

MASTER

On the performance of Dutch design firms a survey study

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Award date:
2011

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Eindhoven, 28-11-2011

**On the performance of Dutch design firms:
a survey study**

By

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in partial fulfilment of the requirements for the degree of

**Master of Science
in Innovation Sciences**

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Summary

This study analyzes different aspects concerning the role of location in the Dutch design sector. It focuses on location decision motives, the use of intellectual property rights (IPR), and firm performance. The analyses are based on data gathered through a telephone survey among founders of Dutch design firms, conducted in the summer of 2011.

With respect to the location decision motives, this study shows that personal considerations like the presence of family, friends, and acquaintances, are of most importance in these decisions. Besides the fact that this aspect has been evaluated as most important by founders, additional data shows that over 40% of the firms are located at the same location the founder has studied. This study challenges the central argument of Florida (2002), who argued that creative workers would be attracted by the presence of cultural amenities and a tolerant atmosphere. It is found that cultural amenities do not play a big role. Furthermore, this study provides support for the view that clusters in this sector do not exist due to agglomeration economies, but rather due to the evolutionary mechanism of spin-offs (Klepper, 2002, 2005, 2007).

Whether firms use intellectual property rights as a means of protecting their designs shows to be mostly dependent on the specific sector the firm is operating in. Industrial design firms more often use IPR than web- and graphic design firms, which is explained by the fact that industrial designs are generally more complex and more expensive to develop than a website or a graphic design, and thus become more worth protecting.

This study finds multiple factors being significantly related to firm performance, with firm performance being defined as the net monthly income of the founder. The main finding is that firm performance is largely dependent on experience. This is supported by the finding that variables such as the age of the firm, the founder's entrepreneurial experience, and being a spin-off firm are all significantly and positively related to firm performance. Furthermore, collaboration also shows to have a positive effect on this performance. Moreover, location related factors such as localization- and urbanization economies do not show to be significantly related to firm performance, implying that cluster advantages do not play a central role in this sector.

Innovation as a measure of performance has also been analyzed. The results drastically differ from the outcomes using a monetary performance measure. Several remarks can be made. First, a new design also entails a substantial cultural and symbolic value, which makes it hard to express the value of a design purely in monetary terms. Second, in the case of the design sector, innovation is a difficult concept to measure, partly due to the fact that every design can be seen as an innovation.

The study concludes with several implications concerning the stimulation of collaboration, the attraction of design activity to particular locations, the enhancing of individual firm performance, and the extent to which theories and policy measures regarding the design sector can be generalized to the creative industry as a whole.

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1. Introduction

The creative industry and its economic relevance have increasingly been recognized in the Netherlands over the last decennium. The industry's economic value has been estimated to lie between 9,8 billion and 16,9 billion euro's, depending on the sector's definition. The industry herewith accounts for 1,6 to 2,8 percent of the Dutch economy (EL&I, 2011) (EZ & Dialogic, 2010). Current innovation policy regards the creative industry as being one of the nine industries with the most potential within the Netherlands (EL&I, 2011). Within the creative industry, the design sector has been rapidly growing in the last decennium. The number of people working in the field of design has grown with an average of 4,3 percent per year compared to the 3,4 percent in the total creative industry and the 1,8 percent in the complete Dutch economy (CBS, 2011).

The design sector is said to be characterized by several clusters (Premsele, 2011), although designers are spread across the whole country. Design firms can have multiple reasons to locate themselves at a certain location, which is illustrated by this nation-wide spread of firms. A recent popular view on locating behavior of people within the creative industry comes from Richard Florida (2002). He argues that creative workers are attracted by cultural amenities and a tolerant atmosphere, which consequently influences their choice to live at such a location. Following on this, creative workers will create economical activity within the creative industry at this chosen location. Thus instead of attracting firms that subsequently attract people, he states that the creative workers should be attracted which in turn results in the emergence of firms. This study aims to get an understanding of the locating behavior of design firms, of which this recent argument is one of the potential motives being analyzed. More specifically, three specific design sectors are studied here: web design, graphic design, and industrial design.

The design sector is highly competitive (Sunley, 2008), which makes it important for firms to extract as much value as possible from their creations. One way of ensuring the firm can exclusively exploit the design is by protecting it by means of intellectual property right (IPR). The combination of design and IPR is a relatively unstudied field, even though it can be a relevant one. This study will make a contribution by attempting to explain why some design firms use IPR and others do not with a particular focus on the potential role of location in these dynamics.

Third, next to analyzing the locating behavior of design firms and the use of IPR, this study will examine whether location influences design firm performance. There are many theories describing advantages of agglomeration economies, which are often said to be the reason for the existence of clusters. On the other hand, scholars within the evolutionary economics have identified a mechanism of evolutionary nature that would result in the emergence and retention of clusters, which is independent of agglomeration economies (Klepper, 2007). This study will attempt to explain design firm performance with a special focus on the influence of location.

Summarizing, the research questions being central in this study are:

(1) What determines the location decision of design firms in the Netherlands?

(2) What determines the use of IPR among Dutch design firms?

(3) What determines the performance of design firms in the Netherlands?

The report will be structured as follows. First in chapter 2, an introduction of the design sector will be given. Chapter 3, 4, and 5 will provide a theoretical background in combination with derived hypotheses on locating behavior, the use of IPR, and design firm performance respectively. Then, chapter 6 will describe the research design, the measurements, and the methods of analysis. Following, chapter 7 will describe the results and finally, chapter 8 will make some concluding remarks.

2. The design sector

In this research, the focus will lie on industrial design, graphics design, and web design. The latter can be defined as the way that content is delivered to an end-user through the World Wide Web. Graphics design can be defined as the process and art of combining text and graphics and communicating an effective message in the design of logos, graphics, brochures, newsletters, posters, signs, and any other type of visual communication. Industrial design is somewhat more complex to define. Ulrich and Pearson (1998) and Gemser and Leenders (2001) define industrial design as the activity that transforms a set of product requirements into a configuration of materials, elements and components that comprise an artefact. Industrial design is part of the wider process of product development, which also includes R&D, product testing, interface with manufacturing production systems and market research and marketing (Rusten & Bryson, 2007).

Although technology has to be developed for certain products to function or for websites to run, it is the design that is more sensational and visible to the consumer. It is the design that lets consumers distinguish between similar products that are made to fit with particular lifestyles and taste communities. Designers need to develop designs that fit with societal and cultural settings as well as meeting the needs and preferences of targeted customers (Farstad, 2003). To take the view of the targeted customers into the design process, it can be useful to acquire some experience of how a previous product has been received by the market. With this knowledge, designers may identify relevant modifications for revised designs. Besides this, designers show their client that they are also interested in the commercial feasibility of the client's product. They need to understand the needs and preferences not only of consumers but also of clients/producers. In addition, they need to understand the possible variations in needs and preferences between places (Rusten & Bryson, 2007). In general, designers have been described as practitioner researchers who operate as a bridge between ideas and practice, linking artistic, imaginative and creative elements with practical, realizable outcomes (Dodgson, Gann, & Salter, 2005).

2.1 Design strategies

Design is acknowledged to be an important part of the value chain of firms. It is then no surprise that design can be strategically used by firms in different ways. Ruston and Bryson (2007) define seven main design strategies. These strategies are all applicable to the field of industrial design, and many are applicable to the fields of web design and graphics design as well. First, there is the 'design product strategy'. In this strategy, a firm deliberately develops a design-informed and even design-rich product. In extreme cases it can be stated that the design is more important than the content of the product. One could think of designed perfume flasks, where it would also be possible to put the substance in a regular flask. In the field of graphics design one could think of a highly designed commercial that does not include much information, but is mainly aimed at drawing the attention of its audience. Second, firms can take a 'product-driven strategy'. One can find this strategy when a firm with a reputation for a designer product tries to expand its brand and reputation by applying its expertise to a new product range which is different from its existing products, but still has some relation to them. Third, the 'process-driven strategy' focuses on the process of creating the actual product, and it only applies to industrial design. In this strategy, a firm develops a designed product in such a way that it maximizes the

benefits of a sophisticated high-technology production system (e.g. designing car parts in such a way that they can be efficiently and economically produced by the production system at hand). Fourth, there is the 'fashion-driven strategy' in which firms developed design-rich products to be exclusive and available only in certain special locations. Fifth, there is a 'customer-driven strategy' in which the firm (almost) completely makes customized designs for the client. This is more common in web design and graphics design, since the client here is almost always an individual person or firm. In industrial design, products have to be more massively produced, which lowers the customizability. Nevertheless, these products can often be partly or completely customized for the client. Sixth, Ruston and Bryson (2007) identify the 'politically motivated design strategy'. Here, a firm designs, develops, or modifies a product taking into consideration certain government regulations. For example, nowadays it is common that products have to become environment-friendly. Therefore, firms often have to use different materials, or alter the design such that it becomes more efficient (perhaps less good-looking) and thus becomes more environment-friendly. This issue is mainly relevant for industrial designers. Nevertheless, governments sometimes put regulation on websites (e.g. search engines) and graphics designers might take into account the rising prices of certain materials due to government regulations. Seventh, and more common is the 'business identity motivated strategy'. Here, surface design is used to support a corporate identity by establishing a visually recognizable look. Perhaps the most famous recent example is Apple with its similar looks across different products.

2.2 Outsourcing design

Much of the design work is not being done in-house, but is outsourced (Vanchan & Macpherson, 2008). Several reasons underlie this phenomenon. First, young design specialists possessing both artistic and engineering talents rarely seek permanent jobs with manufacturing companies if they can help it (Kalafsky, 2006). It is likely partly due to the fact that being 'stuck' in one place hampers the possibility to express one's artistic self, but also due to the cyclical demand characteristics of certain markets like durable goods. This latter might differ in the case of graphic and web design, but a designer's desire to express himself seems plausible to play a role in all three sorts of design. Second, recourse to external specialists is typically a response to a combination of quality-related factors (Vanchan & Macpherson, 2008). These include the shortage of internal talent (Yasuda, 2005), the possibility that designers can offer new types of services that firms do not want to replicate in-house, and the fact that external specialists can sometimes operate and deliver faster (MacPherson, 1997). Moreover, even when firms do have in-house designers, they often let them work together with external designers in order to attract more 'fresh' views and new ideas. In addition, some of the in-house designers sometimes engage in external projects that are not in direct competition of the firm, such that these designers get inspiration and take new ideas back into their 'main' firm. Third, outsourcing can save costs since start-up expenses sometimes do not have to be funded internally (Vanchan & Macpherson, 2008). However, outsourcing design can also bear potential serious risks (Hoecht & Trott, 2006), because the client usually needs to transfer both tacit and codified knowledge. This knowledge is often a proprietary asset of the firm, which it wants to protect. Note that this is probably a more serious threat in industrial design than in graphic and web design, since these forms of design are less knowledge-intensive.

2.3 Explorative findings on the designer-client relation

2.3.1 Relational character of designer-client relationship

The study of Sunley et al. (2008) provides some exploratory insights into the relationship between designers and clients. When they asked designers what a good designer constitutes of, most of the respondents immediately mentioned the ability to understand the client. As Von Stamm (1998) states it is of little use being radically different if the new design does not fit the numerous requirements of the client or the market for which they are aiming. Furthermore, being in the race for a contract of a potential client is said to be highly relational. As said before, successful designs are based on a careful understanding of the client's wishes and expectations. The first impression is very important. This (significant) first impression is said to be made often in briefing meetings prior to specific projects. According to Hesmondhalgh (2007) the business strategies of design firms appear more similar to the targeted, recommendation-based approaches of knowledge intensive business services than to the 'shot-gun' strategies typically seen within directly consumer-oriented, cultural product industries. A branding and communications designer interviewed by Sunley et al. (2008) explained that new business largely came from referrals and clients recognizing the quality of their preceding work. Building up a portfolio and creating a good reputation are then key factors for designers.

2.3.2 Face-to-face communication

To get a good understanding of the needs of the client, face-to-face meetings are very important. These meetings are effective in communicating needs, expectations, and the identity of the client. Even though many firms extensively use electronic communication, face-to-face 'chemistry' meetings with clients are still crucial (Sunley, 2008). Therefore, being in an active and lively location is said to be favorable due to the small distances to your clients.

In industrial design it is especially essential to spend time at the production site, because this type of designer also needs to get information concerning certain technical details and practical experiences that can influence the design of the product. For example, even though one might think of something with high symbolic value, if the production facilities are not equipped with the proper resources (e.g. proper machines, labor capital), the design might not be feasible. More generally speaking, the more complex the design becomes, the more useful face-to-face meetings become due to high levels of tacit knowledge that has to be transferred. According to Rusten and Bryson (2007) face-to-face meetings are especially important in the early stages of the design process, since it is this stage that sets the basis for the rest of the project.

