innovation activities. Innovation activities rose among enterprises that did not experience innovation costs as being too high in 2002–2004, but the decline is striking among enterprises that did experience this obstacle.

Finally, it appears that the innovation activities in enterprises

that were not uncertain about the prospects of being able to market innovative products are largely status quo. This should be set off against a sharp decline in the group of enterprises that were uncertain about the demand for their products (see Table 1.6).

A possible explanation as to why innovative enterprises in the second period frequently did not introduce an innovation could be that the enterprises did not need to develop new products, etc., because they were generating good earnings from the innovations developed in the preceding period. But the survey seems to indicate that this is not the case. In other words, enterprises that did not experience previous innovations as an obstacle to innovation in 2002–2004 are more inclined to drop out than enterprises which experienced them as an obstacle to their innovation activities.

Overall, the survey seems to indicate that an especially large percentage of small enterprises stopped being innovative between 2002–2004 and 2004–2006. This could possibly be due

to the fact that, because of the boom, enterprises had the capacity to live off their ordinary business model and as a result did not need to launch innovations. Conversely, innovation efforts can be relatively cost-intensive for small enterprises, and this may explain in part why small enterprises in particular drop out. Previous studies point out that small enterprises especially experience innovation-related costs as a major obstacle to their innovation activities.¹⁸ A contributing factor could be that small enterprises do not expect to realise sales from their innovation efforts that exceed the costs incurred in the innovation process. This could be because these enterprises do not think that the value of innovation corresponds to the associated costs or the enterprises have been sufficiently competitive to attract financing outside the enterprise. It could also be explained by the fact that some enterprises do not think they can afford to run the possible risk entailed in making a major investment which they have no guarantee will be worth the cost.

Table 1.6: Change from 2004 to 2006 in the percentage of enterprises innovative in terms of products and/or processes which experienced or did not experience obstacles to innovation in 2004

	Change among enterprises that did not experience obstacles	Change among enterprises that experienced some/great obstacles
Insufficient financial resources in the enterprise	-11 %	-11 %
Insufficient funding sources outside the enterprise	-4 %	-18 %
Excessive innovation costs	+7 %	-18 %
Lack of qualified employees	-10 %	-11 %
Insufficient technological information	-10 %	-11 %
Insufficient market information	-10 %	-12 %
Difficult to find innovation partners	-11 %	-11 %
Market dominated by established enterprises	-9 %	-12 %
Uncertain demand for new and significantly improved products	-2 %	-14 %
Unnecessary due to previous innovations	-15 %	-7 %
Unnecessary due to insufficient demand for new or significantly improved products	-11 %	-11 %

Note: This figure shows the change in innovation activities between the periods 2002–2004 and 2004–2006 among enterprises that experienced and did not experience specific obstacles respectively to their innovation process in 2004. The above was calculated on the basis of the enterprises responding that the variable in question was no obstacle or some/great obstacle to the pp innovation activity in 2004. Specifically, the above was calculated as follows: All enterprises that carried out pp innovation in 2006/All enterprises that carried out pp innovation in 2004. In other words, it shows whether there are fewer enterprises in the category that performed pp innovation in 2006 compared to 2004. It is assumed that wherever the two columns differ greatly, the specific obstacle had an impact on the enterprises' decision to stop innovation activities.

Source: Special run performed by the Danish Centre for Studies in Research and Research Policy.

18 Danish Centre for Studies in Research and Research Policy (2006): "Innovation i dansk erhvervsliv – Innovationsstatistik 2002–2004" [Innovation in Denmark's Business Community – Innovation Statistics, 2002–2004]. The question was not included in the survey covering 2004 to 2006.

1.8 Potential for increased innovation activity in Denmark's business community

Generally speaking, a large percentage of Denmark's enterprises are not innovative. There are different possible explanations for an individual enterprise's lack of innovation, and the explanations differ from one enterprise to another.

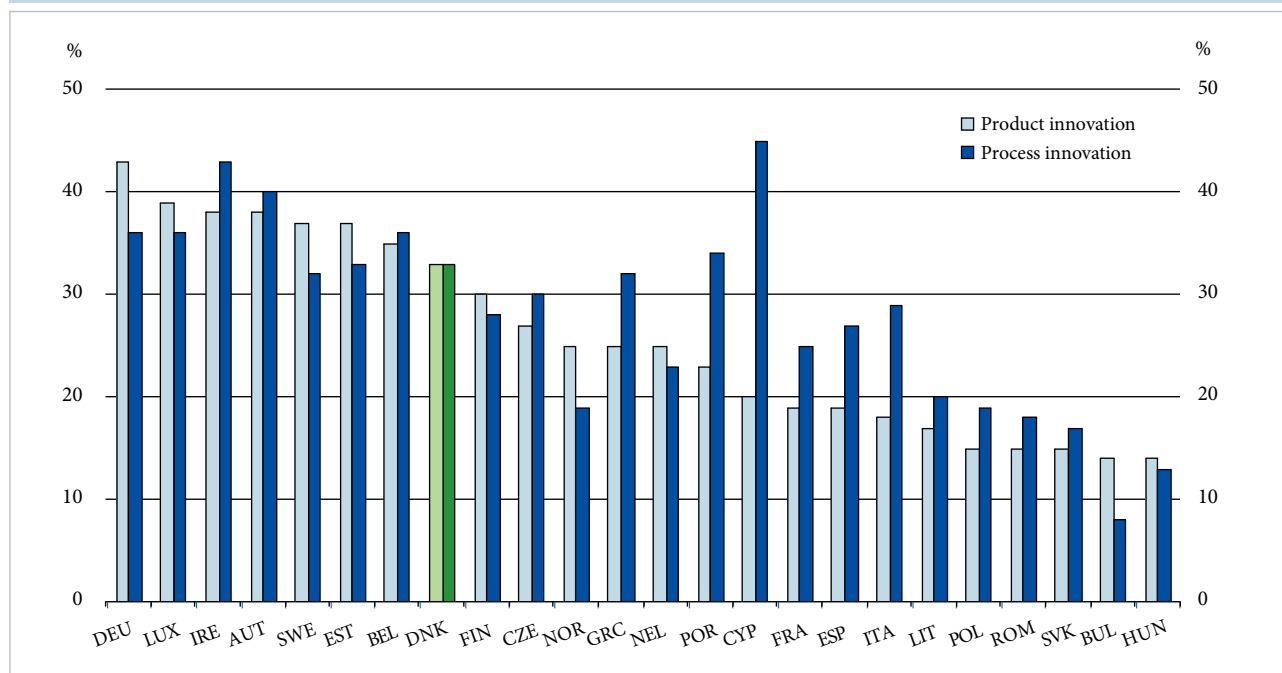
One could be that the boom prompted some enterprises to make the most of their existing business model. For some enterprises, the reason could also be that in the period leading up to the survey timeframe they introduced an innovation they were earning money from. So it is not the experience of all enterprises that renewal speed or competitive pressure requires them to launch new products frequently. Other enterprises might think they did not have the expertise to complete the innovation process, perhaps because the competitive or resource-related obstacles were too great or because the enterprises were not sufficiently competitive to attract capital. One explanation for the third group of enterprises could be that they were not aware of the opportunities provided by innovation and passively decided not to innovate.

Finally, there will be a group of enterprises which have deliberately decided not to get involved in an innovation process. This could be because they prefer other strategic or operational courses of action and do not have the capacity to embark on an innovation process at the same time. Or because the potential gain does not measure up to the costs. This will depend on the enterprise's market situation, sector, product portfolio, etc.

On this basis, it may therefore be difficult to assess the percentage of Danish enterprises that could benefit from increasing their level of innovation activity. A comparison with other countries, adjusted for differences in the business structure, shows that Danish enterprises are in the median range – in front of countries like Finland, Norway and the Netherlands and behind countries like Sweden, Ireland and Germany, both in terms of product innovations and process innovations (see Figure 1.7).

This seems to indicate a general potential for increased innovation activity in Denmark's business community, yet this is difficult to assess based on the data available and it is also difficult to assess the scope of this potential.

Figure 1.7: European enterprises innovative in terms of products and processes



Note: 2002–2004. To ensure comparability between countries, adjustments have been made to account for different business structures by considering the countries' composition differences in terms of sectors and size structures in the comparison. In other words, the figures are not directly comparable with the individual national data. The figure shows enterprises that are innovative in terms of products and processes as a percentage of all enterprises.

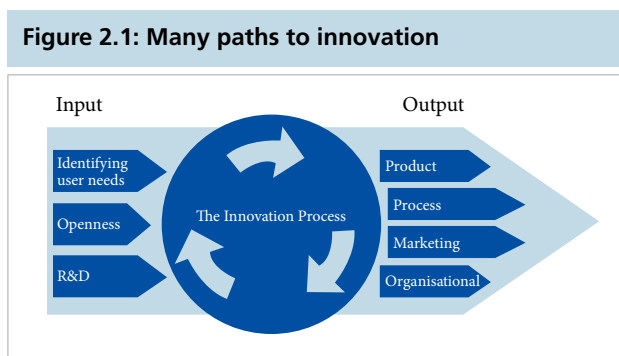
Source: Extract from the Eurostat database.

Chapter 2 Many Paths to Innovation

2.1 Introduction and summary

Tougher innovation-related competition means that new solutions can quickly be copied and imitated and that the competition is continuously launching competitive and attractive solutions. Cost-intensive development products can therefore be unprofitable for an enterprise. At the same time, the selection of products available to the individual customer has multiplied, making it more difficult to sell a product if it does not meet the specific target group's preferences or needs. Finally, globalisation and the emergence of new communication technologies mean that knowledge is being produced and disseminated at a global level. The key to being able to develop a new product could just as well be found in Asia or the US as in the development department of a Danish enterprise.

In the light of this trend, it is interesting to study how enterprises work to convert ideas and knowledge into value. Enterprises have several different methods and types of innovation they can use in this process (see Figure 2.1).



Source: Own illustration.

This chapter presents three specific ways of working to generate innovation, illustrated in cases taken from enterprises in Denmark and abroad:

- User-driven innovation involves letting new developments be based on user demands here and now as well as in the future. The ability to decode user needs and convert this knowledge into unique products and solutions can be an important skill in enterprises that encounter stiffer competition. The methods of user-driven innovation are tools that the enterprises can use to obtain knowledge about user needs. This knowledge can be a contributory factor in relation to whether an innovation process is successful (Section 2.3).
- Open innovation deals with systematically incorporating external knowledge into the innovation process. By purchasing knowledge or collaborating on innovation with other enterprises or institutions, the enterprise can gain

access to knowledge it does not have itself but which can be used for developing new innovation. In some instances, the enterprise can gain the ability to innovate faster and with fewer costs than if it had had to develop all the new knowledge required for the innovation process concerned (Section 2.4).

- The enterprise's ability to continuously develop innovative solutions can also depend on how the enterprise organisationally supports its innovation process and works with various types of innovation. This means that enterprises can work with specific initiatives aimed at ensuring that their organisation and corporate culture promote the continuous generation of good ideas for innovation and the development of the best innovative ideas (Section 2.5).

Enterprises can use a wide range of different methods to build up their innovation model and have several options to work with when developing a specific innovation process. The individual enterprise can put together an innovation model and an innovation practice involving several types of innovation. Depending on the competitive situation, the resources, the market and the customers, the various types of innovation can be combined into an innovation model that is adapted to the enterprise's requirements and resources.

2.2 Several types of innovation in global knowledge-based competition

The previous chapter introduced and defined the concept of innovation as the commercialisation of new ideas. Accordingly, innovation involves the conversion of knowledge into value. The innovation capacity of Danish enterprises, and thus the overall innovation capacity of Denmark's business community, has previously been measured primarily on the basis of surveys of what enterprises innovate and of the inputs included in the innovation process, e.g. the number of highly-educated employees, R&D and IT investments, etc.

The question of how enterprises convert knowledge into innovation and how the enterprises develop and gain access to knowledge relevant to innovation helps to provide a better understanding of Danish enterprises' innovation, however.

Previously, the question of how enterprises create innovation was largely illustrated by studying whether, and to which extent, enterprises invest in in-house R&D. In practice, R&D has often involved investments relating to the development of new technologies or the adaptation of existing technological solutions to specific products.

In recent years, however, increasing focus has been brought to bear on the fact that other driving forces are part of the enterprises' innovation process. These driving forces or types of innovation have been only partly illuminated.¹⁹

19 See, however, the VISION ERA-NET report "Open Innovation and Globalisation: Theory, evidence and implications" by Herstad, Sverre J., Bloch, Carter; Ebersberger, Bernd and van der Velde, Els (April 2008).

2.3 User-driven innovation

To develop attractive products and solutions, enterprises can take existing and future user needs as their point of departure – i.e. in markets where the enterprise already has a presence among the enterprise’s existing clientele, but also in markets which the enterprises are considering entering and among prospective users. The purpose is to target the development processes and create products and services that precisely and efficiently meet user needs.

Many Danish Enterprises already work closely together with customers and listen to their praise, criticism and wishes for new products. Enterprises have been conducting marketing activities and marketing surveys for many years.

Yet a number of leading Danish and foreign enterprises have started to systematically identify future and unrecognised user needs that cannot be identified by means of questionnaire surveys, for instance. Similarly, many enterprises have started to systematically involve users as co-developers of the innovation process.

The user-driven innovation concept is defined here as innovation based on a knowledge of recognised and unrecognised needs of users and prospective users in the development of new products, processes and services.

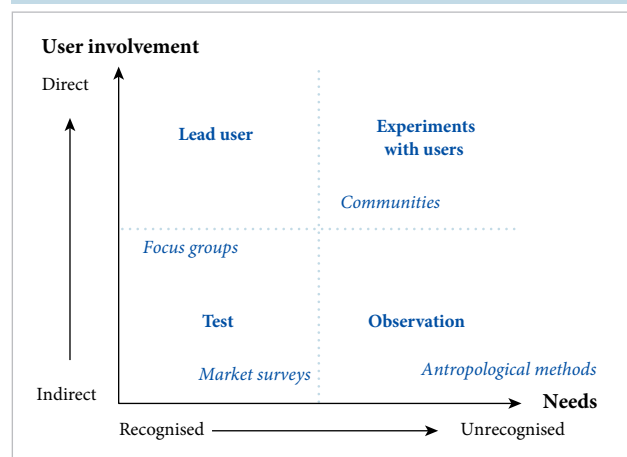
Enterprises’ user-driven innovation efforts can be divided into two dimensions:

- The enterprises can choose to actively involve users in the innovation process to a greater or lesser extent. Actively involving the users in the innovation process can occur, for instance, when the enterprise develops specific products together with users who are trend-setters in a specific market (lead users) or together with users whose needs represent broader groups of users. Less active involvement of users occurs, for instance, when an enterprise initiates observation studies where the user’s daily life and interaction with products and services provide ideas for improvement and new development carried out by the enterprise itself
- Enterprises can work to identify both recognised and unrecognised user needs. As regards recognised user needs, the users directly tell the enterprise their most important wishes and needs. By building up systems that enable user input to be incorporated into the development process, an enterprise can obtain knowledge of specific improvement measures. In several instances, however, knowing a user’s recognised needs is not a sufficient basis on which to generate innovation. The innovative potential lies in identifying

the needs that the user is unable to articulate personally, e.g. when a product does not optimally match a user’s needs. If the user has adapted his/her behaviour to the product, the user will not perceive the product’s design and functionality to be a problem. For this reason, the user will be unable to tell the company that he/she would rather have other functions or options. This is when the user’s unrecognised needs – and thus the innovation potential – can only be discovered through observation studies, for instance, that analyse a user’s daily life and interaction with specific products and solutions.

Figure 2.2 is a graphic presentation of the two dimensions of user-driven innovation.

Figure 2.2: Dimensions of user-driven innovation



Source: FORA (2008): User-Driven Innovation – Context and Cases in the Nordic Region.

Enterprises can work with various specific types of user-driven innovation within this matrix.

The *lead-user method* is based on using inputs and specific innovation ideas from users who are ahead of the market and from expert users. This is a highly active involvement of users who articulate specific, advanced needs and, in some instances, develop the products themselves that are tailored to their needs. Through a joint development process with lead users, the enterprise can develop solutions which its ordinary users could not have imagined (see Box 2.1).

Box 2.1: Lead-user Development at Coloplast

Coloplast is a Danish enterprise that develops medical products and assistive devices. In the mid-1990s, Coloplast set up advisory boards in 22 countries. An advisory board comprises eight to ten professional users, usually nurses and doctors. Advisory board meetings are held twice a year and are used for exploring market needs. The Fistula & Wound Management System, a system for treating fistulas in weeping lesions, was developed on the basis of input from these boards. Nurses were asked to point out and prioritise their most difficult problems and a sizeable majority indicated the treatment of fistulas in weeping lesions as a predominant problem.

As Coloplast knew little about fistula wounds in the first place, the first stage of the product development process was to involve the nurses to learn what characterises these lesions. The nurses were given polystyrene and yellow and red modelling clay and asked to make models of the fistulas and then make their version of an ideal bandage.

On the basis of this, Coloplast's engineers were able to make the first prototype. The next step was actual product testing where workshops were again held with the nurses. This time, they were asked to test the product on one another and provide feedback.

In this way, Coloplast – by involving and collaborating with the lead users – gained access to crucial knowledge about user needs and the possibility of developing a product that effectively meets the user needs.

Source: User-driven Innovation: a Study of Innovation Practices and User Involvement at 15 Leading Companies in Denmark. ReD Associates for the Danish Enterprise and Construction Authority, 2008.

When enterprises work to identify unrecognised user needs, they can incorporate anthropological and ethnographic methods or design methods. Through in-depth interviews, observation studies, pattern recognition and other techniques, the practitioners of these disciplines can use their professional skills to identify the knowledge of unrecognised user needs which the enterprise can use as the point of departure for developing new products and solutions (see Box 2.2).

Box 2.2: User-driven Innovation in Dameca

Dameca is a Danish company that has been manufacturing anaesthetic devices since 1947. In the late 1990s, Dameca experienced declining sales of its anaesthetic devices due to tougher competition, which prompted the company to contact a design firm to get new ideas for developing anaesthetic devices. With the users' needs as their point of departure, the designers participated in a number of surgical operations to observe how doctors used the anaesthetic devices in practice. One thing the designers noticed was that doctors often tended to sit in inexpedient positions for long periods at a time. By observing the doctors working during the operations, the designers gained an appreciation of the doctors' needs, and their observations laid the groundwork for the development of a new device.

Source: www.brugerdreveninnovation.dk.

The enterprises can involve the users' innovation potential more actively by setting up user communities where the enterprise's users jointly develop solutions and make them available to one another. User communities can include ordinary users and expert users in the innovation process. This takes place in open-source IT communities, for instance. In other cases, an enterprise sets up user communities where uniquely advanced users have access to further develop applications, etc., for the enterprise's core products (see Box 2.3).

Box 2.3: LEGO: Mindstorms and User Communities

Toy manufacturer LEGO launched the Mindstorms product line in the late 1990s. Mindstorms is made up of a number of interactive robots developed together with LEGO's users. Instead of developing costly complicated software for the robots in-house, LEGO gave a number of its advanced users a licence to develop software and resell the software based on LEGO's original design. In other words, LEGO outsourced parts of its development process to a community of users who then developed their own specific innovative solutions based on their own needs and resources.

The product is a bestseller and has made it possible for LEGO to reduce the expenditure and risk involved in developing new products, which normally would have been costly for the company. The unique user inputs made it possible to develop a best-selling product range.

Source: Interview with Søren Lind, Project Manager LEGO Mindstorms Nxt, www.vidensbankforinnovationsteknik.dk.

2.4 Openness in the innovation process

Enterprises can also open up their innovation process so the development of new products, etc., is more systematically based on knowledge, ideas and solutions generated outside the enterprise. There are many different specific ways of opening up the innovation process.

Enterprises have previously used external input in their innovation process as well. However, the development of the global economy has meant that enterprises can increasingly benefit from systematically opening up their innovation process,²⁰ because in some cases an open innovation process can allow the enterprises to innovate more economically and efficiently by using existing external knowledge in the innovation process.²¹ This open approach differs from innovation processes where the enterprise's innovation efforts are solely based on knowledge and technologies developed in-house, e.g. in the company's own development department.

There are several specific ways for an enterprise to open up its innovation process²² and gain access to external knowledge that can be important to the enterprise's innovation.

One way of opening up the innovation process is to identify and buy relevant knowledge outside the enterprise and then use this knowledge internally to develop new and innovative solutions. In some cases it may be more worthwhile for an enterprise to buy existing knowledge and technologies instead of counting on and investing in the fact that the next good idea will come from inside the enterprise itself. There are many ways to buy knowledge: buying IP licences or patent rights; acquiring small enterprises; or systematically searching in other markets for new products and technologies that can inspire or provide ideas for developing new products in the enterprise's own market (see Box 2.4).

Box 2.4: Connect and Develop Programme at Procter and Gamble

Procter and Gamble (P&G) manufactures body care and cleaning products. The company's goal is for 50% of the innovative ideas it develops to come from outside the company. P&G has no intention of making its 7,500 researchers and engineers redundant, but it wants to use their expertise to also look for possible technologies and solutions outside the company. This policy came about because the enterprise's in-house R&D expenditure had gradually become so big that it was an obstacle to P&G's growth. This prompted the management to seek new ways of organising the development process more efficiently.

