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IT Maturity of Firms and Economic Crisis

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Use of ICT in Swedish Enterprises 2010

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Statistics Sweden
2011

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Contents

| | |
|--|-----------|
| Introduction | 5 |
| Indicators of IT maturity | 7 |
| Employees | 7 |
| Administrative routines | 7 |
| Marketing | 8 |
| Cutting edge IT infrastructure and competence | 8 |
| IT maturity in economic crisis..... | 9 |
| Growth and IT maturity in economic crisis | 14 |
| Concluding remarks | 17 |
| References..... | 18 |
| Appendix 1..... | 19 |
| The ICT-sector | 19 |

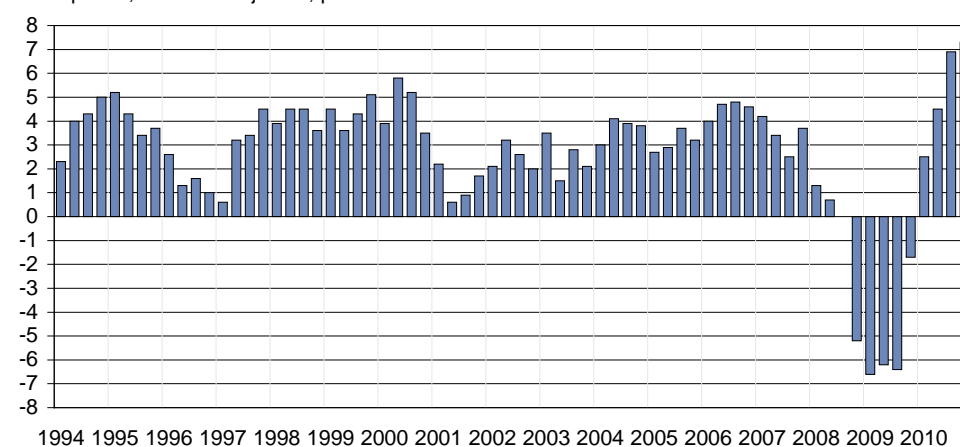
Introduction

A small open economy, like Sweden, is sensitive to changes in international demand. Once again this became apparent during the strong downturn in economic activity following the global financial crunch a few years back. In addition to the fact that industries producing durables are at higher risk than others in times of economic downturn, there are also firms that are hardly touched at all. In this paper, the effect on the information technology (IT) maturity during economic crisis is studied together with its presumptive connection to the firm stamina. The results indicate that the IT maturity is indeed affected to a certain extent, also among those firms that came through the crisis reinforced.

After the 2009 downturn the Swedish economy grows strongly once again. The recession did not only originate domestically, but was intensified by the instability following an overvalued housing market in the United States. This imbalance was spread with high speed all over the world, initially to the financial markets but later also to the real economies. In a small open economy like Sweden that is dependent on international trade, a severely held back international demand will not pass by unobserved. During the year mostly affected, Gross Domestic Product (GDP) decreased by almost 6 per cent on average. A downturn of similar magnitude has not been registered since the interwar period.

Diagram 1. GDP Development

Fixed prices, calendar adjusted, per cent



Note: The diagram reflects the quarterly change over time. Since the dates for some public holidays (for instance Easter) varies among the years, the development needs to be calendar adjusted. This means that the number of possible working days is modified to allow comparisons over time.

Source: Statistics Sweden

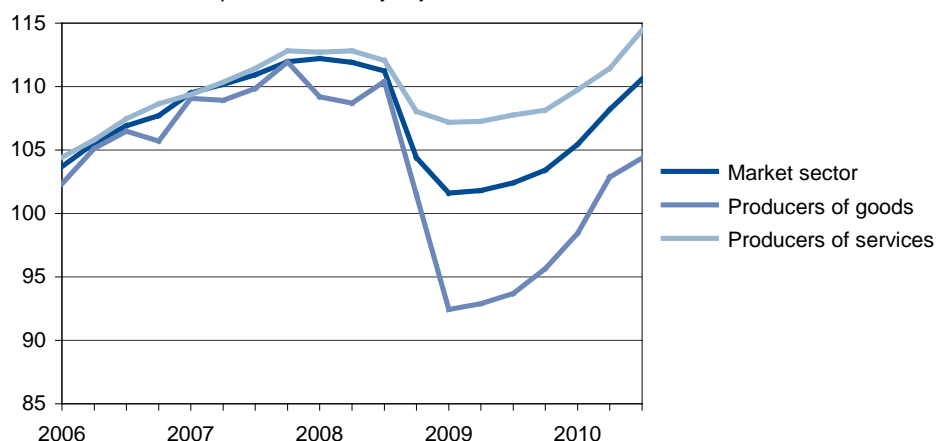
The first sign of an imminent crisis is a drop in confidence on the market, visible during autumn 2007 (higher interest rates among banks and financial institutes, see for instance Sveriges riksbank 2009) when the Swedish economy had grown considerably over several consecutive years and the capacity utilisation was high. In that phase, the ability to allocate the resources optimally often diminishes, which in turn may lead to an increased exposure and higher costs. Thus, indications of a *normal* slowdown in the economy were in place already before the international development took off. The foreseen cooling down was then reinforced by the global downturn.