2.3.3 Long-term relationships

A common theme in the interviews performed by Sunley et al. (2008) was the desirability of building long-term relationships with clients. Some of the larger agencies they interviewed stated that 70 or 80% of their business derived from repeat contracts with their clients. In a way these agencies seek to turn weak-tie relationships into strong-tie relationships. These long-term relationships were said to be especially valuable in types of industrial design where the client technologies were highly specialized and complex. This is due to the fact that design contracts require a high initial investment of time, because the designer needs to get acquainted with the client's complex technology. These long-term

relationships are not only favorable for industrial design firms, but also for other types of designers, because more generally speaking, long-term relationships reduce the costs of gaining new business. In addition, long-term cooperative relations can create so-called 'relational rents' or long-term mutual commercial benefits (De Clercq & Sapienza, 2001) (i.e. not solely focusing on short term benefits which would be the case if a collaboration would be one-off). Note that many design firms also like to attract new business in order to keep their work stimulating and to keep in touch with consumer and business trends. This latter is often also attempted by means of brainstorming with different kinds of people.

It has to be noted that due to long-term relations, design firms may become stale, or at least they might be perceived in this way by clients and employees. This can lead to employee dissatisfaction regarding internal relationships and firm identity or sizes, which in turn often leads to the creation of spin-offs by these employees.

2.3.4 Finding a designer

Some empirical evidence from Norway (Rusten & Bryson, 2007) suggests that for finding a designer, firms often search in their local proximity. This has several reasons. First, this is desirable due to the practical reasons of cost and time. Second, some clients consider the fact that local designers have a better feeling for their business culture and design requirements than 'outsiders'. In these cases the top priority of a client is that the designer understands his needs, not that the designer is a top class designer.

2.4 Explorative findings on design industry dynamics

The explorative interviews performed by Sunley et al. (Sunley, 2008) suggested that for most design firms, intra-firm relationships were far more important than inter-firm relationships. It appeared that some larger and more specialized design firms were frequently involved in cross-firm projects, but this does not hold for most firms. In general, design firms have weak relations with their competitors. The relations that do exist are often related to subcontracting certain functions like printing or specialist 3D computer work, but real inter-agency collaboration is scarce. An argument brought forward is that inter-firm relations are highly competitive, because the ease of entry in the design sector is very high. This makes collaboration between firms disastrous. Unlike other sectors, the design sector thus shows little local operative synergy.

The relation between the design industry and location was very often discussed. Many interviewed firms mentioned benefits of inner city location in terms of access to urban facilities, shopping, cafe's, music, and cultural facilities. Suburban firms seemed to stress the benefits of transport connections while being at an inner city location, while actual inner city located firms stressed that the environment is more conducive to design-thinking, partly because designers were directly confronted with new consumer trends. The interviewees were located in the UK, and it was said that London was a networked place which created an environment in which all the creative talent and thinking was spread easily. Also, a London address would provide more credibility towards clients.

Frequently mentioned was the importance of local buzz. It is the idea that a certain milieu can be vibrant in the sense that there are lots of piquant and useful things going on simultaneously and therefore lots

of inspiration and information to receive for the perceptive local actors (Bathelt, 2004). Even though designers pretty much agreed on the fact that London was a vibrant place, there were some counter arguments. As one respondent put it: "the internet has been quite inspirational in terms of bringing some of those ideas onto your laptop. You know, you can print stuff off, you can view stuff from anywhere around the world . . . you can see a building that's just been built, you know, whereas before you had to wait for a book or a magazine to be published to view it.". Sunley et al. (2008) therefore suggest that "design inspiration is much more eclectic and diverse than simply highly localised cafe' society and art galleries. It includes all forms of widely available everyday experience, plus the importance of wider cultural absorption, such as through design literature and magazines, television and the Internet".

In the study of Sunley et al. (2008), some respondents had problems with relating their design activity to their location. A possible explanation is that location influences tacit knowledge, which is according to Ambrosini and Bowman (2001) either inarticulable or which might be imperfectly articulated but of which the respondents are not fully aware. This makes it more likely that the designers are more aware of direct effects on their projects, instead of more abstract concepts like Marshallian atmospheres. Although it is hard to extract these kinds of dynamics from respondents, the specific location was hardly mentioned as a source of a specific novel idea.

2.5 Intellectual property rights and design

Designers can protect their creations by means of intellectual property rights (IPR). Depending on the type of design, different types of intellectual property rights apply.

2.5.1 Industrial design

In the case of industrial design, designers can protect their designs by means of the 'industrial design right'. An industrial design right is an intellectual property right that protects the visual design of objects that are not purely utilitarian. An industrial design consists of the creation of a shape, configuration or composition of pattern or color, or combination of pattern and color in three dimensional form containing aesthetic value (BBIE, 2011). An industrial design can be a two- or three-dimensional pattern used to produce a product, industrial commodity or handicraft. The scope of protection conferred by a design right includes any design which does not produce a different overall impression on an informed user, taking the degree of freedom of the designer into consideration.

Designs may be protected if:

- they are 'novel', that is if no identical design has been made available to the public;
and if:
- they have 'individual character', that is the "informed user" would find it different from other designs which are available to the public. Where a design forms part of a more complex product, the novelty and individual character of the design are judged on the part of the design which is visible during normal use.

A design is not automatically protected in the Netherlands. You have to register the design. This can be done at the Benelux Office for Intellectual Property (Benelux Bureau voor Intellectueel Eigendom). Registering the design will give you an exclusive right for 5 years, and it can be renewed in blocks of five years up to a maximum of 25 years. The cost of registration of a regular model costs 108 euro's plus 10 euro's per added picture.

Table 1 shows the number of applications in the Netherlands from 2002 until 2006.

Table 1 Number of applications for design right (NL, 2011)

Number of applications for design right	
Year	Number of applications
2002	2764
2003	1595
2004	1261
2006	955

The drop in applications is mainly because of the so-called community designs. This type of protection entails design protection in all 27 members of the European Union. As this harmonized type of protection came into existence, the number of applications for Benelux protection dropped.

By means of the design right designers can exclusively exploit their designs, such that other firms or people cannot copy it and use it for their own gains. Owning a design right can also be a strategic tool since it can serve as an image-building tool for the firm and it can be licensed to other firms for economical gains.

2.5.2 Graphics design and web design

Designs of graphic designers are protected in mainly two ways. Their designs are protected by both copyrights and trademarks.

A copyright is defined as the exclusive right to control reproduction and commercial exploitation of your creative work. Copyright protects any kind of artwork, including illustrations, photographs and graphic design (Bureau, 2011). A website is also protected by the copyright law. Even complete websites can be copyrighted, but it is said that when being a professional web designer you should register your websites, since they are very sensitive to copying. This registering can also be done at 'copyright.co.nl'.

The copyright is a bundle of different exclusive rights. For designers, the relevant rights are the following. First, the copyright gives you the right to reproduce. Second, it gives the right to display. And third, it gives the right to make adaptations on your work. You earn the copyright at the moment you create your work, but to be able to fully enforce your copyright, it is needed to register it. The cost of registering depends on the number of copyrights you want to file. When 'buying' a single copyright registration, the cost is 31 euro's. When buying 10 at the same time, the cost becomes 210 euro's (21 euro's per copyright), and when buying 100 at the same time the cost is 990 euro's (9,90 euro's per copyright).

Very important here is that designers can also sell their copyright to their clients, such that the client can use the design more often and even use adjusted versions. This has to be explicitly arranged in a contract. However, caution has to be kept with respect to the future. A future client can come up to a designer and then tells the designer he really liked his previous work. Consequently, the client might ask for something similar. When the designer has sold all his exclusive rights, he cannot build upon this previous work. Since reputation and former work is very important for designers, care should be taken with selling rights.

Some designers are in favor of a more open system, in which (parts of) designs should be openly shared. Such a system has been developed. It is called 'Creative Commons' (Society, Kennisland, & Informatierecht, 2011), a system in which creators can give public their copyright protected work for certain forms of reuse.

A trademark is defined as a sign which serves to distinguish the goods and services of one organization from those of another (Market, 2011). The trademark may be a word, several words (such as a slogan), a design, symbol, graphic or any combination of these elements. Registering a trademark in Europe costs 900 euro's when filed online, and 1050 when filed in paper form.

Protection by trademarks is mainly protecting the client for which the designer potentially has designed a logo or another firm distinguishing sign or indicator. When it is used by the designer itself for branding

his own firm, it is directly protecting himself. Note that the logo designed for another firm is simultaneously protected by copyright as well.

2.5.3 Alternative general types of IPR

Next to the described types of IPR, some less legally strong and cheaper alternatives exist that apply to all three sectors. The two main alternatives are the so-called i-DEPOT and the tax collectors office stamp. The i-DEPOT is a product of the BBIE (BBIE, i-DEPOT, 2011). With the i-DEPOT you can prove that your idea, concept, format, or design already existed at a certain date. In other words, your design gets a legally valid time stamp. The cost of the i-DEPOT is 35 euro's for five years of protection, an affordable amount of money for small firms. The tax collectors office stamp generally works the same, only here the legally valid time stamp is created by the national tax collectors office (Belastingdienst, 2011). The registration here is free of costs, but the tax collectors office does not store the content of your registration.

To conclude, these forms of IPR give less legal protection, but at the same time are relatively cheap.

2.5.4 General IPR Strategy

Intellectual property rights can be called upon in order to protect one's design. As stated above, there are multiple forms of IPR, all possessing their own unique characteristics. Some firms will choose to actively use copyright to protect their designs, other firms will choose for another alternative, some firms will use multiple forms and others will not use IPR at all. In this study a model will be developed with the aim to explain why some firms actively use IPR, and others do not.

Engaging in the field of IPR can call upon many resources. One of these resources is time. A certain knowledge base regarding this topic is needed to engage in the activity of properly protecting a design. This means that firms have to invest time in order to create this knowledge base. In addition, in the case of infringement, the firm itself that is being infringed has to actively enforce its rights. Note that spotting that another firm is infringing has to be done by the firm itself. These activities are time consuming, and can be a reason to withhold the firm of engaging in the field of IPR. As the firm size increases, and specialization can take place in terms of labor division, the firm is better able to allocate resources to legally protect its designs. Here, in combination with time, human capital is being allocated to protect a design.

Besides time and human capital, financial resources are needed to protect a design. Whether applying for a relatively cheap i-DEPOT, or for a more expensive design patent, a certain amount of resources will have to be spent. When a firm does not expect that its design will be copied, or when it expects that the costs of its design getting copied is relatively small, this financial requirement can already become an insurmountable threshold. Besides this kind of investment cost, legal procedures also bring their cost. Furthermore, much of the required time investment can be translated to monetary resources. Nevertheless, even firms that would not have to invest much time due to for example, a high knowledge base on this topic, would have to invest a certain amount of financial resources. Note that as firms become larger, the relative cost of protecting designs by means of IPR becomes smaller.

Whether it is fruitful for a firm to use IPR depends on the balance between costs and benefits. Required resources as the ones discussed above illustrate the types of costs that are involved. The costs are relatively easily to estimate, especially if the firm knows to what extent it wants to check for infringement. The benefits on the other hand, are more difficult to predict. There are many uncertainties that come into play. One uncertainty follows from the fact that it is difficult to estimate the likelihood of a design being copied. Nevertheless, some factors might increase the likelihood of a design getting copied, such as a high density of designers in the region and the dissemination risk when collaborating. Following on this, a second uncertainty is that it is hard to estimate the extent of damage to the firm when the design is copied. A firm does not exactly know how much benefit the design will create in general, let alone that the firm can know the extent of damage it will take when the design is copied.

Whether a firm will use IPR will also depend on the (expected) value of the design. To illustrate, a complex product design that is developed in twelve months will likely be more worth to protect than a logo designed in two days. The value of the design can depend on, among other things, the specific sector, the time spent on the design, the complexity of the design, and the uniqueness and innovativeness of the design.

3. Theoretical Framework: locational behavior

Many industries are differently concentrated throughout space. One can often observe the presence of clusters in certain regions, while other locations hardly have any economical activity in the corresponding industry. For a long time, this existence of clusters has been explained by geographical economists using the concept of agglomeration economies (Wenting, Atzema, & Frenken, 2011). Certain benefits would accrue to the co-located firms within the cluster. Many arguments have been put forward to explain these agglomeration economies, which will now be discussed.

3.1 Pure agglomeration

One of the first scholars formally addressing this issue was Marshall (1925), whose analysis directly followed the observation of Adam Smith about labor specialization (Blaug, 1985). Marshall gave three reasons why firms would co-locate. These reasons concern a local pool of specialized labor and specialized suppliers, the increased local provision of non-traded input specific to an industry, and the maximum flow of information and ideas. The first reason refers to several advantages. First, there is a labor market system which supports the matching of employers and employees, which corresponds to lower search costs (Simpson, 1992). An implication is that local firms are better able to efficiently adjust their labor employment level in response to changing market conditions than when they would be geographically isolated. Second, firms can benefit from the impacts of human capital accumulation on labor skills (Arrow, 1962) and on firm productivity (Romer, 1987). Thirdly, the presence of specialized suppliers can make it possible to deliver certain products or services. The main reason why this local presence is valuable is because transport costs and transaction costs are relatively low when co-located. These types of costs will be discussed in more detail when the firm-client relationship will be addressed.

