Open innovation in a closed world

Thesis

For Science and Innovation Management (SIM)
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Summary

Innovation is a risky process which needs risk analysis and careful planning. A strategy to mitigate these risks is to cooperate and spread risks among different projects and partners. More companies seem to use this strategy and open up development processes on all types of projects. This study focuses on 'open' innovation projects and what business models are used if the knowledge and technology becomes available for other actors. This study is specifically limited on the ICT sector because this sector is where more open innovation processes were first initiated and new business model development has progressed further.

To answer if there is a relation between open innovation and used business models, 5 hypotheses are created. They test different aspects of business models and the developed technology with how open the innovation strategy is. These hypotheses are tested by acquiring survey data and interview data from relevant respondents in the Netherlands.

The conclusion is that there is indeed a relation between the used business models and open innovation, but that some aspects of business models have more impact on open innovation than other factors. Specialization for instance seems to have a lesser impact than if a company is a publisher or service focused organization. The last conclusion is that technology characteristics do have an impact on open innovation strategies but to a lesser extent on being a publisher or service provider.

1. Introduction

Innovation is more and more stressed in management literature as an important factor for surviving. The ability of a company to assess new technologies and match them with the needs from customers creates new opportunities and profits. The internal knowledge that is needed for such processes is extremely valuable for companies. It is the key for the innovation process and it is vital to protect that knowledge to gain competitive advantages. This is the reason why almost all companies use all sorts of tactics to defend their knowledge against competitors, for instance:

- Copyrights
- Patents
- Non Disclosure Agreements
- Prohibiting spin offs

All these tactics share one goal: the protection of *internally* developed knowledge. The idea of open innovation is that this paradigm may be changing. The title of this thesis is meant to summarize this problem. The (economic) world consists of separate actors that all have their own agenda, competences, knowledge and products. All of these are closed off because of competition and rivalry. Opening up development of new products is therefore risky and a new territory for most.

This open form of development was especially visible in the information and communication technology (ICT) sector. Through the coming of the internet the marginal costs for distributing knowledge went next to zero (Shapiro, 1999), this made it possible that large groups of users and developers collaborate on projects. In the ICT sector this meant that not only knowledge but also source code could be distributed easily to thousands of people. These people could then collaborate on the same software and create value. Products like Apache, Linux, Mozilla, MySQL and OpenOffice are examples of this type of collaboration.

Companies now realize that: “not all the smart people work for you” (Chesbrough, 2003), and that they can create extra value for their customers by distributing their internal knowledge to users and other developers (Shapiro, 1999). The only obvious problem was: how to manage and monetize some of that extra value for customers? This is the problem of open innovation in a nutshell: more value can be created by opening up the innovation process but it also brings along questions about how to manage and monetize innovation within a company.

An innovation strategy describes how to create and develop knowledge. The business model describes how to extract value from products and (new) technologies. But is there a correlation between the two concepts? Do companies with the same open innovation strategies tend to have the same business models or are the two concepts not linked at all?

This study researches the correlation between innovation strategies and business models in the ICT sector. This sector is chosen because companies in this particular sector are forced to rethink existing business concepts due to rapid changes in information technology. In this sector new companies invented new business models and found new ways to market, distribute and sell products before any other sector. Older companies and/or sectors seemed to have more trouble to adapt to this changing environment (Shapiro, 1999). This fact makes the ICT industry an ideal choice for this study. The following research question is therefore proposed:

- *Is there a correlation between the openness of an innovation strategy and the types of used business models in the information and communication technology industry?*

To answer this question two theories are used to define the two relevant concepts. The innovation strategy is defined with the work of Chesbrough (2003). He describes the function of open innovation in modern companies and the difficulties of implementing such open innovation strategies.

The business models are defined by using a typology of April (2007). In this white paper, business models are classified along the degree of specialization and what type of product is sold. This typology is specifically designed for the ICT sector and therefore very useful for answering the research question.

Answering this question is relevant for companies struggling with (open) innovation. Maybe some types of business models are more applicable and used with open innovation strategies than others. This can give companies and their managers information about how to use certain models in conjunction with each other and how to extract value in certain (difficult) situations.

Scientifically the relevance lies in the empirical data for open innovation. There is little empirical evidence of open innovation and how it is used. Current literature exists often of speculation and theories about the concept but lacks the empirical proof. This study is a (small) step in finding empirical proof for this paradigm(shift).

This thesis begins with a theoretical overview of all relevant concepts. Next a methodological framework is created which is helpful for building a questionnaire. Hypotheses are proposed and the variables are defined in terms of their indicators. Next the data is presented, discussed and analyzed in the analysis chapter. At the end conclusions are drawn and some discussion points are stated for further research and debate.

2. Theory

This chapter presents the relevant theories that are needed to answer the research question. The first paragraph gives a literature review of the open innovation concept. In the second paragraph, the open innovation concept is defined specifically for this study. The paragraph describes which definition is used and in what context. Then business models are presented and defined in the third paragraph. Different types of business models are distinguished according to the white paper of April (2007). The fourth paragraph presents the technology characteristics concept with its relevant theoretical background. All three concepts are concluded with a discussion of the concept within the context of the ICT industry. This will give clues to potential indicators and how to acquire data for further research.

This chapter is concluded with 5 hypotheses that will be used to answer the research question. They are directly derived from the theoretical framework(s) that are presented in this chapter and will be tested in the next chapters.

2.1 Open innovation literature review

This paragraph is a literature review of the open innovation concept. The most important authors and their perspectives on the subject are discussed here. The relevant authors for this paragraph are derived from the open innovation bibliography (openinnovation.net, 2008). These authors contributed the most to the academic research on open innovation and its practical use. Not all of these authors and their theories are used in this study, but it gives the reader an overview of the concept and a little insight in its history.

2.1.1 Chesbrough

Chesbrough is the author that invented the term 'open innovation'. His work describes the definition of open innovation and how to apply it in an organization. Chesbrough defines open innovation as a new paradigm in understanding innovation. A new paradigm must point out a new phenomenon that cannot be explained with the old paradigm (Chesbrough, 2006a). Chesbrough argues that spill-overs are not the cost of doing business but rather an opportunity to create profits. Another anomaly is that companies use intellectual properties to protect an organization while open innovation strategies promote the selling and buying of intellectual property rights.

The focus of his literature is mainly on a single organization. The main research question throughout his work is how to profit from releasing (internal) knowledge into a community (Chesbrough, 2003c, 2006b, 2007). Business models are discussed, how to extract value (Chesbrough, 2003a, 2003b) and how to position an organization for optimal benefits of open innovation (Chesbrough, 2006b).
The other literature by his hand focuses on understanding the phenomenon of open innovation (Chesbrough, 2003d, 2006c, 2006d). He tries to define why organizations would exercise such strategies and defines the concept(s). His overall conclusion seems to be that organizations should adopt a mixed model where knowledge sharing and extracting value from new knowledge is balanced. In practice this means that not all internal knowledge should be shared and that the number of actors with access to that knowledge is limited. This approach has the benefit of still be able to make profit on (new) technologies while also improving them with the help of third parties.

All other authors described in the next paragraphs here base their research on Chesbroughs theories and definitions and underline the importance of his literature. Most authors seek new research levels (such as Vanhaverbeke) or another perspective (West) on the same subject. This study also uses Chesbrough work to define open innovation and to define its impact on the software development process.

2.1.2 Vanhaverbeke

Vanhaverbekes focus is mainly on the position of open innovation strategies in a larger network. His first argument is that value is almost never created alone (Vanhaverbeke, 2006a). A large network of suppliers, buyers and partners is almost always needed to create value. This is true for all innovation strategies and therefore also for open innovation strategies.

According to Vanhaverbeke there are multiple levels where an analysis can be done:

- Individual
- Organizational
- Dyads (partnerships between two companies)
- Interorganizational networks
- Regional
- National
- International

Chesbrough focuses solely on the organization and how it can improve its innovation strategies while still extracting value. Most innovation literature describes how to change an organization while treating surrounding networks as given facts and therefore inalterable (Vanhaverbeke, 2006b). The network literature that does focus on changing and using networks is never written from an open innovation perspective. This is the first argument for a network perspective of open innovation strategies.

The second argument is that of increasing complexity and risks. More R&D costs, more complexity, shorter technology life cycles, more knowledge in universities and more knowledgeable users/suppliers are all good reasons for seeking partners in innovation. Therefore any (innovation) literature solely focusing on the organizational level misses a lot of opportunity to develop a successful innovation process. Vanhaverbeke therefore concludes that: “analysis of interorganizational networks in general and value constellations (interorganizational networks that create value together based on new business models) in particular reveals that research about open innovation should be multilayered.”

Vanhaverbeke’s focus is interesting because he treats the innovation network as a dynamic network that can be created in any shape way or form an actor see fit. This perspective means that in development processes extra actors can be found to complete knowledge gaps for a new product. This thesis focuses less on the surrounding network but more on how open the interaction is between a company and its network. This gives insight in ‘how’ but not with ‘whom’ is cooperated.

2.1.3 West

Joel West stresses the importance of intellectual property and its protection. Intellectual Property (or IP) can be used to develop new processes/products or services. By protecting Intellectual properties organizations can attain an higher appropriability (or: a higher quality of being imitable or reproducible). This means that technologies or products are harder to copy for competitors and thus are more valuable to its owner(s) (West, 2006c).

Intellectual properties are often protected by national laws, and certain types of open innovation are only possible through such protection (West, 2006c). West therefore explores how companies with open source strategies extract value while transforming their intellectual properties into public goods (West, 2006a). The question rises in that case how to build a business (model) without a high appropriability (West, 2006b).

West also explores if a high appropriability can retard innovation. Because an innovation network is often needed for successful development, a high irreproducibility of a technology or knowledge can be difficult for communication between actors (West, 2006c).

This innovation network does not have to exist from only companies. West describes how communities (or: non organization actors) can contribute to innovation and how to incorporate their knowledge and help in the innovation process (West, 2008).

The work of West is valuable for a lot of sectors but less important for the software industry. Software is not protected by patents in Europe, it is protected by copyright laws. Only when software is a "non-obvious solution for a technical problem" it is patentable (EPO, 1973). The work of West is therefore less relevant for this study, because the this study focuses on the software sector. How software is protected and what the difficulties are is discussed in paragraph 2.2.2 Knowledge diffusion.

2.1.4 Hippel

When internal knowledge is ´released´ into the public domain it becomes a public good. Any actor can use the information and knowledge how they see fit. Other actors can use it, learn from it or even improve it. Therefore it makes economic sense to release internal knowledge.

Hippel emphasizes the importance of releasing knowledge while still be able to extract value from that knowledge (von Hippel, 2006). His solution to this problem is by creating a private-collective model of innovation. This model is designed to share knowledge between a limited set of actors. This has all the advantages of creating improvements and learning from each other's technologies, but the knowledge is not freely available so it is still possible to extract value from this knowledge.

Hippels work is useable for companies that are trying to find the balance between completely closed and open innovation. Hippel suggests that there is mixed strategy that has all the benefits of open development without the drawbacks of losing all that extra value. This study also uses his mixed model in paragraph 2.2.4 Open innovation factors.

2.2 Open Innovation

Open Innovation is a concept that is used for (innovation) strategies that do not solely focus on the protection of internal knowledge but rather on the diffusion of internal knowledge. This diffusion has several advantages and disadvantages. This paragraph will describe concepts such as the nature of knowledge and the value of knowledge for companies. It is clear that knowledge is vital for all companies and that how they use that knowledge can be the difference between success and failure.

2.2.1 Knowledge

According to Porter (1980) there are two categories of business strategies:

1. To have the lowest price in an industry
2. To differentiate yourself from direct competitors

For both strategies innovation is vital for the successful implementation of that strategy.

The first strategy (price leadership) is pursued by increasing productivity and lowering costs. These goals are achieved by mainly process innovations. By developing new production processes costs can be decreased which can result in lower customer prices. The second strategy (differentiation) focuses more on the product itself. By enhancing properties or adding features of the product, the customer gets more value for their money. Radical and incremental product innovations are the basis for the development of these new features and properties.

Both strategies have two concepts in common: knowledge and innovation. Innovation is needed to successfully execute a business strategy; knowledge is needed to be successful in innovating. Knowledge is therefore vital for the survival of any company.

The problem is that knowledge shows characteristics of a public good. A public good means that no-one can claim ownership and if someone uses that good, it is still useable for everyone else (there is no limited supply). In economic terms: knowledge is non-exclusive and non-rivaled (Varian, 1992). In practice this means that knowledge is freely available for everyone and that no one can be excluded from using it. Because knowledge is a public good there is no incentive for companies to create new knowledge. Otherwise the created knowledge would be available for all actors (even competitors) and would not have any benefits for the creator of that knowledge.

2.2.2 Knowledge diffusion

To keep the incentive for companies to create knowledge, it is protected by governments. Governments have all sorts of legal systems and laws in place to protect the incentive to create knowledge; the most important one for this study are copyrights.

A patent doesn't give the right to use an invention. It does provide the right to exclude other actors from using the technology or knowledge. In most countries a patent expires in 20 years after the filing date. In legal terms a patent is a property which can be sold, licensed, transferred and given away just like other properties (WIPO, 2009). The patent system is thus a system designed to give organizations the incentive to create knowledge and thus to innovate.

Software cannot be patented in Europe. The European patent convention (EPC) from the 1970s states that 'programs for computers' are excluded from the patent system (EPO, 1973). This means that software is protected by copyrights rather than by patents. But a non-obvious technical contribution is patentable even if that contribution is in the form of a computer program/software (EPO, 1973). Protecting intellectual property is therefore difficult for software developers.

Even more difficult for organizations is that both protecting and diffusing knowledge has its advantages. Protection of knowledge gives an organization a competitive advantage in an industry. Competitors cannot copy the invention without consent from the inventor and therefore miss the opportunity to create extra value for customers. Diffusing knowledge or technologies has the advantage of being available for multiple actors who can use, change or further develop the technology. This is almost always beneficiary for the organization that first created the technology because the technology is improved without extra costs.

Open innovation tries to find a balance between these two strategies. The idea is to diffuse the knowledge and technologies to benefit from extra low cost development. But also to protect the knowledge in a way that value can be extracted and profits can be made.

2.2.3 Open Innovation

Open innovation differs from closed innovation because the development process is more open for sharing knowledge with third parties. This means that suppliers/ buyers and competitors can cooperate to gain extra knowledge. This extra knowledge can be used to create extra value for end users. Two parts of this development process are open with open innovation:

1. The part of idea generation
2. The part of development of the idea towards the market

When multiple companies open up their development process, a new market appears where intellectual properties are traded amongst different companies and sectors. This is the big difference with the closed innovation paradigm. Companies with a closed innovation strategy treat intellectual property as an asset to give their internal staff freedom of design for a (new) product. The primary objective was to avoid costly litigation. But most intellectual properties are not worth very much and are not used at all by the companies that hold them.

With open innovation these intellectual properties can create extra value by selling and buying IP's (Intellectual Property rights) and using them to create new markets and business models. This open development is shown in Figure 1.

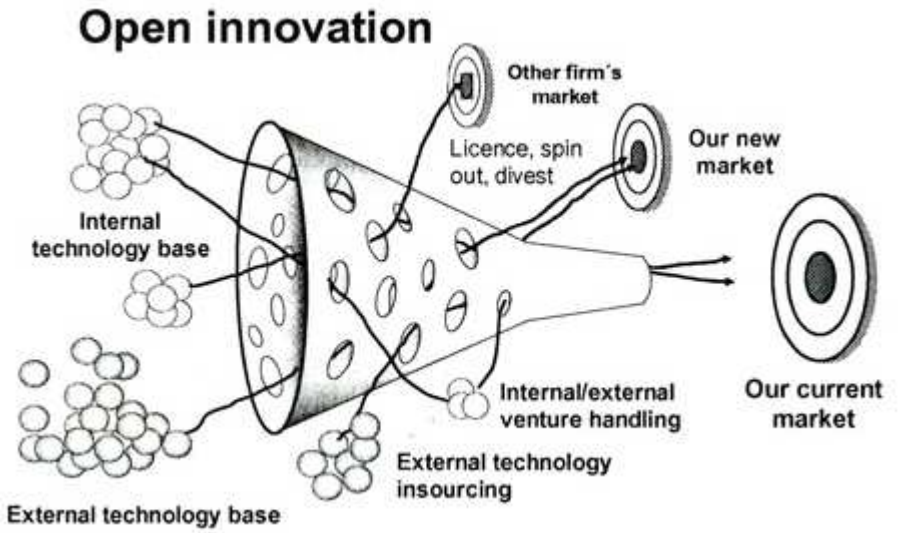


Figure 1 - Open innovation (Chesbrough, 2004)

With closed innovation the funnel is basically without holes and the knowledge comes from within the company. This knowledge is then funneled through the development process and used to develop a product or service. With open innovation there are holes which are controlled. The information is available, but is diffused in a controlled manner.

2.2.4 Open innovation factors in the ICT industry

In figure 1 it is clear that an open innovation strategy influences both the influx and the outflux of knowledge and technology for an organization. To measure how 'open' the innovation strategy of a software developer is, we look at how much knowledge and source code is shared (outflux) and how much is licensed or bought (influx). This should give an idea how open the innovation funnel is for a specific software developer.

The open innovation indicator will result in organizations with completely open strategies, and with completely closed innovation strategies. We give each software developer an open innovation indicator between 1-10. This indicator divides companies in three possible innovation strategies:

1. *Open innovation*

   Completely opening up all internal knowledge to all actors who wish to use, alter or enhance the knowledge and/or technologies that the organization has. Innovation sources are external and internal. And external ideas are heavily used in software development. (Examples: Open Office, Ubuntu)

2. *Half open/half closed innovation, (mixed model)*

The 'best of both worlds' approach: This approach is characterized by trying to have the benefits of open innovation without its obvious drawbacks such as spillovers. Innovation sources are internal and external and the emphasis is on extraction of value from new products. (Examples: Mac OSX, Adobe PDF)

3. *Closed innovation*

   Innovation is for the largest part performed in a closed environment. The software development department is the biggest and often only source of new technologies. This innovation strategy is the classic strategy of performing innovation (Examples: Microsoft Windows, MS Office).

Good indicators are needed to calculate this factor. For software developers good indicators can be how much is cooperated with other developers and to what extent. Source code can also be used in products from other actors if part of the source code is shared among developers. This can be a way for developed code to end up in other markets and even sectors and is therefore also a measurement of the openness of innovation.

2.3 Business Models

This paragraph describes the business model typology that is used to test the correlation between open innovation and used business models. First a conceptual overview is given for the business model concept. Then, a typology specific for the ICT sector is presented.

2.3.1 Business model concept

It is now apparent that open innovation creates extra value for users and customers. But the problem lies in how to extract some of that value for the company. Knowledge was traditionally something to protect so that only the company who developed the knowledge could benefit from it. But if all your competitors can also benefit from that knowledge then how can a company create a competitive advantage? New business models are therefore vital.

A business model serves different functions (Chesbrough, 2003):

1. To articulate the value proposition, that is, the value created for users by the offering based on the technology.
2. To identify a market segment, that is, the users to whom the technology is useful and the purpose for which it will be used.
3. To define the structure of the firm's value chain which is required to create and distribute the offering and to determine the complementary assets needed to support the firm's position in this chain.
4. To specify the revenue generation mechanisms for the firm, and estimate the cost structure and target margins of producing the offering, given the value proposition and value chain structure that is chosen.

In these functions it becomes clear that creating value is vital, but not enough for surviving. A company also has to extract that value (Meer, 2007). These functions also make it clear that a business model is very hard to define. A business model serves as an intermediate between technology and actual profits and returns on investment. It is therefore very hard for managers to define and outline a good business model. This is especially true for new technologies and markets. This intermediate function is shown in Figure 2 - The business model as a cognitive map across domains (Chesbrough, 2003) Figure 2.