Unfortunately, average information on the economic situation will not reveal much about how the crisis strikes. Therefore, GDP calculated from the production side, or the value added (total production minus intermediate goods and services) could be studied. From this it becomes clear that the producers of goods were the ones most affected by the crisis. This seems logical since the Swedish export industry gravitates towards durable goods like cars and lorries.

At a closer glance, transportation as well as the steel and metal industries were among those severely hit with production reductions corresponding to one third during 2009. However, most firms managed to increase their production volumes again by the first quarter of 2010. On the other hand, services production, never decreased during this period of time but suffered only a slow down (thus the pick-up is not as strong as in manufacturing). Nevertheless, sales of cars are one of the exceptions to this. Recent tax reforms allowing deductions on home renovations (ROT) and household services (RUT) may have held the downturn back by stimulating the domestic demand.

Diagram 2. Development of production

Index 2005=100, fixed prices, seasonally adjusted



Note: Refers to value added.

Source: Statistics Sweden (2010).

In addition to such obvious factors as strong international dependency within certain industries, the question arises whether firm organisation or aptitude to use modern technology, for instance information technology, plays a role in the ability to survive a crisis.

Literature reveals that information technology is of importance for growth. Both Draca et al (2006) and Bartel et al (2007) show that information technology impacts productivity. Similar results are presented by Eurostat (2008), where different aspects of the technology have been investigated in relation to firm productivity.

In this study, the IT maturity of firms will be investigated over time, with the additional purpose of looking for possible indications of links to the economic activity. IT maturity is defined as the firm capacity of using different digital services and means. The number of employees is used to describe the progress over time. The study starts with the year 2006, a year with growth rates among the highest of the decennium and ends with 2010.

Indicators of IT maturity

There are many variables that could illustrate the firm IT maturity. However, the discussion here is mainly focused on those that could be considered to impact firm growth. The proportion of employees with Internet access, website, fixed high speed connections, electronic management of inventory levels, electronic invoices, in-house development of software, electronic sales and mobile connections are considered to belong to this category. All these variables will be found in the survey on the firm use of ICT.¹ The employee Internet access via broadband, based on two independent variables, could also be added to this. This means that two of the variables indicate proportions at the firm level meanwhile the remaining ones are qualitative and can be used either for grouping of firms or for showing proportions at the industry level. The suggested variables may also be connected to different activities within the firm; employees, administrative routines, marketing and cutting edge IT infrastructure and competence.

Employees

Proportion of employees with access to the Internet

Proportion of employees with broadband Internet access

Some years ago, the proportion of employees with access to the Internet could be considered an indicator of the firm's willingness to be at the frontier of the digital development. Today, however, this goes without saying in many industries.

The proportion of employees with broadband Internet turned out to have a clear link to the firm performance during the early years of the 2000s (Eurostat, 2008). This was particularly noticeable in the Netherlands, the United Kingdom and the Nordic countries, where the use of information technology long since has been on a high level.

Administrative routines

Electronic management of inventory levels

Electronic invoices, automatically processed

Electronic sales

The electronic management of inventory levels, electronic invoices and electronic sales illustrate to what extent the firm has adopted modern technology and thus ought to work as an efficient indicator of IT maturity.

¹ The firm use of ICT is published by Statistics Sweden in the yearly report *Use of ICT in Swedish Enterprises*.

Marketing

Website

A firm can be considered to use a website (home page) either as a complement to or as the only channel for its marketing activities given that this suits the products. Both alternatives would allow increased efficiency. A web page can also be used for certain transactions.