The category of non-traded inputs refers to the various ways in which firms can benefit from the greater availability and efficiency of particular local services, or from more favorable local availability of capital finance. This category also entails the emergence of a specific local demand/clientele. Furthermore, a spirit of rivalry among competing firms can be grouped under non-traded inputs. This latter is said to be of significant importance for regional clusters' successfulness (Porter, 1990). This second category also implies that the area experiences economies of scale in the employment of particular capital infrastructure (Gordon & McCann, 2000). In the case of ICT, this could be a fast internet network.

The third reason refers to the fact that product and market knowledge can be shared more easily between agents when they are geographically proximate. Knowledge spillovers will thus play a bigger role when firms are co-located. Ways in which knowledge can spillover are interfirm labor migration (Angel, 1991), informal contacts between members of different firms (Jaffe, 1993), and the restructuring of local businesses. According to Nelson and Winter (1982) and Dosi (1988), these may contribute to an evolving localized environment of learning, but their effects can strongly differ depending on the sector the firm is operating in, the firm's nationality, and particular decision-making structures within the firm (Cantwell, 1991).

In Marshall's approach, all benefits that accrue to firms within a cluster are external, since it is only the geographical presence of a firm in a cluster that results in these benefits. According to Gordon and McCann (2000) more modern descriptions of agglomeration tend to follow the classification proposed

by Hoover (1948), which divides the benefits of agglomeration among three groups. These three groups are internal returns to scale, localization economies, and urbanization economies. A single firm may benefit from internal returns to scale due to realized cost efficiencies by serving a large market. There is nothing inherently spatial about this other than that one large firm also means a high local concentration of factor employment. Whether there is a high number of small of firms or one big firm, this high concentration of factor employment may allow the development of external economies within the group of local firms. When these benefits only accrue to firms in a particular sector, these economies of agglomeration are called localization economies. When they accrue to all local firms irrespective of sector, they are called urbanization economies.

This latter distinction between localization economies and urbanization economies crosses some of Marshall's boundaries in the sense that benefits due to co-location are not necessarily restricted to one particular sector. Hence, other authors like Scott (1996) point at sectoral variety as a source of intersectoral knowledge spillovers. These intersectoral spillovers are usually addressed as 'Jacobs externalities'. This line of reasoning states that knowledge spillovers are related to the diversity of industries in an area. This industrially diverse environment encourages innovation because it encompasses people with varied backgrounds and interests, thereby facilitating the exchange of ideas among individuals with different perspectives. The ease with which these ideas are exchanged between individuals depends on the level of proximity.

Related to urbanization economies mentioned above is the so-called 'local buzz' (Storper, 2002). It is the idea that a certain milieu can be vibrant in the sense that there are lots of piquant and useful things going on simultaneously and therefore lots of inspiration and information to receive for the perceptive local actors (Bathelt, 2004). The same idea is named differently by other authors, such as 'local broadcasting' (Owen-Smith, 2002) and 'noise' (Grabher, 2002b). The buzz can be seen as an information and communication ecology created by face-to-face contacts, co-presence and co-location of people and firms. This buzz was said to 'apply' on firms and people within the same industry and place or region, but it can well be the case that related industries in the same region can also contribute to this local buzz. Furthermore, according to Bathelt (2004) the buzz consists of specific information and continuous updates of this information, intended and unanticipated learning processes in organized and accidental meetings, the application of the same interpretative schemes and mutual understanding of new knowledge and technologies, as well as shared cultural traditions and habits within a particular technology field, which stimulate the establishment of conventions and other institutional arrangements. Thus even running into a colleague in the local supermarket is part of this buzz. By just being there, actors continuously contribute and benefit from the diffusion of information, gossip and news (Gertler, 1995).

In the case of design, I will argue that not all of these Marshallian arguments (fully) apply. Specialized suppliers are of relatively low importance, because many types of design like web- and graphic design mainly need proper software, which are not acquired on a frequent basis in which face-to-face contact is needed. The argument of specialized labor is less relevant, because the sector is dominated by firms with few or even without employees. This means that the availability of skilled personnel is less important than in sectors as high-tech systems. The intra-industry knowledge spillovers will be very

limited due to several reasons. First, design firms cooperate relatively little with other designers. This means that little knowledge is flowing between designers during design projects. Second, since high rivalry is said to be the main reason why designers do not often cooperate, it is also likely that relatively little knowledge is transferred through informal channels. This is due to the fact that this rivalry is not a pure external factor to the firm, because it is 'carried' by the designers themselves. This in turn can influence informal contact between designers. Third, labor migration between design firms seems to be relatively low. Some designers state that it is troublesome to hire a designer from another design firm, because they often have different beliefs and working routines (Reimer, 2008). Hiring new young people is often preferred, because they can still be relatively easy molded.

Although the intra-industry knowledge spillovers are limited, some locations might enjoy the benefits of local buzz. Local buzz can be a source of inspiration for designers. They might pick up some new ideas from other people and firms. These firms can be other design firms, clients, potential clients, and even firms that have no direct relation at all. This advantage can therefore be classified under the Jacob's externalities. Although a lot of activity, word on the street, and meetings may be present, it does not necessarily mean everyone benefits from it. However, when being part of these phenomena, a designer has an extra source of inspiration which can stimulate his performance.

Places where intra-industry knowledge flows are significantly present are design events like exhibitions. Here, designers can observe what competitors are doing. In addition, they can use these events as a source of inspiration. These temporary events can be seen as 'temporary clusters'. (Maskell, Bathelt, & Malmberg, 2004), but note that co-location and Marshallian knowledge spillovers seem to be weakly, if at all, related in the design industry. Nevertheless, it is often assumed that when firms from the same sector are located in the same region, they cooperate and share knowledge. Following my concerns I will test the hypothesis that:

Hypothesis 1: Design firms in a cluster collaborate more than design firms outside a cluster.

The advantages of many non-traded inputs for designers seem also limited. Designers need relatively few local services and they do not bear high investment costs. Infrastructure however, might have a significant influence through transport costs, which will be discussed later on.

Access to specialized labor is likely to differ in relevance between the different types of design. Web and graphics design are less knowledge-intensive and less specialized, and some designers mention that it is easy to enter the web- and graphics design industry. The need for being educated in the respective fields is very likely highest in industrial design, because this type of design has on average a higher level of complexity. In the Netherlands, this complexity can also be identified in the fact that industrial design programs are only available at high educational levels, whereas web and graphics design are available at lower educational levels. With a higher level of complexity and specialization, it is plausible that industrial design firms have a greater urge to have access to their respective labor market.

3.2 Firm-client relationship

Next to the pure agglomeration arguments discussed in section 3.1, a second type of explanation regarding agglomeration economies lies within the relationships that firms have with their buyers. This

relationship is also part of the view of Gordon & McCann (2000) who talk about industrial complexes, which are characterized by sets of relations among firms. The focus of this approach is that firms have trading links with buyers (and suppliers), in which the patterns of sales and purchases are the most central in determining firms' locational behavior. Next, this approach states that a firm's location is directly related to its spatial costs. These costs are assumed to consist mostly out of transportation costs and transaction costs. Whereas transportation costs can be simply seen as the costs for moving people and goods, transaction costs are a bit more complex. Transaction costs entail costs borne before, during, and after the actual transaction. Examples of costs before and during the transaction are the drafting, negotiating, and the safeguarding of agreements (Williamson, 1985). After the transaction one might bear costs like maladaptation, haggling and enforcing agreements. These agreements are often made legally in the form of a contract. Without a contract, it is easier for any party to behave opportunistically and consequently it becomes more likely that not both parties' interests are being looked after. However, this contractual governance is costly. Therefore, contracts hardly ever completely lock out all risks for buyers and suppliers. According to Williamson (1985), this leads to the economizing of transaction costs, in the sense that it might be economically rational when ex post transaction problems like delivering inferior quality, delivering delays, and insufficient service, occur. An example is that when switching costs of the buyer are high enough, it can be economically feasible for a supplier to deliver the good or service with lower quality or with delay, since it is too costly for the buyer to 'punish' the supplier by choosing another one.

It is important to govern these transactions in order to being able to engage in economical (and personal) transactions. This governance however, does not necessarily have to be of a legal kind. On the contrary, social norms and values can be more efficient in dealing with opportunistic behavior (Rooks, Raub, & Tazelaar, 2006). Rooks et al. show that when the social network of buyers and suppliers is wider (i.e. more ties between buyers and suppliers), ex post transaction problems occur less frequently and buyer satisfaction is higher. This is due to the fact that with a higher level of 'social embeddedness' buyers can more easily punish the suppliers. When they know more suppliers, it is easier and likely less costly to switch. Second, buyers can communicate about suppliers' performance, such that buyers can recommend some suppliers over others. The reputation that emerges in a social network of buyers and suppliers then becomes a highly valuable asset (Rooks, Raub, & Tazelaar, 2006). Since geographical proximity can strongly stimulate social embeddedness, it can in turn thus also reduce transaction costs.

More recent approaches also include costs like telecommunication costs (Salomon, 1990) and logistics-costs (McCann, 1998). Summarizing, in this industrial complex approach, the focus lies on the relationship between spatial transport and transaction costs and geographical distance, in combination with the input-output requirements of the firm.

Here I will argue that the designer-client relation and its corresponding geographical proximity is very important in the design industry. This is due to several reasons, which will now be discussed.

Accessibility

In the design sector, infrastructure can have a significant influence through transport costs. More specifically, it is the accessibility of the firm and the ease in which the designer can reach his clients that

are important. First, it can reduce transport costs. Since many design firms are small, transport costs (the direct costs but also the opportunity costs) have a relatively high share in the total costs. Note that it can also reduce the costs for clients when they come over to the designer. Second, good accessibility also influences the visibility of the firm. Being located in a central location often means more people will come by. This in turn can help in attracting new business. Especially for new businesses, it is stated that designers mostly rely on local demand, which makes an accessible location even more important.

Trustful relationships and transaction costs

Granovetter (1974) argues that inter-firm and intra-firm relationships are based on trust, which can have a strong influence on a firm's behavior. First, this trust can let employees/firms take risky co-operative actions without a direct fear of opportunism. Second, firms are more willing to reorganize their relationships without the fear of reprisals. And third, firms will be more willing to act as a group in support of common mutually beneficial goals. Or as Uzzi (1996) states it: "actors do not selfishly pursue immediate gains, but concentrate on cultivating long-term cooperative relationships that have both individual and collective level benefits for learning, risk-sharing, investment, and speeding products to market" (Uzzi, 1996, p.693) .

Trust can be very important in the design industry. It is one of the key aspects leading to possible long-term relations, which are said to be very valuable. In addition, it is often mentioned that being located in the same region already creates a certain level of trust, presumably because it makes two parties a bit more alike or at least it is perceived that way. Second, trust lowers transaction costs since fewer topics have to be governed legally in the form of a contract. Third, trustful relationships will be more likely a source of referrals, which can higher reputation and increase the firm's business.

For trust to emerge and increase geographical proximity plays an important role. When being located in the same area, it is easier to create and maintain frequent and intensive interaction, which is the basis for a trustful relationship.

Face-to-face contact

Communicating needs and expectations between the client and the designer is very important. Face-to-face contact is crucial in this. Especially when designs get more complex, more advanced and tacit knowledge has to be transferred. When face-to-face contact frequency goes up, transport costs become more important, and thus the incentive to locate near clients increases. As mentioned in the design industry description this is even more important in industrial design than in web- and graphics design.

Following these different arguments, I hypothesize that:

Hypothesis 2a: Design firms locate near their clients.

Hypothesis 2b: It is more important for industrial design firms to locate near their clients than it is for web- and graphics design firms.

3.3 Entry by spin-offs

A more evolutionary explanation is the one explaining cluster emergence by means of spin-off creation. Within clusters, new firms often emerge from incumbent firms through spin-offs. These newly formed firms mostly benefit from knowledge gained in the parent company. These spin-offs tend to locate near their parent companies, which is a source for co-location. Note that they do not necessarily absorb knowledge from other firms in the cluster. Several studies have shown that the performance of parent companies and their spin-offs are highly correlated (Klepper, 2002) (2007) (2005). In addition, more successful companies also create more spin-offs, which reinforces the local economic activity even more. Thus, the existence of a high concentration of sector activity can be explained by a few successful firms creating (relatively well performing) spin-offs, which in turn can also create spin-offs. This snowball effect can create a cluster and consequently keep it alive.

Also note that the reasons why spin-offs may locate near their parents can find their origin in different arguments made before. Therefore, to explain reality a combination of explanations might be best suitable.

As stated before, when designers spin-off of their parent company, it is often due to a form of dissatisfaction with this parent firm. Nevertheless, the employee has worked with his colleagues for a certain amount of time, which is likely to serve as a form of social capital. In addition, the person creating a spin-off will have worked with certain clients, with which interaction can likely keep on existing. The existence of a previously formed social network will give incentives to the designer to locate himself in roughly the same region. In addition, the designer will know his way around in this region.

Hypothesis 3: Spin-off design firms locate near their parent company.