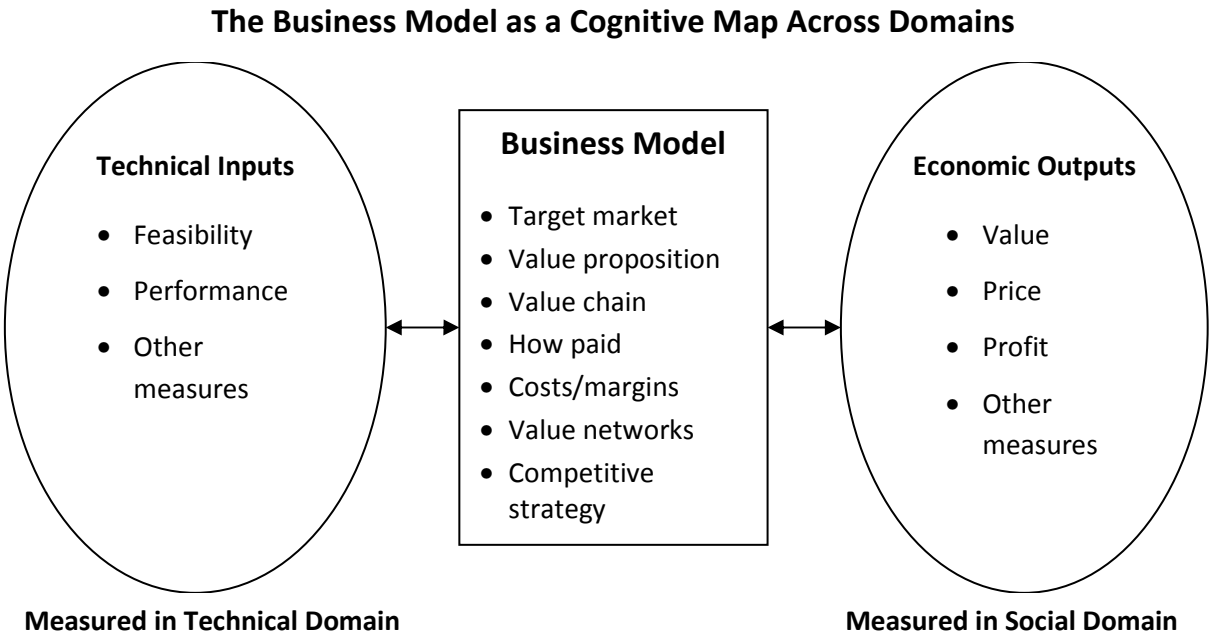


Figure 2 - The business model as a cognitive map across domains (Chesbrough, 2003)

Open innovation strategies make it more difficult to create viable business models. Suddenly, current business models did not apply and new forms of value extractions have to be created. There are already new initiatives to combine forms of open innovation with the extracting of extra value for the company. A few examples:

- *Pooled R&D*, Sharing IP to decrease risks and costs (Mozilla, Linux)
- *Selling complements*, Selling complementary software or hardware (Apple, Apache)
- *Spin Outs*, giving away IP to increase sales of complementary products (Jikes)
- *Donated complements*, Users generate extra value for other users by using a platform (Avalanche, Pcmods)

These are just a few types of business models that are used to extract value in a new way.
This study will focus on a typology of business models that will be explained in the next paragraph.

2.3.2 Typology of business models in the ICT industry

The business model factor in this study is a variable that uses multiple categories. These categories are only useful in the ICT sector, because they distinguish business models that are common in the software developer branche.

Four categories are defined, these categories are divided on two axes (April, 2007):

1. From service to publisher

   This axis describes if a software developer extracts value with service and consultancy around specific information technology problems or just sells (components of) software. In the ICT sector it is common to resell products with extra support and/or service. This axis is focused on where the focus of a software developer lies. On publishing its software or by selling complementary products and services.

2. Specialization, from convenience to specialized applications

   This axis describes if the business model is focused on a very specialized set of customers with very specific problems or rather aims at a broader market with convenience software that can be used in a wide range of scenarios. A higher degree of specialization in this sense is a specific product/market combination that is only useable in a niche.

   An example of a convenience developer can be a software developer that provides a PDF reader (Foxit for instance) for general use. The software is not specialized for specific users or market. But EPD (Electronic Patient Dossier software) is an example of a very specific product/market combination that is only useable for a specific set of organizations (mostly GGZ organizations).

These two axes give 4 types of distinct business models:

Table 1 - The 4 business models (April, 2007)

	Service	**Publisher**
Convenience	Consultancy, installation help and general assistance for ICT problems and (sometimes) multiple software applications. Value is extracted by selling man-hours and knowledge.	Simple software that provides a solution for daily ICT problems in multiple sectors. Value is extracted by selling software in large amounts.
Specialization	Specialized consultancy and assistance in the adoption of new software components in an existing ICT environment. Value is extracted by selling specialized knowledge and experts.	Very specific software for a small amount of customers often in the same industry/sector. Value is extracted by selling specific software (components) with higher margins.

These 4 types will be used to see how much these business models are used with certain open innovation strategies.

To acquire data about what business model is used by a software developer good indicators are needed. Valuable indicators can be how much turnover comes from selling software or complementary products and service. This gives an indication about the service or publisher focus of an developer. A valuable indicator for specialization can be if the development team focuses more on user needs than technical possibilities. A user focus indicates a more specialized focus and a technical focus indicates a more general (convenience) approach.

2.4 Technology Characteristics

Technology characteristics are added to open innovation and the business model typology to acquire a clear picture of how and why a company is choosing a certain innovation strategy with a specific business model. This paragraph discusses the concept and its context in the ICT sector.

2.4.1 Technology characteristics factor

The technology characteristics factor will be a control variable in this study. The expectation is that certain product characteristics will determine the business model and the openness of a firm to diffuse internal knowledge. It is therefore necessary to test this factor to avoid biased results.

In this study the variable 'technology uniqueness' is used. The idea is that most companies will look at the technologies they are using to build a certain product. Unique selling points are valuable and will be protected. The organization will also protect the knowledge to develop these unique selling points and will choose a closed innovation strategy. Complementary technologies and its knowledge will be 'open' for further development by different actors such as users and suppliers.

For instance: An average television contains 600 different inventions. From those 600 inventions only a few differentiate the product from similar products. In this case features such as ambilight (Philips), Picture enhancers and 100Hz displays differentiate the product. The majority of features are not differentiating product features such as: Stereo sound, teletext and automatic channel setup. Therefore it makes sense for television makers to buy/develop those technologies as cheap as possible (Engelfriet, 2007). This is the reason a lot of televisions right now use Linux (an open source operating system) as their operating system: linux is cheap, is further developed by the community (cheap development) and is therefore the ideal choice for an operating

system. Also, the operating system is not a differentiating feature but more a complementary technology for differentiating features for televisions (Engelfriet, 2007) and has therefore no impact on competition with rivals.

Therefore if two technologies are similarly complementary to other technologies in a product chances are a similar (open innovation) strategy is used to develop them. By incorporating this variable it can become clear why similar products have similar business models and even similar innovation strategies.

2.4.2 Technology characteristics factor in the ICT sector

In the ICT sector this works exactly the same. More and more platforms are created to share snippets of source code (Sourceforge, Google Code). Even companies with a history of propriety technology are using platforms like these. For instance: Microsoft shared their code about windows 7 installers, to help system administrators to build custom installers (Anthony, 2009). The installer is not a unique selling point but rather a complementary product/tool to help users. It is therefore logical that Microsoft shares this knowledge to help users.

An indicator can be how many differentiating features are developed. If more differentiating features are developed it will likely lead to a more closed innovation strategy. The other way around is also true: more general features or bug fixes will probably correlate with a more open approach to innovation.

2.5 Hypotheses

All relevant concepts are defined above and can be used to formulate hypotheses to further specify the research problem. The hypotheses are directly derived from the research question and will therefore aid in answering it.

The first two hypotheses formulate the relation between the type of business model and the openness of innovation. The third hypothesis formulates a connection between the specialization of a business model and the openness of innovation. The last two hypotheses formulate a causal connection between the uniqueness of a technology and respectively the innovation strategy and the business model that is used.

- *H1: A higher degree of service focus will have a higher degree of open innovation*

A company focusing on selling service along with a product means that the extraction of the value comes from delivering a service and not the product itself. This means that the software (and its source code) is not the differentiation factor and can therefore be distributed freely for more value for all actors involved. The innovation strategy will have a higher degree of openness to benefit as much as possible from the added value from co-developing actors.

- *H2: A higher degree of publisher focus will have a smaller degree of open innovation*

This hypothesis is the opposite from H2: a company that sells the software as most important product instead of complementary products (such as extra service) will protect its software and source code more. The software and its features are the most differentiating factor for customers and are therefore protected with a more closed innovation strategy.

Hypotheses 1 and 2 both test different situations. The first tests whether an organization with service focus will have more open innovation. The second tests whether publishers will have a more closed innovation strategy. Both situations are extreme cases. The reality is that that most companies sell multiple products and/or services and that the focus of the business model is different for every company. The Business model typology variable is therefore defined as a continuing variable to test the complete spectrum of business model strategies including the two extreme hypotheses which are stated here.

- *H3: A more specialized business model will have a smaller degree of open innovation*

If a company is more specialized it means that the internal knowledge is more specialized for a small group of users/customers. This means that the product and the knowledge are more exclusive and thus more valuable for customer and producer. Higher value means often more protectionism from an organization, or: a more closed environment for knowledge and innovation.

Also, if a company is very specialized than the needed knowledge for further development and improvement will be more specialized. Relevant externally developed knowledge will be very hard to find. On the other hand, internal knowledge will be hard to diffuse because the number of third party actors which have an interest in improving that specialized knowledge will be small.

Both these arguments will result in an organization with a smaller degree of open innovation.

- *H4: A more unique technology drives innovation to a smaller degree of open innovation*

If a technology is more unique it will have a higher value for a company. This higher value will be protected by not diffusing knowledge about that technology. The innovation strategy will therefore be more closed.

- *H5: A more unique technology will have a more publisher focused business model*

A more unique technology will have more value for a company. The company will focus its business model at extracting that higher value by selling the software itself. The opposite is also true: a less unique technology will have less value for a company. The company will try to sell complementary products such as service to extract value.

3. Methodology

This chapter describes the practical method of finding an answer to the presented research question. In the previous chapter the relevant theories and concepts were discussed. This chapter makes them measurable (operationalization) and discusses how the relevant data is acquired . This chapter also gives the general outline of this thesis, the research design. It shows how the data will be used to test the hypotheses that are proposed in paragraph 2.5 Hypotheses. The last paragraph in this chapter describes how triangulation is done to have more reliable data and results.

3.1 Research design

This research is designed to measure companies on how open they innovate. The open innovation factor is the dependent factor in this thesis. Probable independent factors that are used to predict open innovation are:

- Business model typology
  - Publisher/service factor
  - Specialization
- Technology characteristics

The business model typology is divided in the two axis that were discussed in: "2.3.2 Typology of business models in the ICT industry". This is done because the hypotheses predict different relation for both factors. All these concepts together create a conceptual model that can be tested. This model is shown graphically in Figure 3.

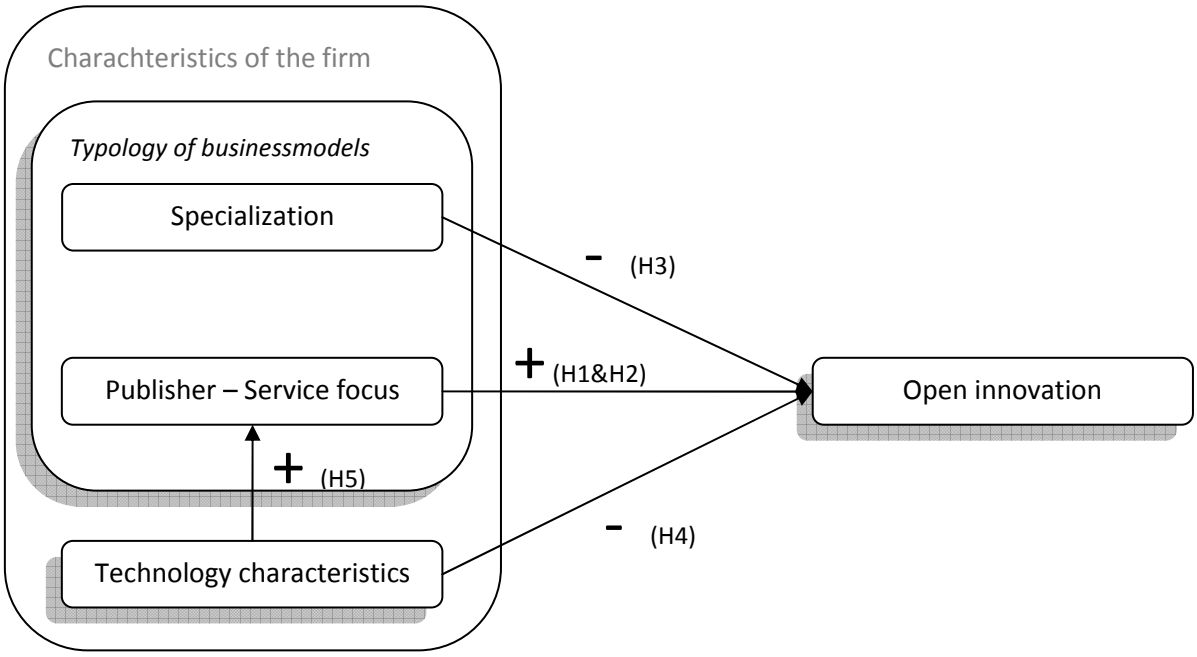


Figure 3 - The conceptual model for the dependent variable: 'open innovation'

All four concepts are shown. Between the concepts, all hypothesized relations are shown including if the relation is expected to be a positive or negative relation. These relations/hypotheses will be tested if there is a relation and if the trend was predicted correctly. The last test will be a multiple regression analysis to see if a predictive model can be created using all factors to predict the degree of open innovation of a company. Another factor is added as a control variable for all relations: the characteristics of a firm. This concept will be used to confirm results and to exclude the possibility that it is actually the size or age of a firm that determines the dependent variable instead of the proposed independent factor.

All factors will be made measurable by giving them a score between zero and one. They are then plotted against each other to calculate if there is any relation and correlation between the two concepts. These results can be plotted in a diagram, an example is shown in Figure 4.

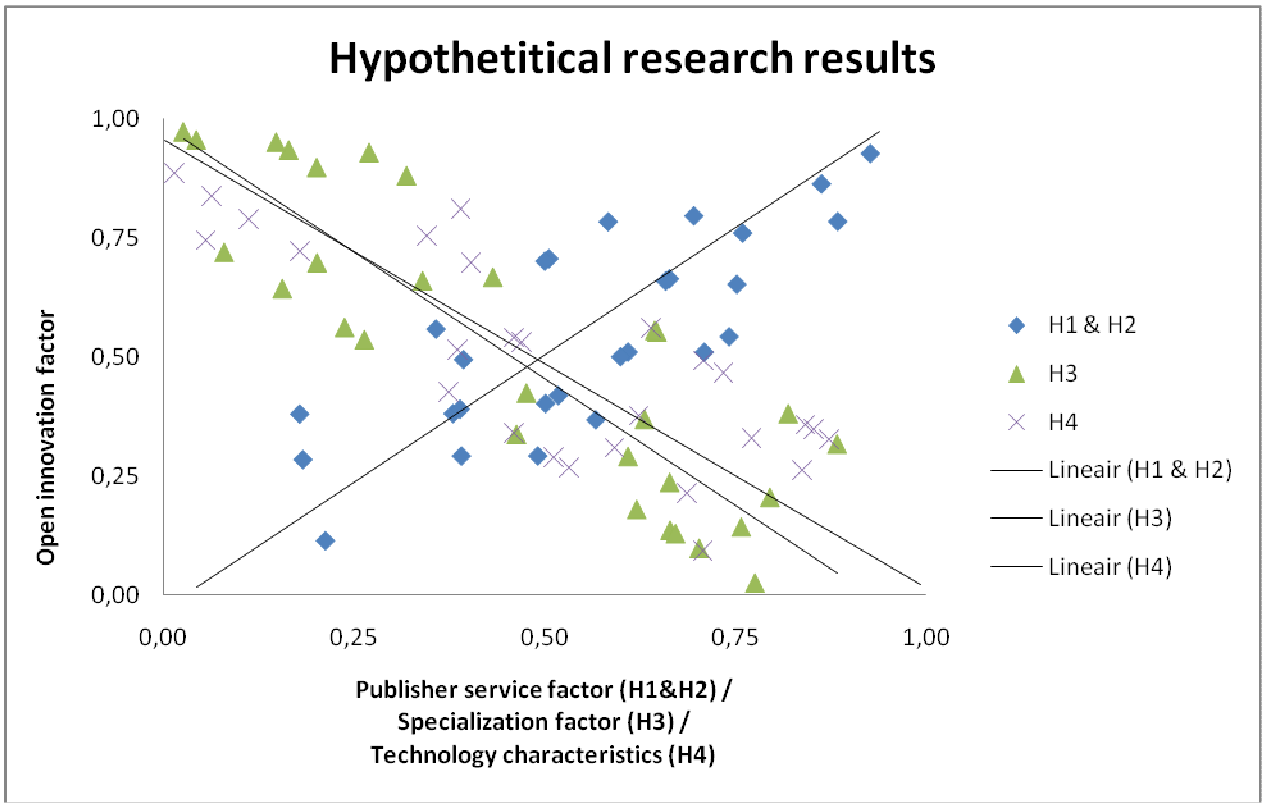


Figure 4 - Example of an open innovation strategy versus specialization diagram

Figure 4 shows an example of 4 hypotheses. All four hypothesis are based on the relation and correlation between open innovation and another factor. The blue squares represent the (fictional) results of the publisher/service factor against open innovation. The green triangles are open innovation against specialization, and the purple crosses are open innovation against technology characteristics.

Three black lines are drawn and represent the linear regression trend lines that are needed to analyze and proof the four hypotheses. The first two hypotheses will be correct if a linear positive trend is found. Hypotheses three and four are proven if a negative linear trend is found in the data. An overview of all hypotheses, needed data and the expected relation is shown in Table 2.

Hypothesis #	Short hypothesis description	Needed data	Expected relation
1	Service focus vs. open innovation	• Publisher/service factor • Open innovation factor	+
2	Publisher focus vs. open innovation	• Publisher/service factor • Open innovation factor	-
3	Specialization vs. open innovation	• Specialization factor • Open innovation factor	-
4	Technology characteristics vs. open innovation	• Technology characteristics factor • Open innovation factor	-

5	Technology characteristics vs. publisher focus	• Technology characteristics factor • Publisher/service factor	+

Table 2 – Hypotheses, their expected relation and the needed data

The needed data will be acquired through a web survey and interviews. How the web survey was created and which population was targeted will be discussed in the next paragraphs.

3.2 Data acquisition

This paragraph describes how the data is acquired for testing the relations. Four factors are needed to test the relations:

1. Publisher/service factor
2. Specialization factor
3. Technology characteristics factor
4. Open innovation factor

This paragraph describes how the needed data was acquired to calculate these factors, which tools and methods were used and which population was targeted.

3.2.1 ICT sector

The goal of this study is to find out if there is a relation between the used business models and the innovation strategies organizations use. This study aims specifically at the openness of those innovation strategies. To research this relation the ICT sector is chosen to acquire the needed data. There are three reasons for this choice:

1. The open source movement started in the ICT sector. The expectation is that it's easier to find organizations with open innovation strategies in this sector than in other sectors.
2. A second reason is depended on the first argument. Because open innovation strategies originated in this sector it is the most likely sector to have evolved business models that are adjusted for new innovation strategies. This makes it easier to have a sample that contains enough organizations with new(er) business models.
3. The ICT sector is expanding rapidly. According to the central bureau of statistics , the revenues ICT sector has increased with an average of 10% the last few years (CBS, 2009). Also the amount of R&D man hours is increasing (CBS, 2003) with an average of 29%. So there is a lot of innovation and growth in the sector. This also means many new companies with new technologies and (new) innovation strategies. This makes the ICT sector ideal as a research subject for the relation between innovation strategies and business models.