Cutting edge IT infrastructure and competence

Fixed high speed connections

Mobile connections

In-house development of software

The fixed high speed connections, whether the firm engage in development of software or if it has mobile connections are variables that could reveal the ability to use advanced infrastructure and competence. Being at the frontier both in the use and the development of technology could make a difference for the prospect of surviving a crisis.

IT maturity in economic crisis

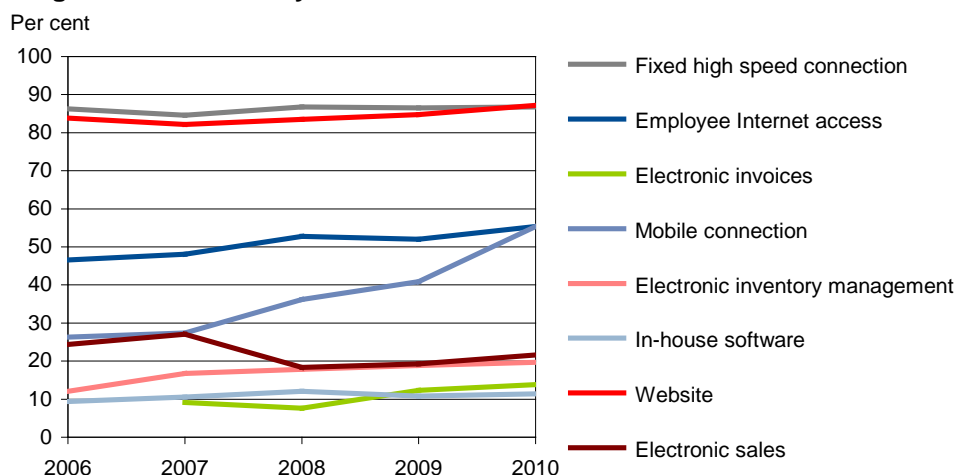
In the following section the development of the IT maturity is reported, starting with the last year of strong economic growth before the heavy downturn and ending with the first year of recovery. Since the use of IT in firms is investigated by a sample survey, the panel studied here has to be kept unbalanced. Otherwise, most observations would be lost because only a smaller amount of firms will appear each year. However, the design of the survey is made to keep the results representative on the aggregated level. To allow comparisons backwards in time, the old industry classification *Standard för svensk näringsgrensindelning 2002* (SNI 2002, NACE revision 1.1) has been used. The new classification in general use is called SNI 2007 (NACE revision 2).

When the firms are sorted by number of employees, it becomes clear that the IT maturity is associated with the firm size. Many firms seem to have reached a level of saturation for fixed high speed connections and websites, despite the fact that the use of this only comes close to 100 per cent for the larger ones.

The IT maturity appears to be most volatile in the medium-sized firms, whereas the larger firms were hardly affected at all. By far the strongest development over time is represented by the mobile connections. In accordance with earlier reasoning, this variable is considered to be of utmost importance and the development shows a strong upward trend even if a slowdown is visible for all groups of firms between the years 2008 and 2009. The electronic sales maturity indicator is most strongly affected and the proportion of firms with such activities declined both among small and medium sized firms. Nonetheless, following a slight change in definitions as from 2008 and onwards the progress over time for this variable needs to be interpreted with care. At the same time as the proportion of employees with access to the Internet decreased temporarily, the medium sized firms also cut down in their use of electronic inventory management.² However, the former came with a certain time lag, which means that other, still unidentified factors may have been in effect as well.

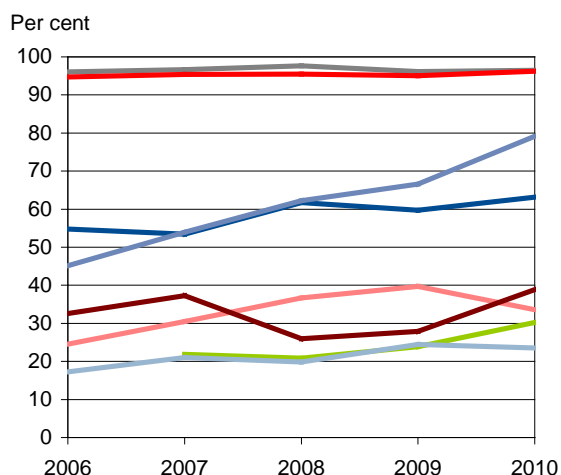
² The proportion of employees with access to the Internet and the proportion of employees with broadband access to the Internet follow the same pattern. Henceforth only the former will be explicitly discussed, although the reasoning could be applied to them both.