As mentioned before, most design firms tend to be small. According to Florida (2002) this means that personal locational decisions and business locational decisions are more often being made at the same time. When the person setting up the spin-off already has a client base, arguments regarding attracting business by choosing a good location will (almost) become irrelevant, and thus more weight can be given to personal considerations (e.g. family, friends, urban amenities).

3.4 Attractive cultural amenities

For explaining spatial clustering within creative industries, Richard Florida (2002) has put forward a paradigm shifting argument. Instead of using firms as a unit of analysis for explaining spatial behavior, Florida looks at the labor population. He argues that a socially tolerant atmosphere and attractive cultural/urban amenities will attract creative workers. In turn, the presence of this 'creative class' will attract high-tech and cultural industries. This line of reasoning thus emphasizes the significance of personal motives of workers for the spatial behavior of firms. Another reason why personal motives can be so prevalent in the creative industries is because many firms operating in the creative industries are relatively small. This increases the likelihood that business and personal motives are combined to come to a location decision.

However, the view of Florida has gotten much criticism. Houston et al. (2008) state:

"that place attractiveness in and of itself is an inadequate force to attract major in-flows of talented people. On the contrary it would seem fair to suggest that most skilled inter-regional and indeed international migrants move in relation to the economic forces at work in the national and international labor market rather than ethereal quality-of-life perceptions."

Also the cause-effect relationships drawn by Florida are criticized. According to van Oort et al. (Oort, 2003), the location decisions by workers and firms go both ways, which makes it statistically very hard to distinguish between the two. Despite these critics, and several more, the argument made by Florida certainly has some relevance. For example, research on Dutch fashion design entrepreneurs shows that personal motives and cultural amenities do play a role in their location decision (Wenting, Atzema, & Frenken, 2011). However, whether this is the case in all other creative industries is not really clear.

Not all creative industries are the same. They have differences on many levels. This also means that the relative influence of attractive cultural amenities can differ. I would argue that already in the case of design this effect differs. As industrial design combines many kinds of knowledge such as technological, marketing, and cultural knowledge, the extent to which this sector is purely cultural and creative differs from other cultural industries. The importance and share of the pure cultural symbolic aspect is greater in graphics- and web design than in industrial design. In line with this, these different kinds of designers may differ in personal characteristics, as well as in the perceived benefits of living in a place with highly attractive cultural amenities. Therefore, I come to the following hypothesis:

Hypothesis 4: Web- and graphics design firms higher value the presence of attractive cultural amenities than industrial design firms.

Note that when this hypothesis holds, it strongly suggests that the generality of Florida's argument may be well limited and that creative industries cannot be categorized as a whole with respect to this topic.

3.5 Reputation

A factor often left out in conventional theories about clustering is reputation. Several studies within creative sectors show that the reputation of a city/region is seriously being taken into account (Reimer, 2008) (Sunley, 2008) (Wenting, Atzema, & Frenken, 2011). Reputation can influence locational behavior at several levels. First, a certain reputation can create a bond with the client. A response of a graphic design manager in the research of Reimer et al. (2008) puts it as follows:

"It's almost that ... the first thing they say to you is 'oh where do you work from' and you say 'Oh Clerkenwell' so they say 'oh that's handy because [it's close by and I know where you are]...' you know, there's a kind of connection there. So I do think it's probably, in the initial stages, I think it was quite an important part of our identity really. If we'd said, if we'd approached a client ... and they'd said 'where are you based?' and we'd said 'oh Norfolk' or somewhere not in Central London they might not have had the same thing [about us]."

For them, being located in central London had some value because they inherently had a certain reputation. Being close to your clients can create some common identity, and with this a certain base level of trust. This is in line with the reasoning of Granovetter (1985).

Second, the place where you are located has a certain reputation in terms of quality. According to Sunley et al. (2008), in interviews with designers in London it was hard to separate talk about the effects of this leading centre both from the symbolic capital attached to location in particular areas and the market value of a central London postcode. It was frequently suggested that a London address provides more credibility as a premium consultancy. This means that the label 'London' is worth something, because clients assume that this location is related to the performance of those firms. Since markets are not fully transparent, the power of perception becomes evident in the case of reputation.

Third, several studies have shown that socializing networks are essential for diffusing reputations (Grabher, 2002a) (Grabher, 2002b) (Rantisi, 2004) (Storper, 2004). Designers are often hired because of referrals from other companies or from seeing their former work. Being located in a highly concentrated area increases the social embeddedness (Granovetter, 1985) and as a consequence, words, chat, and referrals are likely being spread more easily. This can be seen as an advantage.

Reputation can mean several things for designers. First, the possibility to express oneself as a designer is highly valued. A city with a good reputation might tell them the city is a good place to be located as a designer, because of enough work and this possibility to self-express. Note that this possibility to self-express can rise with an increasing market, because larger markets allow for more specialization. In this case the designer can thus specialize in his own field of interest, instead of having to serve a broader audience. Second, a location with a good reputation can have a certain market value in the sense that it can automatically create credibility. Third, since it is plausible that web- and graphics designers higher value cultural symbolic aspects it is also more likely that these types of designers higher value the symbolic expression of locations, namely locations' reputations.

Hypothesis 5: Web- and graphics design firms more strongly prefer to be located in a reputable location than industrial design firms.

3.6 Personal preferences of designers

As stated before, many design firms are small. In addition, generally speaking they do not need a high amount of capital investment to do their job. This combination allows for personal preferences to get a more prominent role in the location decision. Since a designer can think that he can perform his job almost everywhere, it is likely that he strongly takes his family and friends into consideration, both when being the entrepreneur and when choosing for which firm to work. Note that industrial designers are more dependent on their client location than web- and graphics designers, which probably leads to less influence of personal preferences.

Designers have relatively low investment costs, but there is one type of investment that is expensive, namely the investment in the firm's premises. When being a sole proprietor it is sometimes possible to work at home, but especially when the firm becomes larger than one person, it is often needed or desired to work in external premises. The costs of these premises have however a significant impact on

the designer's cost model. Therefore it could be argued that designers set affordable premises at their top priorities when deciding on a location. Note that this latter mechanism is somewhat different than the preceding ones. When a designer would choose a certain city, town, or village to locate, he would still have to find an affordable office space. Nevertheless, this investment cost can influence the choice on city level as well, because housing prices are significantly different among cities.

When personal considerations (can) become particularly relevant for the location decision, it becomes important to assess where the personal life is situated. One of the factors influencing the living location that is identified here, besides the presence of family, friends and acquaintances, is the location in which people have studied. In the beginning of one's career, it can be said that the location of education can have a strong influence on the living location; many students will locate near their education location. During the period of study, it is common that personal, social, and potentially professional relationships are formed at this location. Consequently, given the fact that personal considerations can play a prominent role in this sector, it becomes likely that relatively many firms are founded at the location of education of the corresponding founder. Therefore the following is hypothesized:

Hypothesis 6: Design firms are founded at the education location of the founder.

4. Theoretical framework: use of IPR among design firms

Intellectual property rights can be called upon in order to protect one's design. As described in section 2.6, there are multiple forms of IPR, all with different characteristics. Some firms will choose to actively use copyright to protect their designs, while other firms will choose for another alternative or will not use IPR at all. In this study a model will be developed with the aim to explain why some firms actively use IPR, and others do not.

Engaging in the field of IPR can call upon many resources. One of these resources is time. A certain knowledge base regarding this topic is needed to engage in the activity of properly protecting a design. This means that firms have to invest time in order to create this knowledge base. In addition, in the case of infringement, the firm itself that is being infringed has to actively enforce its rights. Note that spotting that another firm is infringing has to be done by the firm itself. These activities are time consuming, and can be a reason to withhold the firm of engaging in the field of IPR. As the firm size increases, and specialization can take place in terms of labor division, the firm is better able to allocate resources to legally protect its designs. Here, in combination with time, human capital is being allocated to protect a design.

Besides time and human capital, financial resources are needed to protect a design. Whether applying for a relatively cheap i-DEPOT, or for a more expensive design patent, a certain amount of resources will have to be spent. When a firm does not expect that its design will be copied, or when it expects that the costs of its design getting copied is relatively small, this financial requirement can already become a insurmountable threshold. Besides this kind of investment cost, legal procedures also bring their cost. Nevertheless, even firms that would not have to invest much time due to for example, a high knowledge base on this topic, would have to invest a certain amount of financial resources. Note that as firms become larger, the relative cost of protecting designs by means of IPR becomes smaller.

Whether it is fruitful for a firm to use IPR depends on the balance between costs and benefits. Required resources as the ones discussed above illustrate the types of costs that are involved. The costs are relatively easily to estimate, especially if the firm knows to what extent it wants to check for infringement. The benefits on the other hand, are more difficult to predict. There are many uncertainties that come into play. One uncertainty follows from the fact that it is difficult to estimate the likelihood of a design being copied. Nevertheless, some factors might higher the likelihood of a design getting copied, such as a high density of designers in the region and the dissemination risk when collaborating. Following on this, a second uncertainty is that it is hard to estimate the extent of damage to the firm when the design is copied. A firm does not exactly know how much benefit the design will create in general, let alone that the firm can know the extent of damage it will take when the design is copied.

Whether a firm will use IPR will also depend on the (expected) value of the design. To illustrate, a complex product design that is developed in twelve months will likely be more worth to protect than a logo designed in two days. The value of the design can depend on, among other things, the specific sector, the time spent on the design, the complexity of the design, and the uniqueness and innovativeness of the design.

In light of the discussed costs and benefits that come along with the use of IPR, three hypotheses will be formed and subsequently tested. The first hypothesis is related to sector specifics. As stated before, the more investment costs (e.g. time, money) a design has required, the more likely the design is worth protecting. These investment costs cannot be assumed to be equal among specific sectors. Here it will be argued that the average investment costs and therewith the average value of one particular design is higher in the case of industrial design since industrial designs are generally more complex and more expensive to develop than a website or a graphic design. Therefore, I hypothesize that:

Hypothesis 7: Industrial design firms make more use of IPR than web- and graphic design firms.

The second hypothesis is related to the uniqueness of the design. When a new design is not particularly differentiating itself from other designs, the risk and the costs of the design getting copied become relatively small. Put differently, when a design is radically new, it is more likely to strongly differentiate itself from other designs and consequently will likely have a higher value. This leads to the following hypothesis:

Hypothesis 8: Design firms that create radically new designs make more use of IPR.

The third and last hypothesis relates to the potential effect of geographic clustering on IPR use. As mentioned in section 3.1, firms can benefit from certain localization economies. However, these localization economies have their downside. A high concentration of firms in the same sector can be translated to a high level of competition. This high level of competition in turn, can influence the behavior of firms within this highly concentrated area. Although useful knowledge might spill over, unintended spillovers can also occur. Even when two parties collaborate, valuable information that wants to be kept exclusive for one of the parties can be absorbed by the other. In the case of design this can mean that new ideas are relatively easily acquired from other designers, intentionally or unintentionally. Intentional acquisition could be called copying, something most designers want to prevent. As copying seems more likely to occur in highly concentrated areas, it is also more likely that firms within these areas tend to use intellectual property rights more often. Therefore:

Hypothesis 9: Design firms in a cluster more often actively use IPR to protect their designs than design firms outside a cluster.

5. Theoretical framework: firm performance

5.1 Clusters

Although there are many reasons for firms to co-locate, another point of interest is whether a cluster actually increases firms' performance. According to Porter (2000) clusters lower entry barriers and thus enhance entrepreneurship. In addition they enhance the performance of incumbents through efficiency gains. Moreover, firms within a cluster can have better access to resources such as technology, information, inputs (e.g. potential employees, finance), customers, and channels, than they would have when operating in isolation. In addition, clusters can reduce knowledge isolation which results in higher rates of knowledge transfer. This in turn can enhance the level and speed of innovation. Other authors like Baptista (1998) and Swann (1998) support the view that clusters increase productiveness and innovativeness. However, this view is not supported by everyone. Ron Martin and Peter Sunley (2003) strongly criticize the work of Porter, and according to Malmberg (1996) much of the evidence used in support for the superior performance argument is anecdotal and based on a few success stories. In addition, there are few extensive studies which focus on how common and important clustering is within particular industries (Malmberg & Maskell, 1997). Moreover, several studies support the notion that it is not conclusively shown that regions based on specialized clusters consistently enjoy a higher rate of innovation and economic growth (Rodriguez-Pose, 2001) (Steiner, 1998) (Wicksteed, 2001).

There is thus no clear-cut evidence for both directions. It seems plausible that there are mediating factors that determine the success of a cluster. Therefore it is useful to look into cluster dynamics in some more detail.

When looking at localized learning and innovation in clusters it has been increasingly acknowledged by economic geographers that geographical proximity in itself cannot explain these processes (Boschma, 2005). As Boggs and Rantisi (2003) call it, economic geographers have taken a 'relational turn' in the sense that the relational dimension among economic actors has increasingly become the unit of analysis. For information to exchange, it is essential that stable and intense client-supplier linkages are present (Morgan, 1999). Moreover, several studies show that it is important for the transfer of knowledge that there exists a local labor market and the mobility of skilled workers, including spin-off initiatives (Capello, 1999) (Capello & Faggian, 2005) (Camagni, 1991). And according to Keeble and Wilkinson (1999) contemporary analysis of industrial districts places emphasis on the influence of the local community, defined as family and other social relationships, and rules of behavior embedded in those relationships, in guaranteeing standards of behavior which engender trust and cooperation and thereby strengthen inter-firm networks.