3.2.2 Population and sample

The research population that is used for this survey are the software developers in the Netherlands. Via the chamber of commerce (Kamer van Koophandel) in the Netherlands an extract of addresses is obtained with a sample of this population. This sample contains software developers that operate in the region of Midden-Nederland. This region is defined geographically as the region between the cities of Amsterdam and 's-Hertogenbosch in the north and the south and between Woerden and Amersfoort in the west and the east.

This sample is filtered for one man businesses. One man businesses are excluded because these businesses are often focused at selling their expertise in external projects rather than making products themselves. The expectation is that there won't be any product development or innovation in these businesses.

The 922 addresses that remain contain both general software developers and custom software developers. For custom software developers the innovation is not in the creation of a new product (their daily job is creating custom new products) but rather how they develop custom software. Custom software developers tend to create new, or expand existing development platforms. This phenomenon is used to find innovation and innovation strategies with custom developers.

Data is also gathered through 2 more sources. The first source are several forums on the internet. The web survey was promoted on forums specific for software developers. Next to data this also gave more insight in the organizations and innovation strategies. The second method was via Mitopics. This IT consultancy agency helped by spreading the web survey via the newsletter and to a few personal contacts.

3.2.3 Web survey

A web survey data collection method is chosen to find quantitative proof for open innovation and its correlation with business models. Larger amounts of data can be processed and results are easier to process.

Also, a web survey has the advantage of being quickly accessible for many respondents and is easier for the respondents to take the survey without having to mail it back. Another advantage is that the resulting dataset is already digital, which makes it easier to process large amounts of data. The data will be especially useful for trends in the ICT sector, but depending on the results the data can also give trends and useful information for other sectors.

The web survey was created and then first tested to ensure maximum response. This testing was done in 2 phases. The first phase was to call two respondents and walk them through the questionnaire. This had the advantage of getting both data and an immediate response to the questions of the survey.

Some concepts were vague and unclear and were changed with the suggestions from these two respondents. One respondent was a senior developer for a custom software developer, the other respondent was a general software developer. Especially the custom software developer had difficulties answering questions about innovation since they developed something new every day. This problem was solved by adding a custom software path in the questionnaire that focused on development innovation rather than product innovation.

The second phase was releasing the questionnaire in a closed part of a forum for software developers (http://gathering.tweakers.net). This had the advantage of having a little bit more data and some extra suggestions for the questionnaire. After a few more adjustments with these suggestions as input the survey was sent to the “Kamer van Koophandel” addresses.

3.2.4 Triangulation and Interviews

To illustrate the findings of this thesis a few interviews are held. These interviews aim at finding how organizations use (open) innovation strategies and how they share knowledge and collaborate. This will give a more qualitative view of the subject and will illustrate the analysis and conclusions.

The interviews also serve as a form of triangulation. Triangulation of the data is done in two ways. The first method is by interviewing organizations about their innovation strategies and how open or closed their strategy is in terms of knowledge sharing. Drawn conclusions will be stronger if the interviews find similar trends as the survey data.

Another way to triangulate data is by asking different questions about the same topic. The answers to both questions 24 and 25 can be used to identify how much external knowledge is used to develop new products (see

B.1 Web Survey). This type of triangulation gives more reliable data for, in this instance, how open an organization is with their innovation strategy.

3.3 Operationalization

In this paragraph the theoretical concepts from the second chapter are transformed in measurable concepts. These are used to construct the web survey and interview questionnaire. Table 2 shows this process. The concepts are first defined into dimensions. These dimensions are then used to find indicators. The indicators can be used to construct questions.

Table 3 - Operationalization table

Variable	Dimension(s)	Indicator
Business model typology *A Business model is a cognitive map between the technological domain and the social domain used for creating economic, social, and/or other forms of value.*	Service Component	• Which share of revenues is the result of selling complementary products and/or advice (April, 2007)? o Possible complementary products: ▪ Advice/consultancy ▪ Installation manuals ▪ Advertising
	Publisher	• Which share of revenues is the result of selling software? (April, 2007)
	Specialization	• Does the software product solve specialized problems? (April, 2007) o Is there a functional/technical focus and specialization for software development (April, 2007) • Does the software product solve problems for a broad market (April, 2007)? o Is there a trade/industry focus and specialization for software development (April, 2007)
Openness of innovation *The use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the*	Knowledge flows	• Which sources of innovation are consulted/used (Laursen, 2006) • In what extend are these sources used? (Laursen, 2006)

markets for external use of innovation, respectively. Open Innovation is a paradigm that assumes that firms can and should use external ideas as well as their internal ideas, and internal and external paths to market, as they look to advance their technology (Chesbrough, 2003).	Paths to market	• Has new product development ever lead to entering a new market/sector? (Chesbrough, 2003) • Has new technology and/or knowledge ever lead to licensing/spin offs/divestment of the new knowledge/technology? (Chesbrough, 2003)
Technology Characteristics *The degree wherein a certain technology is a differentiating factor in its industry and thus a unique technology. (Engelfriet, 2007)*		• Are recent (in the last year) developed features/technologies a differentiating feature with respect to competing products? (Engelfriet, 2007) • What share of features would you describe as differentiating features with respect to competing products? (Engelfriet, 2007)

4. Analysis

Now all hypotheses are analyzed based on the acquired data. The web survey was taken by 78 respondents. 35% of them filled out the whole questionnaire. The rest filled in between 5 and 95% of the questionnaire.

The research sample consists of organizations that were on average 11,5 year old. The average company had almost 43 FTE of internal employees and last year the average turnover was about 4,9 million euro's. Ten percent of these companies were a part of a larger organization and 77% was focused more on custom developed products and 23% on general software development.

The very first paragraph of this chapter describes two special factors that are used as control variables in this study: the age and size of an organization. Both are used to confirm the findings in the other paragraphs. The other paragraphs describe one hypothesis with its relevant data and analysis. The variables are described in terms of their variance and/or frequencies. Then they are analyzed for correlation and connections. This should give trends and conclusions whether the hypotheses were correct or wrong.

The last paragraph is about the interviews. Here the interview findings are presented and discussed. The focus is if the interviews reinforce the survey findings or contradict them. The interviews were held with 5 people:

- A software developer (Zicht)
- An ICT consultant (Mitopics)
- Telecom/ICT trends consultant (IBM)
- Strategic business manager (KPN)
- Government advisor for innovation in the ICT sector (SenterNovem)

All this data is used to test all 5 hypotheses in this chapter.

4.1 Size and age of an organization

Two more factors are introduced to rule out that the size or age of the firm is the biggest influence on the dependent factor(s). Without these control variables the results can be wrong about the dependency between two concepts. First the age is shortly discussed and then the size is discussed.

4.1.1 Age of an organization

The average sample organization is 15,5 years old. This is largely due to two very old companies that are clear outliers. If both these outliers are removed the average organization age of a respondent is 11,5 years. The effect of these outliers is also confirmed by comparing the mean and median of the age of organizations: between the median and mean is a difference of more than 5 years.

Age of an organization	N	43	
	Mean	15,53	yr
	Standard Deviation	29,06	
	Median	10,00	yr

Table 4 - Age of an organization

The age of an organization can be very influential for multiple factors. The biggest will be the adopted technologies and knowledge. Older firms have a longer history and thus more prior knowledge and competences. These competences can create a lock-in effect with (older) technologies and have a huge effect on related factors.

4.1.2 Size of an organization

The other control variable is the size of a firm. The size is calculated by using two questions from the survey: the number of employees in FTE (full-time equivalent) and the gross turnover from 2008. Both questions are good indicators of the actual size of an organization.

Each question is transformed in class averages which means that if a respondent answered that he had between 11 and 25 employees he gets a score of 18 employees which is the average in that answer. This method is used for both the gross turnover and the number of employees. If all transformed answers are divided by the maximum score a factor is obtained between zero and one. By averaging the turnover and the number of employees a total factor is calculated that is an indicator for the size of a firm. The results are shown in Figure 5.

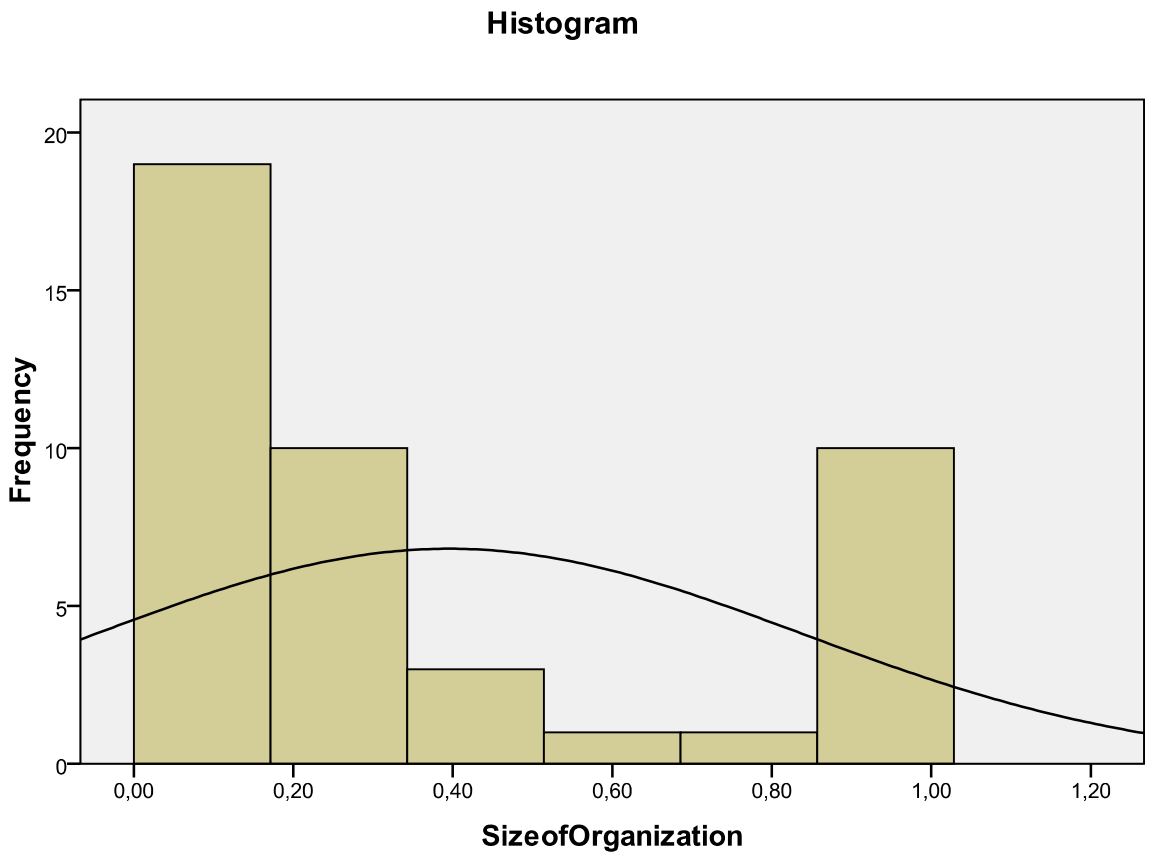


Figure 5 - The distribution of the size of Organizations where zero means the smallest organizations and 1 means the biggest organizations in terms of employees and turnover

There is a clear distribution with a lot of smaller companies and than a decreasing amount of bigger companies. There is however a group of big companies visible at x=1,00 in the graph. This factor is important because the size of a firm can be very influential for investment behavior (Dijk, 1991). This means that bigger or smaller firms can have very different strategies. This factor is therefore also used to confirm findings in the subsequent paragraphs.

4.2 H1 – Service focus vs. open innovation

The first hypothesis was that companies that are more focused towards services will have a more open innovation strategy. This paragraph first discusses how the two factors are constructed for further analytic use. Next the relation and the correlation between the two factors is used to determine if the hypothesis is correct.

4.2.1 Publisher – Service factor

For this factor all relevant questions (For an overview of all relevant questions see Appendix: B.3.1 Which questions were used to calculate what factors) from the web survey are coded to give a maximum score of 1 for service focused and a 0 for publisher focused.

Some questions are used and calculated differently. Question 36 for instance (see: Appendix B.1 Web Survey) is used by adding both percentages for service and remaining turnovers and dividing them by 100. The software sales divided by 100 are then subtracted from these two turnovers to have a ratio between -1 and 1. By adding 1 and dividing by two a score is calculated between 0 and 1 that can be directly used to calculate the service/publisher focus. This method is used instead of a mere ratio calculation because not all respondents answered such that all three type of revenues added up to one hundred percent.

Next, by taking the mean of all relevant scores (of all relevant questions) and multiplying by 10 a score between 0 and 10 is created. Zero means completely publisher focused and 10 means completely service focused. This factor is shown in: Figure 6 - Publisher(0) - Service(10) focused score.

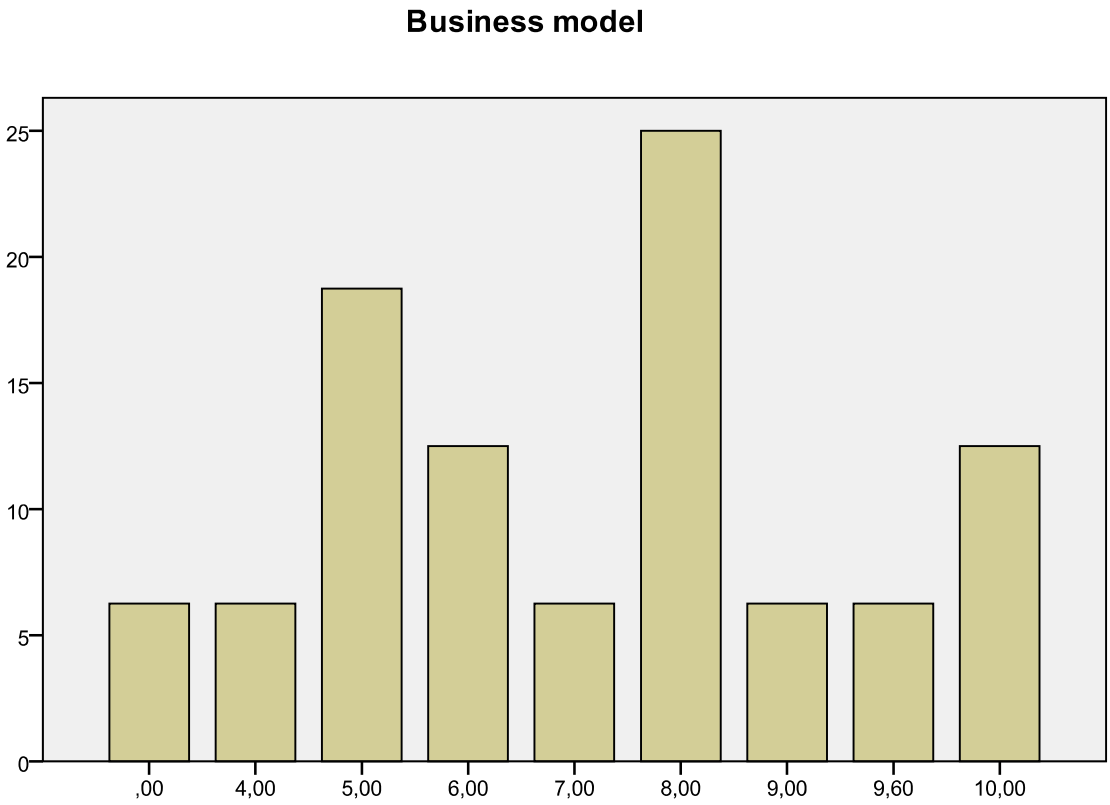


Figure 6 - Publisher(0) - Service(10) focused score in percentage of total respondents

There are two spikes to be seen in the graph. The first is at 5 and the next is at 8. This means that there are a lot of mixed organizations in the research sample that focus both on selling their products as selling complementary services. There seem to be two groups: a mixed group (business model score below 8) and a group of respondents (more than 40% of the respondents) that focus more on complementary services (business model

score of 8 and higher). This last group will be compared with how open they innovate in respect to companies that are more publisher focused.

4.2.2 Open innovation factor

This factor is also calculated by finding all relevant questions (For an overview of all relevant questions see Appendix: B.3.1 Which questions were used to calculate what factors) from the web survey and scoring them zero to one where zero means a closed innovation strategy and one means a completely open innovation strategy.

Henry Chesbrough states that companies should consider launching new products in different markets if the current market is not suitable for a new invention or technology (Chesbrough, 2003). Question 35 (B.1 Web Survey) asks if companies have entered new markets with new or existing products, and, if yes, how many times. 'No' gives zero points for openness, the answer 'yes more than two times' gives 1 point. The other 2 answer categories are evenly divided (0,33/0,66) between zero and one.

By adding all relevant scores and calculating the mean, a score is derived how open the innovation strategy is from a respondent. This factor is show in Figure 7.

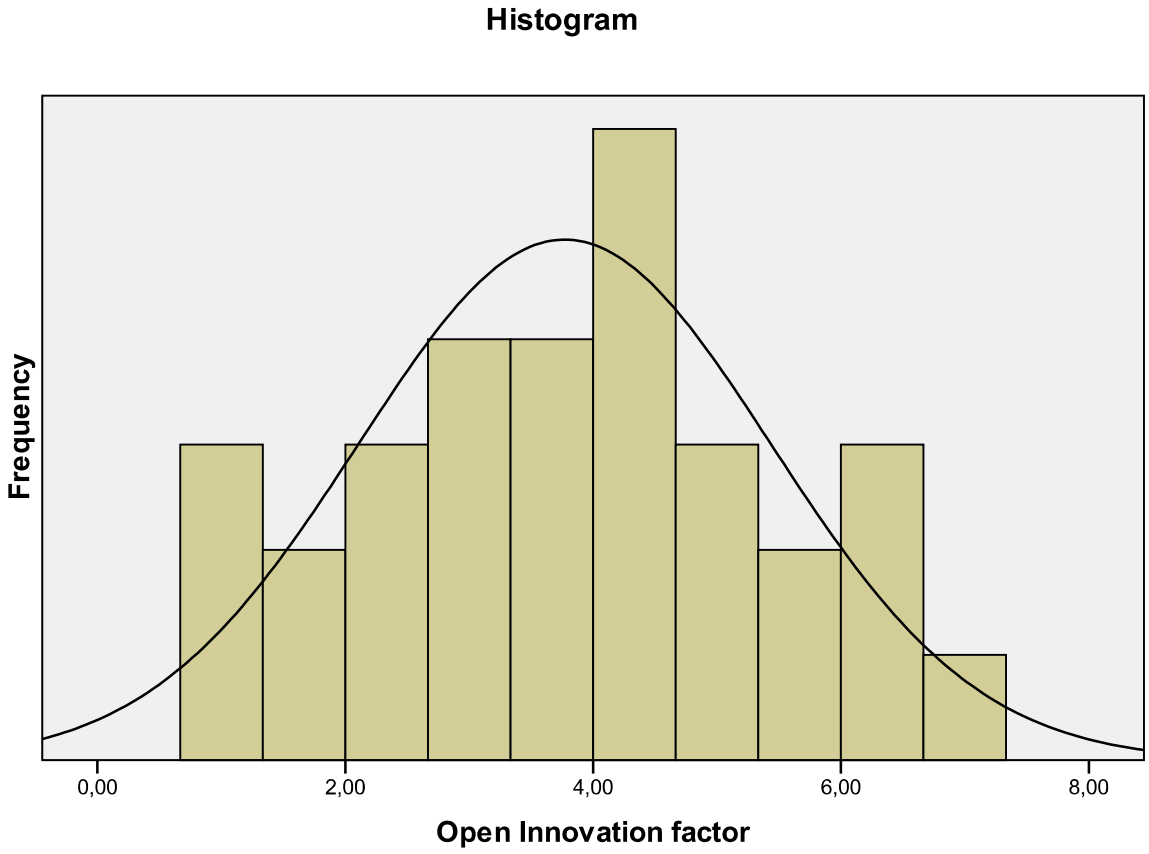


Figure 7 - The open innovation factor. 0 is closed innovation (10 means open innovation)

This factor looks somewhat normal divided with a mean of 3,77 and a standard deviation 1,66(See: Table 5). This means that a little bit more than 68% of the respondents scores between 2,11 and 5,43 for how open they innovate (when assumed they are normally distributed). This indicates that a low percentage of the respondents seems to have a completely open innovation strategy, they rather tend to have a mixed or a closed strategy.