Diagram 3A. IT maturity in small firms



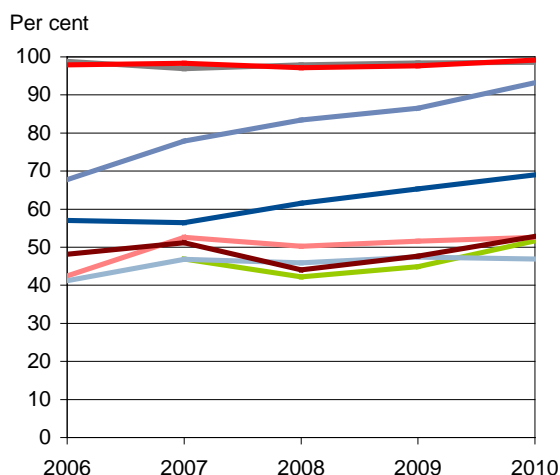
Nota bene: Firms with 10–49 employees.
Source: Statistics Sweden

3B. IT maturity in medium-sized firms



Firms with 50–249 employees.
Source: Statistics Sweden

3C. IT maturity in large firms

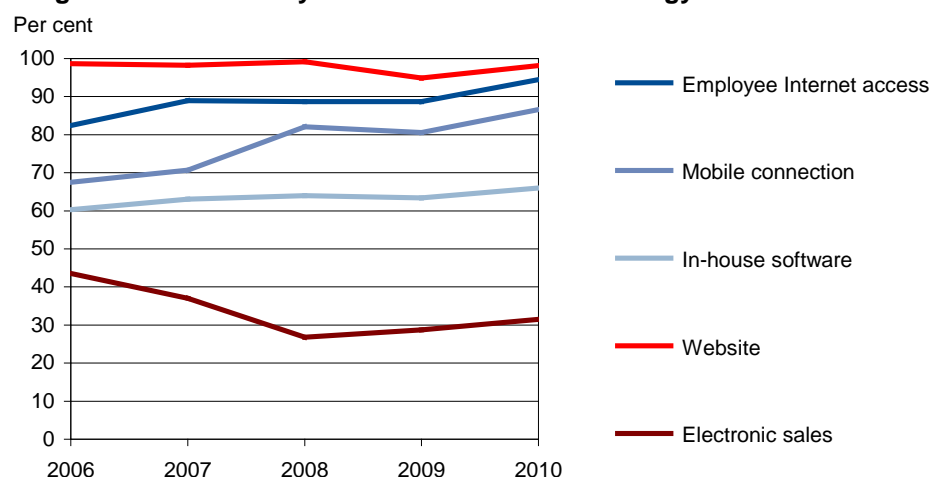


Firms with at least 250 employees.
Source: Statistics Sweden

Earlier, the IT firms were thought to play an important role in the growth of the economy.³ Therefore it might be of interest to present the IT sector separately. Firms that actively work with information and communication processes have been defined as belonging to this sector.⁴

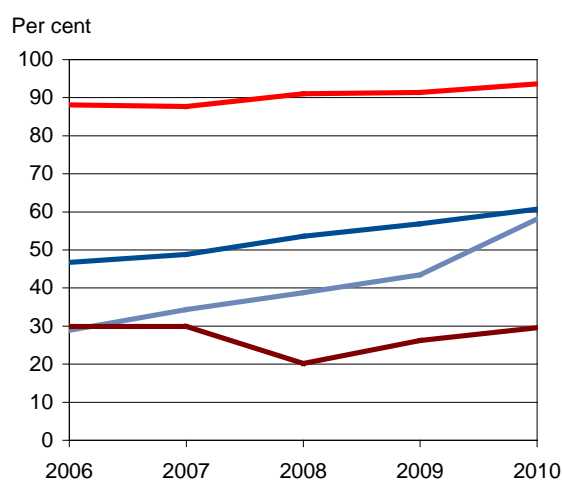
³ See for instance Pilat et al (2002) and Lind (2008).

⁴ The information technology sector is based on a definition by Growth Analysis (2010). This definition in turn, follows what is stipulated by the OECD (2010).