Giuliani (2007) takes a step further and looks at how these social relationships within a cluster emerge and evolve. She states that knowledge is not randomly spilled over and that economic actors do not randomly engage in a relationship. On the contrary, since networking is a time-consuming process, firms looking for an informal technical advice will deliberately target and select firms, which are the most likely to offer a better solution to a problem (Schrader, 1991). This deliberately targeting and selecting firms is related to the relative knowledge bases of the firms. Firms with strong knowledge bases will likely be perceived by other firms as '(technological) leaders' in the area, with the consequence that

these 'leading' firms will be sought more as source of advice and knowledge (Giuliani & Bell, 2005). On the other hand, firms with weak knowledge bases may not have anything valuable to offer to other firms. In addition, this weak knowledge base can also mean they do not have the internal capacity to absorb the stock of knowledge that is available in other firms (Cohen & Levinthal, 1990). Firms with a strong knowledge base will thus be more likely be targeted by those cluster firms that are able to decode and absorb the knowledge that is potentially transferred (Lane & Lubatkin, 1998), which are very likely the ones with a strong knowledge base. As Boschma (2005) puts it, those firms whose 'cognitive distance' from the leaders is not too high can inhibit communication. This has important implications. First, some firms will be more central in the clusters' knowledge network than others. Second, firms with strong knowledge bases will tend to share knowledge with each other instead of with the firms with a weak knowledge base, which makes the gap even wider, and ultimately the leading firms can disconnect from the cluster's knowledge network. As a consequence they might try to strengthen their connections to external knowledge sources. Third, when a cluster is almost exclusively populated by firms with a weak knowledge base it seems plausible that the intra-cluster knowledge network is poorly connected, because no one can likely share valuable knowledge nor absorb potential valuable knowledge (Giuliani, 2007). This empirical evidence of Giuliani (2007) has shown that, in spite of the presence of pervasive business interactions, innovation-related knowledge is exchanged in a rather uneven and selective way. Some firms might benefit from being in a cluster, while other firms might even be negatively influenced. When looking at the successfulness it is thus relevant to look at the internal knowledge network in order to assess possible (knowledge) synergies within a cluster. Worth noting is that business networks (economical relationships with buyers, suppliers etc.) are structurally different from knowledge networks, which indicate that the formation of these two different types of networks may be driven by different underlying motivations (Giuliani, 2007).

When looking at clusters the emphasis often lies at internal linkages and communication. However, Markusen (1996) states that there is not that much empirical evidence supporting the notion that local interaction is superior to nonlocal interaction. Owen and Powell (2002) introduce the concept of 'pipelines', which represent the distant interactions between intra-cluster firms and firms outside the cluster. They conclude that although local interaction and knowledge transfer may occur more effective, decisive, non-incremental knowledge flows are often generated through these network pipelines. This type of knowledge is not diffused in the local buzz. According to Bathelt (2004) the extra-local knowledge flows and the local buzz are mutually reinforcing. The reason for this is that the more firms of a cluster engage in the buildup of translocal pipelines the more information and news about markets and technologies are 'pumped' into internal networks and the more dynamic the buzz gets from which local actors benefit. The translocal pipelines can be seen as 'weak ties' (Granovetter, 1973), which have fundamentally other characteristics than the local relationships, which can be seen as the strong ties.

5.2 Performance

5.2.1 Cluster advantages

Firms can potentially benefit from advantages that accrue to firms located within a cluster. As stated in the previous section, firms can have better access to resources such as technology, information, inputs (e.g. potential employees, finance), customers, and channels, than they would have when operating in isolation. In addition, clusters can reduce knowledge isolation which results in higher rates of knowledge transfer. This in turn can enhance the level and speed of innovation. Consequently, firms' performance is improved.

Besides better access to resources, agglomeration economies as discussed in the theory section can benefit firms within a cluster. Also, transport- and transaction costs would typically be lower, which directly influences firm performance.

Furthermore, local buzz that is present can be beneficial. However, being located in an 'active' region is not per definition beneficial. The role of a firm within a network and its engagement in social interactions play an important role. As mentioned before, local buzz can be a source of inspiration for designers. Although a lot of activity, word on the street, and meetings may be present, it thus does not necessarily mean everyone benefits from it. However, when being part of these phenomena, a designer has an extra source of inspiration and knowledge which can stimulate his performance.

To conclude, there are many potential advantages of being located in a cluster that could increase firm performance, therefore:

Hypothesis 10: Design firms which are located in a cluster perform better than design firms outside a cluster.

5.2.2 Collaboration

Design firms can benefit from collaboration (with other design firms) in different ways (Shrader, 2000). First, useful knowledge exchange about products, services, and practices can take place. Second, it can reduce investment costs of an individual firm (e.g. specific tools to process materials). Third, it can reduce uncertainty about doing business in an unfamiliar environment. For example, designers might often create designs for the same target group. When another target group is focused at, knowledge that is present in other companies could be useful in fitting the designs to specific user needs. Fourth, firms can leverage their competitive advantage as collaboration corresponds with increased size and more combined expertise. Fifth, but less relevant in a small firm focused sector, collaboration can help in more rapid expansion and expanding to more locations.

When a firm internalizes business instead of collaborating with other firms, certain internalization costs come into play. Shrader (2000) identifies the following:

- Additional payroll to be paid
- Additional overhead
- Additional property and equipment

- Costs of administration
- Potential inefficiencies

These five types of costs give even more incentive to collaborate. However, collaborating with other firms has disadvantages. There are costs involved that would not be borne by the firm when everything would be internalized. Shrader (2000) names the following:

- dissemination risk (i.e. the risk that firm-specific advantages in know-how will be expropriated by those with whom the firm collaborates (Hill & Kim, 1988))
- indirect and direct costs of writing, enacting, and enforcing contracts.
- training partners (e.g. the collaboration partner might not have a sufficient skill level with respect to specific software)
- technology assistance
- management assistance
- increased communication complexity
- increased conflict
- real or feigned incompetence of partners
- opportunism

As the list shows, there can be many types of costs that might play a role when collaborating. However, many costs are not inherent to collaboration in itself, but to the characteristics of the partner and the relationship with this partner. Therefore, it can be stated that trust can be an important mediating factor for the successfulness of the collaboration. According to Coleman (1990), trust is more likely to emerge in dense networks. Following on this, local networks are more likely to be dense than inter-location networks, and in turn local collaboration would strengthen the collaboration and the corresponding firm performance. On the other hand, according to Burt (1992) structural holes provide other advantages like more (different) resources, which would favor inter-location collaborations in terms of the effect of collaboration on performance.

Summarized, we expect collaboration to have a positive effect on firm performance, but the direction of the potential mediating effect of location is not explicitly hypothesized.

Hypothesis 11: Design firms perform better when collaborating more with other design firms.

Note that caution must be taken with concluding (strong) causal relationships on this topic. Firms that perform better are likely more attractive to collaborate with. Nevertheless, also note that if there would be no benefits for the better performing firms, they would not collaborate.

5.2.3 Spin-offs

When people leave a firm to start up their own company, they do not leave empty-handed. While working in the parent company, employees gain new knowledge, learn new (working) routines, and get to know new people. In addition, they may learn about multiple aspects such as client wishes and advanced use of software. Once they leave they can transfer this knowledge to the new firm. Spin-offs therefore have an advantage over other firms Klepper (2002, 2005, 2007). This is especially the case

when the parent firm was successful, because the absorbed knowledge is likely more valuable. Furthermore, when the spin-off is of the intra-industry type the transferred knowledge is likely more relevant, which can increase the firm's performance even more. Here, we focus at the intra-industry spin-offs.

Hypothesis 12: Spin-off firms perform better than non-spin-off firms.

5.2.4 Intellectual property rights

The design sector is highly competitive. In some interviews, designers have stated that competitors are real rivals, and that they do not often collaborate with them. To survive in such an environment, it may be helpful, if not necessary, to protect one's creations. When these creations are not protected, the competition may well steal some designs. Especially when many designers are co-located, it becomes more likely that designers get exposed to other designers' creations. This in turn makes it easier to steal or copy designs, because 'search costs' become low, if not non-existent. To fully (and thus exclusively) exploit creations as a designer it is then helpful when these are protected by intellectual property rights. This holds for all types of intellectual property rights. However, since industrial designs are more complex and likely more expensive, it is plausible to assume that protection by means of intellectual property rights is more important for industrial designers.

Hypothesis 13: Designers who protect their designs by means of intellectual property rights perform better.

Also here caution has to be taken with drawing causal relationships. It might be the case that better performing firms more often protect their designs, because the value of their designs is higher.

5.2.5 Innovation

Design firms can have different business models corresponding to different means of competing. One way of competing is by differentiating the firm from other firms with respect to the designs that are being made. Unique, revolutionary designs and potentially new functions can give a firm competitive advantage. Therefore it is argued that innovating companies likely perform better. Note that every design could be defined as an innovation, since they are all new and unique in some way. For this reason, this study will focus on radically new designs thus excluding incremental innovation.

Hypothesis 14: Design firms that introduce radically new designs perform better.

5.2.6 Control variables

Next to clustering, collaboration, being a spin-off, the use of IPR, and innovation, several control variables are included in the analyses. Some of the control variables are relatively common such as age, gender, founding year, education, and firm size (Rosa, Carter, & Hamilton, 1996). In addition entrepreneurial experience is taken into account (Wenting, Atzema, & Frenken, 2011) and specifically for this study the level of specialization of used software within the firm is included.

6. Methodology

This chapter will cover the methodology with respect to this study. The chapter will be divided into three sections: research design, measurements, and method of analysis.

6.1 Research design

There are two distinct topics in this study and two different types of analyses. The first topic entails the motives regarding the location decision of design firms in the Netherlands. These motives have to be evaluated and compared among groups, which will be done by means of statistical methods designed for the comparison of groups.

The second topic focuses on whether location influences the performance of design firms in the Netherlands, and if so, in what way. To address this topic, two models will be created which attempt to explain design firms' performance. These models will not only include location related variables, but also a set of control variables like age, gender, education, and others. The main model (explaining income) will be created by means of an ordinal regression procedure in SPSS, called PLUM (Polytomous Universal Model). A more detailed description of this methodology will follow in section 5.3.2. The second model (explaining innovation) will make use of a logistic regression. Following on innovation, one of these two performance measures, the use of intellectual property right among firms will also be addressed. A logistic regression will be used in attempt to model which type of firms actively use IPR.

This study makes use of data gathered through telephone interviews with founders of design firms, conducted in the summer of 2011. These interviews and the corresponding created questionnaire were designed in light of a combination of two separate studies. This study focuses on the role that location plays in the design sector, while the other study focuses on the role of ICT in this sector. Two main reasons underlie the choice for telephone interviews instead of, for example, a web survey. The first reason is that the response rate will be much higher when people are personally contacted, especially when the number of questions is relatively high as it is in this interview. Again, since the telephone interview had to cover two different studies, the length of the interviews easily reached 15 minutes each. The second reason is that when using telephone interviews, the interviewer can explain questions and concepts when things are unclear (for the respondents). Especially when talking about topics that tend to be interpreted differently by different people, an explanation can help in supporting the aim that respondents are all answering the same questions in a comparable way. The interviews were conducted by the author of this report together with a hired assistant. This assistant was chosen on basis of his proper knowledge base and adequate communicative skills, both needed for properly conducting these interviews.

As mentioned before, this study focuses on Dutch design firms. More specific, it focuses on the sectors industrial design, graphic design, and web design in the Netherlands. In order to contact Dutch firms in these corresponding sectors, contact information of these potentially approachable design firms was needed. There were two main options for the source of this information. First, there is the Chamber of Commerce (in Dutch: Kamer van Koophandel). The Chamber of Commerce keeps track of contact information of all registered firms in the Netherlands. Second, there is the Dutch version of the Yellow Pages, called 'De Gouden Gids'. Here, contact information is stored of firms that have deliberately

applied for it. Note that firms present in the Yellow Pages are also present in the Chamber of Commerce database, but not per se the other way around. After evaluating both databases, two main reasons prevailed for choosing the Yellow Pages. The first reason is that it is likely that this source of information is more 'clean'. With the word clean it is meant that firms in the Yellow Pages are more likely categorized in the right sector, because these firms have deliberately applied themselves to be approachable for others. In addition, the Chamber of Commerce includes firms that purely exist due to reasons regarding tax advantages, which do not play a role in the Yellow Pages. In other words, due to practical reasons this source of contact information would be preferable. The second and more important reason for choosing the Yellow Pages is related to the categorization systems used by the two data sources. Since we are purely interested in three predefined specific sectors, we have to be sure we will be calling firms in these respective sectors. The category closest to our needs that the Chamber of Commerce includes is a category named 'Industrial Design' (in Dutch: Industrieel Ontwerp en Vormgeving). However, when looking at the subsequent subsectors, there are no subsectors addressing our own classification of sectors. The same accounts for web- and graphic design firms; they are scattered across the database. The Yellow Pages on the other hand, includes categories that are in line with ours. This database provided the categories 'Graphic designers (Grafisch ontwerpers)', 'Webdesign', and 'Consultancy - Industrial Design (Adviesbureaus - Industriële Vormgeving)'. The latter category is relatively the least accurate one of the three, because this category also includes firms that help with management, patents, and other industrial design related issues. Nevertheless, the number of firms not active in design itself proved to be limited. Note that one drawback of the Yellow Pages is that very large firms might not be registered here, because they might use other means of communication towards their (potential) clients.