For this reason, P&G developed the Connect and Develop programme, which continuously evaluates the top ten user needs found on the enterprise's markets and subsidiary markets (e.g. remove wrinkles, softer paper products, etc.). This is the common guideline for the external pursuit of new technologies and solutions in other markets and sectors.

In 2006, 35% of the ideas for P&G's new products came from outside the company, and 100 innovation projects were jointly carried out with external partners. In 2000, only 10% of the ideas originated outside the company.

By implementing Connect and Develop, the company doubled its innovation success rate while reducing its R&D expenditure at the same time. Today, the company spends 3.4% of its turnover on R&D, compared to 4.8% in 2000.

Source: Andrew Gaule (2006): Open Innovation in Action – How to be Strategic in the Search for New Sources of Value. Larry Huston & Nabil Sakkab (3/2006): Connect and Develop: Inside Procter and Gamble's New Model for Innovation, Harvard Business Review.

An enterprise can also choose to enter into innovation collaboration with other parties, such as universities, other enterprises or even competitors. By combining one's core expertise with another party's, in some cases it is possible to develop products and solutions that would not otherwise have been possible to develop alone, or which an enterprise could only achieve by investing heavily in own development.²³ In some instances, innovation collaboration can be a way to implement development projects faster and more economically (see Box 2.5).

20 Henry Chesbrough (2003): "Open Innovation – The New Imperative for Creating and Profiting from Technology". Harvard Business School Press, Boston.

21 Henry Chesbrough: "Open Innovation" (2003), "Open Business Models" (2006).

22 OECD (2007) "Globalisation and Open Innovation – Draft Report." In some of the literature on open innovation, user-driven innovation is considered as part of the concept of open innovation. In this report, however, the two forms of innovation are each presented separately.

23 A recently published analysis of the US innovation system shows that the percentage of prize-winning innovations developed by individual enterprises solely on the basis of in-house research and development continues to decline. By contrast the percentage of prize-winning innovation processes developed in collaborative efforts between universities and enterprises has similarly increased from 1970 to 2006. Source: Fred Block and Matthew R. Keller: "Where Do Innovations Come From? Transformations in the U.S. National Innovation System 1970–2006" The Information Technology & Innovation Foundation, July 2008.

Box 2.5: Gabriel: Innovation Success through Teamwork

Gabriel Ltd is a Danish company that manufactures textiles for industrial use. The company uses open innovation and innovation teamwork as an integrated part of its business model. The company's vision is to become the preferred development partner and supplier for leading international furniture manufacturers. Gabriel teams up with selected partners and universities in Denmark and abroad and works with Pera, an international innovation company, to assist in identifying the right partners. Thus, Gabriel has been closely collaborating for years with some of the world's leading furniture manufacturers – e.g. Steelcase, Hay and Tom Dixon – to develop its textiles.

The management believes that its open-innovation approach saves development costs and increases the effectiveness of the company's R&D project investments. The management estimates that open innovation doubles the value created by the enterprise's R&D investments.

Source: Mandag Morgen for the Danish Agency for Science, Technology and Innovation – Open Innovation. Case Studies for Denmark 2007 and www.gabriel.dk.

Much of the innovation collaboration – either with users or other enterprises – can involve finding out how to protect and share IP rights. But not all the intellectual values of the enterprise will be used. In a global perspective, up to 95% of all patented technologies developed by enterprises never become products and are thus not used.²⁴ An important aspect of open innovation involves the active use of IP. This can take place via open-source agreements where IP is made available to all parties or through consolidated IP management with increased use of licence agreements and cross-licensing (see Box 2.6).

Box 2.6: IBM: Active Use of Patent Rights Provides New Source of Income

IBM is a multinational company selling computer technologies and offering a wide range of services and consultancy within IT. In 2007, IBM took out more patents than any other US company for the fifteenth consecutive year. By no means are all the patents used by IBM itself, however. With this in mind, back in 1997, the company set up the Intellectual Property Network, which holds 40,000 of the company's patents. Other companies may search through the database to see whether any of IBM's technologies can be used in their development. If so, discussions are held to see on which terms the company can get a licence to use IBM's intellectual property rights.

The company concerned gains access to the knowledge required for being able to develop innovative new products, and specific value is created for IBM:

In 1990, IBM received USD 30 million a year from its IP licences. By 2007, these revenues had risen to USD 1 billion.

Source: IBM Annual Report 2007 and www.ibm.com.

2.5 Organising the innovation process

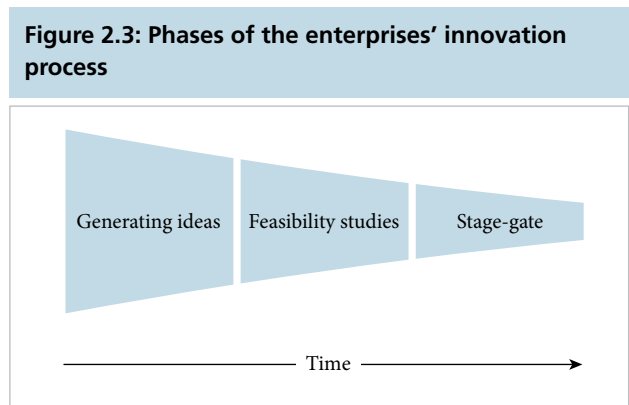
Enterprises can systematically use different types of innovation and assemble them in an innovation model that meets the specific needs of the enterprise. This makes demands on an enterprise's ability to combine and organise its innovation model and innovation processes. Accordingly, an enterprise's innovation capacity can also depend on how it organises the innovation process. An efficiently organised innovation process and model can ensure the expedient use of all organisational resources. This can be done by systematically collecting and using ideas and possible solutions provided by employees, for instance. Also, a well-organised innovation process can ensure that the development of new ideas is managed and assessed on an ongoing basis, to avoid expending unnecessary resources on unimaginative projects or having inadequate resources for projects with great potential. Finally, the correlation between the innovation process and the enterprise's overarching business model and strategy can be important for ensuring control and the support required within the organisation.

Enterprises can take a number of specific initiatives to develop an organisational structure that supports the enterprise's innovation model, e.g. introducing systems for collecting, selecting and developing innovative ideas or the implementing of wage systems that reward particularly innovative units or individuals. A number of enterprises also work to

24 Henry Chesbrough (2006): "Open Business Models", p. 8.

integrate innovation and development in every aspect of the enterprise's business model and business processes instead of letting innovative thinking and innovation be the remit of the R&D department. The specific approach will depend on the conditions in the individual enterprise.

In practice, the innovation can be divided into three phases (see Figure 2.3).



Source: *ReD Associates (2008): User-driven Innovation: a Study of Innovation Practices and User Involvement at 15 Leading Companies in Denmark.*

The idea generation stage is where the innovative thinking starts. Some enterprises make an effort to include good ideas from the entire organisation and all employees (see Box 2.7). Other enterprises work to identify market and user needs or identify other people's good ideas, technologies and business models that could inspire an enterprise's own projects.

Box 2.7: Maersk Container Division: Organising Ideas for Innovation

The management of Maersk's Container Division shipping company set up a new job function titled "Innovation Catalyst", and empowered the position with responsibility for collecting the large volume of unstructured knowledge available in Maersk. The purpose of the position is to ensure the collection and evaluation of the good ideas arising at all levels of the organisation. In this way, Maersk seeks to depart from a linear innovation process solely based on the good ideas submitted by the company's R&D department as the basis of its development projects. All employees – from administrative executives to ship crews – can now upload their good ideas via an intranet portal. The ideas are then studied and evaluated by the company's Innovation Catalyst, who is responsible for presenting the best ideas to the company's Innovation Board, which then selects the ideas to be developed further.

Source: *ReD Associates (2008): User-driven Innovation: a Study of Innovation Practices and User Involvement at 15 Leading Companies in Denmark.*

The idea generation phase is followed by the feasibility-study stage where the opportunities and potential of the various ideas are studied and assessed. This involves finding out which ideas should be prioritised and focused on.

Once an enterprise has selected a set of ideas to continue working with, the actual development phase begins. In the stage-gate method, the development process undergoes a number of stages where decisions are made at regular intervals to determine whether the project should be continued. In this process, technological solutions, etc., can be developed and some enterprises work with rapid prototyping, for example, where the enterprise and users can quickly see and determine whether the prototype is right on the mark. Some enterprises make a targeted effort to increase the speed at which the projects complete the stage-gate model and use this as a goal for how efficiently they are capable of completing an innovation process (see Box 2.8).

Box 2.8: Danfoss – Enlarging the Stage-Gate Model to Include Feasibility Studies

Danfoss, which develops heat-control thermostats and other products, has been working with a stage-gate model for several years. The stage-gate model manages the process after a decision is made to launch an innovation project. The projects went through up to six stages (M0–M6) and at the end of each stage (milestone), a decision was made to continue or stop the project on the basis of a number of specifically defined criteria. Yet, Danfoss was finding that too many projects were being launched in the stage-gate model without having been subjected to a proper feasibility study. The company had more than enough innovative ideas, but lacked the ability to ensure that only best became outright innovation projects. For this reason, the company's stage-gate model was enlarged to include two more stages (M-2 and M-1). The two new stages cover the feasibility study phase of the innovation process and ensure that the commercial and technological potential of the company's innovative ideas is rigorously assessed before continuing in the stage-gate model. The target of the Danfoss model is for 50% of all innovation projects to be disqualified already at the feasibility-study phase.

Source: ReD Associates (2008): User-driven Innovation: a Study of Innovation Practices and User Involvement at 15 Leading Companies in Denmark.

2.6 Correlation between the types of innovation

It is important to emphasise that the methods of working with innovation reviewed here are not mutually exclusive. The vast majority of enterprises involved with innovation use several different types of innovation.

This means that the specific types of innovation used by an individual enterprise can be adapted to the enterprise's market and challenges. Similarly, the choice of innovation model depends on what the enterprise wishes to achieve from the innovation process. The enterprises' points of departure are different and – depending on whether an enterprise wishes to renew its business model, develop a specific product or enter a brand-new market – the way in which an enterprise chooses to innovate can vary greatly. Enterprises have different internal resources at their disposal, and this is also crucial for how they tackle the innovation challenge.

Some enterprises develop their innovation processes exclusively on the basis of in-house R&D, a knowledge of user needs or open types of innovation such as innovation teamwork. But other enterprises might regard it as expedient to use several types of innovation in their work. For instance, an enterprise could combine knowledge purchased externally with its own R&D, and use the external knowledge to accelerate the enterprise's own internal development process. Other enterprises initiate their own development projects based on ideas originating from an identification of user needs. Still other enterprises actively involve the users in an open development process, thus combining user-driven and open innovation.

The types of innovation reviewed complement one another and allow the enterprises to work systematically with several dimensions of innovation and prepare an innovation model adapted to the enterprise's specific situation. For this reason, the rest of the report will focus on how Danish enterprises work with innovation on the basis of these parameters and show the effects of these efforts for the enterprises.

Chapter 3 How Danish Enterprises Innovate

3.1 Introduction and summary

As shown in Chapter 2, enterprises can choose from several different specific ways of working with their innovation processes. The different types of innovation can be complementary, thus allowing the enterprises to work systematically with several dimensions of innovation and develop an innovation model adapted to the enterprise's specific situation. This chapter studies how Danish enterprises specifically approach innovation and the dispersion of the various types of innovation. The central conclusions of the chapter are as follows:

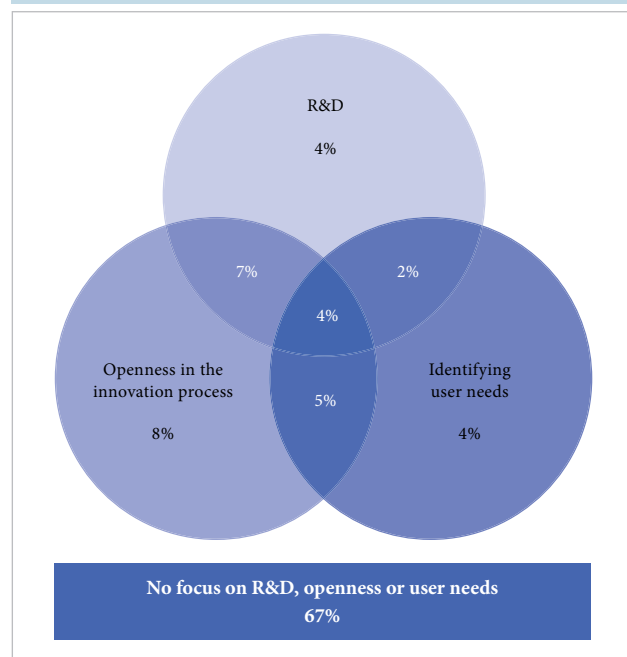
- Almost one-sixth of all Danish enterprises work to identify recognised user needs as an important part of their innovation process. By contrast, only 7% of Danish enterprises use methods for identifying unrecognised user needs as an important or crucial part of the innovation process (Section 3.2).
- One-fourth of all Danish enterprises develop innovation on the basis of an open approach where knowledge developed outside the enterprise is identified and internalised in the enterprise's own innovation process (Section 3.4). The most widespread type of open innovation among Danish enterprises is collaborating on innovation activities (used by 16% of the enterprises). Only 12% have purchased knowledge such as licensing rights or non-patented know-how and inventions from other enterprises or institutions. The least prevalent type of open innovation is the purchase of outright research results from external sources, as only 5% do this, while strategic collaboration is used by 6% (Section 3.2).
- Large enterprises in particular work with user-driven innovation and openness in the innovation process (Section 3.3).
- Enterprises within Finance and Business Services use user-driven and open types of innovation more often than enterprises in other sectors. Finance and Business Services enterprises are also more inclined to systematically organise and lead for the purpose of supporting the organisation's innovation process. Yet enterprises within Manufacturing also work with these types of innovation to some extent (Section 3.4).
- Enterprises that work openly in the innovation process are more inclined to produce product and process innovations than enterprises which do not use openness in their innovation process (Section 3.2).
- A number of Danish enterprises take a systematic approach to organising the innovation process. More than 60% of the enterprises have to some extent or a great extent introduced initiatives for developing an innovative culture and the

enterprise's ability to learn from its mistakes. The study also shows that 26–42% of the enterprises to a great extent or to some extent take specific steps to develop their organisation's innovation capacity and introduce outright systems for supporting the different phases of the innovation process, e.g. methods for systematically collecting and assessing ideas, special wage systems and stage-gate models (see Section 3.2).

Figure 3.1 shows an overview of the dispersion of different types of innovation among Danish enterprises and the percentage of enterprises that combine several of the different types of innovation.

The figure above shows that 67.5%, or more than two-thirds,

Figure 3.1: Dispersion and combination of types of innovation among Danish enterprises, 2004–2006



Note: The figure is specified as a percentage of all enterprises. Organising the innovation process covers how the enterprises specifically organise their efforts involving the types of innovation shown in the figure. For this reason, the organisation of the innovation process is not shown in the figure. The enterprises' own R&D is not studied separately in this report, as previous reports have covered the effects of R&D in depth.²⁵ On the other hand, the report studies the effects of the correlation between R&D and other types of innovation. R&D is included in the figure to provide a combined overview of the dispersion and combinations of the three types of innovation among Danish enterprises.

Source: Own development and CIS2006.

25 See e.g. Danish Ministry of Economic and Business Affairs (2005): "Vækstredgørelse 05" [2005 Regional Growth Report].

of Denmark's enterprises do not invest in their own R&D, do not use openness in the innovation process and do not identify user needs. Chapter 1 shows that slightly more than half of Danish enterprises launched one or more innovation processes in 2004–2006 (see Figure 1.2). More than 15% of Danish enterprises launched an innovation process during the period but did not do so on the basis of the types of innovation identified in this survey. This seems to indicate that some of the enterprises' innovation efforts cannot be identified based on the types of innovation studied in this report.

3.2 Dispersion of types of innovation in Danish enterprises

When Danish enterprises wish to innovate, they have several different specific methods for producing their innovation processes to choose from. To analyse how Danish enterprises innovate, including the types of innovation used by the enterprises, two surveys about Danish enterprises' innovation are utilised.²⁶

It is worth noting that it is not possible to examine all aspects of user-driven innovation, open innovation or the organisation of the innovation process based on the data available about Danish enterprises' innovation. This means that it has not been possible to study aspects like the dimension of user-driven innovation involving the more or less active involvement of users in an enterprise's innovation process. Similarly, it was not possible to study the aspect of open innovation involving enterprises' sale of knowledge, including IP rights, to other parties.

Finally, it is quite certain that, based on the questionnaire surveys, it will not be possible to fully show and identify the existing variation in the way Danish enterprises innovate. As a result, there will be a number of specific ways of working with innovation at Danish enterprises which will not be possible to identify based on the data available for this report. For this reason, among others, the conclusions concerning the enterprises' innovation practices are subject to reservation.

Box 3.1: Basic Data for the Study of User-driven Innovation in Denmark's Business Community

Questions about user-driven innovation:

Which sources contributed to acquiring new ideas for product development and for implementing product development from 2004 to 2006 and what impact did they have?

- structured methods for identifying specific customer preferences (focus groups, panels);
- consumer conduct based on customer data (trend analyses, other statistical methods);
- customer observations for identifying unrecognised needs (in-depth interviews, observation).

Questions about openness in the innovation process:

- Did the enterprise carry out R&D in 2006?
- Did the enterprise purchase external knowledge during the period? Did the enterprise buy external rights (patents, use models, registered trade marks or registered designs or buy licences for using such registered rights) from 2004 to 2006? Did the enterprise buy other external knowledge (non-patented inventions, know-how or other knowledge or licences for utilising unregistered external knowledge from other enterprises or institutions, purchasing of consultancy for systematic studies of customer and market needs) from 2004 to 2006?
- Did the enterprise collaborate with other enterprises or institutions on innovation activities from 2004 to 2006?

- Did the enterprise introduce new ways of organising external relationships with enterprises and public institutions (e.g. alliances, partnerships, outsourcing or external supplies) during the period?

Questions about organising the innovation process:

To what extent did the enterprise develop strategies and initiatives aimed at increasing the internal innovation capacity and innovation culture?

- The enterprise has developed a culture in which everyone, at all levels, is expected to contribute to innovation and development.
- The enterprise has developed methods for collecting and assessing new ideas, e.g. a system, a department or other systems.
- The enterprise has introduced a phased method that supports the development of new products/services, from the generation of ideas to the development of a business plan.
- The enterprise has developed a culture where making mistakes is accepted, and where people systematically learn from their mistakes.
- The enterprise has developed wage systems that reward the generation of ideas and contributions to innovation/development.

Source: CIS2006 and Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005].

²⁶ The study of user-driven innovation and openness in the innovation process uses data from the Community Innovation Survey 2006 (CIS2006). The data cover the period from 2004 to 2006. The study of the enterprises' efforts involving user-driven innovation and organising the innovation efforts uses data from "Erhvervslivets innovation og vækstbetingelser 2005" [The Business Community's Innovation and Growth Conditions 2005]. The data cover the period from 2003 to 2005. See Appendix 1.

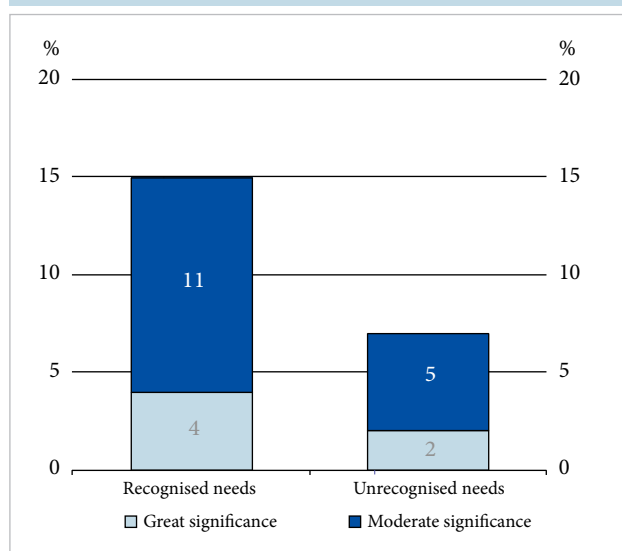
The specific questions on which the survey is based regarding the dispersion of different types of innovation are shown in Box 3.1.

Danish enterprises use several types of innovation. Methodologies for identifying user needs and openness in the innovation process and for organising the innovation process are used to some extent among Danish enterprises.

Enterprises' identification of recognised and unrecognised user needs

The survey shows that 15% of Danish enterprises use methods for identifying recognised user needs, including trend surveys, focus groups and customer panels for the purpose of giving the enterprise's users and customers an opportunity to express their recognised needs to the enterprise. In only half as many enterprises (more than 7% of the enterprises) have methods for identifying unrecognised²⁷ user needs had a great or moderate effect on the enterprise's innovation process (see Figure 3.2).

Figure 3.2: Identifying recognised and unrecognised user needs in the innovation process among Danish enterprises, 2004–2006



Note: The figure is specified as a percentage of all enterprises.

Source: Calculations performed by Statistics Denmark based on CIS2006.