	N	Mean	Standard Deviation
Open Innovation factor	31	3,7702	1,66587

Table 5 - Descriptive statistics about the Open Innovation factor

This factor is now used to see if companies with a service focus tend to have a higher mean of the open innovation score.

4.2.3 Relation between publisher/service focus and open innovation

In this paragraph the hypothesis is tested if a more service focused company has a higher degree of open innovation. First this relation is tested based on the assumption that there are two groups of respondents present. Then the two factors are correlated with each other and a linear regression model is fitted.

To check if there are indeed two distinct groups in the publisher/service factor (see: 4.2.1 Publisher – Service factor) they are checked if they are significantly different from each other in their open innovation score. The results are shown in Table 6.

Non parametrics tests		Significance (p)
Kolmogorov-Smirnov Z (D)	0,77	0,593
Wilcoxon W	33	0,234

Table 6 - Non parametric tests for 2 groups of publisher/service factor

The Wilcoxon test and the Kolmogorov-Smirnov test both start with the null hypothesis that both samples, the group with a low service/publisher score (beneath 8) and the group with a high score (above 8), are from the same distribution. The Wilcoxon test is purely based on the ranking of all values and does not take into account the actual differences between observations. The Kolmogorov test uses the cumulative distribution of both samples to determine if both samples belong to the same distribution.

Both tests score not significant which means that the null hypothesis is not rejected. This means that there aren't two different groups that score significantly different on how open they innovate. This does *not* mean there can't be any relation between service/publisher and open innovation. The relation will be tested with a regression model next which can still give valid results. But there are no two distinct groups present in the research sample.

Now the correlation and regression between the two factors is examined. A scatter plot reveals that on first sight there is not much correlation between the two factors.

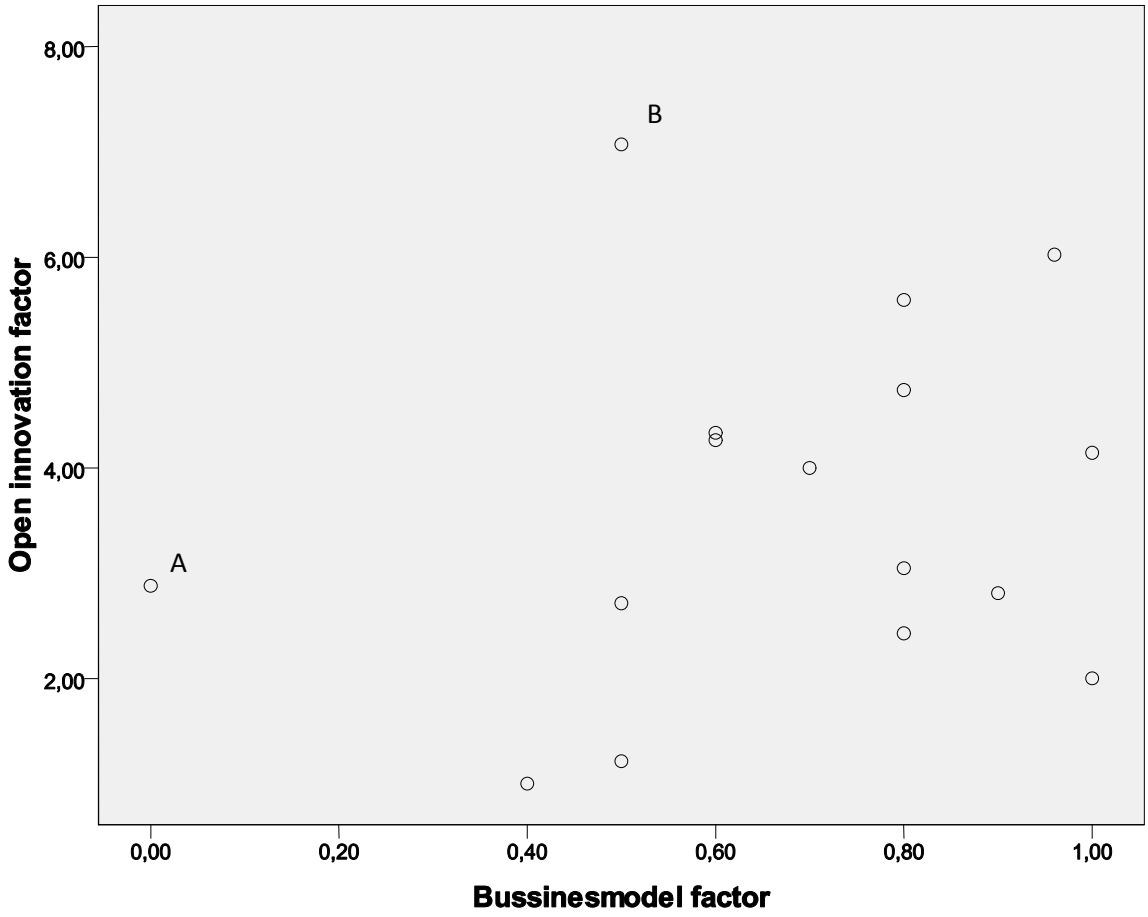


Figure 8 - Scatter plot of Open Innovation (low=closed, high=open) vs Publisher(0)/Service(1,00) factor

There are 2 clear outliers in the scatter plot that are marked A and B. Both data points are checked to see if these results can be rejected. B is a design agency that also develops parts of their content management system (CMS). It is not a direct software developer but more a company that improves their (software) tools to improve their design. The business model factor and the open innovation factor are not directly useful outside the ICT sector. The design agency is therefore rejected as a valid data point. Data point A is a one-man business. One man businesses were excluded because there was too little innovation in the company itself. If a one man business has multiple employers at that time it becomes difficult to correctly determine business models and innovation strategies. Data point A is therefore also rejected as a valid response.

Judging from the scatterplot there seems to be a tendency towards a more open strategy if there is a service focus of the organization. The ideal results would show a (cor)relation between the two factors and a positive trend. A linear regression analysis shows that the business model coefficient is significant. It has a positive trend with a coefficient of 0.492. These results and a plot are shown in Figure 9 and Table 7.

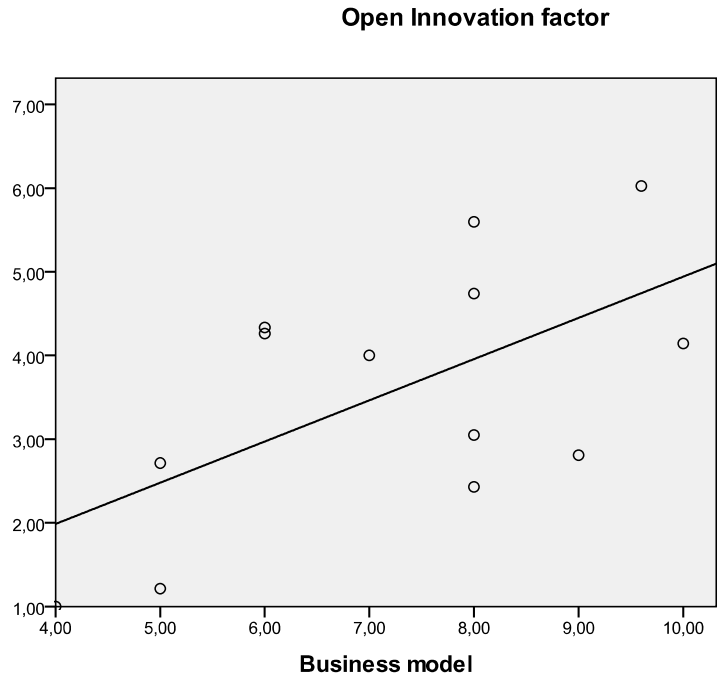


Figure 9 - The linear regression model without the outliers A and B

	Coefficients	Std. Error	Significance	R	R^2
(Constant)	,017	1,455	,991	,604	,365
Business model	,492	,196	,029		

Table 7 - linear model for Bussines model and open innovation

An R squared of 0.365 means that 36.5% of the variance in the data is explained by the fitted model. Or: 36,5% of how open an company innovates is explained by their business model. For one independent variable this is a good score. This seems to indicate that there is indeed a relation between the two factors and that open innovation is dependent on the business model focus.

To confirm this relation further another model is tested which includes both the size and age of an organization. This is done the confirm that the business model is indeed the variable that is responsible for how open is innovated in an organization and not the size or the age. A new model is fitted with all three variables included. The results are shown in Table 8.

	Coefficients	Std. Error	Significance	R	R^2
(Constant)	2,427	1,452	,121	0,277	0,077
Age of an organization	1,660	4,379	,711		
Size of an organization	,072	4,679	,988		
Business model	,099	,230	,674		

Table 8 - The model with two control variables included (size and age of an organization)

The parameters clearly show that both control variables are not significant and that the model explains less of the variance of the dependent variable: open innovation.

Concluding, the trend and the relation seem to correspond with the hypothesis that service focused organizations have a more open development process than organizations that are focused on publishing their

software. The sample size is too small (N=31) to make general statements about this hypothesis. But the trend is that this hypothesis is correct.

4.3 H2 – Publisher focus vs. open innovation

This hypothesis is the same as H1 but than in reverse order. Now the hypothesis is that companies with a publisher focus will have a more closed innovation strategy. The respondents that participated in this research seem to be more service focused than publisher focused in general (see Figure 8). This makes it difficult to make statements about this hypothesis.

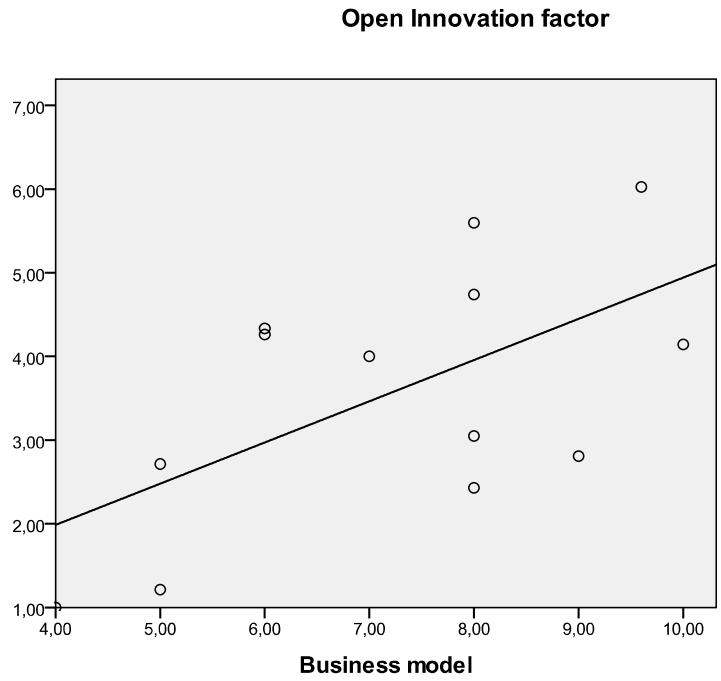


Figure 10 - Bussiness model vs Open innovation (H1 & H2)

The trend seems to be that software publishers focus more on closed innovation than their service focused competitors. This was shown in the previous paragraph. In Figure 10 is visible that the trend is linear. This means that both H1 and H2 are correct. Not only do more service focused companies have a higher degree of open innovation, but publisher focused companies *do* have a lower degree of open innovation. Or: publishers have a more closed development strategy. This is probably due to that their most important asset is their source code. They therefore employ a development strategy that is focused on protecting knowledge and internally developed technologies.

But there is another trend that seems apparent. More and more developers seem to embrace service focused business models. Trends such as SaaS (Software as a Service) and cloud computing (all data and applications are stored on the internet) also seem to add to this trend. This might be a reason for the low response in the publisher population. The population of only software developers without service/consultancy components is shrinking or almost none existent.

This trend is supported by the interviews that where held especially with Mitopics. In this interview the trend towards more service focused business models became very clear. The experience of the user is the most important for most developers. The only way to completely guarantee this experience is by taking over all support, maintenance, installation and hardware related activities that are normally performed in-house. This means not only developing the software but also servicing all other activities for a consumer. This trend became visible in the publisher-service factor.

4.4 H3 – Specialization vs. open innovation

This hypothesis is focused on the question if companies who develop specialized products will have a smaller degree of open innovation. First, the specialization factor is introduced and discussed. The open innovation factor is already discussed in '4.2.2 Open innovation factor' and will also be used to test this hypothesis. Next, the relation and correlation between the specialization factor and the open innovation factor is discussed. This will give a conclusion if this hypothesis was correct.

4.4.1 Specialization factor

The specialization factor is composed of rating all relevant web survey questions between zero and one (For an overview of all relevant questions see Appendix: B.3.1 Which questions were used to calculate what factors). Question 12 is rated somewhat differently for this factor (see B.1 Web Survey). Respondents can answer that their product differentiates because it is developed for a (small) specific group of users/customers. If respondents give this answer than they are awarded with one extra point for the specialization factor. The mean determines the actual value of this factor.

When the factor is divided in percentages of the frequency the next graph is created.

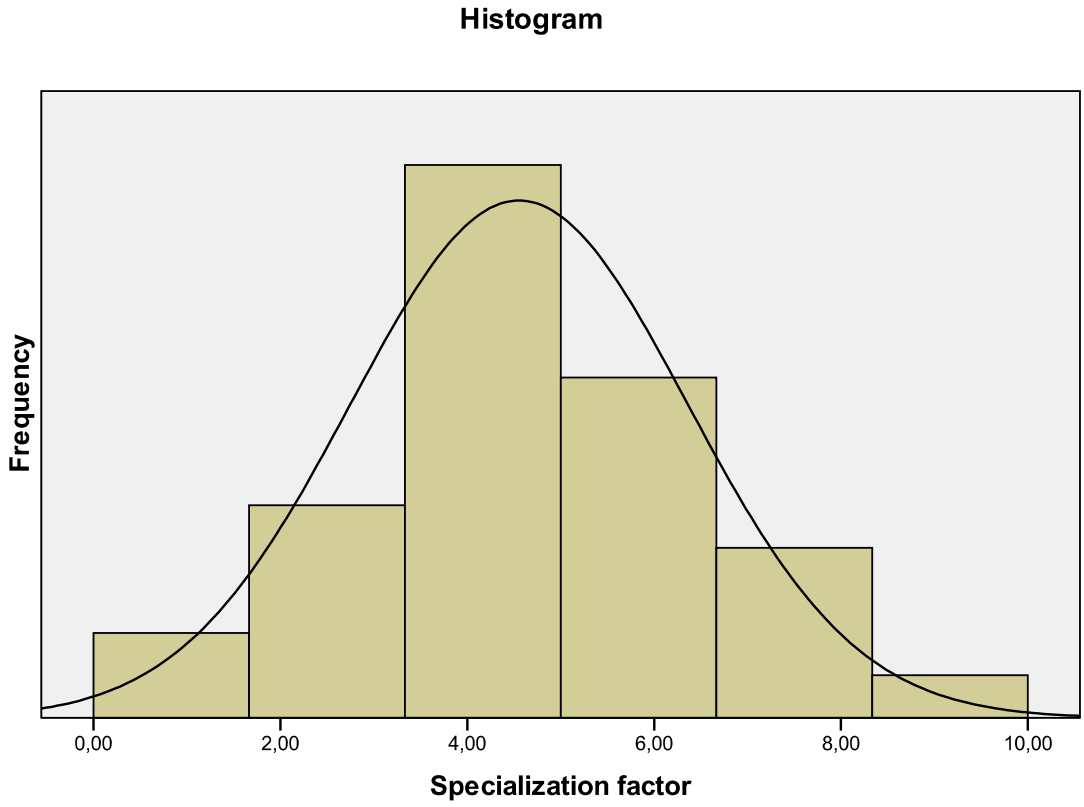


Figure 11 - The specialization factor, 10 means very specialized products, zero means general products

There is a clear normal distribution with a mean of 4.68 and a standard deviation of almost 2 (1,994). Most respondents seem to be organizations that do focus on some sectors and/or businesses but not very specifically. There are also a few general software developers and a few highly specialized software developers.

It is possible that this factor is biased for custom developers. Custom developers always develop for only one client. This could give the impression/result that all custom developers are highly specialized developers. To check this bias question 9 is used. For this question four answers are possible:

- Only custom software
- Mostly custom software
- Mostly general software

- Only general software

If the specialization factor is cross referenced for the custom developers with the general developers a surprising result is obtained.

Tests		Means	Significance (p)
Kolmogorov-Smirnov Z (D)	0,535		0,937
Wilcoxon W	333		0,531
T test (means)	*Custom developers*	3,25	0,301
	General developers	4,28	

Table 9 - the specialization factor for general and custom software developers

On average, the custom developers actually score lower for specialization. The first two test do not assume any distribution and the third test (the t-test) assumes a normal distribution. All three tests confirm that there is no a significant reason to assume that the two groups of developers score differently for specialization.

This means that the specialization factor results do not seem biased towards custom developers. Both categories of developers have (non)specialized developers which is good for the usefulness of this factor.

4.4.2 Relation between specialization and open innovation

In this paragraph the specialization factor is referenced against the open innovation factor. Or: how open or closed does an organization innovate if they are highly specialized? First the correlation is calculated between the two factors with the Open innovation factor as the dependent factor. The results are shown in Table 10.

Linear model	*B*	*t*	*Significance*	*Correlation*	*R squared*
Specialization factor	,064	,394	,697	,073	,005
(Constant)	3,456	4,049	,000		

Table 10 – Linear correlation between Open innovation (dependent) and Specialization (Independent)

A correlation factor of 0.073 means that there is almost no correlation between the two factors with a linear regression analysis. A coefficient of 0.064 means that a change in specialization only has a small impact on how open a company innovate. This is confirmed by the R squared factor. The R^2 shows that the linear model only is able to predict 0.5% of the variance of the dependent variable (open innovation factor). A scatter plot of both factors shows these results graphically.