Diagram 4A. IT maturity in the information technology sector

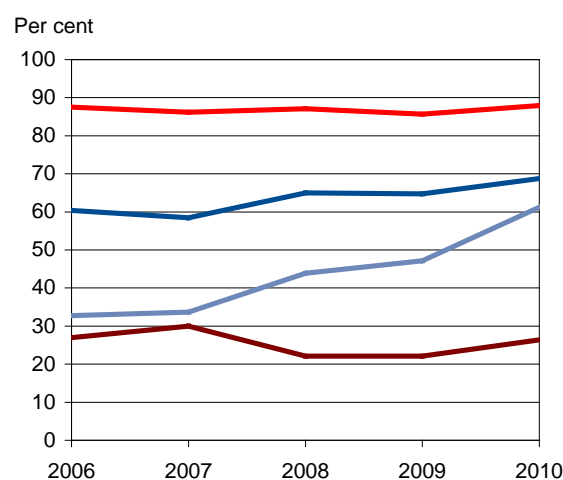
Nota bene: A definition of the IT sector is presented in Appendix 1.

Source: Statistics Sweden

4B. IT maturity in manufacturing firms

Refers to SNI 2002, codes 15–37.

Source: Statistics Sweden

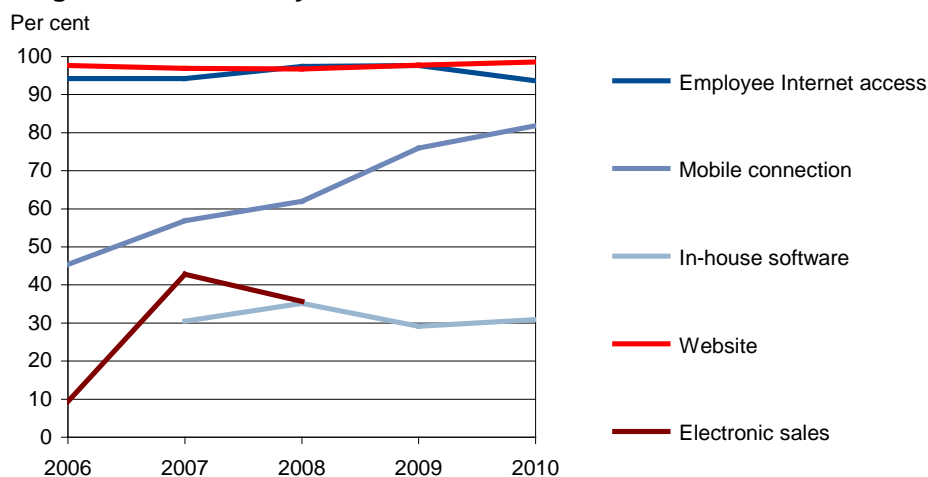
4B. IT maturity in services firms

Refers to SNI 2002, codes 50–93.

Source: Statistics Sweden

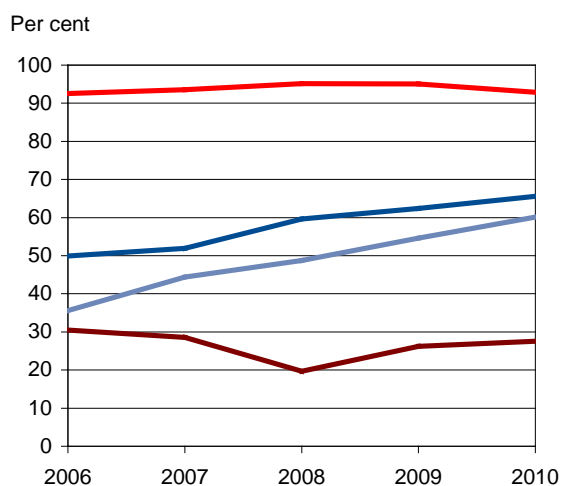
Little surprising, the IT maturity is higher in IT related than in other firms. Despite this, the signs of sensitivity to strong changes in the economic development are clearly visible. The proportion of firms with websites fell temporarily at the same time as the proportion of employees with Internet access came to a standstill. A similar effect could be found for the mobile connections, but from a relatively high level and after the cooling down this development did not again pick up the same speed as before. The electronic sales variable was also affected while the advance of in-house software stayed on a high but very slowly growing level.

If instead the firms are sorted by manufacturers and services, it is quite clear that the IT maturity in the services firms was more strongly affected in the sense that a slowdown or decrease is visible for both the employee access to the Internet and mobile connections as well as for the electronic sales. The recovery after 2009 is also a bit slower than for the manufacturing firms.