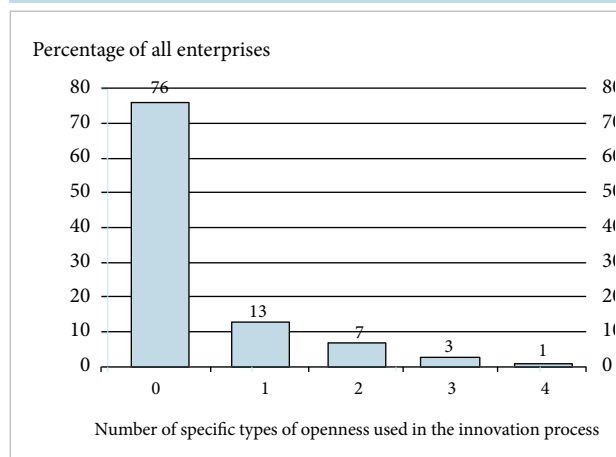
Thus, a limited segment of Danish enterprises take a systematic approach to identifying user needs – recognised and unrecognised alike – as a basis for developing new products, solutions, etc.

Yet it seems that enterprises which work to identify recognised user needs are also more inclined to work to identify unrecognised user needs. Thus, almost 60% of the enterprises indicating that methods for identifying recognised needs play a very important part also indicate that methods for identifying unrecognised needs play an important or very important part. Slightly more than half of the enterprises that systematically work with user-driven innovation use methods for identifying both recognised and unrecognised user needs.

Dispersion of openness in the innovation process

Open types of innovation are used by Danish enterprises to a greater extent than methods for identifying user needs. As Figure 3.3 shows, however, only about one-fourth of Danish enterprises use openness in the innovation process. Only a few enterprises have a high degree of openness in the innovation process. Thus, only 1% of Danish enterprises use all four types of open innovation studied. Slightly more than half of the enterprises working with openness in the innovation process use only one of the four types of openness in the innovation process studied (see Figure 3.3).

Figure 3.3: Open innovation in Danish enterprises, 2004–2006



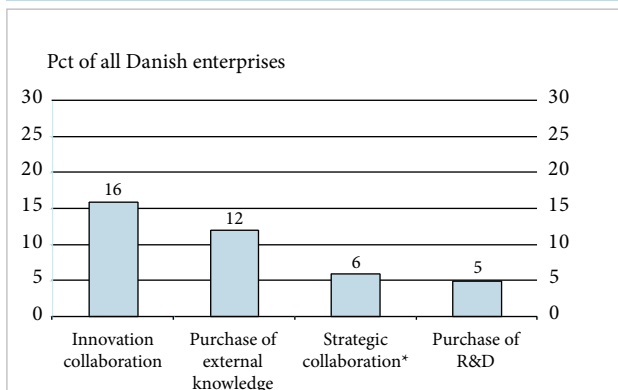
Note: 2004–2006. The figure shows the number of specific types of openness in the innovation process (see Figure 3.4) used by Danish enterprises.

Source: Calculations performed by Statistics Denmark based on CIS2006.

27 See section 2.3 for a description of the difference between recognised and unrecognised user needs.

The most widespread specific type of open innovation is collaborating on innovation activities. Almost one-sixth of all Danish enterprises participated in collaborative efforts regarding innovation activities from 2004–2006. A slightly smaller percentage (12%) buy knowledge, such as licensing rights or non-patented know-how and inventions from other companies or institutions, and use this in their own innovation processes²⁸ By contrast, few enterprises purchase external research results. Only 5% purchased external research in the 2004–2006 period. Finally, only about 6% both collaborated on innovation and also introduced organisational changes to support external relationships with the enterprise's partners (see Figure 3.4).

Figure 3.4: Open innovation in Danish enterprises, 2004–2006



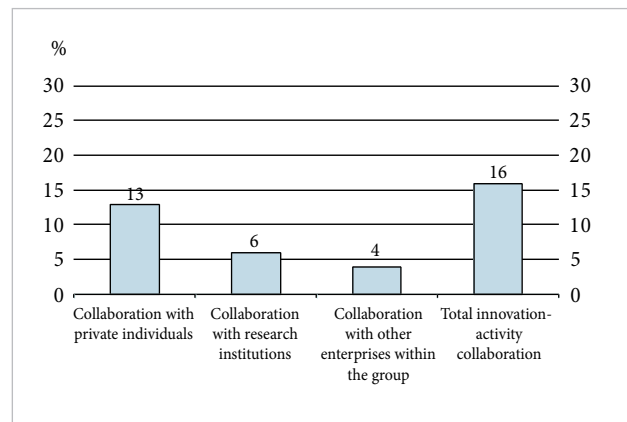
Note: As a percentage of all Danish enterprises. *The variable comprises two questions and measures the percentage of enterprises that collaborate on innovation and, at the same time, have implemented organisational changes to support the external relationships with the company's partners. For this reason, innovation collaboration can be perceived as part of the enterprise's strategy for its relationship to external parties and not as an expression of random/routine collaboration.

Source: Calculations performed by Statistics Denmark based on CIS2006.

Danish enterprises primarily collaborate on innovation with other private-sector enterprises. Thus, 13% of Danish enterprises worked together with other enterprises on innovation activities.

Collaboration with research institutes and with affiliated enterprises in the group is less prevalent. In the 2004–2006 period, 6% and 4% of Danish enterprises respectively collaborated with these partners on innovation (see Figure 3.5).

Figure 3.5: Danish enterprises' innovation partners, 2004–2006



Note: As a percentage of all enterprises.

Source: Calculations performed by Statistics Denmark based on CIS2006.

Statistics Denmark studied Danish enterprises' incentives for entering into collaboration relationships. The study found that collaboration is not only motivated by a wish to increase flexibility and economy of scale but also by a wish to gain access to special expertise and technologies and to develop new products and processes. The most significant obstacles to collaboration were the fear of losing core expertise and the fact that the size of the enterprise and/or business area made collaboration difficult. On the other hand, only a small percentage of the enterprises cited legal factors, rules, etc. as an actual obstacle to collaboration.²⁹

Correlation between openness in the innovation process and the innovation activity

Enterprises applying openness in innovation processes have usually introduced product and process innovations more frequently than enterprises which do not use openness in the innovation process³⁰

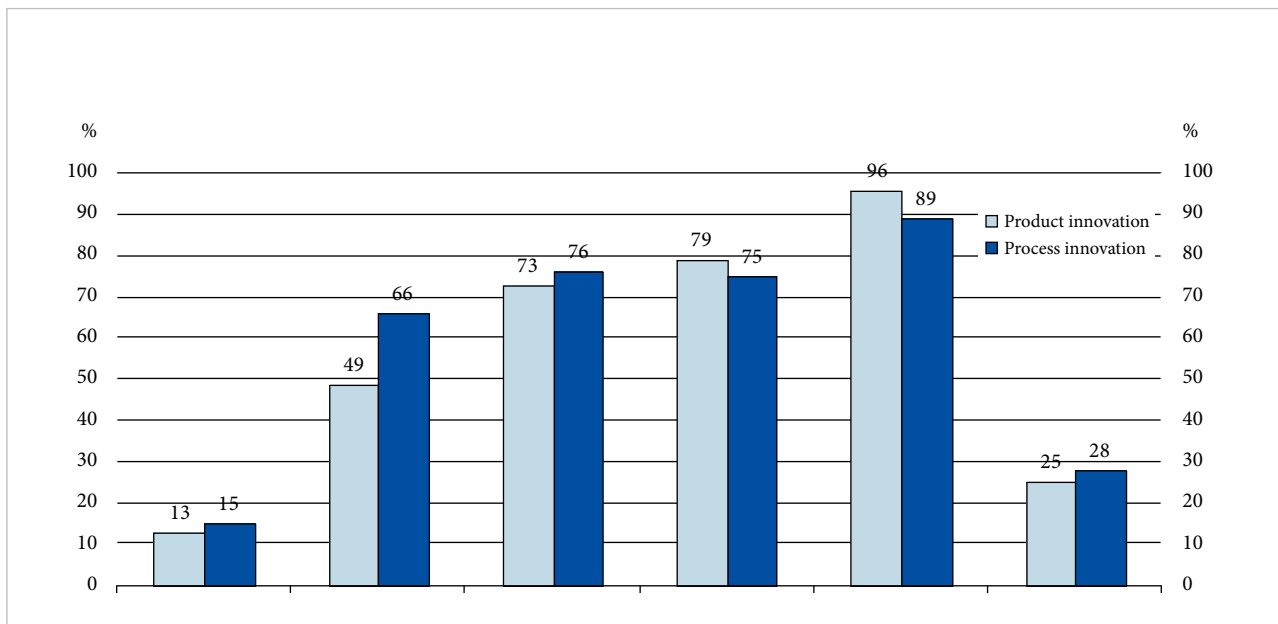
It is also evident that enterprises working with a large degree of openness in the innovation process introduced a product or process innovation more frequently than enterprises which are only slightly open in their innovation process. Finally, the figure shows that only a small percentage of the enterprises not working with open innovation introduced a product or process innovation in the period (see Figure 3.6).

28 For additional data on Danish enterprises' commerce with IP rights, see Statistics Denmark and the Danish Patent and Trademark Office 2008: "Når viden bliver til aktiver – nøgletal om danske virksomheders brug af IPR" [When Knowledge Becomes Assets: Key Figures on Danish Enterprises' Use of IPR]. The study shows that one-third of all Danish enterprises sold or bought rights from 2001 to 2006.

29 Statistics Denmark (2004): "Danske virksomheders samarbejde 2003" [Collaboration of Danish Enterprises 2003].

30 The same positive correlation between openness in the innovation process and innovation activity is found in the VISION ERA-NET report "Open Innovation and Globalisation: Theory, evidence and implications" by Herstad, Sverre J., Bloch, Carter; Ebersberger, Bernd and van der Velde, Els (April 2008).

Figure 3.6: Correlation between openness and product/process innovation



Note: 2004–2006. The specific types of openness in the innovation process are shown in Figure 3.4.

Source: Calculations performed by Statistics Denmark based on CIS2006.

Supporting innovation using the enterprise's organisation and culture

Some Danish enterprises have implemented measures that support their organisation's ability to generate innovations. More than 60% of Danish enterprises have to a great extent or to some extent introduced measures that support the development of an innovative culture within the enterprise based on values like the ability to learn from one's own mistakes. More than 25% of all Danish enterprises have to a great extent – and more than 33% to some extent – implemented measures that support a culture which underpins innovation and innovative thinking and efforts to develop a culture where making mistakes is accepted and where a systematic effort is made to learn from one's own mistakes.

A far smaller percentage of Danish enterprises have introduced specific tools for underpinning an organisation's innovation process, however. 13% of the enterprises respond that the enterprise has to a great extent or some extent developed methods for collecting and assessing innovative ideas. Another 29% respond that they have implemented such systems to some extent.

12% of Danish enterprises have to a great extent or to a very great extent introduced phased methods for supporting the development of the enterprise's innovation projects.

Another 29% have introduced such stage-gate models to a certain extent.

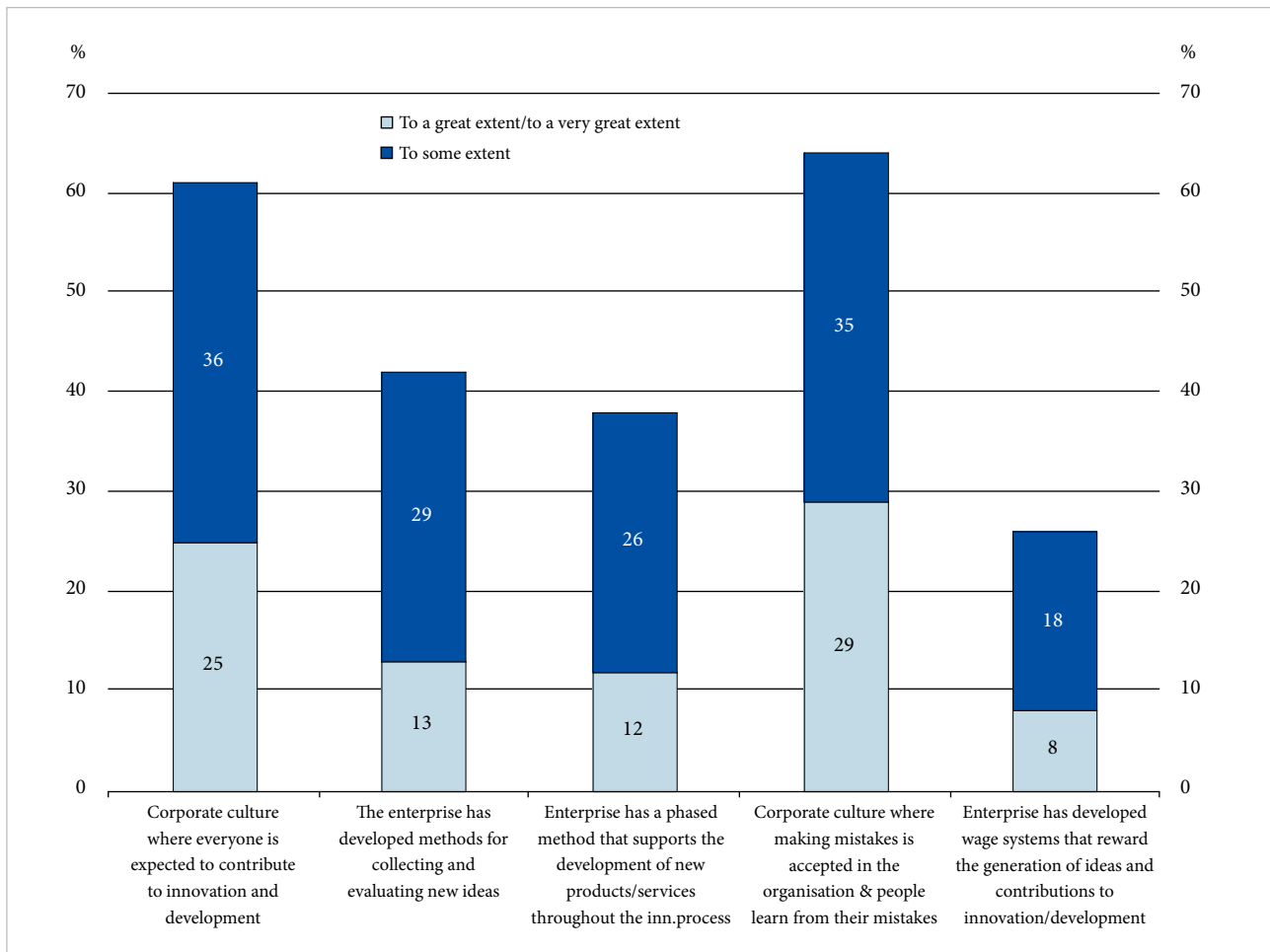
The least common strategy for increasing internal innovation capacity and innovation culture is the introduction of wage systems to support the generation of ideas and innovation contributions. Less than 10% of Danish enterprises have implemented this type of wage system to a great extent or to a very great extent, and another 18% have implemented such wage systems to some extent (see Figure 3.7).

The figures suggest that many Danish enterprises are working to develop the enterprise's internal innovation capacity.

Initiatives to develop an innovative culture and the ability to learn from one's mistakes are the types of organisational measures for supporting innovation most frequently used by the enterprises.

The figures also show that enterprises to a lesser extent seek to increase their organisation's innovation capacity by introducing specific systems to support the innovation process, such as methods for systematically collecting and assessing ideas, special wage systems and stage-gate models (see Chapter 2).

Figure 3.7: Danish enterprises' efforts to organise the innovation process, 2003–2005



Note: As a percentage of all enterprises. The figure shows the percentage of enterprises replying that to a great extent/very great extent or to some extent they have developed specifically measured strategies and initiatives aimed at increasing in-house innovation capacity and innovation culture.

Source: Own calculations based on Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005].

3.3 Large enterprises use more types of innovation than small enterprises

Large enterprises are more inclined to launch innovation processes than small enterprises, including more than one type of innovation at a time (see Chapter 1).

Large Danish enterprises are also more inclined to use the various types of innovation. Both user-driven innovation and openness in the innovation process are more widespread among large enterprises than small enterprises.

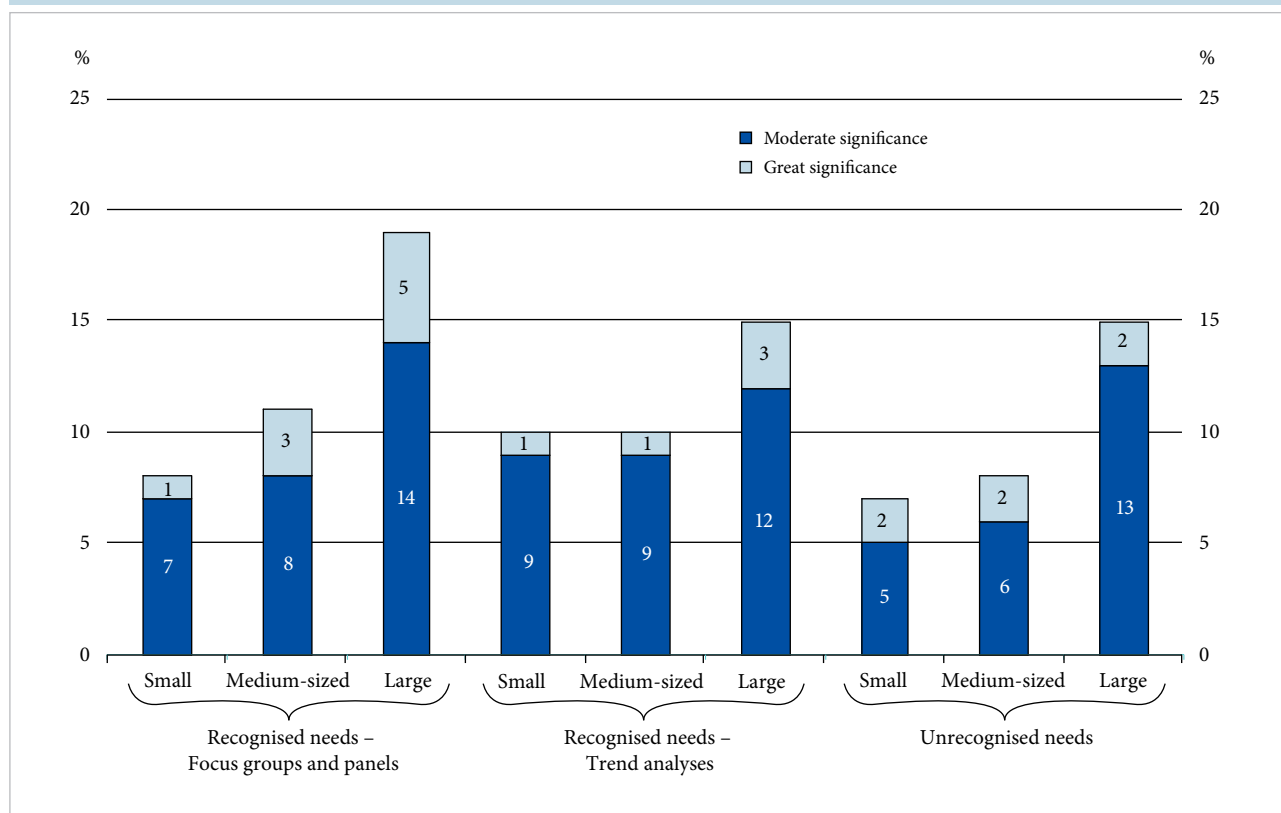
Thus, primarily large enterprises give high priority to methods for identifying recognised user needs. The differences between large, medium-sized and small enterprises are

modest, however. There is no difference across the enterprise size categories regarding the identification of unrecognised user needs.

The use of methods of identifying recognised user needs was of great significance to the enterprise's innovation process for 3–5% of the large enterprises, while 12–14% of the large enterprises attribute moderate significance to this. By comparison, only 1% of the small enterprises attribute great significance to this factor and 7–9% attribute moderate significance to it.

The same trend applies when assessing the significance of methods for identifying unrecognised needs. For large enterprises, 2% consider that these methods are of great signifi-

Figure 3.8: Using analyses to identify recognised and unrecognised customer needs, broken down by enterprise size, 2004–2006



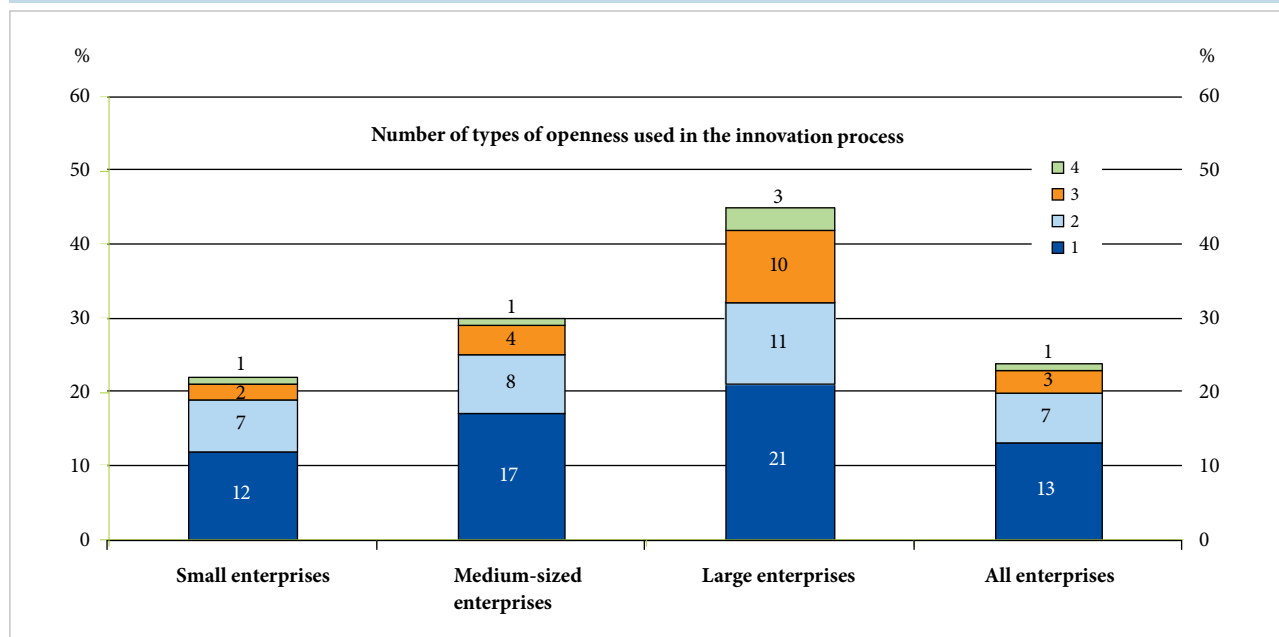
Note: As a percentage of all enterprises. For descriptions of size, see Figure 1.2.