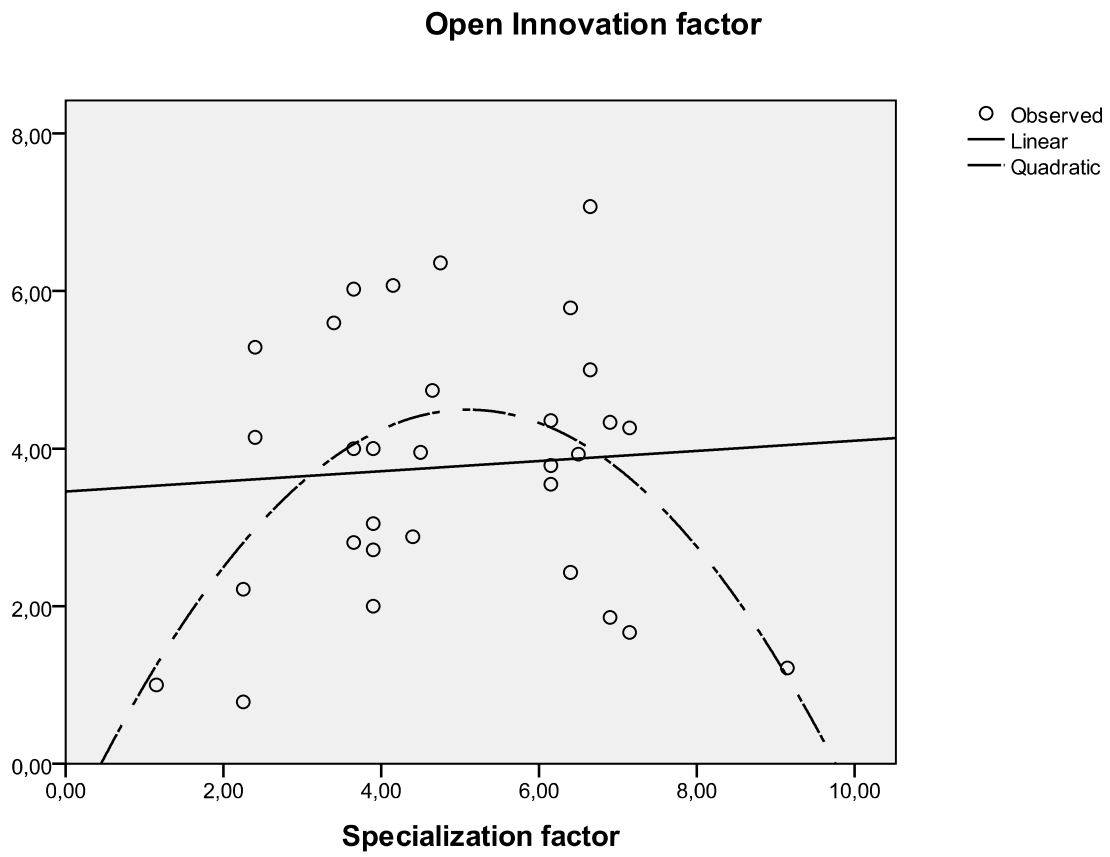


Figure 12 - Scatter plot of Specialization vs. Open Innovation with a linear and quadratic regression model

The graph clearly shows that there is not a linear trend in the observations. But it looks like the observations are in the shape of a parabola, with high scores in the middle and lower scores on both sides. A quadratic regression analysis confirms that this model is more suited for these observations than a linear model. The results for a quadratic model are shown in Table 11.

Quadratic model	*B*	*t*	*Significance*	*Correlation*	*R squared*
Specialization factor	2,116	3,055	,005		
Specialization factor ^ 2	-,207	-3,029	,005	,501	,251
(Constant)	-,907	-,558	,581		

Table 11 - Correlation coefficient of a quadratic regression model with Specialization and Open Innovation

The better correlation factor (0.501) means that not highly specialized developers or completely general developers innovate in an open way. Companies that do specialize but also keep a focus on general consumers tend to have a more open development process of (new) products. 25% of the open innovation variance is explained by this model which is a good score for just one variable.

This is also shown in the significance of the specialization factor to determine the open innovation score. The function of the quadratic model, wherein 'spec' is the specialization factor, now looks like this:

*Open Innovation = -0.907 + 2.116 *Spec – 0.207*Spec^2*

This relation is also checked with help of the two control variables: age and size of the organization. It is not possible to use the same method as in "4.2.3 Relation between publisher/service focus and open innovation", because this relation seems to be a quadratic trend. To still test if this connection isn't dependent on the size and age of a company a factor analysis is calculated with three variables: age, size and specialization.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		,504
Bartlett's Test of Sphericity	Sig.	,681

Table 12 - Factoranalysis results

A factor analysis tests if the variables are not explained by another (hidden) variable. In practice this means that the variables are tested if they can be associated with each other. The KMO factor (Kaiser-Meyer-Olkin measure of sampling adequacy) in Table 12 is almost 0,5 what means that it is indecisive if the factors can be associated. Luckily there is another way to test the null hypothesis that the variables are unrelated and that is via Bartletts test of sphericity. This test gives an insignificant result which means that the variables are unrelated. For this hypothesis this is important because now is clear that the age and size are not the determining factors for open innovation but the specialization factor is.

There are too little observations to draw more general conclusions but this trend seems to contradict the stated hypothesis somewhat. The hypothesis stated that: "*A more specialized business model will have a smaller degree of open innovation"*. But the data seems to point in the direction that very specialized *and* very general developers have a more closed innovation strategy than their counterparts.

An explanation could be that to really have an open innovation strategy a company must be ready to grab every opportunity to improve products and sell new or existing ideas to new markets. This means keeping a broad focus that encompasses both specialized products and general products. So only companies that try to broaden their resources and knowledge in all directions instead of only focusing on their core competence will have an open innovation strategy and/or platform.

Another explanation can be that companies without any specialization don't have any unique selling points. This means that their products easily can be imitated because most knowledge involved isn't unique. In a scenario like this it is more important to protect all knowledge than to share it with third party actors. So innovation strategies will have a lower degree of openness which is visible in the estimated model for this hypothesis.

4.5 H4 – Technology characteristics vs. open innovation

This paragraph centers on the hypothesis that more unique technologies will be protected by organizations with more closed innovation strategies. First the technology characteristic factor is discussed. Then this factor, together with the open innovation factor which is discussed earlier in this chapter, will be used to prove this hypothesis.

4.5.1 The technology characteristic factor

The technology characteristics factor aims at giving a score how novel or new to technologies and ideas are that are used for product development. To obtain this score all relevant questions (For an overview of all relevant questions see Appendix: B.3.1 Which questions were used to calculate what factors) from the web survey are scored between 0 and 1. By calculating a mean and multiplying by ten a total score is derived. The distribution of this score is shown in Figure 13.

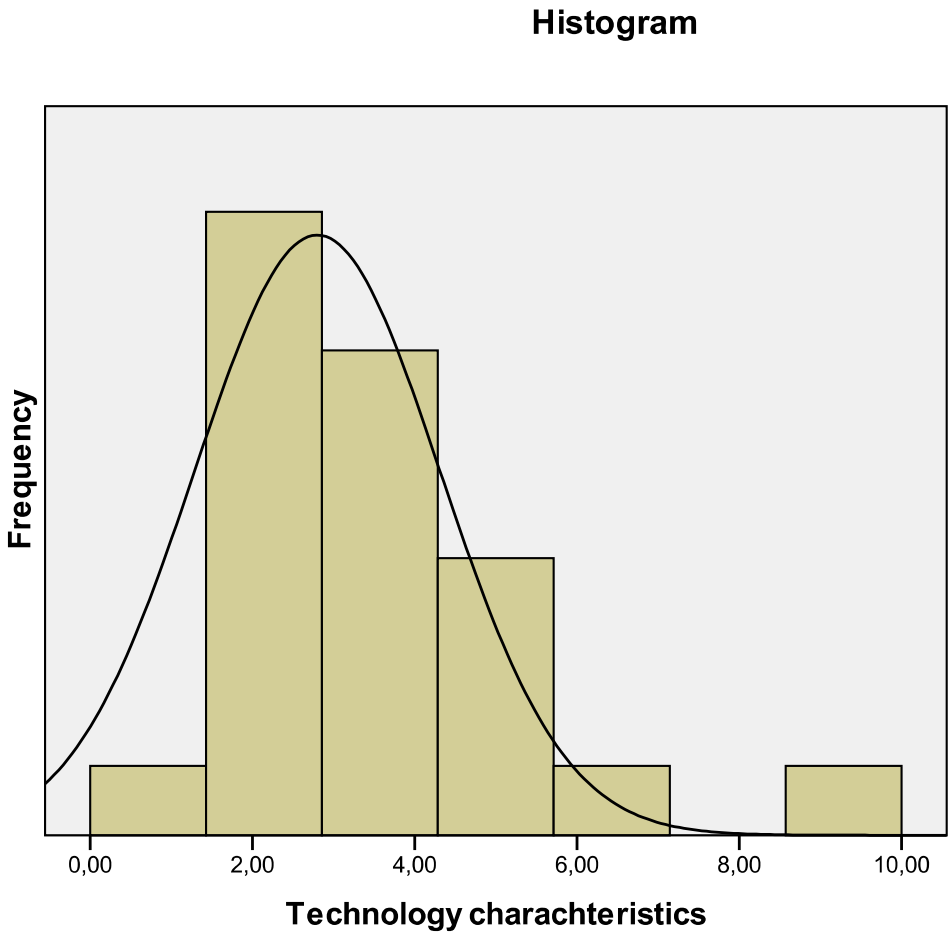


Figure 13 - Distribution of the technology characteristics score (0= general technologies, 10=unique technologies)

The histogram shows the factor where zero means that almost no unique technologies are used and developed and ten means very unique technologies are developed. It seems distributed normally with a mean of 3,41 and a standard deviation of 1.828. This means that on average the respondents worked with not so novel technologies.

There is also a respondent group that uses very novel techniques and knowledge. This respondent can be seen between the 8 and 10 marker in the above graph. This is a clear outlier and is checked if it should be included in further research. In this case the outlier is an office suite developer that uses new web technologies to produce its software. Respondents with such high scores can be technology startups that are created around a new technology or idea. Such high scoring respondents are useful to check if this hypothesis is correct. Because if that group has a lower open innovation score than there is a trend that corresponds with the stated 4th hypothesis.

4.5.2 Relation between technology characteristics and open innovation

In this paragraph the hypothesis is checked with the available data. Both the open innovation factor and the technology characteristics factor is used to check this. First a simple scatter plot with a linear regression model is created to see if there is any correlation between the two factors.

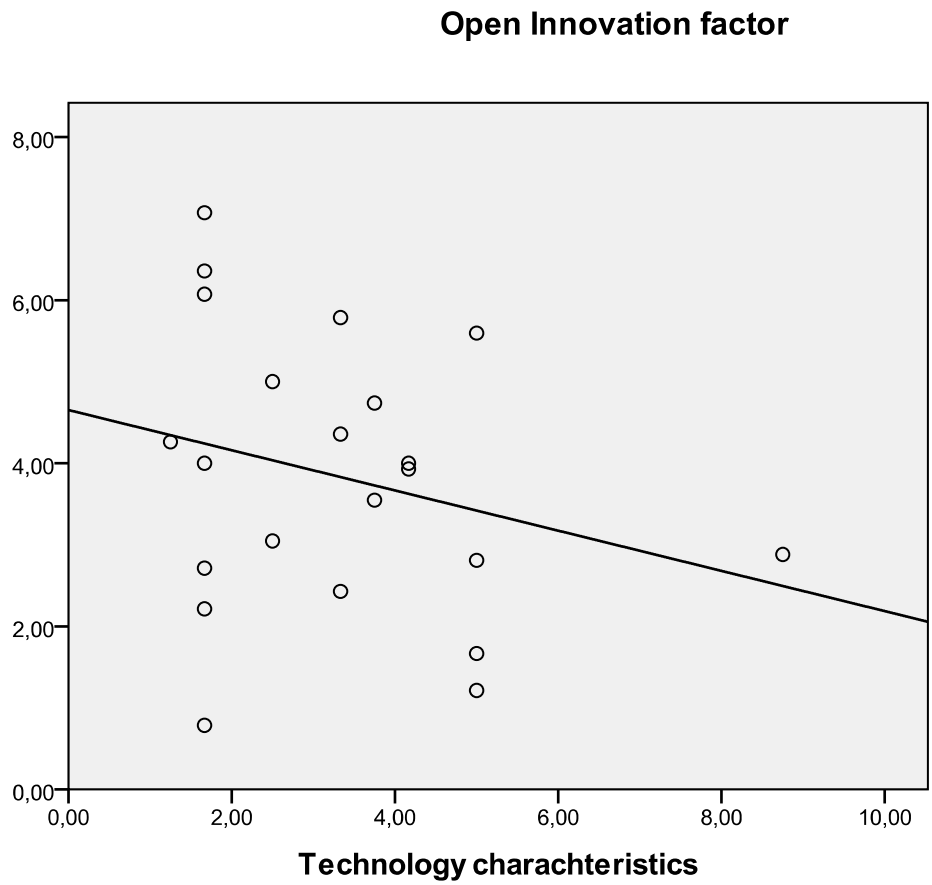


Figure 14 - Scatter plot and curve estimation of open innovation vs. technology characteristics

Linear model	*B*	*t*	*Significance*	*Correlation*	*R squared*
Technology charactheristics	-,191	-,686	,502	,160	,025
(Constant)	4,321	4,596	,000		

Table 13 - A linear regression model for technology characteristics vs open innovation (N=32)

The correlation factor is 0.160 what means that there is not a lot of correlation or dependence between the two factors. The R squared confirms this finding because only 2.5% of the variance of open innovation can be explained by technology characteristics. This is also visible in the Figure 14. But the linear regression model does calculate a downward trend which corresponds with the stated hypothesis. If the two groups (low and high uniqueness) are compared on how they score at open innovation, a good result is obtained.

T test **Technology charachteristics**	**Open innovation mean**	**Mean difference**	**t**	**Significance (p)**
General technologies (Tech score < 5)	4,1365	1,3025	1,554	0,136
Unique technologies (Tech score > 5)	2,834			

Table 14 - Open innovation scores for two technology characteristics groups and their significance

Organizations that work with unique technologies have more closed innovation than organizations with more general technologies. This means that there is a downward trend in the relation between these two factors. The relation is not significantly proven but the trend seems to correspond with the hypothesized trend.

But if the relation is checked for interference with the age and size of an organization the conclusion that this relation is non-existent is confirmed.

	Coefficients	Std. Error	Significance	R	R^2
(Constant)	4,071	1,029	,001		
Age of an organization	,541	1,656	,748		
Size of an organization	1,777	,963	,082	0,545	0,297
Technology characteristics	-,237	,190	,229		

Table 15 - Linear regression model with added control variables age and size of an organization

Table 15 shows that the largest influence (that coefficient is the largest) comes from the size of an organization rather than how unique the information and technologies are. The size of an organization is even significant at an interval of 90% and this model explains much more (29,7% instead of 2,5%) variance of the open innovation factor than the previous proposed model. This means that this hypothesis can be rejected even though the direction of the trend seems to match the hypothesis.

4.6 H5 – Technology characteristics vs. publisher focus

This paragraph tests the hypothesis that more unique technologies will have a publisher focused model. The two factors are already presented in previous paragraphs so this paragraph will only discuss the relation between the two factors.

4.6.1 Relation between technology characteristics and publisher focus

First a scatter plot with a regression curve is calculated. This graph is shown in Figure 15.

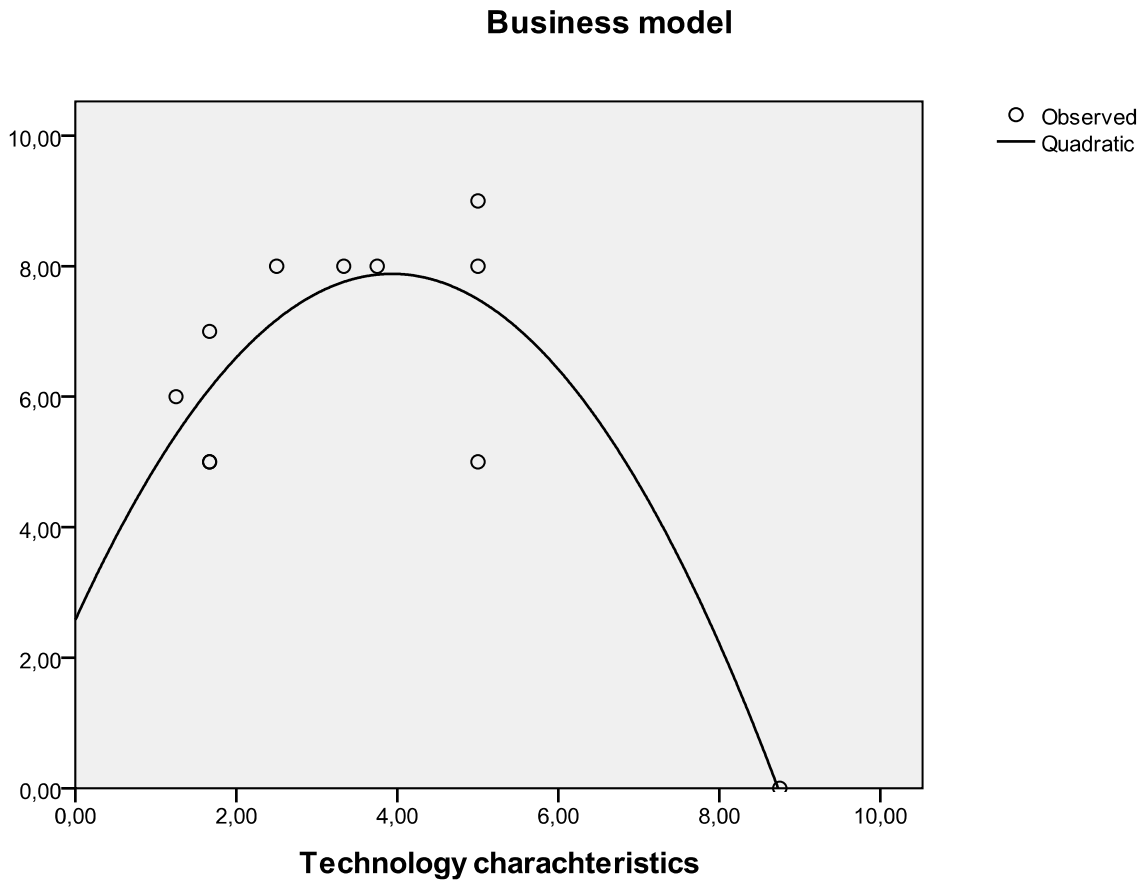


Figure 15 - Scatter plot with quadratic regression model of business model vs. technology characteristics

Again, there are not many observations but a clear trend seems to be visible. A quadratic regression model gives a coefficient of determination of 0.795 and has significant coefficients (see Table 16). The model even produces an explained variance of 79.5% which is extremely high for one independent variable!

Quadratic model	*B*	*t*	*Significance*	*Correlation*	*R squared*
Technology charachteristics	2,696	3,898	,005	,892	,795
Technology charachteristics ^ 2	-,343	-4,804	,001		
(Constant)	2,581	1,874	,098		

Table 16 - Quadratic model for business model vs. technology characteristics results

This result means that general and very unique technologies are used in combination with publisher focused business models. Organization that have a mix of unique and general technologies tend to have a higher service focus.

This is not corresponding with the hypothesis that stated that organizations with more unique technologies will have a publisher focus. Unique technologies tend to correspond with a publisher focus, but very general technologies also seem to have a publisher focus. An explanation can be that developers that use very common technologies are often small firms that develop a small product with common technologies and knowledge. For instance, there are many PDF readers (portable document format) from firms that use common and generally available knowledge. But they don't focus on service component but rather on low costs (cheap technology and development) and low turnovers (only publishing small products).

This is again checked with a control variable: the size of a firm. The clear outlier with the highest Technology score is removed this time to produce results less influenced by this respondent. A new control model is fitted trough the data which gives confirming results (see Table 17). The technology characteristics factor is still significant but the size of an organization is not significant. Also: the new model even explains less of the variance of the business model factor.

Control Model	*B*	*t*	*Significance*	*Correlation*	*R squared*
Constant	10,010	5,402	,001		
Size of Organization	-6,701	-1,462	,182	,611	,373
Technology characteristics	-,776	-2,132	,066		

Table 17 - The control model with a control variable added: the size of an organization

The size of a firm is therefore not a determing in factor in chosing a business model but a unique or common technology does determine a business model strategy. So there is definitely a relation between the technology characteristics and the chosen business model but the trend and direction of the relation seem to be somewhat more complex than the 5th hypothesis stated.

4.7 Total model

This paragraph describes the total conceptual model which is acquired by testing all hypotheses statistically. The most surprising result is that unique technologies do not determine the degree of open innovation but rather determine the chosen business model focus. This is confirmed when a factor analysis is calculated with all factors. The results are shown in Table 18.