Diagram 5A. IT maturity in financial firms

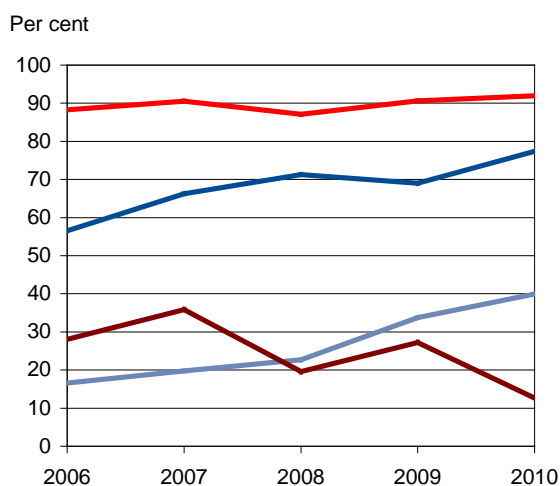
Nota bene: Refers to SNI 2002, codes 65-67. As from 2009 the financial firms are not required to leave information on their electronic sales anymore.

Source: Statistics Sweden

5B. IT maturity in firms producing machinery and vehicles

Refers to SNI 2002, codes 29–37.

Source: Statistic Sweden

5C. IT maturity in firms selling vehicles

Refers to SNI 2002, code 50.

Source: Statistics Sweden

Among the industries most badly hit during the financial crisis were not only the financial firms but also those producing and selling vehicles. The financial firms experienced a slight drop in the proportion of in-house produced software and the proportion of employees with access to the Internet. None of those have yet recovered fully.

Despite the severity of the crisis among the machinery and car producers, the effect on the IT maturity in this industry group has been comparatively small. Nevertheless, the proportion of firms with websites is still high but lower now than before. The rest of the variables have picked up again. Studying the producers of vehicles separately (SNI codes 34-35) it is obvious that the IT maturity of these firms is more affected than the whole industry on average.⁵

⁵ Information about the industry cannot be presented in more detail due to disclosure issues.

This was particularly apparent for the employee access to the Internet, which decreased markedly and for the electronic sales that showed stronger fluctuations. On the other hand, the mobile connections both originated from a higher level and were less affected than on average in the whole industry group.

Car retailers were severely hit by the crisis. The same could be said for some of their IT maturity variables, particularly the electronic sales.

Growth and IT maturity in economic crisis

The course of events presented in the previous section indicates that the IT maturity of firms is sensitive to strong fluctuations in the economy.

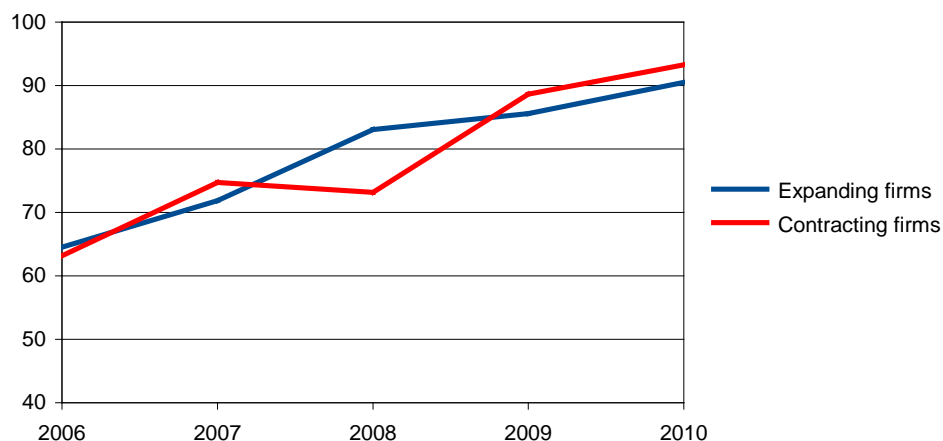
However, the IT maturity gives no clear-cut information about how well the firms in general manage through the bad times. The well-being of firms could be investigated by relating their number of employees or sales before to the situation after the economic downturn. Henceforth the number of employees is used, since this source contains more recent information.

Due to the sample survey design and because of certain exits from the market, only 630 firms from 2006 could be found in the 2010 survey as well. This group mainly consists of large firms and its IT maturity appears to be less sensitive to economic fluctuations. Most likely this group also has other features in common, like the employee level of education and wages.