Source: Calculations performed by the Danish Centre for Studies in Research and Research Policy based on CIS2006.

cance to the enterprise's innovation and 13% assess them as moderately significant. For small enterprises, 2% attribute great significance to these methods and 5% attribute some significance to the methods (see Figure 3.8).

Similarly, large enterprises are more inclined to use openness in the innovation process. Among large Danish enterprises with more than 250 employees, 45% work openly in the innovation process and almost 25% of the large enterprises are working with two or more types of open innovation. By comparison, 21% of the small enterprises work openly in the innovation process and less than 10% work with several types of open innovation (see Figure 3.9).

Figure 3.9: Open innovation processes in Danish enterprises, broken down by enterprise size, 2004–2006



Note: As a percentage of all enterprises. The figure shows how many types of openness in the innovation process (see Figure 3.4) are used by Danish enterprises. Size categories: see notes to Figure 1.2.

Source: Calculations performed by Statistics Denmark based on CIS2006.

Differences are also seen between small and large enterprises in terms of different methods of working with openness in the innovation process. On the other hand, the percentage of enterprises using specific open types of innovation is relatively the same in small and medium-sized enterprises.

There is a clear difference between small and medium-sized enterprises in terms of the percentage of enterprises buying

R&D, however. Also, large enterprises are definitely more inclined to buy R&D than medium-sized enterprises. Collaborating on innovation activities is also more widespread among large enterprises than small ones. The percentage of large enterprises that enter into innovation collaboration is twice that of small enterprises (see Table 3.1).

Table 3.1: Open innovation in Danish enterprises broken down by enterprise size

	Small enterprises	Medium-sized enterprises	Large enterprises	All enterprises
Buys R&D	4 %	10 %	15 %	5 %
Buys other external knowledge	11 %	13 %	27 %	12 %
Collaborates on innovation activities	14 %	19 %	32 %	16 %
Strategic collaboration*	6 %	5 %	11 %	6 %

Note: 2004–2006. For size categories, see notes to Figure 1.2. *The variable comprises two questions and measures the percentage of enterprises that collaborate on innovation and, at the same time, have implemented organisational changes to support the external relationships with the enterprise's partners. For this reason, innovation collaboration can be perceived as part of the enterprise's strategy for its relationship to external parties and not as an expression of random/routine collaboration.

Source: Calculations performed by Statistics Denmark based on CIS2006.

There is a clear difference between small and medium-sized enterprises in terms of the percentage of enterprises buying R&D, however. Also, large enterprises are definitely more inclined to buy R&D than medium-sized enterprises. Collaborating on innovation activities is also more widespread among large enterprises than small ones. The percentage of large enterprises that enter into innovation collaboration is twice that of small enterprises (see Table 3.1).

There is a clear difference between small and medium-sized enterprises in terms of the percentage of enterprises buying R&D, however. Also, large enterprises are definitely more inclined to buy R&D than medium-sized enterprises. Collaborating on innovation activities is also more widespread among large enterprises than small ones. The percentage of large enterprises that enter into innovation collaboration is twice that of small enterprises (see Table 3.1).

Organisational support of innovation across the enterprise size categories

The percentage of Danish enterprises that to a great extent or a very great extent develop strategies and initiatives aimed at increasing the internal innovation capacity varies across the enterprise-size categories.

Two-thirds of Danish enterprises have implemented to a great extent or a very great extent at least one of the surveyed measures to support the internal innovation capacity. The same applies to 39% of the small enterprises.

Large and small enterprises differ especially in terms of the implementation of “stage-gate” models supporting the development of new products, etc., at each stage of the innovation process. Thus, 36% of the large enterprises have implemented such phased methods to a great extent or to a very great extent. By comparison, only 10% of all small or medium-sized enterprises have implemented stage-gate models to a great extent or to a very great extent. Similarly, 50% of the large Danish enterprises have taken steps to a great extent or to a very great extent to develop an organisation that systematically learns from its own mistakes. The same is true of 25% of the small Danish enterprises and 33% of the medium-sized enterprises.

By contrast, the difference is less among small, medium-sized and large enterprises when it comes to the implementation of initiatives that promote the development of an innovative culture in the enterprise and the implementation of wage systems that reward the generation of ideas or methods for collecting ideas (see Table 3.2).

Not surprisingly, large enterprises in particular have implemented strategies and initiatives aimed at increasing the

enterprise’s innovation capacity and innovation culture. The stage-gate model,³¹ which provides guidelines for how innovation projects undergo continuous development and assessment, is presumably more appropriate for enterprises with a large product portfolio and, thus, with a number of concurrent innovation projects. In addition, large enterprises need clearer guidelines for innovation, as the management cannot participate in all decision-making processes regarding initiation, continuation and implementation of innovation projects. For this reason, the management may need to stipulate common guidelines for how innovation takes place in the enterprise.

Several of the questions about how Danish enterprises support innovation processes organisationally do not show major differences among small, medium-sized and large enterprises, however.

3.4 Sector differences in the use of different types of innovation

For the individual enterprise, a wide variety of specific factors determine how an enterprise produces its innovative products, solutions and services. As is evident in the section above, large companies tend to use several different types of innovation more frequently, however, just as Chapter 1 showed that large enterprises produce more innovation processes than small enterprises.

Similarly, there are significant differences as to how innovation is carried out by the enterprises in the different sectors.

Enterprises in Finance and Business Services and Manufacturing focus most on user-innovation potential and open innovation

When it comes to different methods for identifying user needs and involving users in the innovation process, the sector breakdown depends on the methods involved.

In general, only a few Danish enterprises use methods for identifying recognised and unrecognised user needs, with unrecognised user needs being the least prevalent (see Table 3.3).

Across sectors it is seen that enterprises in Manufacturing and in Finance and Business Services use focus groups and customer panels more often than other enterprises. In both sector categories, 11% of the enterprises regard these methods as being of great or moderate significance to the enterprise’s innovation, as opposed to 6% of the enterprises within Retail. Trend analyses and other statistical methods are usually used by enterprises within Finance and Business Services, as in the

31 See Chapter 2.

Table 3.2: Organisational variables, broken down by enterprise size, as a percentage of all enterprises

Percentage of enterprises responding that they have to a great extent/to a very great extent implemented the specific strategies and initiatives as part of efforts to increase in-house innovation capacity and innovation culture.

	Small enterprise	Medium-sized enterprise	Large enterprise	All enterprises
The enterprise has developed an innovative culture in which everyone is expected to contribute to innovation and development	24 %	30 %	30 %	25 %
The enterprise has developed methods for collecting new ideas	12 %	17 %	19 %	13 %
The enterprise has implemented a staged method that supports the development of new products/ services in all stages of the innovation process.	10 %	9 %	36 %	11 %
The enterprise has developed a culture where making mistakes is accepted in the organisation and people learn from own mistakes	27 %	30 %	50 %	28 %
The enterprise has developed wage systems that reward the generation of ideas and contributions to innovation	7 %	9 %	5 %	7 %
The enterprise has to a great extent or a very great extent implemented at least one of the above strategies	39 %	51 %	66 %	42 %

Note: For size categories, see notes to Figure 1.2. For the sake of clarity, the percentage of enterprises responding “to some extent” or “to a small extent” are not reported in the table.

Source: Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community’s Innovation and Growth Conditions 2005].

opinion of 14% of the enterprises, the trend analyses are moderately important and 2% of the enterprises regard trend analyses as important for the enterprise’s innovation process.

The sector difference is least apparent in terms of methods for identifying unrecognised user needs. It is evident, however, that enterprises in the Transport, Postal Services and Telecom sector category are less inclined to use these methods than enterprises in other categories. It is true of the rest of the sector categories that 7–9% regard methods for identifying unrecognised user needs as being very or moderately important for the enterprise’s innovation processes (see Table 3.3).

Also in terms of open types of innovation, enterprises in Finance and Business Services (followed by Manufacturing) are the most frequent users of this type of innovation. More than 32% of the enterprises in Finance and Business Services work openly in the innovation process to some extent, just as 26% of the enterprises in Manufacturing do. These same sectors have the highest percentage of enterprises that work very openly in the innovation process and use three or more types of openness in the innovation process. Enterprises in Agriculture, Fisheries and Extraction and enterprises in Transport, Postal Services and Telecom are least inclined to work with open innovation methods (see Figure 3.10).

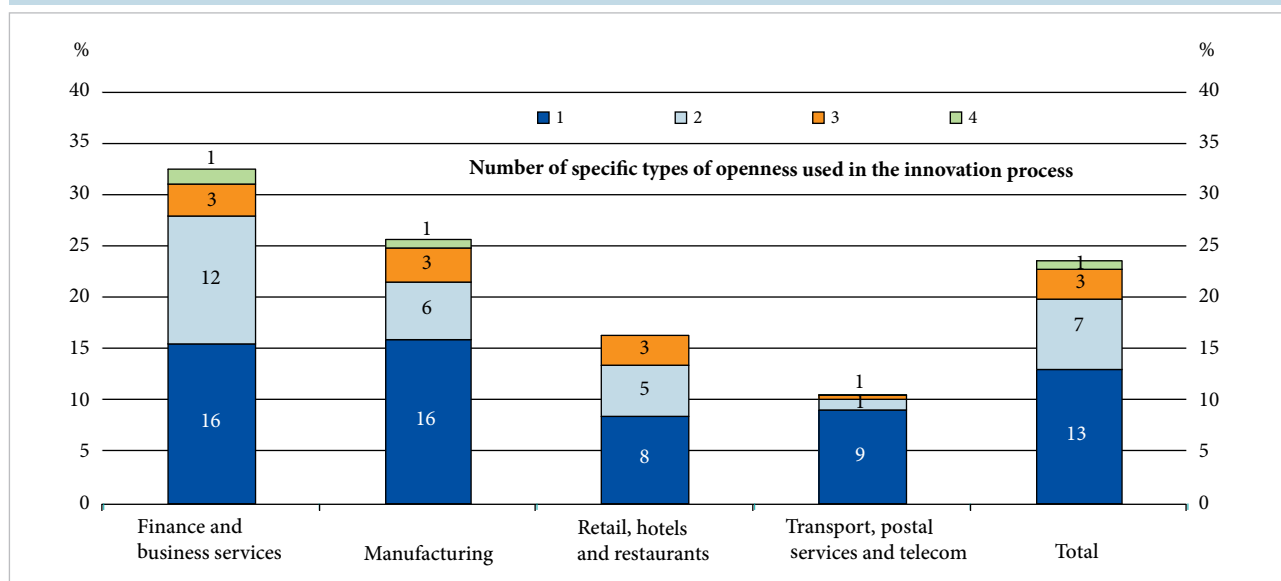
Table 3.3: The enterprises' identification of recognised and unrecognised customer needs, broken down by sector as a percentage of all enterprises in the sector

Main sector	Manufacturing	Retail	Transport, postal & telecom	Finance and business services	All enterprises
Recognised needs					
<i>Focus groups and panels</i>					
Moderate significance	10 %	5 %	3 %	8 %	7 %
Great significance	1 %	1 %	1 %	3 %	2 %
<i>Trend analyses and other statistical methods</i>					
Moderate significance	9 %	6 %	5 %	14 %	9 %
Great significance	0 %	1 %	0 %	2 %	1 %
Unrecognised needs					
Moderate significance	5 %	6 %	2 %	7 %	5 %
Great significance	2 %	1 %	1 %	2 %	2 %

Note: As a percentage of all enterprises. The sectors Agriculture, Fisheries and Extraction; Energy and Water Supply; and Construction are omitted due to insufficient observations.

Source: Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005].

Figure 3.10: Sector breakdown for open innovation



Note: The figure is specified as a percentage of all enterprises, 2004–2006.

The sector categorisation is based on a standard nine-sector categorisation. The sectors Agriculture, Fisheries and Extraction; Energy and Water Supply; and Construction are omitted due to insufficient observations.

Source: Calculations performed by Statistics Denmark based on CIS2006.

Differences are also evident in terms of the types of openness in the innovation process studied. For example, the purchase of R&D and the purchase of other external knowledge are most prevalent in enterprises in Finance and Business Services and in Manufacturing and least prevalent in enterprises in Transport, Postal Services and Telecom.

Insofar as innovation collaboration is concerned, enterprises

in Finance and Business Services differ by having the highest percentage of collaboration on innovation activities. In the 2004–2006 period, 25% of the enterprises in this sector collaborated with other enterprises on innovation.

Similarly, it is enterprises within this sector that have most frequently implemented new business procedures regarding their relationships with external partners and which collaborate on innovation at the same time (see Table 3.4).

Table 3.4: Open innovation in Danish enterprises broken down by sector

	Manufacturing	Retail, hotels and restaurants	Transport, postal & telecom	Finance and business services	All enterprises
Purchase of R&D	6 %	4 %	2 %	7 %	5 %
Purchase of other ext. knowledge	13 %	10 %	6 %	14 %	12 %
Innovation collaboration	16 %	10 %	3 %	25 %	16 %
Strategic collaboration*	5 %	4 %	0 %	10 %	6 %

*Note: The figure is specified as a percentage of all enterprises, 2004–2006. *The variable comprises two questions and measures the percentage of enterprises that collaborate on innovation and, at the same time, have implemented organisational changes to support the external relationships with the enterprise's partners. For this reason, innovation collaboration can be perceived as part of the enterprise's strategy for its relationship to external parties and not as an expression of random/routine collaboration.*

Source: CIS2006.

Enterprises in Finance and Business Services and in Retail are more frequently involved with the organisation of the innovation process

At the same time, differences are also seen between sectors in terms of the introduction of different measures and systems for organisationally supporting the enterprises' innovation. For all parameters, enterprises in Finance and Business Services differ from enterprises in other sectors more fre-

quently by holding that the organisation of the innovation process is important or very important for the enterprise's innovation. After Finance and Business Services, enterprises in Retail, Hotels and Restaurants and then enterprises in Manufacturing are also above average in terms of how Danish enterprises assess the importance of the specific manner in which the innovation process is organised (see Table 3.5).

Table 3.5: Organisation of the innovation process: sector differences

Percentage of enterprises responding that they have to a great extent/to a very great extent implemented the following specific strategies and initiatives as part of efforts to increase in-house innovation capacity and innovation culture.

	Manufacturing	Retail, hotels and restaurants	Transport, postal & telecom	Finance and business services	All enterprises
The enterprise has developed an innovative culture where everyone is expected to contribute to innovation and development	22 %	30 %	9 %	45 %	25 %
The enterprise has developed for collecting new ideas	12 %	15 %	7 %	26 %	13 %
The enterprise has implemented a phased method that supports the development of new products/ services in all phases of the innovation process	14 %	13 %	9 %	18 %	12 %
The enterprise has developed a culture where making mistakes is accepted in the organisation and people system. learn from own mistakes	26 %	36 %	15 %	41 %	29 %
The enterprise has developed wage systems that reward the generation of new ideas and contributions to innovation	6 %	9 %	5 %	14 %	8 %

Note: The sector categorisation is based on a standard nine-sector categorisation. The sectors Agriculture, Fisheries and Extraction; Energy and Water Supply; and Construction are omitted due to insufficient observations.

Source: Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005], the Virksomhedsdatabasen [company database] and own calculations.

Chapter 4 The Effects of Working with Innovation

4.1 Introduction and summary

A basic prerequisite for all enterprises is that their innovation process must have a positive impact on the enterprise's competitiveness. In order for an enterprise to deem it interesting to invest resources in innovation activities, the investment has to make itself felt on the bottom line at some point.

Whether an enterprise succeeds in creating value from its innovative processes depends on a number of different factors. Overall, it is a question of how an enterprise innovates and what it innovates. The way in which an enterprise organises its innovation efforts is also important.

As a successful innovation process largely depends on the individual enterprise's competitive situation, portfolio, sector, size, etc., this process will differ from one enterprise to another. Even so, something seems to indicate that the enterprises which get the most out of their innovation process are those which incorporate knowledge about customers and markets into the innovation process and which open up their innovation process to external inputs and to collaborating with partners in the innovation process.

There are also great differences regarding when the effects of the innovation efforts will show up on the bottom line. Some types of innovation have immediate effects, while other types take longer to have an impact. This depends on factors like how close to the markets the innovations occur. It has not been possible to study the long-term effects in this survey, however, as the data available preclude this. The accessible timeframes are inadequate, but it will be increasingly possible to assess the long-term effects of innovation activities concurrent with the growth of accessible data generated by additional CIS surveys and updates of the Virksomhedsdatabasen [company database].

Consequently, there may be long-term effects like a better market position, new business areas, etc., that have yet to appear in the immediate effects on added value and which will not appear until later on. In the light of the analyses presented in this chapter, it is possible to draw a number of conclusions regarding the correlation between different innovation activities and the effects they have on the enterprises' financial performance. It is worth noting, however, that the basic data and the method applied are subject to uncertainty, and the conclusions should be read with some qualification.

A wide variety of different analyses were conducted concerning the correlation between the enterprises' innovation practice and their financial results. As a result, it is not possible to establish a general correlation between innovation practice and the enterprises' financial results that applies to all enterprises. In the instances where an effect has been identified, this involves positive effects in most cases, and only a few instances of negative effects have been found.

- In some instances, the analyses suggest that incorporating knowledge about users and customers into the innovation process and opening up the innovation process to external input and collaborative relationships generate positive financial effects. In most cases, however, the overall picture shows that correlations with added value are insignificant. In this respect, the results indicate that the correlation between innovation practice and added value can differ from one sector to another and from one enterprise to another. This could be because the innovation practice in each enterprise must be adapted to the individual enterprise's product portfolio, competitive situation, manufacturing process, etc.
- Isolated positive effects of incorporating knowledge about users and customers can in some instances be identified, particularly in the service sectors, while a few positive effects are found in Manufacturing when knowledge about users and customers is linked to R&D (see Section 4.3).
- Positive effects of opening up the innovation process, in the form of entering into collaborative relationships with other enterprises, were identified in a few instances. This particularly applies to the working relationships with other private-sector enterprises. Here, too, however, the analyses show that the effects of opening up the innovation processes vary depending on the sector and the type of enterprise. Overall, there are many insignificant effects, which blurs the fact that the same positive effects are not found in all the individual sectors. The effects of collaborating with public research institutions are more mixed. The collaboration generates positive effects for some enterprises and negative effects for others (see Section 4.4).
- There are instances of positive and, in some cases, insignificant correlations between the enterprises' purchase of external knowledge (consultancy, external research and development or non-patented knowledge) and the enterprises' added value. Here, too, the effects seem to differ depending on the sector and enterprise involved (see Section 4.4).
- Systematically organising the innovation process internally in the enterprise appears to have a positive effect in a few instances, but otherwise is insignificant for the most part. It is primarily the introduction of methods for collecting new ideas in the enterprise that can be linked to positive economic results (see Section 4.5).
- Finally, there are a few positive effects of combining R&D with other innovation activities. A few instances of the positive impact on added value from linking R&D with having a knowledge of customers and users and collaborating in the innovation processes were identified, especially in Manufacturing.

4.2 Innovation activities can contribute to creating value

Previous analyses suggest that a positive correlation may exist between the enterprises' R&D efforts and their financial results.³² The analyses in this chapter are an attempt to identify the correlation between the enterprises' identification of user needs, openness in the innovation process, organisation of innovation processes in enterprises, etc., on the one hand and the enterprises' financial performance on the other.

The principal conclusions are based on a number of analyses of the correlation between the enterprises' innovation activities in the period from 2003 to 2005 and the enterprises' financial performance, expressed as added value in 2004 and 2005. This means that there may be long-term effects – e.g. a better market position, new business areas, etc. – which are

not yet visible in terms of direct effects on added value and which may not appear until later on (see Box 4.1).

4.3 User-driven innovation creates value for enterprises

The analyses show that incorporating knowledge about customers and users into the innovation process can positively impact the enterprises' financial results in a few instances. In most cases, however, the correlation is insignificant. The analyses show mostly positive effects on added value and only a few instances of negative effects.

The positive effects of knowledge about customers and markets are manifested differently in the different sectors. This suggests that incorporating users and knowledge about users into the process has the greatest possible effect if it is adapted

Box 4.1: Calculation of the enterprise's economic performance: added value and TFP

Added value expresses the creation of value that takes place in enterprises. Added value is defined as turnover plus other operating income, less the consumption of goods and services. The analyses study the factors on which the added value is based.