	Component		
	1	2	3
Open Innovation factor	,485	,066	-,596
Specialization factor	,179	-,081	,586
Business model	-,044	,956	-,151
Technology charachteristics	-,590	-,725	-,065
Size of Organization	,909	-,125	-,037
Age of Organization	,866	,188	,041

Table 18 - Factor analysis for with all factors including the control variables

The table shows that there are 3 components calculated. All values are correlation factors between the variable and the new calculate component.

The first component (first column) correlates highly with both the size and age of an organization (high positive and negative result which both indicate a strong correlation). This seems to suggest that the age and size of a firm a closely linked. This is no surprise because there is more evidence that older firms are larger on average in the software industry (Mishra, 2004).

The second component (second column) correlates highly with both the technology characteristics and the business model factor (dark black numbers). This result means that there is a component (or new variable) that explains both variables. Or: technology characteristics and the business model factor are highly associated with each other.

	Component	Significance (Bartlett)
	1	
Technology charachteristics	,852	,162
Business model	-,852	

Table 19 - Factor analysis of only technology characteristics and business model focus

When both associated variables are entered in a factor analysis the results are almost significant (p = 0,162). The results definitely indicate that technology characteristics determine the business model focus which determines the degree of openness of the innovation strategy. The results are not quite significant because the number of observations are low which is a big factor in determining the significance.

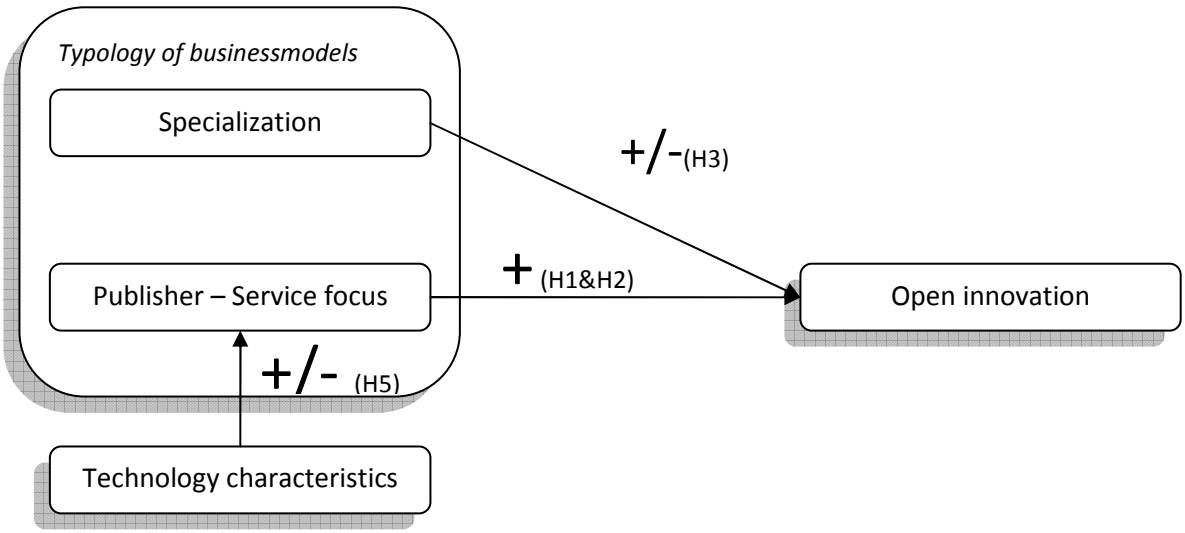


Figure 16 – A new conceptual model

This statistical information is applied to the proposed conceptual model in "3.1 Research design". The new model is presented in Figure 16 – A new conceptual model. This model will be discussed further in the conclusions chapter but will first be checked more thoroughly in the next paragraph: interview results.

4.8 Interview results

This paragraph describes the relevant information that was obtained via interviews. It serves as a triangulation for the data acquired via the web survey as well as a more practical insight in (open) innovation strategies. All 5 hypotheses are briefly discussed and analyzed if they are consistent with the findings of the interviews.

4.8.1 Interview analysis

According to Mitopics and Senternovem there is a definite trend towards a more service based ICT sector (Mitopics, 2009; SenterNovem, 2010[1]). Clients buy problem solving ICT solutions with all services and support that come with it. The classic model of buying software and hardware and giving in-house support seems to decreasing rapidly. With this trend comes the consequence that the software or the source code is not the most valuable product anymore. Rather the tacit knowledge of how to support, implement and install a complex system has become more valuable.

This also seems to overlap with the 4th hypothesis (H4). The software isn't that unique anymore and is therefore not the differentiating feature. Companies use the software as the lure to make money on complementary products (Mitopics, 2009). The software developers can share knowledge of their software products to increase the customer value and therefore to increase the lure. This fact corresponds with the first and the second hypotheses (H1 & H2).

This fact is also true for custom software developers (Zicht, 2009). Custom developers aim at having good developer tools to create high quality custom build products. The innovation in IDE's (Integrated Development Environments) are therefore often open source (Zicht, 2009). This means that everyone (even competitors) can share that knowledge and contribute again. The real differentiating value is, again, in the skill and knowledge of the developers that build the custom software and web applications and not in the IDE itself. This is proof for the 4th hypothesis (H4).

On the other way around: more unique software technologies give more reason to sell the software itself (IBM, 2010). If there is more unique technology involved in a product then a company will have a bigger incentive to sell the software itself. This means that the business model focus of a company shifts to a publisher business model (H5).

KPN (KPN, 2009) stressed the fact that today all innovation has an open component. Because of complexity and risks all innovation is shared with partners and suppliers. Most telecom and ICT innovations are developed in consortiums or smaller cooperation deals. Every company in such a collaboration supplies and obtains knowledge via that created network. This means that completely closed innovation almost doesn't exist anymore. Complex innovation requires too many parts and risks to innovate completely alone. The scale does vary. Some innovation projects only need a dedicated supplier that helps in the innovation process, other projects involve a wide variety of technology contributors, suppliers and users. The RFID program of KPN is an example of the latter.

The third hypothesis (H3) is more difficult to prove. There seem to be so many types of specialization that it is difficult to relate specialized companies to a degree of open innovation. There is a big difference in innovation and open innovation strategies for highly specialized new technology startups and highly specialized large(r) companies (SenterNovem, 2010). It is very important therefore to distinguish between how different companies are specialized in different topics. Also factors such as size, sector and producttype are big determinants for how

[1] All references in this paragraph are from interviews, the full references can be found in Appendix: A.2 Interviews

a company shapes their innovation strategy (SenterNovem, 2010). This relation is therefore weaker and is more difficult to prove.

5. Conclusion

This chapter will answer the main research question. This question stated, that:

"*Is there a correlation between the openness of an innovation strategy and the types of used business models in the information and communication technology industry?*"

This question was divided in 5 hypotheses. These hypothesis were derived from literature and then tested quantitatively and qualitatively. All 5 hypotheses with their analysis summaries are shown graphically in Table 20.

#	Hypothesis	Expected positive or negative trend	Quantitative proof for direction of trend	Quantitative proof for relation	Qualitative proof
1	Service focus vs. open innovation	+	✓	✓	✓
2	Publisher focus vs. open innovation	-	✓	✓	✓
3	Specialization vs. open innovation	-	✗ / ✓	✓	✗
4	Technology characteristics vs. open innovation	-	✓	✗	✓
5	Technology characteristics vs. publisher focus	+	✗ / ✓	✓	✓

Table 20 - Analysis summary for all hypotheses

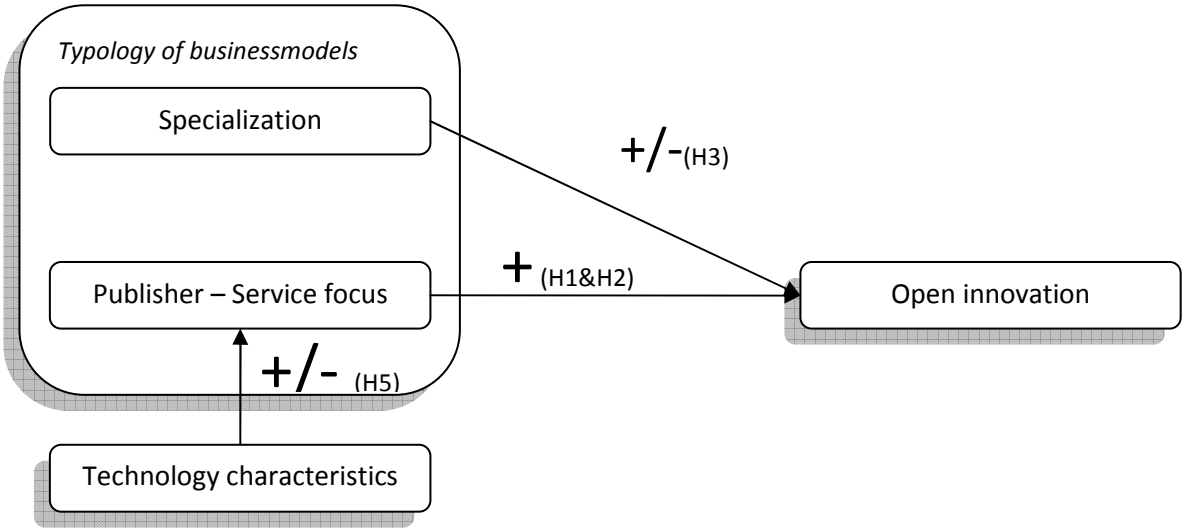
The first two hypothesis are correct according to both data analysis and the interviews. This means that the answer to the research question is: "Yes, there is a correlation between used business models and how 'open' the innovation strategy is performed". This is true for the difference between service focused and publisher focused business models.

Even the degree of specialization has a direct impact on the degree of open innovation. The direction of the trend however, is more complex than that the hypothesis stated and specialized software developers do not always have a closed innovation strategy. Some specialized developers are very open because they probably operate in a market where an open strategy is vital for survival. This means that the business model typology has a relation with open innovation but that relation is not always straightforward.

The 4th hypothesis has no direct relation with open innovation according to the survey data. This hypothesis is therefore rejected. But technology characteristics do have an indirect relation with open innovation. The 5th hypothesis is correct and seems to indicate that technology characteristics influence the chosen business model focus and through the business model how open is innovated.

In practice this means that if the software is not the unique technology anymore, business tend to shift to a more service focused business model. In this situation, developers sell complementary services rather than the software itself. The software itself can be opened up for external development or even opening up the source code.

The model now looks like this:



The 4th hypothesis is rejected which erases the relation between technology characteristics and open innovation. The other relations are valid although the direction of the trend is sometimes a little bit more complex than hypothesized.

Another interesting insight is that it seems that size and age of a firm do not affect how open is innovated. One could argue that older firms have more old competences and strategies and have therefore a lock-in disadvantage when adopting new strategies. Open innovation is a risky strategy that needs to be well executed for it to work. It has big advantages if it succeeds but the initial risks are high of sharing knowledge. This risk could be easier to cover for larger organizations but also the size does not seem to influence the proposed relations in any significant way. This makes the model and the conclusions stronger.

This conclusion agrees with business literature that states that a company first looks at their (new) product and uses product and technology information to create a business model. The product/technology information and the business model are than input for how the innovation strategy is chosen. This is even more true for the ICT sector. Technology in this sector has changed rapidly in the span of only a few years. This technology push is so radical that it drives software developers to new business and development strategies.

The impact on innovation management of this study is to broaden its perspective on how innovation management should coincide with the creation of business strategies. Sometimes innovation management is treated as a separate strategy in an organization that is created without much thought about current *business* strategies. There is more literature about current technological competences and their influence on innovation strategies than there is on how business models and innovation strategies influence each other. This study focused on the ICT sector and specifically open innovation. But more information from other sectors is required with a business model typology that is useable in a broader way. That way, more general conclusions can be drawn about how business models and innovation should interact with each other to create competitive advantages.

6. Discussion

In this chapter the results and the data will be discussed. First the theory is discussed. Next the methodical problems and shortcomings are presented. Then the data is discussed and finally a research agenda is presented with topics for further research and debate.

6.1 Theoretical

There are a few theoretical difficulties with this study. First there is the vague difference between open innovation and sorts of collaboration. Innovation almost never happens only in a lab or a R&D department. Suppliers, users and other actors are almost always involved in the development process (KPN, 2009[2]). This means that there is no real 'closed' innovation anymore. For this study it was difficult in interviews or in survey questions to make a clear distinguish between open innovation and collaboration while developing new products.

This is also due to Chesbroughs (2003) very wide definition of open innovation:
"the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively." Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology." (Chesbrough, 2003).
The definition clearly states that companies should use internal and external ideas for advancing their technology. But if a company collaborates with a supplier in the development process of new technology, is that immediately a form of open innovation? One can argue it is a form of open innovation because the company will learn and thus gains knowledge with this collaboration. But you can also argue that the company is not having an active role in finding external ideas and knowledge if the company is just collaborating with his supplier to overcome potential problems. This gives Chesbrough space to define almost every knowledge transaction a form of open innovation, but he does not specify the concept enough to be really useful for academic research.

Chesbrough tries to determine a new paradigm of open innovation. But he fails because he defines open innovation so broadly that every knowledge transaction can be a form of open innovation. This is a serious limitation of the theoretical framework of Chesbrough. A second shortcoming is the fact that Chesbrough seems to avoid quantitative research on the subject. Only theoretical frameworks and hypotheses are presented. But if there is indeed a new paradigm, empirical data is needed to prove the existence of such a paradigm. There does seem to be a trend towards open standards and open innovation strategies, especially in the ICT sector. But Chesbrough contributes very little by not proving this trend and only stating the obvious.

This study created a more precise definition by operationalizing the concept. But the difference was sometimes still difficult to grasp for respondents and interviewees.

The business model typology was very useful for this study but has two shortcomings. The first is that it is only useable for the ICT sector. The business model typology (especially the publisher/service axis) focuses on business model trends in the software developer sector. This limits the possibility to draw more general conclusions for other sectors. The other shortcoming is that it only tests two aspects of a business model. There are many variations on business models in all sectors. This study is performed with two very important business model characteristics (in the ICT sector): specialization and the service/publisher focus. But there are many more aspects such as: size of sector, size of average customer and selling methods (subscription based, licensing fees,

[2] Some references in this chapter are from interviews, they are written down as (company, year). The full references can be found in Appendix A.2 Interviews.

direct sale, etc). This study does not give a definite answer on what aspects of business models influence the innovation strategy. With the help of literature (April, 2007) two important characteristics are chosen which will give insight in the relation, but a larger study on business model aspects and their influence on other strategies such as innovation strategies will gain more insight on this.

6.2 Methodical

There were a few methodical problems while planning potential sources for respondents. The KvK sample for instance was filtered for all 1 man companies. But 2 man companies were still allowed in the sample. These companies sometimes are new technology based start ups, but sometimes they were just holdings for freelancers selling themselves and their partner to external companies. The problem is that there is no innovation in that company itself. And there was no way to check to whom they hired themselves. So this makes it difficult to interpret the data of those respondents.

The other methodical problem was the use of internet forums as a source of respondents. The problem is that every forum has its own very specific community. This could give biased results based on the particular community the forum was based on. To overcome this problem, only general internet/software developer forums were used. No specific open-source communities or other specialized communities were used to avoid biased results.

The last problem was the technology characteristics. The first versions of the web survey gave biased answers on the proposed questions of the operationalization. The questions and indicators were intrinsically good, but most respondents answered that their products had a lot of differentiating features. This gave marketing information intended for PR and sales instead of valid research data. The questions were altered a few times until there was asked for specific differentiating strategies. For instance: “Do you aim at the lowest costs?” or “Do you try to differentiate your product by offering compatibility with other products”. The answers to these questions gave better results and therefore more useable data for further analysis.

6.3 Data

Data collection and analysis went difficult due to a small number of respondents. There were 75 respondents. Almost half of those respondents filled in more than 95% of the survey. The other half answered between 10-95% of the survey. The problem is that that data is almost instantly unusable. There are a few statistical calculation methods to fill in gaps of data, but the problem is that any significant change in the analysis result would be a consequence of this calculation technique rather than the raw data. In other words: this data was only used to create an idea of some factors or the complete group of respondents rather than using it to correlate factors and drawing conclusions based on them.

Another problem of this small dataset is that it is not possible to draw general conclusions based on them. Only generic trends can be derived. To draw stronger, more general conclusions interviews were planned. These interviews had the function of supporting or disproving the data and the hypotheses. They gave more merit to any outcome the data would have and all conclusions that are drawn.

The last data problem are the interviews itself. Not all interviews were performed in the ICT sector and amongst developers. Those interviews were held with people in the telecommunication industry or the government and still gave good information about open innovation, and there is only a small chance that ICT developers would gave different information. The people from the ICT industry that were interviewed delivered the same information and similar trends as those from the telecommunications industry. It also gave a broader view of open innovation and how related sectors used open innovation with various products and technologies. So the information was good and useable for this study.

6.4 Research agenda

Further research is warranted in innovation ecosystems. A lot of innovations take place within ecosystems. This has consequences for how the innovation process is designed. Each actor should know its core competences and what role it fulfills in the ecosystem (IBM, 2010). Only then can a more open approach to innovation succeed. So more research could be performed on what roles are perfect for open innovation strategies and how those relations should look like. Maybe the research can be focused on different actors, such as: suppliers, users, universities and competitors.

User involvement in R&D is a valid research topic on its own. There is a lot of literature already on the subject (Adamian, 1994; Gales, 1995) but not in relation to open innovation. In ICT it is more and more common to release alpha and beta products (early releases) to have early user involvement. This guides development processes in the right direction and can detect potential problems early.

Both subjects focus on knowledge gathering and how it's used in the development process. Business models are also a relevant topic for further research. New models are created fast and it is difficult to predict who will be successful in such fast changing markets. But maybe there are more trends to learn that are even applicable outside the ICT and telecom sector. This research will have to focus on the application of new findings of open innovation and new business models outside the sectors where it emerged. Jarvis (2009) made a good start by searching for winning strategies in web 2.0 and applying them to services, public utilities and public welfare, but more lessons can be learned there.

The direction of causality is hard to determine. This study shows there is a relation between types of business models and the degree of open innovation but it does not show the direction of this causality. Was there first a product and strategy to improve the product and did those two influence the business model or was the innovation approach determined by the product and business model? To find this direction an organization needs to be tested during a period of time. In this period changes can be tested in business model typlology and innovation strategy. This will give insight in the direction this causality, and will help firms to understand how to approach new strategy making.

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A.2 Interviews

- 10-08-2009, Richard den Heijne Bak, Ruud Ramakers, Arne Smedema, Mitopics
  - Subject(s): Innovation in ICT sector, trends in the ICT sector, (open) innovation strategies in the ICT sector
- 18-9-2009, Gerard van Helden, Senior Developer, Zicht
  - Subjects: Open Source IDE's, open development techniques and rationales
- 09-11-2009, Jan Kroon, Business manager Strategy and Innovation , KPN
  - Subject(s): Open innovatie, waardenketens en samenwerkingsvormen
- 17-12-2009, Jan Kroon, Business manager Strategy and Innovation, KPN
  - Subject(s): Breakthroug innovations, innovationmanagement strategies at KPN, Innovation partners and collaborators with KPN
- 07-01-2010, Gerwin Woelders, Michiel van den Berg, Advisor(s) innovation and ICT, SenterNovem
  - Subject(s): Open innovatie in the ICT sector, Open innovation from a governments perspective, WBSO
- 08-01-2010, Rob F. van Dam, EMEA Telecommunications Leader, IBM Business Institute for Value
  - Subjects: Innovationecosystems, open innovation and collaobration

B. Appendices

B.1 Web Survey

Open Innovatie in de ICT sector

1. Innovatie in de ICT enquête

Deze enquête gaat over innovatie en de ontwikkeling van verbeterde of nieuwe diensten en producten. De bedoeling is om een beeld te krijgen van hoe ontwikkelstrategieën en businessmodellen succesvol kunnen samenhangen.