During the period of time studied, almost every other firm expanded their activities and somewhat more than one out of three reduced their numbers of employees. The majority of the growing firms are found in services. There could also be other explanations to down-sizing than bad times, outsourcing or voluntary downscaling for instance, but information on that cannot be found in the available data sources. However, reasons other than these economic ones are assumed to lie behind only a minority of the cases.

Diagram 6A. Mobile connections and firm progress

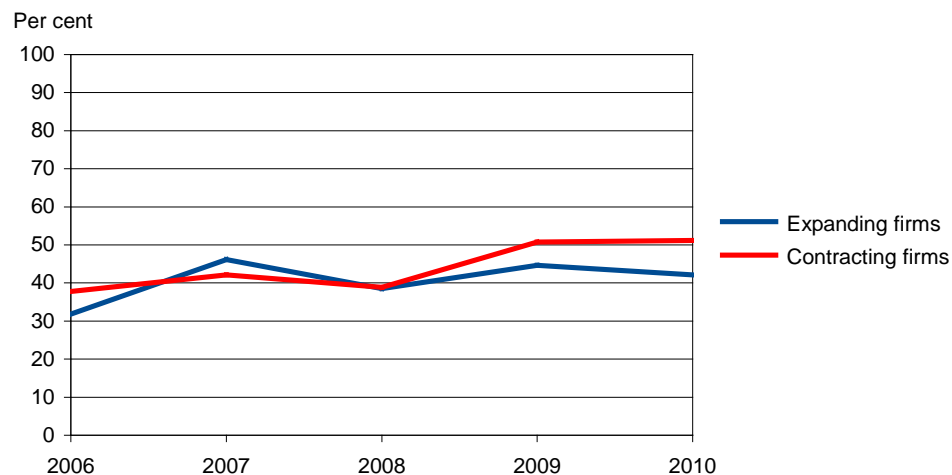
Per cent



Source: Own calculations.

Despite a relatively homogenous group, there are differences between those who came through well and those who did worse during the crisis. Even if an impact can be found for all firms, the traces are more pronounced for contracting firms.

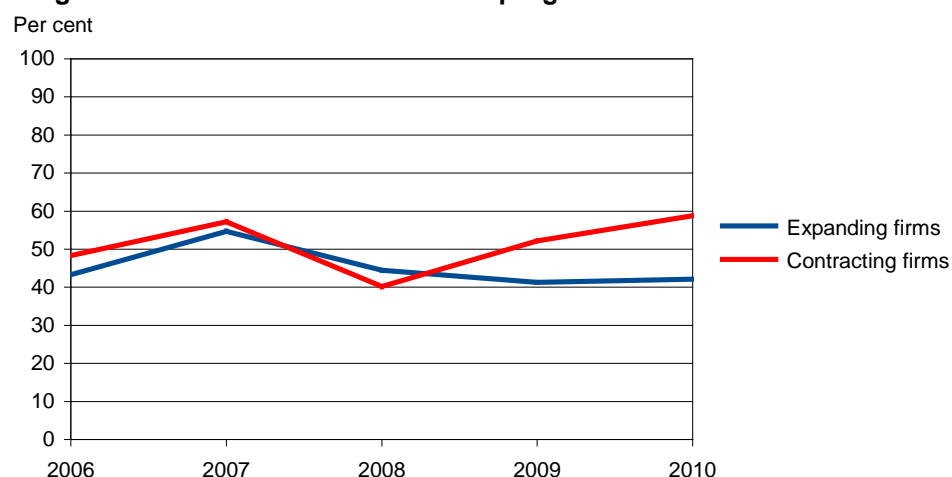
Diagram 6B. In-house software and firm progress



Source: Own calculations.

There are signs that contracting firms have ventured more in an attempt to over win the crisis, meaning that their development in IT maturity at least during a period of time is more rapid than for expanding firms. Similar behaviour seems to appear both for mobile connections and in-house software. A new level of IT maturity could indicate that the firms have been forced to improve efficiency during the crisis, including their systems, in an attempt to survive. It may as well have been the case that the crisis has lead the firms to refine their activities implying changed demand of technology and staff qualifications.