Labour, the capital apparatus (buildings, machinery, etc.) and the consumption of raw materials and services in the manufacturing process are the primary contributors to added value, but factors like the level of education/training and competitive intensity in the market also play an important part. After adjusting for these factors, the part of the added value remaining is not directly explainable. This remainder is called Total Factor Productivity (TFP).

Changes to TFP are the result of factors that are not measurable in terms of the above factors, e.g. when things are made smarter by means of innovation activities, better organisation and work planning, etc. In other words, the concept expresses the pro rata rise in production that is not just the result of an increased effort by the workforce, infusion of capital or manufacturing expenditure, including in the innovation activities. TFP is calculated residually in growth accounts and will accordingly catch measurement errors in specifying production growth, contribution of capital and the workforce, etc. Changes to TFP can thus be explained by many factors, including those that do not necessarily reflect the innovation activities studied in the report. In continuation of this, the analyses include a residual factor that cannot be explained statistically by the factors above or by the enterprises' innovation activities, but which could be explained by factors that do not systematically affect this study. Therefore, the report's results are subject to considerable uncertainty and should be interpreted with caution.

A number of statistical analyses have been carried out to study the amount of added value created by the enterprises' innovation practices. The analyses were conducted on the

basis of the Ministry of Economic and Business Affairs' Virksomhedsdatabasen [company database], which contains the most central information about the enterprises' financial results from 1999 to 2005, as well as a number of factors such as capital, number of employees, level of employee training/education, etc. These data are linked to the questionnaires "Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005]" and "The Community Innovation Survey 2002–2004" which include information about the enterprises' innovation practices. As more recent data about the enterprises' financial results is unavailable, it has not been possible to draw conclusions about the long-term effects of the enterprises' innovation practices.

Each set of data was tested using three different dependent variables: added value (level), growth of added value over two years, and added value per employee. Two different statistical models were set up within each variable, i.e. 12 different statistical models were set up. Separate model runs have been carried out for each sector category in the sector-specific analyses (reported in Table 4.1, Table 4.2 and Table 4.3). This chapter presents the results of the combined number of analyses to provide an overview of the analyses' viability.

For the purpose of indicating the viability of the results of the specific statistical models, the analysis results are reported across the different models. Looking at the overall trends in the effects across the different models, they can be interpreted with a certain amount of reliability. Overall, they depict a statistically viable picture of the enterprise-related effects of various innovation activities (see Appendix 3).

Further information about the basic data is found in Appendix 1, and further information about statistical methods is found in Appendix 3.

32 See e.g. Danish Ministry of Economic and Business Affairs (2005): "Vækstredegørelse 05" [2005 Regional Growth Report].

Figure 4.1: Correlation between working with knowledge of customers and markets and the economic performance of the enterprises ³¹

	<i>The number and breakdown of positive and negative effects respectively in the analyses conducted, as well as the number of insignificant results</i>		
	Positive	Negative	Insignificant
Knowledge of recognised needs ^B	11		19
Known of unrecognised needs ^B	2	2	26
Customers and clients as a source of innovation ^A		2	22
Customers and clients as a source of innovation combined with R&D ^A	6		18

Note: A: CIS4. B: Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005]. R&D applies both when it is specified in the analyses as R&D intensity and R&D in DKK. The value of the individual bars indicates the number of times a positive, neutral or negative correlation was identified between the individual innovation method and the enterprises' added value. The sum of the values indicates the total number of analyses.

Source: Own calculations based on CIS4, Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005] and the Virksomhedsdatabasen [company database].

to the individual enterprise's business model. Looking at the knowledge of recognised needs, for instance, there are nineteen instances of insignificant effects and eleven instances of positive effects. Looking at the knowledge of unrecognised needs, the effects were insignificant in 26 instances and negative in 2 (see Figure 4.1).

Another indicator of user-driven innovation is whether enterprises state that customers and clients are a source of innovation. For enterprises citing this, the effects are mostly insignificant and involve only a few instances of negative effects. If the involvement of customers and clients as a source of innovation is combined with R&D, however, some positive effects and mostly insignificant effects appear. The positive effects are identified in the business community as a whole, in Manufacturing and in Finance and Business Services, where positive effects are identified in each area in two out of six analyses. In the other sectors, only insignificant effects were identified (see Appendix 3).

The fact that in most cases insignificant correlations are identified between incorporating knowledge of customers and users into the innovation process on the one hand and added value on the other is closely related to the fact that the analyses were conducted for the business community as a whole as well as in a number of sectors. As a result, the combined analyses cover a number of different enterprises involved in different competitive situations. This could be explained by the fact that the effects depend on the type of enterprise involved, the market in which they operate and the products they are marketing.

Positive independent effects from working with identifying recognised and unrecognised user needs were especially ascertained in the service sectors. The results are primarily insignificant, however. The results in Manufacturing are primarily insignificant, but positive correlations were identified in some instances when customers and markets were linked to R&D investments (see Appendix 3).

The fact that especially the service sectors manifest independent effects of working with incorporating knowledge about users and markets could be because the enterprises in these sectors have direct customer contact in many cases.

31 See Chapter 2.

In addition, new solutions are less dependent on the development of new technology and deal more with the extent to which the enterprises offer new solutions and concepts with value for customers and users. In the service sector, it is largely a matter of how the individual user experiences the product or service provided (see Box 4.2).

The fact that negative results occur in Manufacturing from using customers and clients as a source of innovation by itself, but that positive results occur if this is combined with R&D, could be explained by factors such as the necessity of converting knowledge about customers and markets into specific physical products, which requires a certain amount of technological input.

Box 4.2: Non-technological Innovation in the Service Sector

The Codan insurance company carried out a project to identify the frequency with which distrust arises between insurance companies and their customers, despite the fact that insurance companies are there to help their customers in times of need. In-depth interviews with claims agents and customers revealed that the distrust is based on the contradictory interests arising in the claim processing situation. This is exemplified by customers who feel they have to take a strategic approach when they contact the insurance companies and by claims agents who are suspicious when customers contact them.

One result of the study is that Codan now expends far more resources than before on injury/damage prevention. The injury/damage prevention situation provides a better point of departure for customer contacts, as the customer and insurance company feel they have common interests in this situation.

By applying methods for user-driven innovation, the company gained greater insight into its customers' wishes and needs and in so doing is able to plan its services based on whether the initial contact with a customer involves something of common interest to both parties.

Source: ReD Associates (2008): User-driven Innovation: a Study of Innovation Practices and User Involvement at 15 Leading Companies in Denmark for the Danish Enterprise and Construction Authority.

4.4 Opening up the innovation process to external input pays off

Something seems to indicate that innovation collaboration with other enterprises can be beneficial in some instances for enterprises. The same is true of collaboration involving enterprises which team up with other companies in the same group or with enterprises outside the group.

When Danish enterprises join forces with other enterprises to innovate, some positive effects on the enterprises' financial results can be identified, while insignificant effects are identified in other cases. For the business community as a whole, six instances of positive effects and six instances of insignificant effects from teaming up with other enterprises on innovation were identified. No instances of negative effects were found.

Whether an enterprise achieves a positive financial effect depends, however, on a number of factors, such as the enterprise's competitive situation, market position, product portfolio, etc. This is underpinned by the results of the sector-specific analyses, as insignificant effects are the most common overall. Thus, working together with other enterprises on innovation will not necessarily have a beneficial effect on the results of all enterprises, but will vary from one sector and enterprise to another. The positive effects recur in all sectors, however, while negative effects from collaborating with other enterprises are not found in any sectors.

Positive financial results from innovation collaboration were especially identified in the service sectors. In Finance and Business Services, and in Transport, Postal Services and Telecom, positive effects were found in some instances and insignificant effects in fewer instances. A few positive effects are found in the other sectors, but mostly insignificant effects (see Appendix 3).

When Danish enterprises collaborate on innovation with other enterprises in their group, positive effects on financial performance are achieved in some instances. Overall, however, mostly insignificant results, but no negative effects, are seen. This could be explained by the fact that collaboration within a group is only relevant to large enterprises and groups of companies where the enterprise is functionally divided into various departments or groups of enterprises. The positive effects established in relation to internal collaboration in the enterprises and collaboration between enterprises takes place especially in the service sectors (see Appendix 3).

The results are more mixed when it comes to innovation collaboration with research institutions. This applies both when the innovation collaboration is isolated and when it is combined with in-house R&D. The effects identified are mostly insignificant, but there are also a few positive and negative effects (see Figure 4.2). A few positive effects of collaborating with research institutions on innovation are seen in Manufacturing in particular, as positive effects are seen in four out of six instances. In the service sectors, the effects are primarily insignificant and, in a few cases, negative (see Appendix 3).

Figure 4.2: Correlation between enterprises' collaboration with other enterprises or research institutions on innovation activities and the enterprises' financial performance

	<i>The number and breakdown of positive and negative effects respectively in the analyses conducted, as well as the number of insignificant results</i>		
	Positive	Negative	Insignificant
Collaboration with enterprises ^{AB}	17		37
In-house collaboration ^A	8		16
Collaboration with private-sector enterprises combined with R&D ^A	1	1	22
Collaboration with re-search institutions combined with R&D ^A	6	5	13
Collaboration with research institutions ^A	4	2	18

Note: A: CIS4. B: Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005].

The figure is based on 30 and 24 models respectively run on the basis of two sets of data, i.e. Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005] and CIS4. Each time a positive effect of an individual variable appeared, this is indicated in green and each negative effect is indicated in blue. The "Insignificant" column shows the number of insignificant results. The sum of the values indicates the total number of models. As a result, the interesting aspect is that it is possible to identify some clear trends relating to the individual variable across the different models, in positive and negative directions respectively.

Source: Own calculations based on CIS4, Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005] and the Company Database.

The results could mean that some enterprises will get more out of innovation collaboration than others. Some enterprises will apparently gain from developing solutions together with partners. This could be because collaboration speeds up the development process and reduces development costs as these are shared with other parties. At the same time it could be because the enterprises, by collaborating on innovation can draw on other expertise and solutions which they are not capable of producing alone. In so doing, enterprises can jointly develop solutions which the enterprises would find it difficult to arrive at alone.

The fact that positive effects of collaborating with research institutes are found only in Manufacturing could be because Manufacturing is more dependent on the development of new knowledge and technology in the technical field. Thus, it could be due to the fact that high technological content is more decisive for enterprises manufacturing products than those providing services. For instance, technology and scientific knowledge could be a more decisive competitive factor within the electronics or medico industry than in wholesale trade.

Another way of acquiring external knowledge is by purchasing knowledge outside the enterprise, either by buying R&D outright or by buying external knowledge in the form of non-patented know-how, licences, consultancy, etc. Enterprises that buy R&D show some cases of positive and insignificant effects on the financial results, and only a few instances of negative financial effects. Especially for the purchase of other external knowledge, such as consultancy, licences and non-patented know-how, the results are primarily insignificant and only positive in a few instances (see Figure 4.3).

The results of comparing the enterprises' collaboration with research institutions with the purchase of R&D show that, overall, the outright purchase of R&D generates positive effects to a greater extent than collaborating with research institutions. This could be because the enterprises do not purchase external knowledge until they know what they need; in other words, when they are relatively certain that the knowledge purchased will make a positive contribution to the enterprise's results.

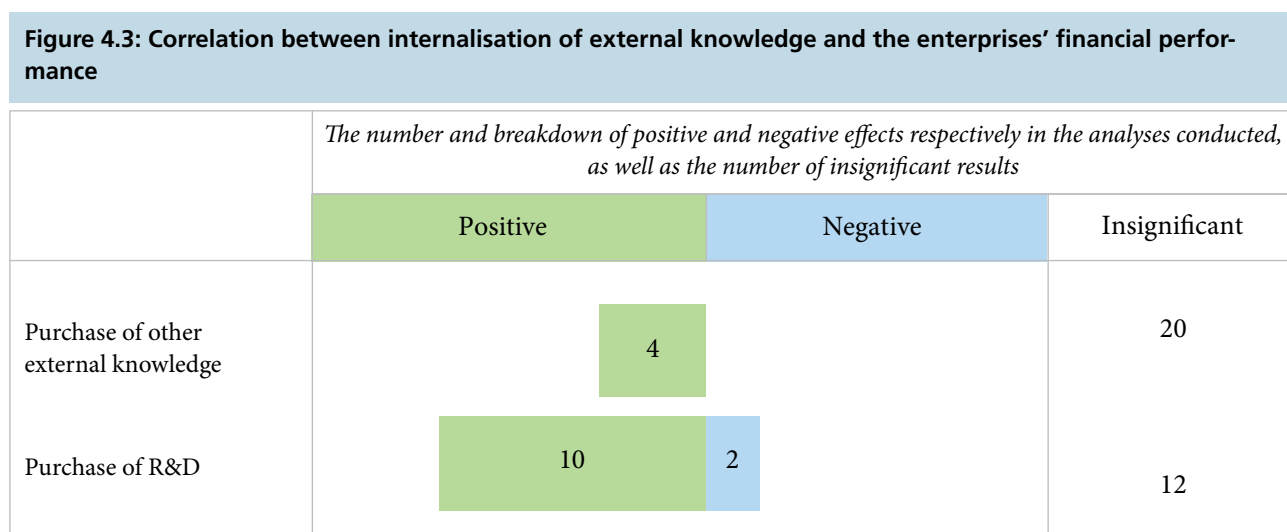
In both instances, however, the results suggest that in the development of technologically intensive products in particular, it can be advantageous to draw on the knowledge resources available outside the enterprise, as positive correlations are identified in a few instances in Manufacturing (see Appendix 3). This could be done, for example, by acquiring knowledge about the users and the market or by collaborating with research institutions or other enterprises. Overall, it is possible to identify neutral and positive effects on the enterprises' performance from collaborating with partners on innovation activities. The only area in which negative effects of collaborating with research institutions are identified is for enterprises in Finance and Business Services.

4.5 Organising the innovation process

Many of the analyses show insignificant effects, but also a few positive effects on enterprises' performance from actively working to organise the innovation activities within the enterprise (see Appendix 3). The analyses cover five specific methods for organising the innovation process:

1. The enterprise has developed a culture in which everyone, at every level, is expected to contribute to innovation and development.
2. The enterprise has developed methods for collecting and assessing new ideas, e.g. a system, a department or other facilities.
3. The enterprise has introduced a stage-gate method that supports the development of new products/services, from the generation of ideas to the development of a business plan.
4. The enterprise has developed a culture where making mistakes is accepted and where the organisation systematically learns from its mistakes.
5. The enterprise has developed wage systems that reward the generation of ideas and contributions to innovation/development.

On the basis of the above, an overall variable for the enterprises' overall innovation capacity has been set up to provide an overarching explanation of the significance of working to organise the innovation process in the enterprises. Enterprise that work in one way or another to systematise their innovation activities mostly achieve insignificant or, in fewer instances, positive results. Methods for collecting new ideas in particular have a positive effect on the enterprise's results (see Figure 4.4).



Note: The figure is based on 24 models run on CIS4. Each time a positive effect of an individual variable appeared, this is indicated in green and each negative effect is indicated in blue. The "Insignificant" column shows the number of insignificant results. The sum of the values indicates the total number of models. As a result, the interesting aspect is that it is possible to identify some clear trends relating to the individual variable across the different models, in positive and negative directions respectively.

Source: Own calculations based on CIS4 and the Virksomhedsdatabasen [company database].

Figure 4.4: Correlation between the organisation of the innovation process and the enterprises' financial performance

	<i>The number and breakdown of positive and negative effects respectively in the analyses conducted, as well as the number of insignificant results</i>		
	Positive	Negative	Insignificant
In-house innovation capacity ^A	5		10
Utilisation of methods for collecting ideas	6		9
Development of wage systems that reward ideas	1		14
Development of innovative culture	2	1	12
Implementation of stage-gate methods supporting innovation	2	1	12
Establishment of a culture where making mistakes is accepted			15

Note: The figure is based on 15 models run on Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005]. Each time a positive effect of an individual variable appeared, this is indicated in green and each negative effect is indicated in blue. The "Insignificant" column shows the number of insignificant results. The sum of the values indicates the total number of models. As a result, the interesting aspect is that it is possible to identify some clear trends relating to the individual variable across the different models, in positive and negative directions respectively.

A: Internal innovation capacity is a combined variable set up on the basis of the other five variables reported in the figure.

Source: Own calculations based on Erhvervslivets innovation og vækstbetingelser 2005 [The Business Community's Innovation and Growth Conditions 2005] and the Virksomhedsdatabasen [company database].

On the other hand, less or no significance was identified from working with wage systems that reward innovation or a culture in which making mistakes is accepted. A few positive results do occur, however (see Appendix 3). The results are mixed in Manufacturing and in Retail, Hotels and Restaurants, though mostly neutral and positive (see Appendix 3).

The results of introducing stage-gate methods for developing new products and building up an innovative culture seem to be mixed. Consequently, this method does not make an unequivocally positive contribution to value creation but the outcomes can differ depending on the sector, for instance (see Appendix 3).

Appendiks 1: Rapportens datagrundlag

Denne rapport giver et overblik over innovationsaktiviteten i danske virksomheder og går dybere ned i sammenhængen mellem, hvordan virksomhederne arbejder med at omsætte idéer og nytænkning til kommerciel værdi og virksomhedernes økonomiske resultater. De konkrete spørgsmål, der er anvendt til afdækning af, hvilke typer af innovation virksomheder har implementeret, fremgår af boksen nedenfor.

Innovationstyper

I denne analyse anvendes OECD og EU's definition af innovation³³, jf. OECD (2005). Det er en fælles international definition, der bl.a. benyttes til at indsamle data om innovation i EU ved *Community Innovation Survey* (CIS) samt i flere ikke-europæiske OECD-lande:

Produktinnovation: Introduktion af en ny vare eller tjenesteydelse på markedet eller af en vare eller tjenesteydelse, hvis egenskaber er blevet væsentligt forbedret: 1) *Nye eller væsentligt forbedrede varer og/eller* 2) *nye eller væsentligt forbedrede tjenesteydelser.*

Procesinnovation: Implementering af en *bedre udnyttelse eller udveksling af information*, 3) *organisering af produktudviklingsarbejdet* 4) *nye metoder til arbejdspladsens organisering med hensyn til uddelegering af ansvar og beslutningstagning*, og/eller 5) *måder hvorpå eksterne relationer til virksomheder og offentlige institutioner organiseres, fx alliancer, partnerskaber, outsourcing eller underleverandører.*

Markedsføringsinnovation: En ny eller væsentligt ændret salgs- og markedsføringsmetode: 1) *Ændringer i designet af en vare eller tjenesteydelse*, 2) *indpakning*, 3) *brug af nye medietyper eller teknikker til promovring*, 4) *markedsføringsstrategier rettet mod at nå nye kundegrupper eller markedssegmenter*, 5) *nye salgskanaler og metoder til produktplacering* eller 6) *nye prissætningsmetoder, fx rabatsystemer, bonussystemer, efterspørgselsbestemt prisfastsættelse.*

Kilde: Erhvervslivets forskning og innovation 2006 (CIS2006).

Der findes ikke registerbaserede data om virksomheders arbejde med og resultater af innovationsprocessen. Det betyder, at det er nødvendigt at anvende spørgeskemaundersøgelser om innovation. Der kan derfor være usikkerhed omkring tallene. Dels fordi der vil være en statistisk usikkerhed, fordi ikke alle danske virksomheder svarer på undersøgelsen, dels fordi der er usikkerhed forbundet med, om virksomhederne har forstået spørgsmålene korrekt. Samt endelig fordi innovationsprocesser er komplekse, og det derfor kan være vanskeligt at afdække vigtige nuancer i virksomhedernes forskellige måder at arbejde med innovation på med udgangspunkt i

mere overordnede spørgeskemaundersøgelser. Der vil således være dele af virksomhedernes innovationsaktiviteter, der ikke kan dækkes ind af de tilgængelige spørgeskemaundersøgelser.

For den beskrivende statistik over innovationsprocesser blandt danske virksomheder, anvendes det nationale datasæt bag *Community Innovation Survey* (CIS) fra 2006 (CIS2006). CIS2006 er den senest offentliggjorte samling af data over danske virksomheders innovationsaktiviteter.

Herudover er der anvendt data fra Erhvervslivets Innovation og Vækstbetingelser 2005, der som den eneste undersøgelse afdækker danske virksomheders organisering af innovationsprocessen.

I forbindelse med de analyser, der undersøger sammenhængen mellem virksomhedernes innovationspraksis og de økonomiske præstationer, har det været nødvendigt at anvende spørgeskemaer, der undersøger virksomhedernes innovationsprocesser i 2004 og 2005. Det skyldes, at det ikke er muligt at koble data om virksomhedernes regnskaber i 2006 til innovationsundersøgelserne før 2009.

Der eksisterer relativt få data om åbenhed i innovationsprocessen og brugerdreven innovation før 2006. Med henblik på at afdække både brugerdreven innovation og åbenhed i innovationsprocessen så grundigt som muligt trækkes derfor på to forskellige spørgeskemaundersøgelser: *Community Innovation Survey 2002-2004* (CIS4), der især afdækker, hvilke innovationer virksomhederne lancerer, deres forskning og udviklingsarbejde samt åbenhed i innovationsprocessen. Disse spørgsmål dækkes ikke i samme omfang i *Erhvervslivets innovation og vækstbetingelser 2005*, der til gengæld afdækker brugerdreven innovation samt organisering af innovation i virksomheden væsentligt mere grundigt end CIS4.