De enquête start met een aantal vragen over uw organisatie en uw belangrijkste product. Daarna wordt gevraagd naar hoe dit product ontwikkeld is en waar u zich op richt qua ontwikkeling. De enquête sluit af met een aantal vragen over businessmodellen.

Als in de enquête wordt verwezen naar de periode 2007-2008 dan wordt daarmee bedoeld vanaf begin 2007 tot einde 2008.

Als u interesse heeft in de resultaten van dit onderzoek om zodoende meer inzicht te krijgen in ontwikkeling en businessmodellen kunt u dat aangeven aan het einde van deze enquête.

Uiteraard worden alle gegevens vertrouwelijk behandeld en zal de verwerking ervan anoniem gebeuren.

1. Hoe bent u geïnformeerd over deze enquête?

- Via de Mitopics nieuwsbrief
- Via Gathering of Tweakers
- Via een contact bij Mitopics
- Via algemene e-mail

Anders, namelijk:

Deze vragen zijn bedoeld om meer inzicht te krijgen in uw organisatie.

2. Wat is de naam van uw bedrijf?

3. Wat is uw functie binnen het bedrijf?

4. In welk jaar is uw organisatie opgericht?

5. Bent u onderdeel van een grotere organisatie?

- Ja
- Nee

6. Hoeveel medewerkers heeft uw bedrijf (in FTE)?

- 5 of minder
- 6-10
- 11-25
- 26-50
- 51-100
- Meer dan 101

7. Hoe groot was de bruto omzet van uw bedrijf in 2008 bij benadering?

- Minder dan € 100.000
- € 100.000 - 500.000
- € 500.000 - 1.000.000
- € 1.000.000 - 5.000.000
- € 5.000.000 - € 10.000.000
- Meer dan € 10.000.000

* 8. Heeft u in de periode 2007-2008 zelf software ontwikkeld (of zelf code geschreven)?

- Ja
- Nee

*** 9. Heeft u in de periode 2007-2008 maatwerkproducten geleverd?**

- Alleen maatwerkproducten ontwikkeld
- Voornamelijk maatwerkproducten ontwikkeld
- Voornamelijk algemene software ontwikkeld
- Alleen algemene software ontwikkeld

4. Product Features

Om een beter beeld te krijgen van uw zelf ontwikkelde (software)product worden er nu een aantal vragen gesteld hierover.

10. Wat is de naam van het softwareproduct dat de meeste omzet genereerde voor uw bedrijf het afgelopen jaar (oftewel uw belangrijkste product)?

11. Wat is het huidige versienummer van dit softwareproduct?

12. Wat onderscheidt dit product van uw concurrenten? (meerdere antwoorden mogelijk)

- [ ] De lage prijs
- [ ] Compatibiliteit/Integratie met andere producten
- [ ] Makkelijke gebruikersinterface
- [ ] Specialisatie voor een bepaalde groep gebruikers

Anders, namelijk:

13. Wat is de hoofdfunctionaliteit/taak van uw softwareproduct?

14. Hoeveel directe concurrenten heeft u?

- ( ) 1
- ( ) 2
- ( ) 3

Meer, namelijk:

15. Kunt u enkele directe concurrenten noemen?

16. In welke sectoren (conform BIK indeling) verkoopt u uw producten en diensten? (meerdere antwoorden mogelijk)

- Landbouw en visserij
- Industrie
- Bouwnijverheid
- Groothandel
- Detailhandel
- Horeca
- Vervoer
- Financiën
- Adviesdiensten
- Zakelijk beheer

Anders, namelijk:

5. Maatwerk

Deze vragen gaan specifiek over het ontwikkelen van maatwerkoplossingen. De innovatie zit dan vaak in de gebruikte programmeertalen/ontwikkelplatformen en hoe een maatwerkproduct tot stand komt.

17. Wat voor soort maatwerkproducten produceert u (indien het een module of losse feature is geef dan aan met welke applicatie deze compatible is)?

- Meet & Regeltechniek
- ERP applicaties
- Voorraadbeheer applicaties
- Back office applicaties
- Sales applicaties
- CRM applicaties
- Front Office applicaties
- Webapplicaties

Anders, namelijk:

18. Wat is de meest gevraagde functionaliteit door klanten?

19. Hoeveel directe concurrenten heeft u?

- 1
- 2
- 3

Meer, namelijk:

20. Kunt u enkele directe concurrenten noemen?

21. In welke sectoren (conform BIK indeling) verkoopt u uw producten en diensten? (meerdere antwoorden mogelijk)

- Landbouw en visserij
- Industrie
- Bouwnijverheid
- Groothandel
- Detailhandel
- Horeca
- Vervoer
- Financiën
- Adviesdiensten
- Zakelijk beheer

Anders, namelijk:

Nu volgen een aantal vragen over **de manier van ontwikkeling** van maatwerkproducten. De manier van ontwikkelen wordt veelal bepaald door het IDE (Integrated Development Environment) en wordt hieronder aangeduid als ontwikkelplatform.

22. Welk type ontwikkelplatformen wordt gebruikt bij de ontwikkeling van maatwerkproducten?

- Open Source ontwikkelplatform
- Propriety ontwikkelplatform
- Beide

Namelijk:

23. Welke stelling is van toepassing op uw belangrijkste ontwikkelplatform in de periode 2007-2008 voor wat u zelf ontwikkeld/bijgedragen heeft? (meerdere antwoorden mogelijk)

- Onze organisatie heeft een nieuw ontwikkelplatform ontwikkeld
- Onze organisatie heeft een nieuwe ontwikkelmodule ontwikkeld
- Onze organisatie heeft de mogelijkheden van het ontwikkelplatform uitgebreid
- Onze organisatie heeft de bestaande eigenschappen van het ontwikkelplatform verbeterd
- Geen van allen

24. Wie heeft deze innovaties ontwikkeld?

- Voornamelijk uw bedrijf of andere bedrijven binnen uw concern
- Uw bedrijf samen met andere bedrijven of personen
- Voornamelijk andere bedrijven of personen

25. Hoe belangrijk waren de volgende informatiebronnen in de periode 2006-2008 voor de innovatie/ontwikkel activiteiten van uw bedrijf?

	1 Totaal niet belangrijk	2 Niet belangrijk	3 Neutraal	4 Belangrijk	5 Heel erg belangrijk
Eigen ontwikkeling/R&D					
Universiteiten					
Concurrenten					
Klanten/Gebruikers					
Leveranciers					
Conferenties					
Vakliteratuur					

6. Ontwikkeling & Innovatie

Er is steeds meer een trend waar te nemen waarin bedrijven samen met gebruikers, leveranciers en/of kennisinstellingen nieuwe producten ontwikkelen.

De volgende vragen gaan over de introductie van producten en/of diensten die sterk verbeterd zijn voor wat betreft de toepassingsmogelijkheden. Bijvoorbeeld nieuwe of verbeterde software, gebruikersvriendelijkheid, componenten, modules en/of subsystemen. Deze vragen gaan over uw belangrijkste zelf ontwikkelde product:

26. Welke stelling is van toepassing op uw belangrijkste zelfontwikkelde product in de periode 2007-2008? (meerdere antwoorden mogelijk)

- ☐ Het is een nieuw ontwikkeld product
- ☐ Er is een nieuwe module ontwikkeld
- ☐ De mogelijkheden van het product zijn uitgebreid
- ☐ De bestaande eigenschappen zijn verbeterd

27. Hoeveel bedroeg ongeveer, in % van uw totale omzet in 2008, het aandeel van elk van deze groepen:

In 2008 geïntroduceerde producten- of diensteninnovaties die **nieuw voor uw markt waren.**	
In 2008 geïntroduceerde producten- of diensteninnovaties die **nieuw voor uw bedrijf waren.**	
In 2008 verkochte producten- of diensten die **niet of nauwelijks veranderd zijn** (inclusief doorverkoop of diensten die van andere ondernemingen zijn ingekocht).	

28. Wie heeft deze innovaties ontwikkeld?

- ○ Voornamelijk uw bedrijf of andere bedrijven binnen uw concern
- ○ Uw bedrijf samen met andere bedrijven of instellingen
- ○ Voornamelijk andere bedrijven of instellingen

29. Hoe belangrijk waren de volgende informatiebronnen in de periode 2006-2008 voor de innovatie/ontwikkel activiteiten van uw bedrijf?

	1 Totaal niet belangrijk	2 Niet belangrijk	3 Neutraal	4 Belangrijk	5 Heel erg belangrijk
Eigen ontwikkeling/R&D	€	€	€	€	€
Universiteiten	€	€	€	€	€
Concurrenten	€	€	€	€	€
Klanten/Gebruikers	€	€	€	€	€
Leveranciers	€	€	€	€	€
Conferenties	€	€	€	€	€
Vakliteratuur	€	€	€	€	€

30. Wat is uw jaarlijks budget voor de ontwikkeling van nieuwe toepassingsmogelijkheden?

- € Minder dan € 10.000
- € € 10.000 - 25.000
- € € 25.000 - 50.000
- € € 50.000 - 75.000
- € € 75.000 - 100.000
- € € 100.00 – 200.000
- € Meer dan € 200.000

31. Hoeveel mensen (in FTE) zijn jaarlijks bezig met het ontwikkelen van nieuwe features voor uw softwarepakket? (zowel intern als extern)

- € Minder dan 1 FTE
- € 1 - 5 FTE
- € 66 - 10 FTE
- € 11 - 20 FTE
- € 21 - 50 FTE
- € 51 - 100 FTE
- € Meer dan 101 FTE

32. Wat is uw jaarlijks budget voor het testen van software?

- Minder dan € 10.000
- € 10.000 - 25.000
- € 25.000 - 50.000
- € 50.000 - 75.000
- € 75.000 - 100.000
- € 100.00 – 200.000
- Meer dan € 200.000

33. Hoeveel mensen (in FTE) zijn jaarlijks bezig met het testen van uw softwarepakket? (zowel intern als extern)

- Minder dan 1 FTE
- 1 - 5 FTE
- 66 - 10 FTE
- 11 - 20 FTE
- 21 - 50 FTE
- 51 - 100 FTE
- Meer dan 101 FTE

7. Business modellen

De volgende vragen gaan over uw business model. Welke activiteiten leveren omzet op voor uw organisatie en hoe specialistisch is uw doelgroep?

34. Hebben nieuw ontwikkelde producten, diensten of technologieën in de periode 2007-2008 geleid tot: (meerdere antwoorden mogelijk)

- ☐ Spin offs (Een nieuwe onderneming of business unit die de nieuw ontwikkelde technologie verkoopt in dezelfde of andere markt)
- ☐ Licentieverkoop (Licensering van 1 technologie of deelproduct aan een derde partij en dus niet uw gehele product!)
- ☐ Geen van allen

35. Heeft u in de periode 2007-2008 bestaande of nieuwe producten of diensten verkocht in voor uw bedrijf nieuwe markt(en) of doelgroep (en)?

- ○ Nee
- ○ Ja, 1 keer
- ○ Ja, 2 keer
- ○ Ja, meer dan 2 keer

36. Kunt u een omzetindicatie per product/dienst geven in het jaar 2008 in een percentage van uw totale omzet?

Omzet verkoop software	
Omzet diensten	
Omzet overig	

37. Kunt u een grove schatting maken van uw marktaandeel in procenten (%)?

- 0 - 10 %
- 11 - 20 %
- 21 - 30 %
- 31 - 40 %
- 41 - 50 %
- 51 - 60 %
- 61 - 70 %
- 71 - 80 %
- 81 - 90 %
- 91 - 100 %

38. Is uw softwareproduct breed inzetbaar of heeft het softwareproduct een specifiek probleemoplossend vermogen?

- Breed inzetbaar
- Specifiek probleemoplossend vermogen

39. Werd er in 2007-2008 bij de (verdere) ontwikkeling van uw product meer gefocust op de technische aspecten van de software of meer op de specifieke problemen van klanten en/of de sector?

- Technische aspecten van de software
- Specifieke problemen van klanten

Waar blijkt dit uit?

Open Innovatie in de ICT sector

8. Einde

Bedankt voor het invullen van de enquête!

40. Indien u interesse heeft in de resultaten naar aanleiding van deze enquete mag u hier uw e-mailadres achterlaten:

41. Als u nog op of aanmerkingen heeft op deze enquête kunt u die hier achterlaten!

B.2 Interview questionnaire

Interview vragen

Hoofdvraag / Doelvraag Interview:

- Hoe gaat uw organisatie met Open Innovatie om?

Vragen

- Kan u iets vertellen iets over uw werk en verantwoordelijkheden?
    - Welke afdeling?
    - Welke plek neemt u in uw totale organisatie?
    - Welke verantwoordelijkheden heeft u binnen de totale organisatie?
    - Welke verantwoordelijkheden heeft uzelf binnen de afdeling?
- Hoe wordt er vormgegeven aan een Innovatie strategie?
    - Bestaat er een gedocumenteerde Innovatie strategie?
        - Zo ja, hoe ziet dat eruit?
    - Welke rollen zijn vertegenwoordigd in de strategie?
        - Wie zijn verantwoordelijk voor welke onderdelen?
    - Waar komt de benodigde kennis en informatie vandaan?
        - Typen informatie:
            - Concurrenten
            - Trends
            - (Nieuwe) technologieën
            - Vraag/markt informatie
        - Waar komt deze informatie en kennis vandaan?
        - Is dit proces geformaliseerd?
            - Zo ja, wie is daar voor verantwoordelijk?
    - Output van innovatie strategie
            - Producten
            - Processen
            - Diensten
        - Waar wordt op gefocused? En hoe?
- Wat is volgens u open innovatie?
    - Wat is het (definitie)
    - Wat is ‘open’ aan uw innovatie proces?
    - Hoe kan je dit terugvinden in het bedrijf (is dit te zien voor buitenstaanders)?
    - Wat zijn positieve eigenschappen/consequenties van open innovatie?
        - Algemeen
        - Binnen uw organisatie
    - Wat zijn negatieve eigenschappen/consequenties van open innovatie?
        - Algemeen
        - Binnen uw organisatie
- Hoe werkt u samen met andere bedrijven?
    - Welke rol speelt kennis en kennisbescherming bij samenwerking?
        - Alliantie
        - Licenties
        - Joint Ventures
        - Patentendeling (pool)
    - Welke rol hebben deze bedrijven veelal?
        - Supplier

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        - Buyer
        - Research institute
        - Anders, nl:
- Business modellen
    - Hoe wordt er geld verdiend met nieuwe producten en diensten?
        - Producten zelf
        - Diensten
    - Verandert deze strategie afhankelijk van het product en/of markt?
        - Zo ja, hoe dan?
- Vragen over interview of mijn onderzoek?
- Bedankt voor interview

B.3 Websurvey codebook

Algemeen

- Vraag 4
  - Jaartallen
  - 2009-jaartal = leeftijd organisatie
- Vraag 5
  - Ja = 1
  - Nee = 0
- Vraag 6
  - Klassegemiddelden dus:
    - 3
    - 8
    - 18
    - 38
    - 75
    - 125
- Vraag 7
  - Klassegemiddelden
    - 50000
    - 300000
    - 750000
    - 3000000
    - 7500000
    - 15000000
- Vraag 8
  - Ja = 1
  - Nee = 0

Type software ontwikkeling

- Vraag 9
  - Alleen maatwerk = 1
  - Voornamelijk maatwerk = 1
  - Voornamelijk algemeen = 0
  - Alleen algemeen = 0

Product Features

- Vraag 12
  - Lage prijs = 1
  - Compatibiliteit = 1
  - Gebruikersinterface = 1
  - Specialisatie = 1
- Vraag 14
  - 1 = 1
  - 2 = 0,66
  - 3 = 0,33
  - Anders, namelijk: x = 1/X

- Vraag 16
    - Landbouw en visserij = 1
    - Industrie = 1
    - Bouwnijverheid = 1
    - Groothandel = 1
    - Detailhandel = 1
    - Horeca = 1
    - Vervoer = 1
    - Financiën = 1
    - Adviesdiensten = 1
    - Zakelijk beheer = 1
    - Anders, namelijk = …. (1)

Maatwerk

- Vraag 17
    - Meet & Regeltechniek = 1
    - ERP applicaties = 2
    - Voorraadbeheer applicaties = 3
    - Back office applicaties = 4
    - Sales applicaties = 5
    - CRM applicaties = 6
    - Front Office applicaties = 7
    - Webapplicaties = 8
    - Anders, namelijk: 9
- Vraag 19
    - 1
    - 0,66
    - 0,33
    - X = 1/X
- Vraag 21
    - Landbouw en visserij = 1
    - Industrie = 1
    - Bouwnijverheid = 1
    - Groothandel = 1
    - Detailhandel = 1
    - Horeca = 1
    - Vervoer = 1
    - Financiën = 1
    - Adviesdiensten = 1
    - Zakelijk beheer = 1
    - Anders, namelijk = …. (1)
- Vraag 22
    - Open Source ontwikkelplatform = 1
    - Propriety ontwikkelplatform = 0
    - Beide = 0,5
- Vraag 23
    - Onze organisatie heeft een nieuw ontwikkelplatform ontwikkeld = 4
    - Onze organisatie heeft een nieuwe ontwikkelmodule ontwikkeld = 3
    - Onze organisatie heeft de mogelijkheden van het ontwikkelplatform uitgebreid = 2

    - Onze organisatie heeft de bestaande eigenschappen van het ontwikkelplatform verbeterd = 1
    - Geen van allen = 0
- Vraag 24
    - Voornamelijk uw bedrijf of andere bedrijven binnen uw concern = 0
    - Uw bedrijf samen met andere bedrijven of personen = 0,5
    - Voornamelijk andere bedrijven of personen = 1
- Vraag 25
    - Eigen ontwikkeling/R&D (5-1)
    - Universiteiten (1-5)
    - Concurrenten (1-5)
    - Klanten/Gebruikers (1-5)
    - Leveranciers (1-5)
    - Conferenties (1-5)
    - Vakliteratuur (1-5)

Ontwikkeling & Innovatie

- Vraag 26
    - Het is een nieuw ontwikkeld product = 4
    - Er is een nieuwe module ontwikkeld = 3
    - De mogelijkheden van het product zijn uitgebreid = 2
    - De bestaande eigenschappen zijn verbeterd = 1
- Vraag 27
    - Nieuw voor uw markt = % * 1
    - Nieuw voor uw bedrijf = % * 0,5
    - Nauwelijks veranderd = % * 0
- Vraag 28
    - Voornamelijk uw bedrijf of andere bedrijven binnen uw concern = 0
    - Uw bedrijf samen met andere bedrijven of personen = 0,5
    - Voornamelijk andere bedrijven of personen = 1
- Vraag 29
    - Eigen ontwikkeling/R&D (5-1)
    - Universiteiten (1-5)
    - Concurrenten (1-5)
    - Klanten/Gebruikers (1-5)
    - Leveranciers (1-5)
    - Conferenties (1-5)
    - Vakliteratuur (1-5)
- Vraag 30
    - Klassengemiddelden, dus:
        - 5000 (0,1)
        - 17500
        - 37500
        - 62500
        - 87500
        - 150000
        - 250000 (1)
- Vraag 31
    - Klassengemiddelden, dus:
        - 1 (0,1)

        - 3
        - 8
        - 16
        - 36
        - 75
        - 150 (1)
- Vraag 32
    - Klassengemiddelden, dus:
        - 5000 (0,1)
        - 17500
        - 37500
        - 62500
        - 87500
        - 150000
        - 250000 (1)
- Vraag 33
    - Klassengemiddelden, dus:
        - 1 (0,1)
        - 3
        - 8
        - 16
        - 36
        - 75
        - 150 (1)