Firms were randomly selected out of these three categories. Consequently, they were called in the order provided by the randomization process. In light of the data gathering, 737 different firms were called. Of these 737 firms, 200 firms participated in our study, 238 firms did not want to participate, and with 299 firms we had not come in contact. When looking at the total number of firms called, it makes the response rate 27%, but when only firms are taken into account with which contact was established, the response rate becomes 46%. We have strived for an equal distribution of designers in terms of the different sectors they could belong to. Some design firms were active in more than one of our predefined sectors. This has led to the following distribution: 75 firms were active in industrial design, 75 firms were active in web design, and 90 firms were active in graphic design. The sample size for our analyses is thus 200, but according to the exact analysis at hand, this number can become smaller. This is mainly due to two reasons. First, a few data points are missing. Second, and more important, some design firms did not want to provide us with performance related measures such as their monthly income (even though the questions were formulated such that they were as least personal as possible).

6.2 Measurements

As stated before, a questionnaire was created in order to gather data from design firms. Besides this questionnaire, additional data about municipalities is used. The variables and their operationalization will now be discussed. First, the questionnaire itself will be briefly described. Second, the variables concerning the location decision of design firms will be elaborated on. Third, the variables regarding explaining design firm performance are discussed. Lastly, variables concerning the model explaining the use of intellectual property rights among firms will be addressed. All variables will be summarized in a table in section 5.2.6.

6.2.1 The questionnaire

The questionnaire can be divided in seven parts:

- preliminary questions to check whether the person we are speaking to belongs to our target group,
- general questions about the respondent and the firm,
- questions about the relations the firm has with other design firms,
- questions about the use of intellectual property right,
- questions about the location decision of the founder,
- questions regarding ICT use in the firm,
- questions regarding business- and working routines/practices

The complete questionnaire can be read in appendix A (Dutch) and B (English). Note that the last two parts are mainly constructed for the other study that is making use of the questionnaire. Nevertheless, some information is also used in this study.

6.2.2 Checking the Yellow Pages data

The data that is used from the Yellow Pages is potentially inaccurate. Therefore two preliminary questions are used in order to check the data. The first question is: *"Is it true that you are active in the design sector, and if so, in what exact types of design?"*. Next to checking the presence of invalid data, there is another issue with the data source. Firms can only subscribe to one category in the Yellow Pages. Therefore, it cannot be seen beforehand whether a firm is active in multiple areas, which makes it necessary to check whether firms are also active in other types of design. The second question is: *"Are you the founder of this firm?"*. There are two reasons for implementing this question. The first reason is that it is preferable to speak to the founder instead of an employee, due to the fact that the founder is better able to answer questions about his/her location decision. Secondly, since we have taken the net income of the founder as a proxy for firm performance, it is less likely to receive this information from an employee. (The reason for taking net income will be discussed in the next section). The eventual dataset consists out of 191 founders, and 9 employees capable of answering the questions.

6.2.3 Location decision variables

To examine the location decision motives of founders of design firms in the Netherlands a distinction is made between nine different motives. These motives are: the presence of other designers, the availability of educated personnel, the availability and affordability of premises, the design reputation of

the location, the presence of (potential) clients, the extent to which the environment is inspiring, the presence of cultural amenities, the availability of a fast internet connection, and the presence of family, friends, and acquaintances. Note that not all these motives are strict business motives. Several motives are of a personal nature. As described in the theory section, since many design firms are small (often one-man businesses) it is possible for the founder to give more weight to personal reasons.

Firms that have taken the presence of clients into account when deciding on their location have provided more specific information on this topic (see questionnaire). This information will be used in an attempt to elucidate the dynamics around this phenomenon.

6.2.4 Design firm performance variables

In this section, the variables concerning firm performance will be discussed. The dependent variables will be discussed first, followed by the independent variables.

Dependent variables

In the analyses regarding firm performance, two dependent variables are used. The first, and the main dependent variable in this study, is the net monthly income of the founder of the design firm. The second dependent variable is innovation. Innovation as a performance measure is included because innovation measures another type of performance than the net monthly income. Innovation can be seen as a form of performance relevant for society as a whole, while net monthly income can be seen as a form of performance relevant for the individual firm.

Net monthly income

There are several reasons underlying the choice for taking the net monthly income as an indicator for firm performance. The first reason is related to the availability of the data. Theoretically, one could use information regarding a firm's turnover, profit, and turnover-to-profit ratio to indicate the firm's performance. However, when talking with respondents over the telephone, it is uncertain whether firms can access that information at that time and whether these numbers are in close proximity when they do have access. Even if this information is present in the building or stored in a computer, it could take time to find it and report it. The time and effort it takes can hold respondents back from successfully cooperating. Furthermore, it can substantially increase the interview length, which is undesirable both for reasons regarding response rate as for efficiency reasons for the researcher. Due to these practical reasons, it was attempted to use an indicator that respondents can quickly report. Beforehand, it was known that the average firm size in these sectors is small. There are many one-man businesses. With small firms and especially one-man firms, profit and net monthly income are relatively highly correlated, since the profit of the firm becomes income for the founder. The profit could also be used for investments, which is a drawback of the indicator. Another drawback is that respondents may find net monthly income too personal to report. This has been taken into account in the formulation of the question. Respondents were asked to report their net monthly income on a 'rough' scale. The scale consists out of the categories 0-1000 euro's, 1000-2000 euro's, 2000-3000 euro's, 3000-4000 euro's, 4000-6000 euro's, and 6000 euro's or more. To increase the response rate for this question, this relatively rough scale has been used. Note that in the higher income categories, the interval length increases. This is done because of two reasons. First, people with very high incomes might not want to

report their net monthly income on a 1000 euro interval scale. Assumedly, response rate will increase when the interval becomes larger. Second, very high income categories would likely only have one or a two entries, which causes problems with the statistical analyses later on.

Innovation

The second dependent variable that is used in this study is innovation. In a Schumpeterian approach, productivity growth is reached by means of innovation. Innovation can provide competitive advantages in terms of cost reduction and differentiation. Therefore, in this line of reasoning firms that will survive and prosper under competitive conditions will likely be the firms that successfully innovate.

In this study, the concept of innovation is operationalized in the following way. Respondents were asked whether their firm had introduced a radically new design in the last twelve months. Radically new was explained to the respondents as something new in the sense that it was completely new for the company, something they had not done before. This could be, among other things, a new functionality, a complete new design style such as 3D-design, or a newly used material. It has to be stressed that it is not about a radically new design for the whole (international) market, but radically new in light of the firm. Innovation is namely not only about the few first firms that create a new product, service, or design. In addition, respondents will likely not have an overview of the whole market, which would make it hard to relate their own firm to the rest of the market.

In this question, 'twelve' months is used for two reasons. First, explicitly describing the length of the period we are looking at deals with ambiguity. For example, using the notion of one year could be interpreted as a calendar year, an academic year, the year 2011, twelve months and possible other concepts. Secondly, we have to take memorizing issues into account. It can be hard for respondents to memorize how things were in the past. Twelve months is a period for which it could be reasonably assumed that respondents can still memorize things accurately.

Note that innovation is a difficult concept in the design sector. There are many aspects making it difficult to measure innovation in this sector. Here, every design can be seen as something new, and thus as an innovation. Therefore, the term 'radical' is used in an attempt to grasp the more than incremental differences between designs. Next to the problem of defining innovation, there are other aspects making innovation hard to measure. As described above, a trade-off has to be made on the capability of memorizing and the time scale on which innovation is addressed. Furthermore, innovation is approached from the firm's point of view, in the sense that radical innovation in light of the individual firm is central. Although this latter is better measurable than looking at innovation from a sector perspective, it brings the risk that imitation and innovation are put in the same category. A radical innovation for one firm might be standard business for another firm. In other words, while for some firms a new design might be classified as a radical innovation, it might be classified as imitation from a sector perspective.

Independent variables

Control variables

Multiple independent variables are used in the analyses, of which several variables are control variables. The set of control variables includes the year of birth (*Age*), whether the gender of the founder is male (*Male*), education, the founding year of the firm (*Founding year*), whether the founder has founded a firm before (*Entrepreneurial experience*), and the log of the number of fulltime workers in the firm (*Firm size*). The log is taken due to diminishing marginal returns on firm size. Education is coded according to two aspects: the level of education (HBO/WO or other levels) (*Higher education*) and the design relatedness of the education (*Design related education*). Whether the education is design related has been evaluated by the author of this report.

Specific design sector variables

Design firms can be active in one or several types of design. Whether or not the respondent firm is active in each of the three predefined design sectors is captured by three dummy variables (*Active web design*, *Active graphic design*, *Active industrial design*).

Location variables

With respect to the location of the firm, different types of information are used. First, the location of the firm itself is needed, because data regarding the municipalities in which the firm is located will be used. Note that the Yellow Pages provide the name of the city in which the firm is located. Therefore, asking respondents for the address is a check of this location information.

One location variable concerns the cluster effect (*Cluster*) or following the conceptualization of Hoover (1948), localization economies. The extent of clustering that is present at the location of the firm is used as a predictor for firm performance. This extent of clustering is operationalized by taking the number of firms in the specific design sector in the same municipality and the adjacent municipalities (i.e. the municipality plus the first ring of municipalities). The data about the number of design firms in every municipality is extracted from the Yellow Pages. Here, the number of design firms (per category) in every municipality is listed.

The second location variable concerns the urbanization economies (*Urbanization*); co-location advantages that are not restricted to one particular sector. The way this is operationalized is by taking the number of inhabitants of the corresponding municipality. The argument is that urbanization economies increase with the number of inhabitants, because more inhabitants will very likely mean a broader offer of (specialized) services and goods. Moreover, aspects like reputation building and local buzz are also likely increasing with municipality size, instead of with specific sector size. The data about the number of inhabitants is extracted from the Central Bureau for Statistics (CBS) in the Netherlands.

Spin-off variable

The question regarding earlier employment in the design sector is the operationalization of the concept of spin-offs. It measures whether the founder has been employed in wage labor in the design sector before founding the firm (*Spin-off*). As is described in the theory section, the dynamics among spin-offs

is a possible explanation for the existence of clusters and the increased performance of firms within this cluster. We want to examine whether cluster effects are present after controlling for the spin-off effect.

Collaboration variables

In this study two variables are used to proxy collaboration. Here, collaboration is defined as a combined effort, regardless of the business results. We mainly consider three forms of collaboration: working on an assignment in a consortium, outsourcing design work to a fellow designer, and joint action in the area of promotion and marketing.

The first variable is the number of other design firms the company has collaborated with in the last twelve months (*Nr. firms collaboration*). More specific, in the analyses the log of this number of firms is used due to diminishing marginal returns on the number of firms a company collaborates with. The second variable is the number of other design firms the company has approached for business related advice (*Nr. firms advice*). This variable has also been transformed using a log with the same reasons.

Intellectual property rights variable

This variable (*Use of IPR*) displays whether a firm actively uses intellectual property rights in order to protect its designs. The reason why this definition states 'actively' is related to copyright. Copyright namely exists from the moment a (copyright covered) design is created. Therefore, not defining the use as active would mean that everyone (in the web- and graphic design sector) would use IPR, which would make the variable of little value.

Specialized software variable

Design firms can differ in the extent to which they are specialized. An indicator hereof is the software packages firms use, since more specialized design work requires more specialized software. In this study, all software packages used by the respondents have been divided into two groups: a relatively specialized software group and a relatively unspecialized software group (*Specialized software*). This divide has been made by the author of this report.

6.2.5 Use of IPR variables

The dependent variable in this analysis is the independent variable of the design firm performance analysis regarding the active use of IPR in order to create the firm's designs (*Use of IPR*). The independent variables of this former analysis are equal to the independent variables used for this analysis.

6.2.6 Variables summary

To summarize all the variables that are used in this study, a summary table is placed below.