33 OECD-Eurostat (2005): Oslo Manual, Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition, Paris.

Spørgeskemaundersøgelser

Community Innovation Survey 2002-2004 (CIS4) og 2004-2006:

CIS-målingerne bliver gennemført som et standardiseret spørgeskema i EU samt i en række øvrige OECD-lande, hvilket gør det muligt at sammenligne på tværs af de forskellige medlemslande. CIS4 har til formål at undersøge omfanget af innovationsaktivitet i dansk erhvervsliv over perioden 2002 til 2004. Det bygger på en spørgeskemaundersøgelse, hvor spørgsmålene ud over generelle spørgsmål såsom antal ansatte bl.a. omhandler, hvorvidt virksomheden har introduceret nye innovationer (produkt, proces, organisatorisk eller markedsføring), virksomhedens samarbejdspartnere i forbindelse med innovation og graden af samarbejdet i innovationsprocessen. CIS4 bygger på svar fra 2097 private virksomheder med mindst 6 ansatte – i nogle brancher dog helt ned til 2 ansatte og i andre brancher flere ansatte. Virksomhederne er blevet udvalgt stratificeret med henblik på at sikre repræsentation fra alle brancher og størrelsesgrupper. Data er efterfølgende vægtet, så resultaterne afspejler den danske erhvervsstruktur, samtidig med, at de er repræsentative.

CIS2006 bygger videre på samme principper som CIS4, dog er formuleringerne i nogle tilfælde ændret. CIS2006 bygger på svar fra 2307 private virksomheder, hvor det mindste antal ansatte afhænger af branchens F&U-aktivitet (desto min-

dre F&U-aktivitet desto højere minimumsgrænse for antal ansatte). Dækningen af dansk erhvervsliv er udvidet, så den omfatter flere mindre virksomheder i flere brancher end tidligere. Eksempelvis er transport, post og tele udvidet, så den omfatter virksomheder med ned til 10 ansatte, hvor den i CIS4 omfattede virksomheder med ned til 50 ansatte. Den generelle grænse er dog stadig minimum 6 ansatte.

Erhvervslivets innovation og vækstbetingelser 2005:

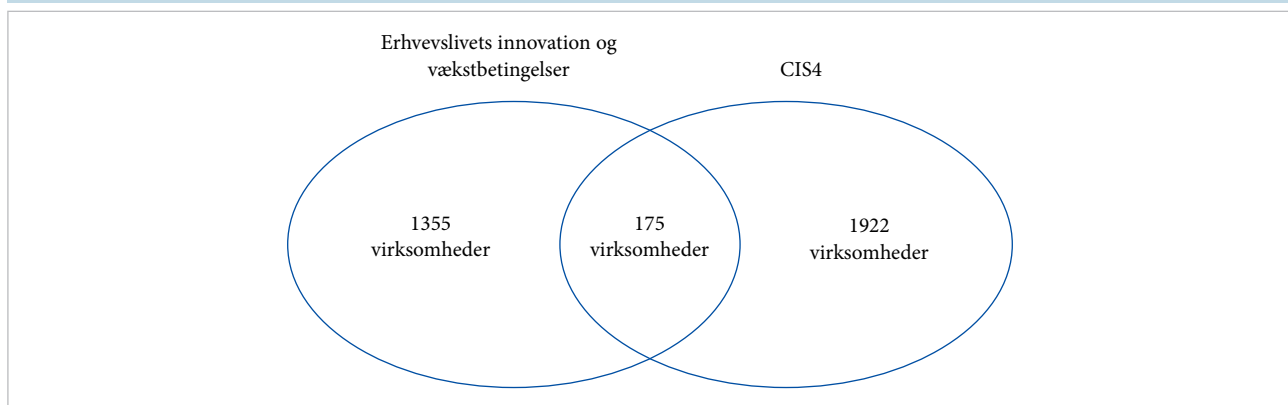
Den tilgængelige kvantitative viden om virksomhedernes anvendelse af brugerdreven innovation stammer primært fra undersøgelsen *”Erhvervslivets innovation og vækstbetingelser 2005”*, der er gennemført af Danmarks Statistik. Undersøgelsen havde til formål at belyse det danske erhvervslivs præstationer og vækstbetingelser regionalt. Undersøgelsen blev gennemført ved hjælp af et spørgeskema, der blev tilsendt et repræsentativt udvalg af virksomheder i Danmark. Undersøgelsen blev gennemført i efteråret 2005 og foråret 2006 og dækker i alt en population på 1552 virksomheder. Spørgeskemaet blev sendt til 4877 virksomheder og havde en svarprocent på 31,8 pct. Brugerdreven innovation er i projektet *”En mere målrettet innovationspolitik”* blevet afgrænset til at omfatte spørgsmål, som omhandler anvendelsen af *analyser til afdækning af erkendte behov og avancerede metoder til at afdækning af ikke-erkendte behov*.

Kilde: Center for Forskningsanalyse (2006): Innovation i Dansk Erhvervsliv 2002-2004 – Metode og datagrundlag, Center for Forskningsanalyse (2008): Innovation i Dansk Erhvervsliv 2004-2006 – Metode og datagrundlag.

Der er tale om to forskellige spørgeskemaundersøgelser med et relativt lille overlap mellem de to populationer. Det betyder, at det kun i begrænset omfang er muligt at gennemføre analyser, der medtager alle detaljerede aspekter fra begge undersøgelser. Analyserne er derfor udført separat på de to datasæt,

og der er anvendt proxy for brugerdreven innovation i CIS4 (kunder og klienter som kilde til innovation) og for åbenhed i innovationsprocessen samt forskning og udvikling i de analyser, der benytter sig af *Erhvervslivets innovation og vækstbetingelser 2005*, jf. figur 0.1.

Figur 0.1: Populationsoversigt



Anm: Afvigelsen i det samlede antal virksomheder mht. Erhvervslivets innovation og vækstbetingelser 2005 mellem boks 0.1 og figur 0.1 fremkommer pga., at enkelte virksomheder har afleveret ufuldstændige besvarelser.

Kilde: CIS4 og Erhvervslivets innovation og vækstbetingelser 2005.

De to spørgeskemaundersøgelser er blevet koblet med Økonomi- og Erhvervsministeriets virksomhedsdatabase med henblik på at sammenholde virksomhedernes innovationsaktiviteter med virksomhedernes nøglekarakteristika samt med henblik på at afklare, hvordan virksomhederne efterfølgende har klaret sig. Det kan lade sig gøre for CIS4 og *Erhvervslivets innovation og vækstbetingelser 2005*, som har referenceår i henholdsvis 2002-2004 samt 2005, mens der findes data for virksomhedernes økonomiske præstationer til og med 2005.

Boks: Økonomi- og Erhvervsministeriets virksomhedsdatabase

Danmarks Statistik har for Økonomi- og Erhvervsministeriet opbygget en omfattende virksomhedsdatabase med oplysninger om alle danske virksomheder (firmaer, dvs. den juridiske enhed) og deres ansatte for perioden 1999-2005 på baggrund af firmastatistikken og IDA. Databaseen udbygges løbende med nye informationer og tilknytning af nye år. Databaseen gør det muligt at følge virksomhedernes udvikling og dispositioner over tid, hvilket f.eks. gør den velegnet til strukturelle policy- og erhvervsøkonomiske analyser. Derudover fungerer databaseen som en databank til detaljeret deskriptiv statistik af virksomhederne i Danmark, hvilket gør det nemt og hurtigt at udtrække specifikke oplysninger. Virksomhedsdatabaseen indeholder årlige informationer om ca. 300.000 virksomheder fordelt på mere end 200 variable.

Appendiks 2: Særkørsler vedr. PP-innovationsaktiviteter

Tabel I: Udviklingen i danske virksomheders innovationsaktivitet målt ved pp-innovation fra 2002-2006 opgjort på brancher

Branche	Kun pp-innovative 2002-2004	Kun pp-innovative 2004-2006	PP-innovative begge år	Ingen innovation
Industri	44 pct.	6 pct.	3 pct.	47 pct.
Handel	21 pct.	10 pct.	19 pct.	49 pct.
Transport, post og telekommunikation	26 pct.	10 pct.	11 pct.	53 pct.
Finansierings- og forretningsservice	40 pct.	7 pct.	13 pct.	41 pct.
Øvrige brancher (1,3,4)	15 pct.	13 pct.	6 pct.	66 pct.
Alle virksomheder	39 pct.	8 pct.	14 pct.	39 pct.

Kilde: Særkørsel foretaget af Center for Forskningsanalyse

Tabel II: Udviklingen i danske virksomheders innovationsaktivitet målt ved pp-innovation fra 2002-2006 opgjort på virksomhedsstørrelse

Antal ansatte	Kun pp-innovative 2002-2004	Kun pp-innovative 2004-2006	PP-innovative begge år	Ingen innovation
2 - 9	18 pct.	0 pct.	46 pct.	36 pct.
10 - 49	17 pct.	5 pct.	29 pct.	48 pct.
50 - 249	13 pct.	12 pct.	37 pct.	38 pct.
250 +	7 pct.	8 pct.	58 pct.	27 pct.
Alle virksomheder	14 pct.	8 pct.	39 pct.	39 pct.

Kilde: Særkørsel foretaget af Center for Forskningsanalyse

Tabel II: Udviklingen i danske virksomheders innovationsaktivitet målt ved pp-innovation fra 2002-2006 opgjort på virksomhedsstørrelse

Antal ansatte	Kun pp-innovative 2002-2004	Kun pp-innovative 2004-2006	PP-innovative begge år	Ingen innovation
Manglende økonomiske ressourcer	14 pct.	6 pct.	56 pct.	23 pct.
Manglende finansieringskilder	18 pct.	6 pct.	52 pct.	23 pct.
For høje innovationsomkostninger	19 pct.	6 pct.	56 pct.	19 pct.
Mangel på kvalificeret personale	16 pct.	8 pct.	56 pct.	21 pct.
Mangel på informationer om teknologi	16 pct.	8 pct.	56 pct.	20 pct.
Mangel på information om markederne	16 pct.	8 pct.	56 pct.	20 pct.
Vanskeligt at finde samarbejdspartnere	16 pct.	8 pct.	54 pct.	22 pct.
Dominans af etablerede virksomheder	18 pct.	9 pct.	49 pct.	24 pct.
Usikker efterspørgsel	17 pct.	7 pct.	54 pct.	22 pct.
Unødvendigt pga. tidligere innovationer	14 pct.	10 pct.	49 pct.	27 pct.
Ingen efterspørgsel	15 pct.	8 pct.	46 pct.	30 pct.

Kilde: Særkørsel foretaget af Center for Forskningsanalyse

Appendiks 3: Analyseresultater

Kørsler på CIS4 og *Erhvervslivets innovation og vækstbetingelser 2005*.

Nedenstående skemaer viser de samlede resultater fra de gennemførte analyser. Der er foretaget analyser på baggrund af i alt 12 forskellige statistiske *cross-section* modeller. At der er anvendt 12 modeller i stedet for blot en enkelt, skyldes en række begrænsninger i data.

Den umiddelbart største udfordring i forhold til de enkelte modeller er tidsfaktoren. Det må forventes, at effekter af innovationsaktiviteter er forsinkede, og at de vil variere afhængigt af typen af aktivitet og af den kontekst, den forekommer i. Hvis en virksomhed afholder omkostninger i forbindelse med innovationsaktiviteter, kan effekten af disse aktiviteter derfor enten vise sig umiddelbart efter, at aktiviteten er afholdt, eller der kan gå flere år, før de viser sig. Det stiller store krav til, at data skal være dækkende over længere tidsperioder. Dette er ikke tilfældet i hverken CIS undersøgelse eller *Erhvervslivets Innovation og Vækstbetingelser 2005*. Samtidig vil det ikke være muligt at vurdere de langsigtede effekter før om 5-10 år.

En anden udfordring er, at analyserne af virksomhedernes innovationsaktiviteter er baseret på spørgeskemadata, hvilket alt andet lige er mindre robust end registerbaseret datamateriale. Yderligere er populationsstørrelsen begrænset, hvilket gør robustheden begrænset, når data splittes op på brancher, regioner, mv.

Endelig er det en udfordring, at der ikke tidligere er gennemført lignende analyser af effekterne af virksomheders innovationsaktiviteter, hvorfor der ikke findes forhåndsviden om, hvilke modeller der med fordel kan anvendes, og hvordan de konkrete variable skal kodes. De variable, der indgår i modellerne, kan således kodes på forskellige måder, hvilket vil have konsekvenser for de anvendte estimater. De enkelte udslag er således forbundet med en vis usikkerhed, og der skal tolkes varsomt på disse.

Med henblik på at sikre robusthed i analyserne er det derfor valgt at foretage analyser på 12 forskellige statistiske modeller. På tværs af analyserne er det derfor muligt at vurdere robustheden af de fund, der præsenteres. Fund, der går igen på tværs af modeller og brancher, kan således siges at være relativt robuste. Ser man således på de overordnede tendenser i udslagene på tværs af de forskellige modeller, kan der tolkes med en vis sikkerhed på disse. De tegner samlet set et statistisk robust billede af de virksomhedsnære effekter af forskellige innovationsaktiviteter.

Modellerne er kørt 12 gange på de brancher, hvor der har været tilstrækkeligt med observationer til at afdække statistisk valide og signifikante effekter. Dette betyder, at der ligeledes har været mulighed for at afdække særlige branchespecifikke effekter. Resultaterne peger på, at der er forskellige i effekterne mellem hver branche, hvilket ikke er overraskende i lyset af, at brancherne lever af at frembringe vidt forskellige typer af produkter og ydelser, og at de har forskellige typer af produktionsprocesser m.v. Således vil kravet til teknologi være

forskelligt fra forsikringsbranchen til højteknologisk fremstillingsindustri.

Modellerne måler effekten udtrykt ved enten værditilvækst, vækst i totalfaktorproduktiviteten i perioden 2003-2004 og 2004-2005 eller værditilvækst pr. beskæftiget.

Cross-section modeller

De tolv modeller er såkaldte cross-section modeller, hvor virksomheders værditilvækst bestemmes ud fra antallet af ansatte, omfanget af kapital samt en række branche- og virksomhedsspecifikke variable. Konkret ser modellerne ud som følger:

$$y_i = \alpha + \beta_l * l_i + \beta_k * k_i + \beta_x * X_i + \varepsilon_i, i \in N$$

” y_i ” angiver værditilvæksten i virksomhed ” i ”, l og k angiver henholdsvis arbejdskraft og kapital og X angiver øvrige virksomheds- og branchespecifikke variable såsom: Virksomhedernes uddannelsesniveau, konkurrenceintensitet (målt som koncentrationen af markedsandelene angivet ved Herfindahl-Hirschman indekset, angivet i nedenstående tabeller med stjerne), samt intensiteten af eksport og import. Variablene er nærmere beskrevet i Økonomi- og Erhvervsministeriets arbejdsrapport nr. 2/2004, der kan downloades via www.oem.dk.

Analyserne er gennemført på to forskellige populationer – Erhvervslivets innovation og vækstbetingelser 2005 med 1552 respondenter og Community Innovation Survey 2002-2004 med 2097 respondenter (se boks 0.1) – og kørt sammen med oplysninger om virksomhederne fra Økonomi- og Erhvervsministeriets virksomhedsdatabase. Hvert datasæt er testet med tre forskellige afhængige variable: Værditilvækst (niveau), vækst i værditilvækst mellem to år og værditilvækst pr. beskæftiget. Inden for hvert af disse er der opstillet to forskellige statistiske modeller. Der er således i alt opstillet 12 forskellige statistiske modeller.

I de branchespecifikke analyser (rapporteret i tabel 4.1, tabel 4.2, tabel 4.3. samt i Appendiks 3) er der gennemført adskilte modelkørsler for hver branchegruppering. Således tillades det på denne måde, at koefficientestimaterne for α og β værdierne varierer på tværs af branchegrupperingen. I de branchespecifikke analyser er Danmarks Statistiks standard 9-gruppering benyttet som branchegruppering.

Valget af branchegruppering er sket efter en vurdering af omfanget af de givne datasæt samt hensynet til branchespecifikke karakteristika. En mere detaljeret (og dermed finere opdelt branchegruppering) ville resultere i en større korrektion af branchespecifikke karakteristika. Dette har imidlertid ikke været muligt grundet det givne antal observationer i datasættene.

Analyserne er på den samlede stikprøve (CIS4) gennemført på et datasæt indeholdende flere tidsperioder, hvor den såkaldte GMM-SYS estimator er anvendt. Resultaterne herfra underbygger resultaterne fra kørslerne via ovenfor beskrevne metode. GMM-SYS metoden er tilsvarende beskrevet i Økonomi- og Erhvervsministeriets arbejdsrapport nr. 2/2004.

CIS4: Generel kørsel for erhvervslivet som helhed

Label	1. Værditilvækst		2. Vækst i TFP mellem 2003 og 2004		3. Værditilvækst pr. antal ansatte	
	F&U intensitet (N = 1797)	F&U i 1000 kr. (N = 1797)	F&U intensitet (N = 1768)	F&U i 1000 kr. (N = 1768)	F&U intensitet (N = 1797)	F&U i 1000 kr. (N = 1797)
(log)Kapitalapparat	0,133 (0,008)	0,123 (0,008)	0,032 (0,009)	0,031 (0,009)	0,129 (0,008)	0,124 (0,008)
Koncentration af konkurrence*	0,041 (0,009)	0,032 (0,010)	0,048 (0,020)	0,049 (0,020)	0,045 (0,007)	0,040 (0,007)
Uddannelse af ansatte	0,035 (0,002)	0,031 (0,003)	(-0,016) (0,008)	(-0,016) (0,009)	1,771 (0,129)	1,384 (0,122)
(log)Antal ansatte	0,809 (0,011)	0,825 (0,011)	0,461 (0,028)	0,463 (0,028)	Indgår ikke i modellen	Indgår ikke i modellen
F&U intensitet ³⁴	-0,901 (0,333)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	-1,007 (0,338)	Indgår ikke i modellen
F&U i kr.	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	6,5E-4 (1,62E-4)
Samarbejde indenfor koncernen	0,119 (0,034)	0,088 (0,035)	Insignifikant	Insignifikant	0,130 (0,034)	0,113 (0,033)
Landbrug, fiskeri mv.	Insignifikant	(0,354) (0,211)	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Industri	Insignifikant	(0,061) (0,037)	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Bygge & anlæg	0,296 (0,054)	0,308 (0,060)	Insignifikant	Insignifikant	0,276 (0,054)	0,241 (0,055)
Handel, hotel & restauration	0,123 (0,027)	0,167 (0,037)	Insignifikant	Insignifikant	0,131 (0,027)	0,123 (0,027)
Transport, post & telekommunikation	0,243 (0,052)	0,293 (0,059)	Insignifikant	Insignifikant	0,221 (0,052)	0,220 (0,053)
Finansiering og forretningsservice	Insignifikant	Indgår ikke i modellen	Insignifikant	Insignifikant	Insignifikant	Insignifikant
F&U intensitet & samarbejde med forskningsinstitutioner	-0,346 (0,147)	Indgår ikke i modellen	-0,166 (0,075)	Indgår ikke i modellen	-0,349 (0,149)	Indgår ikke i modellen
Køb af F&U	0,108 (0,031)	(0,054) (0,031)	Insignifikant	Insignifikant	0,104 (0,031)	Insignifikant
F&U intensitet & kunder som kilde til innovation	(0,579) (0,324)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,658 (0,328)	Indgår ikke i modellen
F&U i kr. & samarbejde forskningsinstitutioner	Indgår ikke i modellen	4,44E-4 (1,82E-4)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Kunder & klienter som kilde til innovation	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant

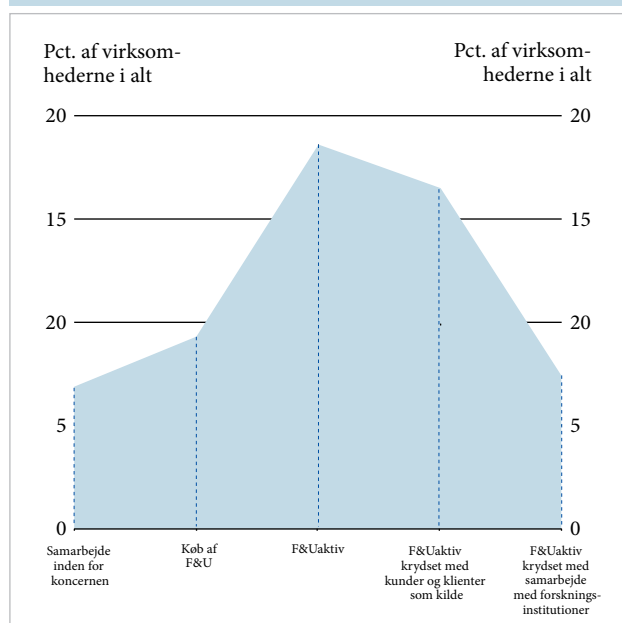
34 I de analyser, hvor GMM-SYS estimatoren er anvendt, der tager højde udviklingen over tid, findes der positive effekter af at arbejde med F&U som selvstændig aktivitet. Når dette kombineres med kunder og klienter som kilde til innovation, findes der positive effekter af kombinationen mellem forskning og udvikling og kunder og klienter som kilde til innovation.