Business modellen

- Vraag 34
    - Spin offs (Een nieuwe onderneming of business unit die de nieuw ontwikkelde technologie verkoopt in dezelfde of andere markt) = 1 punt
    - Licentieverkoop (Licensering van 1 technologie of deelproduct aan een derde partij en dus niet uw gehele product!) = 1 punt
    - Geen van allen = 0
- Vraag 35
    - Nee = 0
    - Ja, 1 keer = 0,33
    - Ja, 2 keer = 0,66
    - Ja, meer dan 2 keer = 1
- Vraag 36
    - (((Omzet diensten + Omzet overig) - Omzet verkoop software) +1) /200
- Vraag 37
    - 0 - 10 % = 5/100
    - 11 - 20 % = 16/100
    - 21 - 30 % = 26/100
    - 31 - 40 % = 36/100
    - 41 - 50 % = 46/100
    - 51 - 60 % = 56/100
    - 61 - 70 % = 66/100
    - 71 - 80 % = 76/100
    - 81 - 90 % = 86/100
    - 91 - 100 % = 96
- Vraag 38

    - Breed inzetbaar = 0
    - Specifiek probleemoplossend vermogen = 1
- Vraag 39
    - Technische aspecten van de software = 1
    - Specifieke problemen van klanten = 0

B.3.1 Which questions were used to calculate what factors

Factor	**Questions**	**Scale of factor**
Open Innovation	22, 24, 25, 28, 29, 34, 35	1 - 10
Specialization	12, 16, 21, 37, 38	1 – 10
Business model	36, 37	1 – 10
Technology charachteristics	12, 19	1 – 10
Innovation	23, 26, 27, 30, 31, 32, 33	1 – 10
Control Variables		
Size of Organization	6, 7	
Age of Organization	4	

B.4 Overview of survey results

1. Hoe bent u geïnformeerd over deze enquête? Create Chart Download

	Response Percent	Response Count
Via de Mitopics nieuwsbrief	1.3%	1
Via Gathering of Tweakers	52.0%	39
Via een contact bij Mitopics	1.3%	1
Via algemene e-mail	45.3%	34
Show replies Anders, namelijk:		4
answered question		75
skipped question		3

5. Bent u onderdeel van een grotere organisatie? Create Chart Download

	Response Percent	Response Count
Ja	22.4%	11
Nee	77.6%	38
answered question		49
skipped question		29

6. Hoeveel medewerkers heeft uw bedrijf (in FTE)? Create Chart Download

	Response Percent	Response Count
5of minder	32.7%	16
6-10	4.1%	2
11-25	22.4%	11
26-50	12.2%	6
51-100	6.1%	3
Meer dan 101	22.4%	11
answered question		49
skipped question		29

7. Hoe groot was de bruto omzet van uw bedrijf in 2008 bij benadering?

Create Chart | Download

	Response Percent	Response Count
Minder dan € 100.000	11.1%	5
€ 100.000 - 500.000	24.4%	11
€ 500.000 - 1.000.000	6.7%	3
€ 1.000.000 - 5.000.000	**28.9%**	**13**
€ 5.000.000 - € 10.000.000	6.7%	3
Meer dan € 10.000.000	22.2%	10
answered question		45
skipped question		33

8. Heeft u in de periode 2007-2008 zelf software ontwikkeld (of zelf code geschreven)?

Create Chart | Download

	Response Percent	Response Count
Ja	**84.6%**	**44**
Nee	15.4%	8
answered question		52
skipped question		26

9. Heeft u in de periode 2007-2008 maatwerkproducten geleverd?

Create Chart | Download

	Response Percent	Response Count
Alleen maatwerkproducten ontwikkeld	29.5%	13
Voornamelijk maatwerkproducten ontwikkeld	**40.9%**	**18**
Voornamelijk algemene software ontwikkeld	20.5%	9
Alleen algemene software ontwikkeld	9.1%	4
answered question		44
skipped question		34

Product features:

12. Wat onderscheidt dit product van uw concurrenten? (meerdere antwoorden mogelijk)

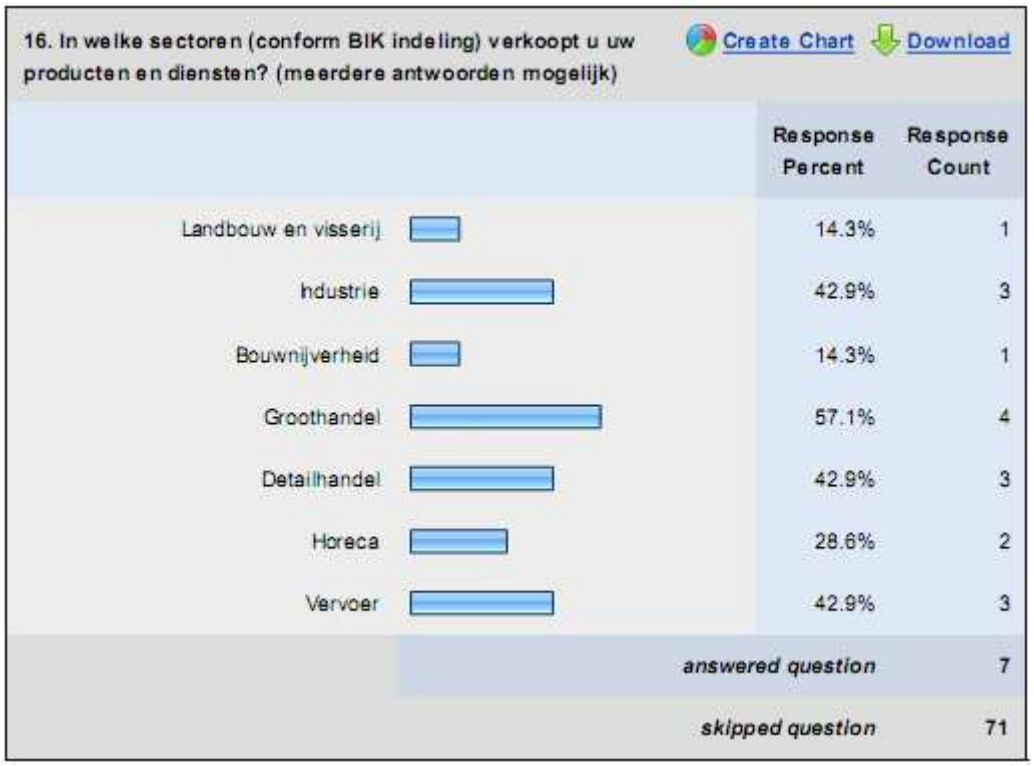
Create Chart | Download

	Response Percent	Response Count
De lage prijs	60.0%	6
Compatibiliteit/Integratie met andere producten	60.0%	6
Makkelijke gebruikersinterface	50.0%	5
Specialisatie voor een bepaalde groep gebruikers	**70.0%**	**7**
Show replies Anders, namelijk:		3
answered question		10
skipped question		68

14. Hoeveel directe concurrenten heeft u?

Create Chart | Download

	Response Percent	Response Count
1	20.0%	1
2	20.0%	1
3	**60.0%**	**3**
Show replies Meer, namelijk:		6
answered question		5
skipped question		73



16. In welke sectoren (conform BIK indeling) verkoopt u uw producten en diensten? (meerdere antwoorden mogelijk)

Create Chart | Download

	Response Percent	Response Count
Landbouw en visserij	14.3%	1
Industrie	42.9%	3
Bouwnijverheid	14.3%	1
Groothandel	57.1%	4
Detailhandel	42.9%	3
Horeca	28.6%	2
Vervoer	42.9%	3
answered question		7
skipped question		71

16. In welke sectoren (conform BIK indeling) verkoopt u uw producten en diensten? (meerdere antwoorden mogelijk)

Create Chart | Download

Financiën	57.1%	4
Adviesdiensten	42.9%	3
Zakelijk beheer	**71.4%**	**5**
Show replies Anders, namelijk:		4
answered question		7
skipped question		71

Maatwerk:

17. Wat voor soort maatwerkproducten produceert u (indien het een module of losse feature is geef dan aan met welke applicatie deze compatible is)?

Create Chart | Download

	Response Percent	Response Count
Meet & Regeltechniek	14.3%	3
ERP applicaties	9.5%	2
Voorraadbeheer applicaties	0.0%	0
Back office applicaties	14.3%	3
Sales applicaties	0.0%	0
CRM applicaties	0.0%	0
Front Office applicaties	0.0%	0
Webapplicaties	**61.9%**	**13**
Show replies Anders, namelijk:		2
answered question		21
skipped question		57

	Response Percent	Response Count
1	23.1%	3
2	23.1%	3
3	**53.8%**	**7**
Show replies Meer, namelijk:		8
answered question		13
skipped question		65

21. In welke sectoren (conform BIK indeling) verkoopt u uw producten en diensten? (meerdere antwoorden mogelijk)

Create Chart | Download

	Response Percent	Response Count
Landbouw en visserij	18.2%	4
Industrie	31.8%	7
Bouwnijverheid	13.6%	3
Groothandel	31.8%	7
Detailhandel	31.8%	7
Horeca	22.7%	5
Vervoer	27.3%	6
Financiën	**54.5%**	**12**
Adviesdiensten	31.8%	7
Zakelijk beheer	50.0%	11
Show replies Anders, namelijk:		3
answered question		22
skipped question		56

	Response Percent	Response Count
Open Source ontwikkelplatform	33.3%	7
Propriety ontwikkelplatform	23.8%	5
Beide	**42.9%**	**9**
Show replies Namelijk:		7
answered question		21
skipped question		57

23. Welke stelling is van toepassing op uw belangrijkste ontwikkelplatform in de periode 2007-2008 voor wat u zelf ontwikkeld/bijgedragen heeft? (meerdere antwoorden mogelijk)

Create Chart | Download

	Response Percent	Response Count
Onze organisatie heeft een nieuw ontwikkelplatform ontwikkeld	10.0%	2
Onze organisatie heeft een nieuwe ontwikkelmodule ontwikkeld	10.0%	2
Onze organisatie heeft de mogelijkheden van het ontwikkelplatform uitgebreid	20.0%	4
Onze organisatie heeft de bestaande eigenschappen van het ontwikkelplatform verbeterd	35.0%	7
Geen van allen	**50.0%**	**10**
	answered question	20
	skipped question	58

24. Wie heeft deze innovaties ontwikkeld?

Create Chart | Download

	Response Percent	Response Count
Voornamelijk uw bedrijf of andere bedrijven binnen uw concern	**55.0%**	**11**
Uw bedrijf samen met andere bedrijven of personen	15.0%	3
Voornamelijk andere bedrijven of personen	30.0%	6
	answered question	20
	skipped question	58

25. Hoe belangrijk waren de volgende informatiebronnen in de periode 2006-2008 voor de innovatie/ontwikkel activiteiten van uw bedrijf?

Create Chart

	1 Totaal niet belangrijk	2 Niet belangrijk	3 Neutraal	4 Belangrijk	5 Heel erg belangrijk
Eigen ontwikkeling/R&D	5.0% (1)	0.0% (0)	20.0% (4)	**45.0% (9)**	30.0% (6)
Universiteiten	20.0% (4)	**50.0% (10)**	20.0% (4)	10.0% (2)	0.0% (0)
Concurrenten	15.8% (3)	21.1% (4)	26.3% (5)	**36.8% (7)**	0.0% (0)
Klanten/Gebruikers	5.0% (1)	5.0% (1)	0.0% (0)	**45.0% (9)**	**45.0% (9)**
Leveranciers	15.0% (3)	20.0% (4)	**30.0% (6)**	20.0% (4)	15.0% (3)
Conferenties	20.0% (4)	**25.0% (5)**	15.0% (3)	**25.0% (5)**	15.0% (3)
Vakliteratuur	15.8% (3)	5.3% (1)	26.3% (5)	**36.8% (7)**	15.8% (3)
					answered question
					skipped question

Ontwikkeling en Innovatie:

26. Welke stelling is van toepassing op uw belangrijkste zelfontwikkelde product in de periode 2007-2008? (meerdere antwoorden mogelijk)

Create Chart Download

	Response Percent	Response Count
Het is een nieuw ontwikkeld product	**60.0%**	**6**
Er is een nieuwe module ontwikkeld	30.0%	3
De mogelijkheden van het product zijn uitgebreid	50.0%	5
De bestaande eigenschappen zijn verbeterd	40.0%	4
answered question		10
skipped question		68

27. Hoeveel bedroeg ongeveer, in % van uw totale omzet in 2008, het aandeel van elk van deze groepen: Download

	Response Percent	Response Count
Show replies In 2008 geïntroduceerde producten- of diensteninnovaties die nieuw voor uw markt waren.	100.0%	7
Show replies In 2008 geïntroduceerde producten- of diensteninnovaties die nieuw voor uw bedrijf waren.	100.0%	7
Show replies In 2008 verkochte producten- of diensten die niet of nauwelijks veranderd zijn (inclusief doorverkoop of diensten die van andere ondernemingen zijn ingekocht).	100.0%	7
answered question		7
skipped question		71

28. Wie heeft deze innovaties ontwikkeld? Create Chart Download

	Response Percent	Response Count
Voornamelijk uw bedrijf of andere bedrijven binnen uw concern	90.0%	9
Uw bedrijf samen met andere bedrijven of instellingen	10.0%	1
Voornamelijk andere bedrijven of instellingen	0.0%	0
answered question		10
skipped question		68

29. Hoe belangrijk waren de volgende informatiebronnen in de periode 2006-2008 voor de innovatie/ontwikkel activiteiten van uw bedrijf?					Create Chart
	1 Totaal niet belangrijk	2 Niet belangrijk	3 Neutraal	4 Belangrijk	5 Heel erg belangrijk
Eigen ontwikkeling/R&D	0.0% (0)	0.0% (0)	11.1% (1)	33.3% (3)	**55.6% (5)**
					answered question
					skipped question

29. Hoe belangrijk waren de volgende informatiebronnen in de periode 2006-2008 voor de innovatie/ontwikkel activiteiten van uw bedrijf?					Create Chart
Universiteiten	22.2% (2)	11.1% (1)	11.1% (1)	**44.4% (4)**	11.1% (1)
Concurrenten	0.0% (0)	11.1% (1)	**44.4% (4)**	33.3% (3)	11.1% (1)
Klanten/Gebruikers	0.0% (0)	0.0% (0)	0.0% (0)	33.3% (3)	**66.7% (6)**
Leveranciers	11.1% (1)	22.2% (2)	**33.3% (3)**	22.2% (2)	11.1% (1)
Conferenties	22.2% (2)	**44.4% (4)**	33.3% (3)	0.0% (0)	0.0% (0)
Vakliteratuur	11.1% (1)	0.0% (0)	**44.4% (4)**	**44.4% (4)**	0.0% (0)
					answered question
					skipped question

30. Wat is uw jaarlijks budget voor de ontwikkeling van nieuwe toepassingsmogelijkheden?

Create Chart | Download

	Response Percent	Response Count
Minder dan € 10.000	0.0%	0
€10.000 - 25.000	10.0%	1
€25.000 - 50.000	0.0%	0
€50.000 - 75.000	10.0%	1
€ 75.000 - 100.000	20.0%	2
€ 100.00 – 200.000	**30.0%**	**3**
Meer dan € 200.000	**30.0%**	**3**
	answered question	10
	skipped question	68

31. Hoeveel mensen (in FTE) zijn jaarlijks bezig met het ontwikkelen van nieuwe features voor uw softwarepakket? (zowel intern als extern)

Create Chart | Download

	Response Percent	Response Count
Minder dan 1 FTE	0.0%	0
	answered question	10
	skipped question	68

31. Hoeveel mensen (in FTE) zijn jaarlijks bezig met het ontwikkelen van nieuwe features voor uw softwarepakket? (zowel intern als extern)

Create Chart | Download

1 - 5 FTE	**50.0%**	**5**
66 - 10 FTE	20.0%	2
11 - 20 FTE	20.0%	2
21 - 50 FTE	10.0%	1
51 - 100 FTE	0.0%	0
Meer dan 101 FTE	0.0%	0
	answered question	10
	skipped question	68

32. Wat is uw jaarlijks budget voor het testen van software? Create Chart Download

	Response Percent	Response Count
Minder dan € 10.000	22.2%	2
€10.000 - 25.000	22.2%	2
€25.000 - 50.000	22.2%	2
€50.000 - 75.000	11.1%	1
€ 75.000 - 100.000	0.0%	0
€ 100.00 – 200.000	11.1%	1
Meer dan € 200.000	11.1%	1
answered question		9
skipped question		69

33. Hoeveel mensen (in FTE) zijn jaarlijks bezig met het testen van uw softwarepakket? (zowel intern als extern) Create Chart Download

	Response Percent	Response Count
Minder dan 1 FTE	20.0%	2
1 - 5 FTE	60.0%	6
66 - 10 FTE	10.0%	1
11 - 20 FTE	10.0%	1
answered question		10
skipped question		68

33. Hoeveel mensen (in FTE) zijn jaarlijks bezig met het testen van uw softwarepakket? (zowel intern als extern) Create Chart Download

21 - 50 FTE	0.0%	0
51 - 100 FTE	0.0%	0
Meer dan 101 FTE	0.0%	0
answered question		10
skipped question		68

Business Modellen:

34. Hebben nieuw ontwikkelde producten, diensten of technologieën in de periode 2007-2008 geleid tot: (meerdere antwoorden mogelijk)

Create Chart | Download

	Response Percent	Response Count
Spin offs (Een nieuwe onderneming of business unit die de nieuw ontwikkelde technologie verkoopt in dezelfde of andere markt)	31.0%	9
Licentieverkoop (Licensering van 1 technologie of deelproduct aan een derde partij en dus niet uw gehele product!)	37.9%	11
Geen van allen	**44.8%**	**13**
	answered question	29
	skipped question	49

35. Heeft u in de periode 2007-2008 bestaande of nieuwe producten of diensten verkocht in voor uw bedrijf nieuwe markt(en) of doelgroep(en)?

Create Chart | Download

	Response Percent	Response Count
Nee	26.7%	8
Ja, 1 keer	23.3%	7
Ja, 2 keer	13.3%	4
Ja, meer dan 2 keer	**36.7%**	**11**
	answered question	30
	skipped question	48

36. Kunt u een omzetindicatie per product/dienst geven in het jaar 2008 als percentage van uw totale omzet?

Download

answered question	17
skipped question	61

		Response Percent	Response Count
Show replies	Omzet verkoop software	100.0%	17
Show replies	Omzet diensten	100.0%	17
Show replies	Omzet overig	94.1%	16
	answered question		17
	skipped question		61

37. Kunt u een grove schatting maken van uw marktaandeel in procenten (%)?

Create Chart Download

	Response Percent	Response Count
0 - 10 %	59.3%	16
11 - 20 %	11.1%	3
21 - 30 %	7.4%	2
31 - 40 %	7.4%	2
41 - 50 %	7.4%	2
51 - 60 %	3.7%	1
61 - 70 %	0.0%	0
71 - 80 %	0.0%	0
81 - 90 %	3.7%	1
91 - 100 %	0.0%	0
answered question		27
skipped question		51

38. Is uw softwareproduct breed inzetbaar of heeft het softwareproduct een specifiek probleemoplossend vermogen?

Create Chart | Download

	Response Percent	Response Count
Breed inzetbaar	56.7%	17
Specifiek probleemoplossend vermogen	43.3%	13
answered question		30
skipped question		48

39. Werd er in 2007-2008 bij de (verdere) ontwikkeling van uw product meer gefocust op de technische aspecten van de software of meer op de specifieke problemen van klanten en/of de sector?

Create Chart | Download

answered question		29
skipped question		49

	Response Percent	Response Count
Technische aspecten van de software	34.5%	10
Specifieke problemen van klanten	65.5%	19
Show replies Waar blijkt dit uit?		15
answered question		29
skipped question		49