Table 2 Variables summary

Variable name	Variable description	Type of variable
Income	The net monthly income of the founder of the design firm	Dependent
Innovation	Whether the firm has introduced a radically new design in the last twelve months	Dependent/Independent
Use of IPR	Whether the firm actively uses IPR in order to protect its designs	Dependent/Independent
Age	The age of the founder	Independent
Male	The founder is a male	Independent
Founding year	The year the firm is founded	Independent
Entrepreneurial experience	Whether the founder has founded a firm before	Independent
Firm size	The (log of the) number of fulltime employees within the firm	Independent
Higher education	Whether the founder completed a HBO/WO educational program	Independent
Design related education	Whether the completed education program is design related	Independent
Active web design	Whether the firm is active in web design	Independent
Active graphic design	Whether the firm is active in graphic design	Independent
Active industrial design	Whether the firm is active in industrial design	Independent
Cluster	The number of firms in the specific design sector in the same municipality and the adjacent municipalities	Independent
Urbanization	The number of inhabitants of the design firm's municipality	Independent
Spin-off	Whether the founder has been employed in wage labor in the design sector before founding the firm	Independent
Nr. firms collaboration	The (log of the) number of other design firms the company has collaborated with in the last twelve months	Independent
Nr. firms advice	The number of other design firms the company has approached for business related advice	Independent
Specialized software	Whether the firm uses specialized software	Independent

6.3 Method of analysis

The two distinct topics in this study require different methods of analysis. The respective analysis methods are now discussed in the same order as the measurements.

6.3.1 Method of analysis: location decision

For examining the motives of founders to locate themselves at a certain location, two types of analyses are used. The first type is mostly explorative, and makes use of descriptive statistics. By means of this descriptive information, conclusions can be drawn about the ranking of the nine named different motives among founders of design firms. In addition, data concerning the location of study and the location of the (possible) mother firm are used to elucidate the movement of design firm founders.

However, the use of descriptive data has limitations with respect to testing hypotheses. Hypotheses 2a, 3, and 6 make a statement about the locating behavior of design firms, but the evaluations of these hypotheses based on descriptive data remain arbitrary to some extent. Therefore, the data that is used for these respective hypotheses can potentially provide support for the corresponding hypotheses, but hard conclusions cannot and will not be drawn.

The second type of analysis, capable of making strong statistical comparisons, is the Mann-Whitney U test. It is a non-parametric test for assessing whether one of two samples of independent observations tend to have larger values than the other. The test is comparable with a t-test. However, the t-test cannot be used in this study due to the distribution of the variables of interest. Recall that for assessing the evaluation regarding location motives of founders, the answer possibilities are 'it played no role', 'it played a small role', and 'it played a big role'. In terms of the influence on the location decision, it can be stated that the second answer is larger than the first one, and the third answer is larger than the second one. However, the three answer options are not symmetric and the spacing between adjacent values cannot be assumed to be constant. The data can thus not be seen as interval data, but has to be seen as ordinal data. The Mann-Whitney U test is suitable to compare groups on variables with this type of data.

6.3.2 Method of analysis: use of IPR

To explain the use of IPR based on several independent variables, a logistic regression model is used in this study.

Logistic regression

In a binary logistic regression model, a set of regression coefficients that predict the probability of an outcome are estimated. The outcome can have two outputs, often defined as 1 and 0. The model can be written in several ways, but when one wants to express the outcome in terms of a linear combination of parameters, the model looks like follows:

$$\ln \left(\frac{\text{prob}(\text{event})}{1 - \text{prob}(\text{event})} \right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k$$

with the X's being the independent variables and the β 's being the respective regression coefficients.

The left side of the equal sign is the so-called 'logit'. This is the log of the odds an event occurs. In this analysis the event is the active use of IPR.

6.3.3 Method of analysis: firm performance

To explain firm performance based on several independent variables, regression models are used in this analysis. Two types of regression models are used, based on the nature of the dependent variable. To explain innovation, a binary logistic regression analysis is performed, because the outcome has two possible answer options. It is thus the same type of analysis used for explaining the use of IPR with the only main difference being the dependent variable.

In the case of the net monthly income, an ordinal regression, or 'Polytomous Universal Model' (PLUM), is used due to the ordinal nature of the data. The ordinal regression method can be seen as an extension on the logistic regression method.

Ordinal regression

The binary logistic regression model can be modified in order to incorporate the ordinal nature of a dependent variable by defining the probabilities differently. Instead of considering the probability of an individual event, you consider the probability of that event and all events ordered before it (i.e. the particular score or less). For example: the probability of the score '2' (net monthly income of 1000-2000 euro's) is the probability that someone has an income of 0-1000 euro plus the probability that someone has an income of 1000-2000 euro's.

When fitting an ordinal regression, you assume that the relationship between the independent variables and the logits is the same for all logits. That means that the results are a set of parallel lines; one for each category of the outcome variable. For this reason, this assumption is called the assumption of parallel lines. Take for example the independent variable gender. In statistical terms it would mean that for each score, the estimated odds of the cumulative scores for men divided by the the estimated odds of the cumulative scores for women (odds ratio) are equal. Therefore, in an ordinal regression every independent variable has one regression coefficient (i.e. one β -value) . However, this assumption has to be checked. When this assumption is not met, a multinomial logistic regression should be used. In this type of regression model, every independent variable gets a different regression coefficient for every category. This latter analysis method does not take ordering in the data into account. In addition, results become more complex and likely harder to interpret. Therefore, using the ordinal regression method would be preferable. The assumption of parallel lines holds in the model of this study. Hence, the ordinal regression method is used for explaining design firm performance.

7. Results

7.1 Descriptive findings

Data is collected from 200 design firms. Of these 200 firms, 75 firms are active in web design, 75 firms are active in industrial design, and 90 firms are active in graphic design. The sum of these numbers exceeds 200, because 40 firms are active in more than one type of design.

Much of the data can be summarized to get a global view of the sector. Characteristics of the founders/designers will now be discussed first, followed by firm characteristics, and location decision motives.

7.1.1 Designer characteristics

Of all respondents, 70% is male and 100% has the Dutch nationality. The average age is 42, with the youngest respondent being 21 years old and the oldest respondent being 89 years old. The educational programs respondents have completed differ in terms of topic and difficulty level; 76% completed higher tertiary education (in Dutch: HBO or WO) and 62% completed a design related educational program.

Founders also differ in former experience. For 18% of the respondents, this firm is not the first firm they founded. These founders have founded at least one other firm before. Furthermore, 52% of the 200 respondents have been employed in wage labor in the design sector before founding this firm; that is, these firms are identified as spin-off firms.

Designers also differ with regard to the tools they use for their job. When looking at some basic ICT applications, 73% of the firms use a scanner, and only 14% still make use of a fax. The design sector has not remained unreached for the upcoming of the social media; 68% of the firms makes use of social media (e.g. Facebook, Twitter, LinkedIn) in a business-related way. Of all respondents, 30% uses them daily.

Different software packages are being used, depending on the details of the design work of each firm. Nevertheless, some packages are being widely used. By far the mostly used package is the Adobe Creative Suite; this software package is running in 74% of the respondent firms. More specialized software like Autodesk, Fractal Webdesign and Unigraphics, is only used by a limited amount of designers.

Designers can differ substantially on their income. The net monthly income in terms of euro's has been divided into six categories: 0-1000, 1000-2000, 2000-3000, 3000-4000, 4000-6000 and >6000. The income distribution is shown below.

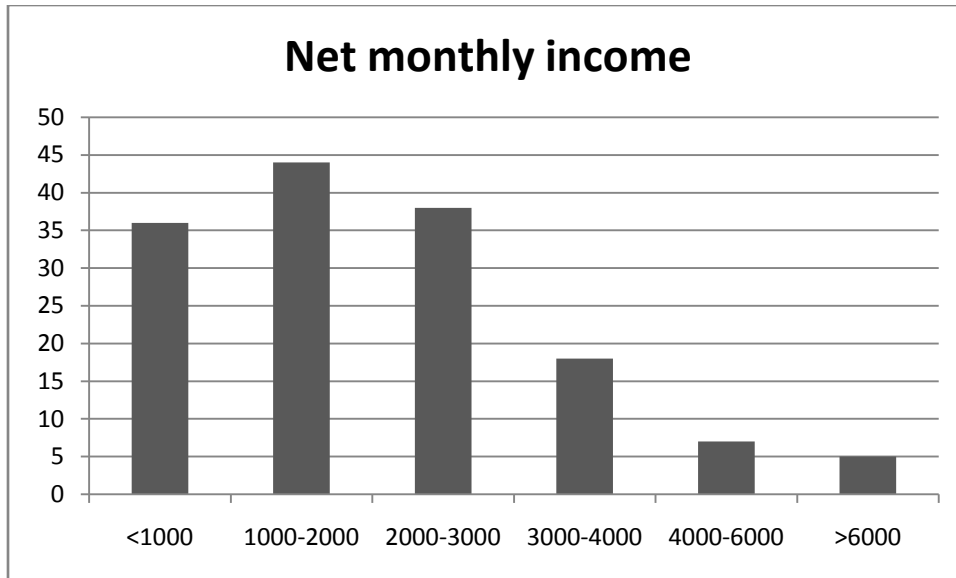


Figure 1 Distribution of net monthly income in euro's among founders of design firms

Of the 200 respondents, 148 have indicated to which category they belong. The other 52 did not want to answer, they were not able to answer, or net monthly income was not applicable (e.g. respondent that has recently started). For the respondents that did not want to answer or could not answer, it has been examined whether this answer alternative is correlated with other variables. This is done to check whether there is a bias towards firms with certain properties. For example, larger firms could be less willing to answer the question, which would lead to a biased sample. However, the correlations with other variables are very low (i.e. around 0.1), indicating that the income distribution is not susceptible to this bias.

7.1.2 Firm characteristics

The average number of employees is 2.3, with the largest company having 30 employees. Most firms only count one employee. 69% of the firms are one-man firms and only 3% of the firms have 10 employees or more. Some small firms cannot (yet) grow, and others do not have the desire to grow. Either way, these numbers illustrate the focus on SME's in this sector.

Firms differ with regard to their age. The average firm is 10 years old, with the youngest firms being founded in 2011 and the oldest firm being founded in 1959.

An average firm has collaborated with 2.7 design firms in the last twelve months, of which 1.1 were located in the same municipality. The average total number of collaborations with design firms is somewhat higher, laying at 6.8. Besides collaborating with other design firms, in the last twelve months the average design firm has approached 3.1 other design firms for business related advice.

Intellectual property rights are dealt with in different manners. Of all firms, 20% makes active use of IPR. This active use can take many forms. For example: some firms register their copyright, other firms have design patents or normal patents, some others register an i-DEPOT, and some are connected to an organization that takes care of protection issues for their members. Although a substantial part of the

firms engages in actively protecting their designs, most of the firms does not expect the benefits to exceed the costs. Their reasons can be very diverse and different in nature. Some designers for example, do not expect other designers to copy their designs. A whole other type of reason is related to the IPR system and the boundaries of protection. A firm active in 3D-printing explained that in the (near) future end products can be easily and economic feasibly customized, which makes it pointless to protect each and every single design, since there will be too many different designs. Although these are just two examples, they show how complex and context-dependent the activities around this phenomenon can be.

7.1.3 Location decision motives

Respondents were asked to evaluate the importance of nine different location decision motives. The extent of importance is captured by three answer possibilities: 'it played no role', it played a small role', and 'it played a big role'. Figure 1 shows to what extent these nine motives have played a small or big role for the founders of these 200 firms. Although absolute values may be hard to interpret, comparing the different evaluations can give valuable insights. As the graph clearly shows, the presence of family, friends, and acquaintances together with the availability and affordability of premises are prominently evaluated as the most important motives. It could be stated that these motives are relatively personal in nature.

Following on these two motives, the presence of clients and the extent to which the environment is inspiring are also considered as relatively important. Hereafter, relevance seems to become limited. At rank nine, the end of the spectrum, there is the availability of educated personnel. It seems that founders do not evaluate this aspect as very relevant, which is not surprising as most design firms are small.

Next to this data, which is vulnerable to inaccuracy due to the self-reporting nature of the information, additional data is used to examine their location decision motives. Data concerning the company location, the location in which the founder has completed the educational program, and the location in which the founder has (possibly) previously worked in wage labor are combined to examine whether they potentially exercise influence on each other.

Of all respondents, 41.2% founds the firm at the same location they have completed their educational program. Here, the same location is defined as the same municipality or an adjacent municipality. When dividing the respondents into two age groups, people older than 50 years and people until 50 years old, the numbers provide some extra information. Of people older than 50 years, 47.7% has founded the firm in the same location. People until 50 years old locate themselves in the same location 39.1% of the time. This difference in numbers might point at a difference in mobility between older and newer generations. In any way, it can be said that many people (41.2%) have founded their firm at the same location they had studied.

When looking at spin-offs, there seems to be a relationship between the location of the former employer and the location of the founded firm. Of the spin-off firms, 59% locate at the same location as

the former employer. Again, the same location is defined as the same municipality or an adjacent municipality.