Label	1. Værditilvækst		2. Vækst i TFP mellem 2003 og 2004		3. Værditilvækst pr. antal ansatte	
	F&U intensitet (N = 1797)	F&U i 1000 kr. (N = 1797)	F&U intensitet (N = 1768)	F&U i 1000 kr. (N = 1768)	F&U intensitet (N = 1797)	F&U i 1000 kr. (N = 1797)
Samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Samarbejde med forskningsinstitutioner	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Køb af anden ekstern viden	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Samarbejde med andre virksomheder & organisatoriske innovationer	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
F&U intensitet & samarbejde med andre virksomheder	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
F&U i kr. & kunder som kilde til innovation	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
F&U i kr. & samarbejde med andre virksomheder	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant

Anm: Estimer angivet i parentes er insignifikante på et 5 pct.-niveau, men signifikante på et 10 pct.-niveau.
Tallene skrevet med småt under parameterestimerne er de tilhørende standardfejl.
Kilde: Egne kørsler på CIS4.

CIS4: Generel kørsel for erhvervslivet som helhed – innovationslandskab (n = 2091)

Figuren viser, hvor mange virksomheder der har svaret ja til de variable, der er signifikante i modellen.



Anm: 2002-2004.

Kilde: CIS4 samt egne kørsler på Virksomhedsdatabasen.

Erhvervslivets innovation og vækstbetingelser 2005: Generel kørsel for erhvervslivet som helhed³⁵

Label	1. Værditilvækst		2. Vækst i TFP mellem 2004 og 2005		3. Værditilvækst pr. antal ansatte	
	Kørsel 1 (N = 1281)	Kørsel 2 (N = 1281)	Kørsel 1 (N = 1274)	Kørsel 2 (N = 1274)	Kørsel 1 (N = 1281)	Kørsel 2 (N = 1281)
Kapitalapparat	0,137 (0,010)	0,138 (0,010)	0,055 (0,010)	0,055 (0,010)	0,133 (0,009)	0,133 (0,009)
Antal ansatte	0,837 (0,017)	0,835 (0,017)	0,522 (0,033)	0,522 (0,033)	Indgår ikke i modellen	Indgår ikke i modellen
Uddannelse af ansatte	0,054 (0,005)	0,053 (0,005)	-0,020 (0,009)	-0,020 (0,009)	2,638 (0,223)	2,613 (0,223)
Koncentration af konkurrence*	0,050 (0,010)	0,050 (0,010)	Insignifikant	Insignifikant	0,040 (0,009)	0,041 (0,009)
Landbrug	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Industri	-0,083 (0,038)	-0,084 (0,038)	-0,051 (0,022)	-0,051 (0,022)	-0,196 (0,041)	-0,199 (0,041)
Bygge & anlæg	0,148 (0,045)	-0,151 (0,045)	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Handel, hotel & restauration	Insignifikant	Insignifikant	Insignifikant	Insignifikant	-0,128 (0,040)	-0,130 (0,040)
Transport, post & telekommunikation	(0,090) (0,052)	(0,090) (0,052)	-0,140 (0,032)	-0,140 (0,032)	Insignifikant	Insignifikant
Finansierings- & forretningservice	-0,162 (0,049)	-0,159 (0,049)	Insignifikant	Insignifikant	-0,321 (0,055)	-0,319 (0,055)
Forskning fra forskningsinstitutioners rolle for virksomhedens innovation	(-0,034) (0,019)	(-0,032) (0,019)	-0,028 (0,013)	-0,028 (0,013)	-0,038 (0,019)	(-0,036) (0,019)
Erkendte behov	0,047 (0,017)	0,046 (0,017)	0,021 (0,009)	0,021 (0,009)	0,049 (0,017)	0,049 (0,017)
Samarbejde med andre virksomheder	0,096 (0,041)	0,097 (0,041)	0,058 (0,028)	0,058 (0,028)	0,094 (0,041)	0,096 (0,041)
Intern innovationskapacitet ³⁶	0,040 (0,020)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,040 (0,020)	Indgår ikke i modellen
Ikke-erkendte behov – krydset med intern innovationskapacitet	-0,019 (0,009)	-0,020 (0,009)	Insignifikant	Insignifikant	-0,021 (0,009)	-0,022 (0,009)
Innovationskapacitet – Opsamling nye idéer	Indgår ikke i modellen	0,039 (0,015)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,040 (0,015)
Ikke-erkendte behov	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Forskning udviklet i virksomhedens rolle for virksomhedens innovation	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant

35 I kørsel 1 indgår skalavariablen intern innovationskapacitet, mens der i kørsel 2 indgår de enkelte variable, som intern innovationskapacitet er baseret på.

36 Skalavariabel over spørgsmål i det regionale spørgeskema om innovationsledelse: Udvikling af en innovationskultur, systematisk opsamling og vurdering af idéer, trinvis innovationsmetode, udviklingen af en kultur, hvor det er i orden at fejle, udvikling af lønsystemer.

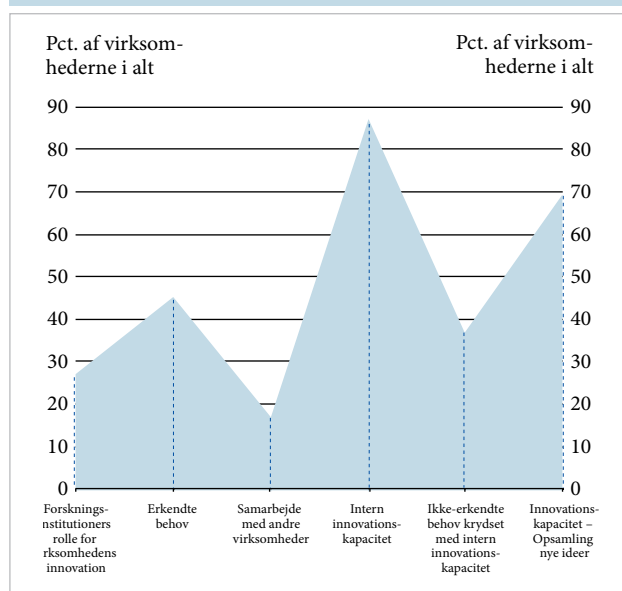
Label	1. Værditilvækst		2. Vækst i TFP mellem 2004 og 2005		3. Værditilvækst pr. antal ansatte	
	Kørsel 1 (N = 1281)	Kørsel 2 (N = 1281)	Kørsel 1 (N = 1274)	Kørsel 2 (N = 1274)	Kørsel 1 (N = 1281)	Kørsel 2 (N = 1281)
Erkendte behov krydset med intern innovationskapacitet	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
Erkendte behov krydset med ikke-erkendte behov	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Erkendte behov krydset med samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Ikke-erkendte behov krydset med samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Innovationskapacitet – Innovativ kultur	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Innovationskapacitet – Trinvis metode	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Innovationskapacitet – Lærer af fejl	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Innovationskapacitet – Lønsystemer	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant

Anm: Estimer angivet i parentes er insignifikante på et 5 pct.-niveau, men signifikante på et 10 pct.-niveau. Tallene skrevet med småt under parameterestimerne er de tilhørende standardfejl.

Kilde: Erhvervslivets innovation og vækstbetingelser 2005 samt egne kørsler på Virksomhedsdatabasen.

Erhvervslivets innovation og vækstbetingelser 2005: Generel kørsel for erhvervslivet som helhed – innovationslandskab (n = 1530)

Figuren viser, hvor mange virksomheder der har svaret ja til de variable, der er signifikante i modellen.



Anm: 2003-2005. Skalavariablerne indeholder også de virksomheder, der har svaret lille rolle, lille grad eller lign., hvor der gennemgående i rapporten kun betragtes de virksomheder, der har svaret stor/meget stor rolle eller høj/meget høj grad.

Kilde: Erhvervslivets innovation og vækstbetingelser 2005 samt egne kørsler på Virksomhedsdatabasen.

CIS4 skema: Industri

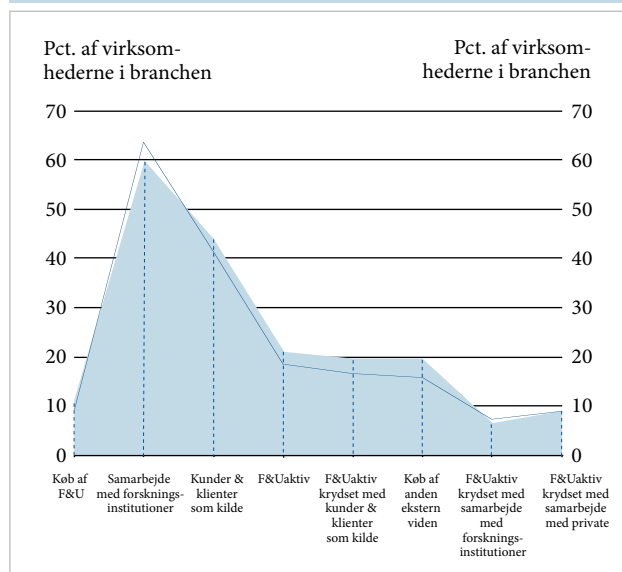
Label	1. Værditilvækst		2. Vækst i TFP mellem 2003 og 2004		3. Værditilvækst pr. antal ansatte	
	F&U intensitet (N = 702)	F&U i 1000 kr. (N = 702)	F&U intensitet (N = 699)	F&U i 1000 kr. (N = 699)	F&U intensitet (N = 702)	F&U i 1000 kr. (N = 702)
(log)Kapitalapparat	0,115 (0,011)	0,113 (0,011)	0,057 (0,017)	0,057 (0,017)	0,121 (0,011)	0,117 (0,011)
Uddannelse af ansatte	0,027 (0,005)	0,022 (0,005)	-0,052 (0,014)	-0,052 (0,014)	1,630 (0,274)	1,192 (0,256)
(log)Antal ansatte	0,880 (0,017)	0,882 (0,017)	0,259 (0,038)	0,259 (0,038)	Indgår ikke i modellen	Indgår ikke i modellen
Koncentration af konkurrence*	0,051 (0,011)	0,052 (0,012)	Insignifikant	Insignifikant	0,031 (0,009)	0,034 (0,009)
F&U intensitet	-5,144 (0,871)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	-4,597 (0,863)	Indgår ikke i modellen
F&U i kr.	Indgår ikke i modellen	-0,007 (0,002)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	-0,0048 (0,002)
Køb af F&U	0,098 (0,036)	0,118 (0,034)	(-0,039) (0,023)	(-0,039) (0,023)	0,128 (0,128)	0,124 (0,035)
Samarbejde med forskningsinstitutioner	(0,070) (0,037)	0,007 (0,002)	Insignifikant	Insignifikant	0,084 (0,037)	(0,070) (0,037)
Kunder & klienter som kilde til innovation	-0,066 (0,031)	Insignifikant	Insignifikant	Insignifikant	-0,061 (0,031)	Insignifikant
F&U intensitet & kunder som kilde til innovation	4,781 (0,871)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	4,102 (0,861)	Indgår ikke i modellen
F&U i kr. & samarbejde private virksomheder	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,0052 (0,002)
Køb af anden ekstern viden	Insignifikant	Insignifikant	0,049 (0,024)	0,049 (0,024)	Insignifikant	Insignifikant
F&U intensitet & samarbejde med forskningsinstitutioner	(0,671) (0,373)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,847 (0,370)	Indgår ikke i modellen
Samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Samarbejde med andre virksomheder & organisatoriske innovationer	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
F&U i kr. & kunder som kilde til innovation	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
F&U intensitet & samarbejde med andre virksomheder	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen

Label	1. Værditilvækst		2. Vækst i TFP mellem 2003 og 2004		3. Værditilvækst pr. antal ansatte	
	F&U intensitet (N = 702)	F&U i 1000 kr. (N = 702)	F&U intensitet (N = 699)	F&U i 1000 kr. (N = 699)	F&U intensitet (N = 702)	F&U i 1000 kr. (N = 702)
F&U i kr. & samarbejde med forskningsinstitutioner	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Samarbejde indenfor koncernen	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant

Anm: Estimater angivet i parentes er insignifikante på et 5 pct.-niveau, men signifikante på et 10 pct.-niveau.
Tallene skrevet med småt under parameterestimaterne er de tilhørende standardfejl.
Kilde: CIS4 samt egne kørsler på Virksomhedsdatabasen.

CIS4 skema: Industri – innovationslandskab baseret på beskrivende statistik (n = 733)

Figuren viser, hvor mange virksomheder der har svaret ja til de variable, der er signifikante i modellen.



Anm: 2002-2004.

Kilde: CIS4 samt egne kørsler på Virksomhedsdatabasen.

Erhvervslivets innovation og vækstbetingelser 2005: Kørsel for industri³⁷

Label	1. Værditilvækst		2. Vækst i TFP mellem 2004 og 2005		3. Værditilvækst pr. antal ansatte	
	Kørsel 1 (N = 349)	Kørsel 2 (N = 349)	Kørsel 1 (N = 348)	Kørsel 2 (N = 348)	Kørsel 1 (N = 349)	Kørsel 2 (N = 349)
Kapitalapparat	0,105 (0,017)	0,106 (0,017)	0,068 (0,022)	0,069 (0,021)	0,124 (0,018)	0,127 (0,017)
Antal ansatte	0,953 (0,032)	0,943 (0,032)	0,668 (0,071)	0,666 (0,071)	Indgår ikke i modellen	Indgår ikke i modellen
Uddannelse af ansatte	0,024 (0,009)	0,019 (0,009)	Insignifikant	Insignifikant	1,713 (0,403)	1,381 (0,426)
Koncentration af konkurrence*	0,080 (0,015)	0,077 (0,015)	Insignifikant	Insignifikant	0,043 (0,014)	0,044 (0,014)
Intern innovationskapacitet	Insignifikant	Indgår ikke i modellen	(0,039) (0,021)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
Innovationskapacitet – innovativ kultur	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	(-0,049) (0,028)
Innovationskapacitet – Opsamling af nye idéer	Indgår ikke i modellen	(0,041) (0,022)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,095 (0,028)
Innovationskapacitet – Trinvis metode	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,034 (0,016)	Indgår ikke i modellen	Insignifikant
Ikke-erkendte behov	Insignifikant	Insignifikant	(-0,031) (0,017)	(-0,033) (0,017)	Insignifikant	Insignifikant
Forskning udviklet i virksomhedens rolle for virksomhedens innovation	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Forskning fra forskningsinstitutioners rolle for virksomhedens innovation	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Erkendte behov	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Erkendte behov krydset med ikke-erkendte behov	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Ikke-erkendte behov krydset med samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Erkendte behov krydset med intern innovationskapacitet	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
Ikke-erkendte behov krydset med intern innovationskapacitet	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant

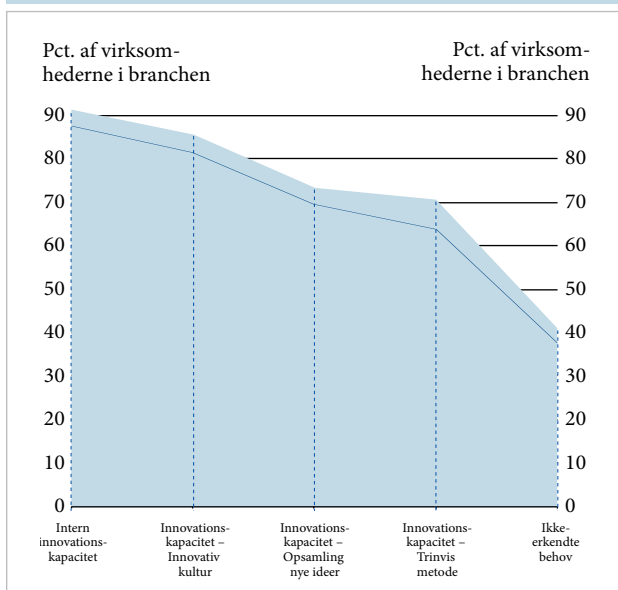
37 I kørsel 1 indgår skalavariablen intern innovationskapacitet, mens der i kørsel 2 indgår de enkelte variable, som intern innovationskapacitet er baseret på.

Label	1. Værditilvækst		2. Vækst i TFP mellem 2004 og 2005		3. Værditilvækst pr. antal ansatte	
	Kørsel 1 (N = 349)	Kørsel 2 (N = 349)	Kørsel 1 (N = 348)	Kørsel 2 (N = 348)	Kørsel 1 (N = 349)	Kørsel 2 (N = 349)
Erkendte behov krydset med samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Innovationskapacitet – Lærer af fejl	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Innovationskapacitet – Lønsystemer	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant

Anm: 2003-2005. Estimer angivet i parentes er insignifikante på et 5 pct.-niveau, men signifikante på et 10 pct.-niveau.
Tallene skrevet med småt under parameterestimerne er de tilhørende standardfejl.
Kilde: Erhvervslivets innovation og vækstbetingelser 2005 samt egne kørsler på Virksomhedsdatabasen.

Erhvervslivets innovation og vækstbetingelser 2005: Kørsel for industri – innovationslandskab baseret på beskrivende statistik (n = 353)

Figuren viser, hvor mange virksomheder der har svaret ja til de variable, der er signifikante i modellen.



Anm: 2003-2005.

Kilde: Erhvervslivets innovation og vækstbetingelser 2005 samt egne kørsler på Virksomhedsdatabasen.

CIS4: Handel, hotel & restauration

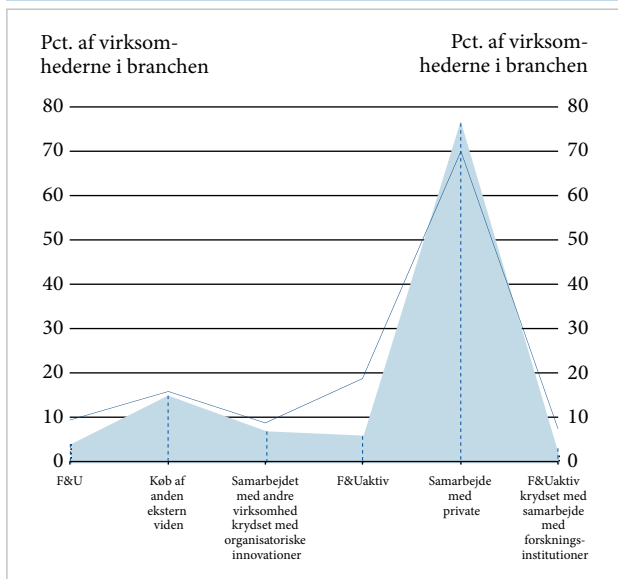
Label	1. Værditilvækst		2. Vækst i TFP mellem 2003 og 2004		3. Værditilvækst pr. antal ansatte	
	F&U intensitet (N = 438)	F&U i 1000 kr. (N = 438)	F&U intensitet (N = 432)	F&U i 1000 kr. (N = 432)	F&U intensitet vN = 438)	F&U i 1000 kr. (N = 438)
Uddannelse af ansatte	0,058 (0,007)	0,056 (0,007)	-0,067 (0,024)	-0,067 (0,024)	3,177 (0,377)	3,177 (0,377)
(log)Kapitalapparat	0,113 (0,020)	0,115 (0,020)	Insignifikant	Insignifikant	0,112 (0,020)	0,112 (0,020)
(log)Antal ansatte	0,832 (0,027)	0,834 (0,027)	0,567 (0,078)	0,567 (0,078)	Indgår ikke i modellen	Indgår ikke i modellen
Koncentration af konkurrence*	Insignifikant	Insignifikant	Insignifikant	Insignifikant	0,051 (0,016)	0,051 (0,016)
F&U intensitet	-8,085 (3,944)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
F&U i kr.	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Køb af F&U	0,213 (0,098)	Insignifikant	0,223 (0,075)	0,223 (0,075)	Insignifikant	Insignifikant
Køb af anden ekstern viden	(0,115) (0,069)	(0,133) (0,068)	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Samarbejde med andre virksomheder	Insignifikant	Insignifikant	0,157 (0,070)	0,157 (0,070)	Insignifikant	Insignifikant
Samarbejde med andre virksomheder & organisatoriske innovationer	Insignifikant	Insignifikant	-0,242 (0,102)	-0,242 (0,102)	Insignifikant	Insignifikant
F&U intensitet & samarbejde med forskningsinstitutioner	(6,603) (3,942)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
Kunder & klienter som kilde til innovation	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
F&U intensitet & kunder som kilde til innovation	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
Samarbejde med forskningsinstitutioner	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Samarbejde inden for koncernen	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
F&U intensitet & samarbejde med andre virksomheder	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
F&U i kr. & kunder som kilde til innovation	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant

Label	1. Værditilvækst		2. Vækst i TFP mellem 2003 og 2004		3. Værditilvækst pr. antal ansatte	
	F&U intensitet (N = 438)	F&U i 1000 kr. (N = 438)	F&U intensitet (N = 432)	F&U i 1000 kr. (N = 432)	F&U intensitet (N = 438)	F&U i 1000 kr. (N = 438)
F&U i kr. & samarbejde med andre virksomheder	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
F&U i kr. & samarbejde med forskningsinstitutioner	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant

Anm: Estimer angivet i parentes er insignifikante på et 5 pct.-niveau, men signifikante på et 10 pct.-niveau.
Tallene skrevet med småt under parameterestimerne er de tilhørende standardfejl.
Kilde: CIS4 samt egne kørsler på Virksomhedsdatabasen.