Diagram 6C. Electronic sales and firm progress

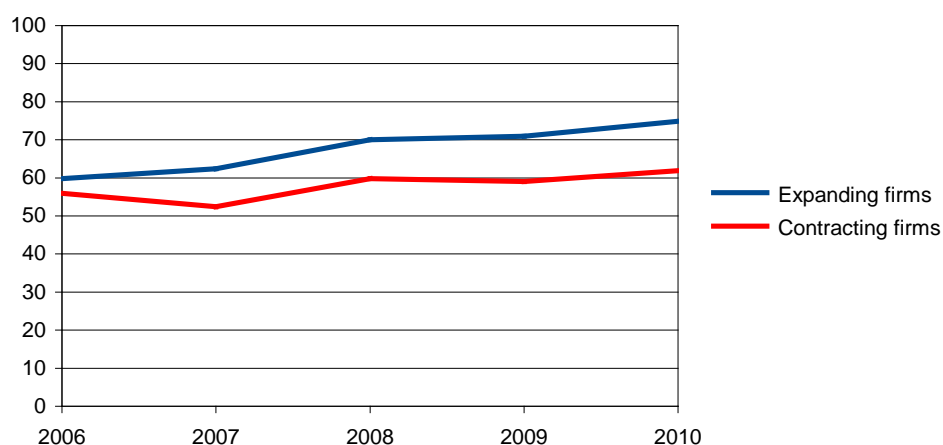


Source: Own calculations.

In certain cases the trends are almost alike, but not necessarily on the same level or with similar volatility. An example of this is the mobile connections. The in-house software is produced on an analogous level as well, but a somewhat clearer pick-up could be seen among those who suffered during the crisis. Following changes in the definition, the electronic sales variable needs to be interpreted with care. However, from 2008 and onwards it is possible to observe that the electronic sales increases among the contracting firms but not among the expanding ones. This development seems reasonable since prosperous firms do not need to acutely re-evaluate their activities and systems.

Diagram 6D. Employee Internet access and firm progress

Per cent



Source: Own calculations.

During the period of time studied, the pattern of the employee Internet access between contracting and expanding firms deviates from the other IT maturity variables studied in that an initial spread grows somewhat over time. Both groups experienced stagnation during the worst crisis, but after that the development for the contracting firms is slower. It is not completely easy to figure out why those contracting firms are keeping their employee Internet access on a lower and slower level. One hypothesis is that earlier those firms were generous with the access, but cannot afford it anymore. The progress of this variable indicates that it could still be a factor of success, just like it is described by Eurostat (2008). It is also important to note how the success has been distributed among firms. The manufacturers suffered more during the crisis, and were already from the beginning among those firms that have a lower IT maturity.

Concluding remarks

The IT maturity of firms, in this case approximated by the IT use of employees or firms is to a certain degree sensitive to major changes in economic activity. The larger firms are among those least affected and the medium-sized ones the most, somewhat surprisingly since small firms otherwise tend to be more vulnerable. However, in this case the lower IT maturity and larger flexibility of the smaller firms may have been to their advantage. As a paradox, the effect on IT maturity is more visible within the services industries, despite the fact that those firms were far less affected by the crisis in sales terms than the manufacturers.

Among those studied over time, the reductions in firm activities have led to stronger emphasis on the internal digital systems on the way out of the crisis. There are clear signs that the same firms are becoming less generous with the employee Internet access. However, it appears to be the case that the employee Internet access still is a success story, since the expanding firms not only started out from a higher level but also enlarged the gap to the contracting firms during the period of time studied.

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Appendix 1

The ICT-sector

| SNI 2002 | Industry |
|----------|--|
| 30010 | Manufacture of office machinery |
| 30020 | Manufacture of computers and other information processing equipment |
| 31300 | Manufacture of insulated wire and cable |
| 32100 | Manufacture of electronic valves and tubes and other electronic components |
| 32200 | Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy |
| 32300 | Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods |
| 33200 | Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment |
| 33300 | Manufacture of industrial process control equipment |
| 51432 | Wholesale of radio and television goods |
| 51840 | Wholesale of computers, computer peripheral equipment and software |
| 51860 | Wholesale of electronic parts |
| 51872 | Wholesale of computerized materials handling equipment |
| 51873 | Wholesale of telecommunication equipment |
| 6420 | Telecommunications |
| 7133 | Renting of office machinery and equipment including computers |
| 7210 | Hardware consultancy |
| 7221 | Publishing of software |
| 7222 | Other software consultancy and supply |
| 7230 | Data processing |
| 7240 | Data base activities |
| 7250 | Maintenance and repair of office, accounting and computing machinery |
| 7260 | Other computer related activities |

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