CIS4: Handel, hotel & restauration – innovationslandskab baseret på beskrivende statistik (n = 460)

Figuren viser, hvor mange virksomheder der har svaret ja til de variable, der er signifikante i modellen.



Anm: 2002-2004.

Kilde: CIS4 samt egne kørsler på Virksomhedsdatabasen.

Erhvervslivets innovation og vækstbetingelser 2005: Handel, hotel & restauration³⁸

Label	1. Værditilvækst		2. Vækst i TFP mellem 2004 og 2005		3. Værditilvækst pr. antal ansatte	
	Kørsel 1 (N = 327)	Kørsel 2 (N = 327)	Kørsel 1 (N = 323)	Kørsel 2 (N = 323)	Kørsel 1 (N = 327)	Kørsel 2 (N = 327)
Kapitalapparat	0,135 (0,023)	0,129 (0,023)	0,042 (0,021)	0,043 (0,021)	0,135 (0,023)	0,132 (0,023)
Antal ansatte	0,791 (0,039)	0,792 (0,039)	0,367 (0,081)	0,384 (0,081)	Indgår ikke i modellen	Indgår ikke i modellen
Uddannelse af ansatte	0,055 (0,011)	0,057 (0,011)	Insignifikant	Insignifikant	2,358 (0,486)	2,334 (0,483)
Koncentration af konkurrence*	0,120 (0,024)	0,118 (0,024)	Insignifikant	Insignifikant	0,108 (0,020)	0,112 (0,021)
Samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	(0,154) (0,086)
Forskning udviklet i virksomhedens rolle for virksomhedens innovation	(0,050) (0,030)	Insignifikant	Insignifikant	Insignifikant	(0,053) (0,030)	Insignifikant
Erkendte behov	0,160 (0,054)	Insignifikant	0,033 (0,015)	Insignifikant	0,153 (0,055)	Insignifikant
Intern innovationskapacitet ³⁹	0,169 (0,055)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,167 (0,056)	Indgår ikke i modellen
Erkendte behov krydset med intern innovationskapacitet	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	-0,091 (0,029)	Indgår ikke i modellen
Ikke-erkendte behov krydset med intern innovationskapacitet	-0,096 (0,029)	-0,086 (0,032)	Insignifikant	Insignifikant	Insignifikant	-0,084 (0,032)
Ikke-erkendte behov	Insignifikant	0,164 (0,066)	Insignifikant	Insignifikant	Insignifikant	0,155 (0,066)
Innovationskapacitet – innovativ kultur	Indgår ikke i modellen	(0,066) (0,037)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	(0,65) (0,037)
Innovationskapacitet – Opsamling af nye idéer	Indgår ikke i modellen	(0,075) (0,040)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	(0,070) (0,040)
Innovationskapacitet – Trinvis metode	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	(-0,033) (0,019)	Indgår ikke i modellen	Insignifikant
Erkendte behov krydset med ikke-erkendte behov	Insignifikant	Insignifikant	Insignifikant	0,015 (0,006)	Insignifikant	Insignifikant
Forskning fra forskningsinstitutioners rolle for virksomhedens innovation	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Erkendte behov krydset med samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant

38 I kørsel 1 indgår skalavariablen intern innovationskapacitet, mens der i kørsel 2 indgår de enkelte variable, som intern innovationskapacitet er baseret på.

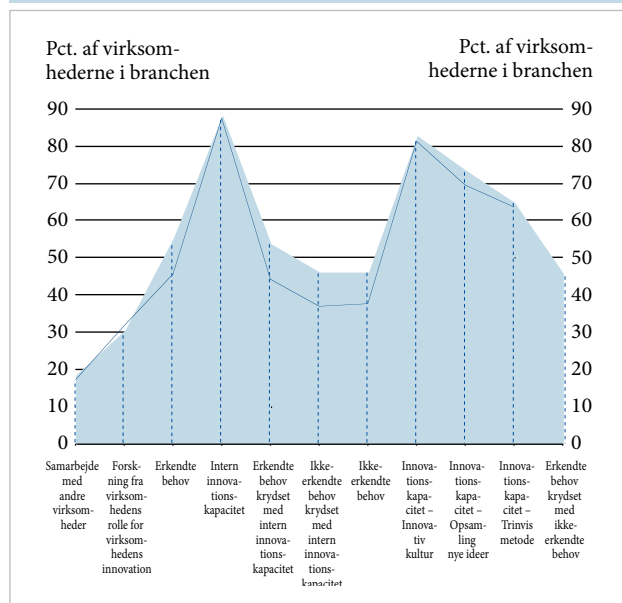
39 Skalavariabel over spørgsmål i det regionale spørgeskema om innovationsledelse: Udvikling af en innovationskultur, systematisk opsamling og vurdering af idéer, trinvis innovationsmetode, udviklingen af en kultur, hvor det er i orden at fejle, udvikling af lønsystemer.

Label	1. Værditilvækst		2. Vækst i TFP mellem 2004 og 2005		3. Værditilvækst pr. antal ansatte	
	Kørsel 1 (N = 327)	Kørsel 2 (N = 327)	Kørsel 1 (N = 323)	Kørsel 2 (N = 323)	Kørsel 1 (N = 327)	Kørsel 2 (N = 327)
Ikke-erkendte behov krydset med samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Innovationskapacitet – Lærer af fejl	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Innovationskapacitet – lønsystemer	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant

*Anm: 2003-2005 Estimer angivet i parentes er insignifikante på et 5 pct.-niveau, men signifikante på et 10 pct.-niveau.
Tallene skrevet med småt under parameterestimerne er de tilhørende standardfejl.
Kilde: Erhvervslivets innovation og vækstbetingelser 2005 samt egne kørsler på Virksomhedsdatabasen.*

Erhvervslivets innovation og vækstbetingelser 2005: Handel, hotel & restauration – innovationslandskab baseret på beskrivende statistik (n = 333)

Figuren viser, hvor mange virksomheder der har svaret ja til de variable, der er signifikante i modellen.



Anm: 2003-2005.

Kilde: Erhvervslivets innovation og vækstbetingelser 2005 samt egne kørsler på Virksomhedsdatabasen.

Erhvervslivets innovation og vækstbetingelser 2005: Transport, post & telekommunikation⁴⁰

Label	1. Værditilvækst		2. Vækst i TFP mellem 2004 og 2005		3. Værditilvækst pr. antal ansatte	
	Kørsel 1 (N = 136)	Kørsel 2 (N = 136)	Kørsel 1 (N = 135)	Kørsel 2 (N = 135)	Kørsel 1 (N = 136)	Kørsel 2 (N = 136)
Kapitalapparat	0,183 (0,027)	0,183 (0,027)	0,194 (0,042)	0,195 (0,041)	0,183 (0,027)	0,183 (0,027)
Antal ansatte	0,845 (0,047)	0,845 (0,047)	0,746 (0,111)	0,741 (0,111)	Indgår ikke i modellen	Indgår ikke i modellen
Uddannelse af ansatte	0,060 (0,020)	0,060 (0,020)	Insignifikant	Insignifikant	3,039 (0,849)	3,039 (0,849)
Koncentration af konkurrence*	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Forskning fra forsknings- institutioners rolle for virksomhedens innovation	Insignifikant	Insignifikant	-0,123 (0,057)	-0,110 (0,054)	Insignifikant	Insignifikant
Erkendte behov krydset med samarbejde med andre virksomheder	Insignifikant	Insignifikant	(0,083) (0,044)	Insignifikant	Insignifikant	Insignifikant
Samarbejde med andre virksomheder	0,334 (0,128)	0,334 (0,128)	Insignifikant	Insignifikant	0,303 (0,1259)	0,303 (0,125)
Innovationskapacitet – lønsystemer	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,078 (0,036)	Indgår ikke i modellen	Insignifikant
Forskning udviklet i virksomhedens rolle for virksomhedens innovation	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Erkendte behov	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Ikke-erkendte behov	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Erkendte behov krydset med ikke-erkendte behov	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Erkendte behov krydset med intern innovationskapacitet	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
Ikke-erkendte behov krydset med samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Ikke-erkendte behov krydset med intern innovationskapacitet	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Intern innovationskapacitet	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
Innovationskapacitet – innovativ kultur	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Innovationskapacitet – Lærer af fejl	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant

40 I kørsel 1 indgår skalavariablen intern innovationskapacitet, mens der i kørsel 2 indgår de enkelte variable, som intern innovationskapacitet er baseret på.

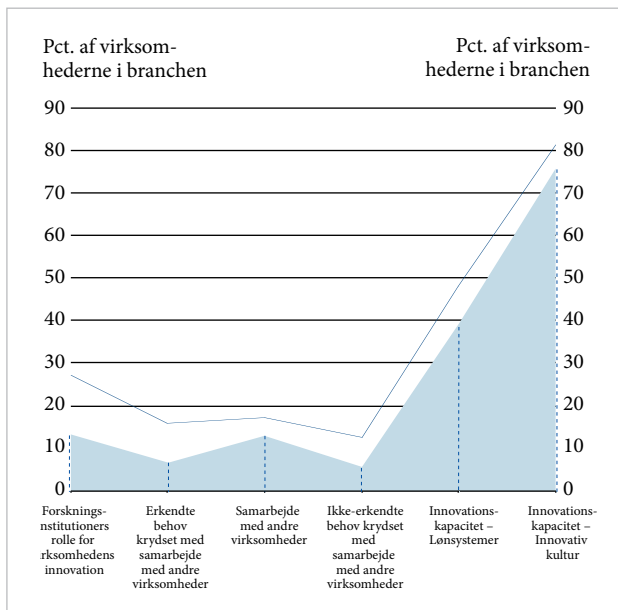
Label	1. Værditilvækst		2. Vækst i TFP mellem 2004 og 2005		3. Værditilvækst pr. antal ansatte	
	Kørsel 1 (N = 136)	Kørsel 2 (N = 136)	Kørsel 1 (N = 135)	Kørsel 2 (N = 135)	Kørsel 1 (N = 136)	Kørsel 2 (N = 136)
Innovationskapacitet – Opsamling af nye idéer	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Innovationskapacitet – Trinvis metode	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant

Anm: 2003-2005. Estimer angivet i parentes er insignifikante på et 5 pct.-niveau, men signifikante på et 10 pct.-niveau. Tallene skrevet med småt under parameterestimerne er de tilhørende standardfejl.

Kilde: Erhvervslivets innovation og vækstbetingelser 2005 samt egne kørsler på Virksomhedsdatabasen.

Erhvervslivets innovation og vækstbetingelser 2005: Transport, post & telekommunikation – innovationslandskab baseret på beskrivende statistik (n = 155)

Figuren viser, hvor mange virksomheder der har svaret ja til de variable, der er signifikante i modellen.



Anm: 2003-2005.

Kilde: Erhvervslivets innovation og vækstbetingelser 2005 samt egne kørsler på Virksomhedsdatabasen.

CIS4: Finansierings- & forretningsservice

Label	1. Værditilvækst		2. Vækst i TFP mellem 2003 og 2004		3. Værditilvækst pr. antal ansatte	
	F&U intensitet (N = 472)	F&U i 1000 kr. (N = 472)	F&U intensitet (N = 457)	F&U i 1000 kr. (N = 457)	F&U intensitet (N = 472)	F&U i 1000 kr. (N = 472)
(log) Kapitalapparat	0,129 (0,015)	0,113 (0,016)	Insignifikant	Insignifikant	0,132 (0,016)	0,119 (0,016)
(log) Antal ansatte	0,779 (0,019)	0,797 (0,019)	0,570 (0,051)	0,569 (0,051)	Indgår ikke i modellen	Indgår ikke i modellen
Uddannelse af ansatte	0,032 (0,004)	0,027 (0,004)	Insignifikant	Insignifikant	1,356 (0,254)	1,080 (0,251)
Koncentration af konkurrence*	Insignifikant	Insignifikant	Insignifikant	Insignifikant	0,042 (0,014)	0,034 (0,014)
F&U intensitet	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
F&U i kr.	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Samarbejde med andre virksomheder	(0,099) (0,060)	(0,131) (0,068)	Insignifikant	Insignifikant	(0,109) (0,062)	0,168 (0,068)
Samarbejde indenfor koncernen	0,168 (0,075)	(0,130) (0,076)	Insignifikant	Insignifikant	0,159 (0,077)	Insignifikant
F&U i kr. & kunder som kilde til innovation	Indgår ikke i modellen	(6,56E-4) (3,90E-4)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	(6,67E-4) (4,01E-4)
Samarbejde med forskningsinstitutioner	Insignifikant	-0,262 (0,071)	Insignifikant	Insignifikant	Insignifikant	-0,251 (0,073)
F&U intensitet & samarbejde med forskningsinstitutioner	-0,689 (0,115)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	-0,705 (0,124)	Indgår ikke i modellen
F&U i kr. & samarbejde med forskningsinstitutioner	Indgår ikke i modellen	0,002 (6,23E-4)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,0022 (6,38E-4)
Køb af F&U	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
F&U i kr. & samarbejde med andre virksomheder	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	-8,21E-4 (3,70E-4)	Indgår ikke i modellen	Insignifikant
Kunder & klienter som kilde til innovation	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
F&U intensitet & kunder som kilde til innovation	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
Køb af anden ekstern viden	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant

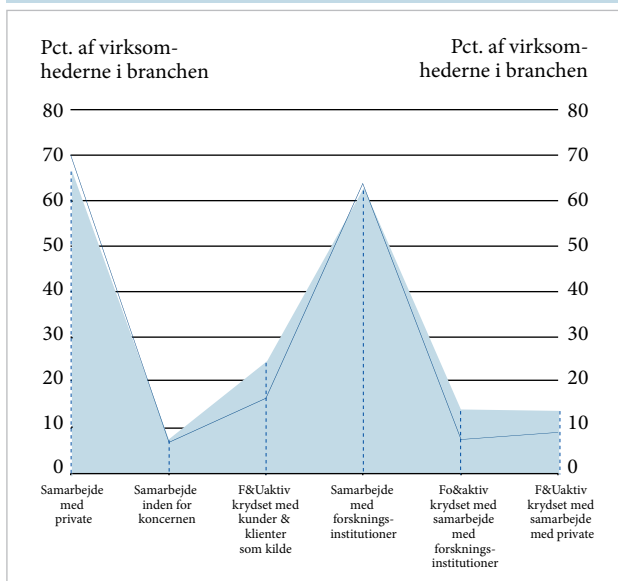
Label	1. Værditilvækst		2. Vækst i TFP mellem 2003 og 2004		3. Værditilvækst pr. antal ansatte	
	F&U intensitet (N = 472)	F&U i 1000 kr. (N = 472)	F&U intensitet (N = 457)	F&U i 1000 kr. (N = 457)	F&U intensitet (N = 472)	F&U i 1000 kr. (N = 472)
Samarbejde med andre virksomheder & organisatoriske innovationer	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
F&U intensitet & samarbejde med andre virksomheder	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen

Anm: 2002-2004. Estimater angivet i parentes er insignifikante på et 5 pct.-niveau, men signifikante på et 10 pct.-niveau. Tallene skrevet med småt under parameterestimaterne er de tilhørende standardfejl.

Kilde: CIS4 samt egne kørsler på Virksomhedsdatabasen.

CIS4: Finansiering og forretningsservice – innovatjonslandskab baseret på beskrivende statistik (n =)

Figuren viser, hvor mange virksomheder der har svaret ja til de variable, der er signifikante i modellen.



Anm: 2002-2004.

Kilde: CIS4 samt egne kørsler på Virksomhedsdatabasen.

Erhvervslivets innovation og vækstbetingelser 2005: Finansiering og forretningsservice⁴¹

Label	1. Værditilvækst		2. Vækst i TFP mellem 2004 og 2005		3. Værditilvækst pr. antal ansatte	
	Kørsel 1 (N = 222)	Kørsel 2 (N = 222)	Kørsel 1 (N = 221)	Kørsel 2 (N = 221)	Kørsel 1 (N = 222)	Kørsel 2 (N = 222)
Kapitalapparat	0,145 (0,023)	0,145 (0,023)	Insignifikant	(0,037) (0,021)	0,174 (0,022)	0,167 (0,022)
Antal ansatte	0,712 (0,035)	0,712 (0,035)	0,344 (0,057)	0,341 (0,057)	Indgår ikke i modellen	Indgår ikke i modellen
Koncentration af konkurrence*	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Uddannelse af ansatte	0,069 (0,008)	0,069 (0,008)	Insignifikant	Insignifikant	3,390 (0,409)	3,437 (0,410)
Forskning fra forskningsinstitutioners rolle for virksomhedens innovation	(-0,080) (0,047)	(-0,080) (0,047)	(-0,054) (0,033)	(-0,058) (0,033)	-0,114 (0,049)	-0,097 (0,048)
Forskning udviklet i virksomhedens rolle for virksomhedens innovation	Insignifikant	Insignifikant	0,053 (0,026)	(0,049) (0,026)	Insignifikant	Insignifikant
Erkendte behov	Insignifikant	Insignifikant	Insignifikant	0,071	0,111 (0,054)	Insignifikant
Erkendte behov krydset med intern innovationskapacitet	Insignifikant	Indgår ikke i modellen	0,041 (0,013)	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
Erkendte behov krydset med samarbejde med andre virksomheder	0,262 (0,075)	0,26 (0,075)	Insignifikant	Insignifikant	0,198 (0,087)	0,284 (0,076)
Ikke-erkendte behov krydset med samarbejde med andre virksomheder	-0,309 (0,095)	-0,308 (0,095)	Insignifikant	Insignifikant	(-0,227) (0,117)	-0,334 (0,097)
Erkendte behov krydset med ikke-erkendte behov	Insignifikant	Insignifikant	-0,045 (0,011)	-0,042 (0,010)	(-0,034) (0,020)	Insignifikant
Innovationskapacitet – Trinvis metode	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	0,052 (0,024)	Indgår ikke i modellen	Insignifikant
Ikke-erkendte behov	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Samarbejde med andre virksomheder	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Intern innovationskapacitet	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen
Ikke-erkendte behov krydset med intern innovationskapacitet	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant	Insignifikant
Innovationskapacitet – innovativ kultur	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Innovationskapacitet – Opsamling af nye idéer	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant

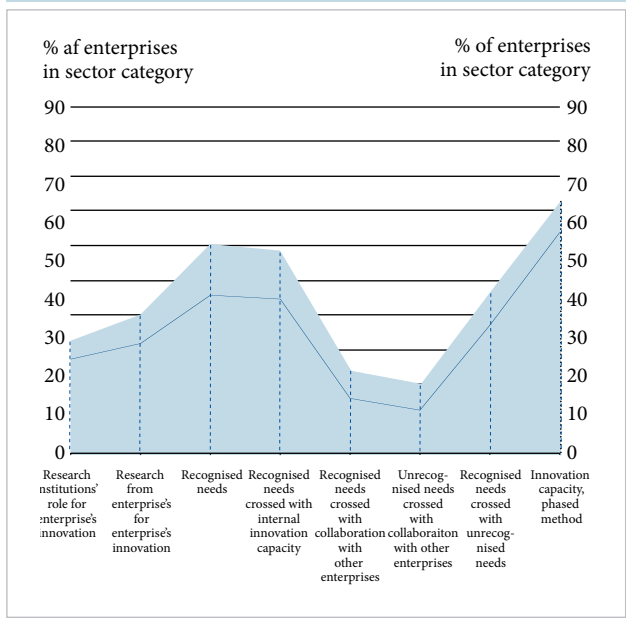
41 I kørsel 1 indgår skalavariablen intern innovationskapacitet, mens der i kørsel 2 indgår de enkelte variable, som intern innovationskapacitet er baseret på.

Label	1. Værditilvækst		2. Vækst i TFP mellem 2004 og 2005		3. Værditilvækst pr. antal ansatte	
	Kørsel 1 (N = 222)	Kørsel 2 (N = 222)	Kørsel 1 (N = 221)	Kørsel 2 (N = 221)	Kørsel 1 (N = 222)	Kørsel 2 (N = 222)
Innovationskapacitet – Lærer af fejl	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant
Innovationskapacitet – lønsystemer	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant	Indgår ikke i modellen	Insignifikant

*Anm.: 2003-2005. Estimer angivet i parentes er insignifikante på et 5pct.-niveau, men signifikante på et 10pct.-niveau. Tallene skrevet med småt under parameterestimerne er de tilhørende standardfejl.
Kilde: Erhvervslivets innovation og vækstbetingelser 2005 samt egne kørsler på Virksomhedsdatabasen.*

Den regional konkurrenceevnemodel: Finansiering og forretningsservice – innovationslandskab baseret på beskrivende statistik (n = 278)

Figuren viser, hvor mange virksomheder der har svaret ja til de variable, der er signifikante i modellen.



Anm: 2003-2005.

Kilde: Erhvervslivets innovation og vækstbetingelser 2005 samt egne kørsler på Virksomhedsdatabasen.

The Danish Ministry of Economic and Business Affairs

Slotsholmsgade 10-12

DK-1216 Copenhagen K

Tel.: +45 3392 3350

Fax: +45 3312 3778

www.oem.dk