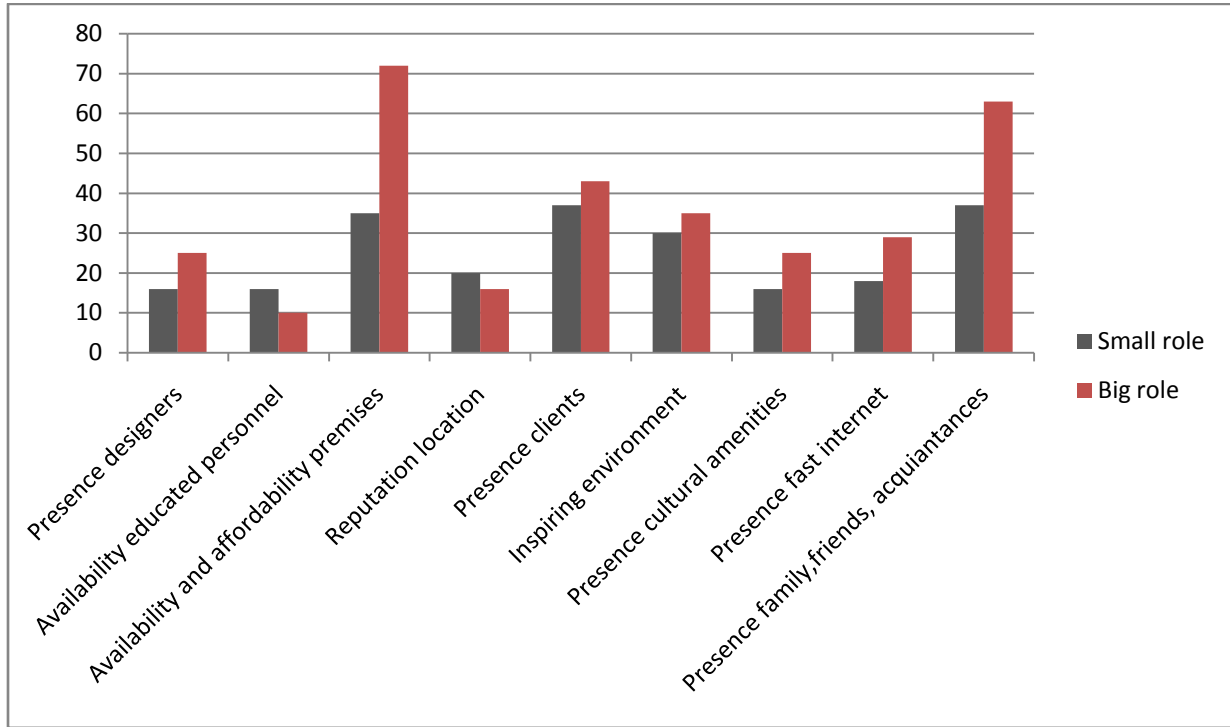


Figure 2 Location decision motives

7.2 Hypotheses testing

In this section the hypotheses formulated in the theory section will be tested and discussed. The hypotheses are divided into three groups: location decision hypotheses, use of IPR hypotheses, and design firm performance hypotheses. They will be discussed in this order, followed by a summary of the hypotheses and their corresponding level of support provided by the data.

7.2.1 Location decision hypotheses

Hypotheses 1-6 focus on different mechanisms that can play a role in design firms' location decisions. These hypotheses try to shed some light on how design firms decide to locate at a certain location, and on whether there are significant differences between different types of designers.

Hypothesis 1: Design firms in a cluster collaborate more than design firms outside a cluster.

Firms located within a highly concentrated area of design firms have more possible firms in close proximity to collaborate with. However, whether they do collaborate more has to be tested. To test this hypothesis two different analyses have been run.

The first analysis examines whether the extent of clustering and the number of companies a firm collaborates with are correlated. The results are shown in table 3.

Table 3 Correlation between Cluster and Nr. firms collaboration

Correlation matrix		Nr. firms collaboration
Cluster	Pearson correlation	-0.40
	Sig. (2-tailed)	0.577
	N	199

The correlation coefficient is negative, which means that a higher density of design firms corresponds with less collaboration. However, there is no significant correlation between Cluster and Nr. firms collaboration. Therefore, according to this analysis hypothesis 1 would be rejected.

In this first analysis, the notion of clusters is operationalized on a continuous scale. It might however be argued that the notion of clusters and the corresponding dynamics cannot be expressed on a continuous scale, but that a critical mass of the cluster is a condition for these mechanisms to hold. Therefore, the second analysis dichotomizes the cluster variable at a 80%/20% split. When a firm has more than 200 other design firms (within its own specific sector) in the same municipality or an adjacent municipality, the firm is defined to be in a cluster. Until having 200 proximate other design firms, the firm is defined as not being part of a cluster. The dichotomous cluster variable is summarized in table 4.

Table 4 Descriptive statistics with respect to the dichotomous cluster variable

Descriptive statistics		N	Mean	Std. Deviation
Nr. firms collaboration	Part of a cluster	38	2.34	3.290
	Not part of a cluster	161	2.80	8.387

A t-test is run on the number of companies firms collaborate with, grouped by this dichotomous cluster variable. The result is shown in table 5.

Table 5 t-test on Nr. firms collaboration grouped by a dichotomous cluster variable

t-test	t	df	Sig. (2-tailed)	Mean difference	Std. Error Difference
Nr. firms collaboration	-0.331	197	0.741	-0.459	1.387

The t-test indicates that there is no significant difference between the two groups in terms of the number of other design companies these firms have collaborated with. Again, the insignificant relationship suggests that firms outside clusters collaborate more than firms within clusters. The sign is thus inversed compared to the formulated hypothesis. Since firms within clusters do not significantly collaborate more, hypothesis 1 would also be rejected by this second analysis.

Summarized, both analyses indicate the same result. Firms within clusters do not collaborate more than firms outside clusters, therefore:

No support is found for hypothesis 1.

Hypothesis 2a: Design firms locate near their clients.

A design firm being located in a close proximity to its clients can reap several benefits. Whether these potential benefits are taken into account by the founder when deciding on a location, will now be tested and discussed.

To examine this hypothesis, data concerning the evaluation of respondents with respect to the influence of the presence of clients on their location decision has been used. A summary of this data is shown in figure 3.



Figure 3 The influence of the presence of clients on the founders' location decision

The figure shows that 119 respondents reported the presence of clients to play no role at all, 37 respondents reported it to play a small role, and 43 respondents considered it to have played a big role. This means that 80 respondents, or 40%, took the presence of clients into account when deciding on a location. Furthermore, this locating motive is ranked third in terms of relative importance in this study.

Despite the fact that 40% is a substantial amount of founders taking this motive into account, it is still a minority and therefore it lacks the power to fully support hypothesis 2a. For this reason we will state that:

Some support is found for hypothesis 2a.

Hypothesis 2b: It is more important for industrial design firms to locate near their clients than it is for web- and graphics design firms.

Industrial designers typically create more complex designs. The required knowledge to properly create these designs has to be retrieved from different sources, of which one is the client and potentially its technical staff. As complex information is hard to share by means digital media, face-to-face contact can be extremely helpful. In turn, face-to-face contact is more easily established when located in a close proximity of the client.

The evaluation on the presence of clients is compared between industrial design firms and web- and graphic designs by means of a Mann-Whitney U test. The results are shown in tables 6 and 7.

Table 6 Ranks presence of clients

Ranks		N	Mean rank	Sum of ranks
Presence clients	Active in industrial design	75	92.40	6930.00
	Not active in industrial design	124	104.60	12970.00

Table 7 Test statistics of the Mann-Whitney U test

Test statistics	
	Presence of clients
Mann-Whitney U	4080.000
Asymp. Sig. (2-tailed)	0.099

Table 6 shows that the presence of clients is more often being evaluated as important by web- and graphic design firms than by industrial design firms. Table 7 shows the results of the test that calculates whether this difference is significantly large. The two-tailed significance level is 0.099, which means that web- and graphic design firms have significantly more often reported the presence of clients to be important. This is not in line with the hypothesis, therefore:

No support is found for hypothesis 2b.

Hypothesis 3: Spin-off design firms locate near their parent company.

As discussed in the theory section, there are multiple reasons for a spin-off firm to locate near its parent company. These reasons can be business related (e.g. existent relationships with partners, clients, and the parent company at the respective location) and can be of a personal nature (e.g. the founder lives at the location, knows his way around, established personal contacts).

In this study, the way to analyze whether spin-off firms locate near their parent company is by examining the proportion of spin-off firms that actually do so. As mentioned in the descriptive findings, 59% of the spin-off firms locate near their parent company. Given the fact that a founder can have many reasons to locate at a certain location, it is remarkable that more than half of all the spin-off firms has located itself near their parent company. Therefore:

Strong support is found for hypothesis 3.

Hypothesis 4: Web- and graphics design firms higher value the presence of attractive cultural amenities than industrial design firms.

Following the argument of Florida (2002), creative workers will be attracted by attractive cultural amenities, and consequently potentially set-up their company on that location. However, the author of this report argues that the effect of this mechanism can differ among different creative sectors. Even

within the design sector this effect can already differ. The importance and share of the pure cultural symbolic aspect is greater in graphics- and web design than in industrial design. These different kinds of designers may differ in personal characteristics, as well as in the perceived benefits of living in a place with highly attractive cultural amenities. Therefore, it will be tested whether differences on this regard between different types of designers exist.

A Mann-Whitney U test is run on the evaluation of the presence of attractive cultural amenities with 'Active industrial design' as the grouping variable. The results are shown in the two tables below.

Table 8 Ranks presence cultural amenities

Ranks		N	Mean rank	Sum of ranks
Presence cultural amenities	Active in industrial design	75	93.90	7042.50
	Not active in industrial design	124	103.69	12857.50

Table 9 Test statistics of the Mann-Whitney U test

Test statistics	
	Presence of cultural amenities
Mann-Whitney U	4192.500
Asymp. Sig. (2-tailed)	0.099

The first table shows that firms active in industrial design lower rank the importance of the presence of cultural amenities than web- and graphic designers. The second table shows that the difference between these two groups is significantly large, and thus web- and graphic design firms higher value the presence of cultural amenities than industrial design firms. Therefore:

Strong support is found for hypothesis 4.

Hypothesis 5: Web- and graphics design firms more strongly prefer to be located in a reputable location than industrial design firms.

In the theory section different aspects and potentially benefits of a location with a good reputation are discussed. These aspects include the possibility to self-express, increased market value, and an increased level of cultural symbolic expression of the location. It is argued that overall, reputation plays a bigger role for web- and graphic designers than for industrial designers due to the cultural and symbolic value that it is accompanied with.

In order to investigate whether the data supports this view, also here a Mann-Whitney U test is run. Again, the grouping variable is 'Active industrial design'. The results are shown in tables 10 and 11.

Table 10 Ranks reputation

Ranks		N	Mean rank	Sum of ranks
Presence cultural amenities	Active in industrial design	75	101.74	7630.50
	Not active in industrial design	124	98.95	12269.50

Table 11 Test statistics of the Mann-Whitney U test

Test statistics	
	Presence of cultural amenities
Mann-Whitney U	4519.500
Asymp. Sig. (2-tailed)	0.621

The evaluation of both groups is relatively equal, which is supported by both tables. The significance level is 0.621, which means that there is no significant difference between these two groups of designers in terms of importance of the location reputation. Therefore:

No support is found for hypothesis 5.

Hypothesis 6: Design firms are founded at the education location of the founder.

In this report it is argued that personal considerations can take a prominent role in the location decision of the founder. In addition, it is argued that in many cases, the education location is directly related to personal life and the living location of an individual. As a result of this combination, it becomes likely that firms locate at the education location of the founder.

The data shows that 41.2% of the respondents has founded the firm at the same location as where they have studied. Moreover, the percentage becomes 47.7% when looking at people above the age of 50 and the percentage becomes 39.1% for people till the age of 50. This latter suggests that mobility may have been increased over the years. Despite the differences between age groups, it can be said that a substantial amount of firms are founded at the founder's education location. Therefore:

Some support is found for hypothesis 6.

7.2.2 Use of IPR hypotheses

This section will cover hypotheses 7-9, which are focused on the use of IPR among design firms. The hypotheses will be tested by means of a multivariate binary logistic regression model, where the dependent variable is the 'Use of IPR'. With respect to the independent variables, the model includes variables directly related to the hypotheses and several control variables. The variables directly related to the hypotheses are 'Active industrial design', 'Innovation', and 'Cluster'.

The control variables take several potentially relevant mechanisms, mentioned in section 4, into account. First, some variables are included that are related to the knowledge base required to engage in the field of IPR, namely 'Age', 'Higher education', 'Design related education', 'Founding year', 'Entrepreneurial experience', and 'Spin-off'. These are all variables related to the potential acquisition of useful knowledge in light of IPR usage. Second, two variables are included related to the extent of exposure of the firm's designs, namely 'Nr. firms collaboration' and 'Cluster'. These variables can correspond to unintended knowledge spillovers. Third, 'Innovation' and 'Specialized software' are included as proxies for the extent to which the firm's designs are unique. Fourth, 'Income' and 'Firm size' are included to indicate the firm's resource base, which is relevant in the light of investment costs. Lastly, the standard control variable 'Male' is included to account for potential differences between men and women.

Before presenting the multivariate binary logistic regression model on which the hypothesis testing is based, two preliminary analyses are performed. First, univariate regressions will be run on 'Use of IPR' to examine the effects of the independent variables on the dependent variable when they are singly included in the model. This enables us to check whether certain effects appear or disappear when more variables are accounted for. Second, it will be examined whether multicollinearity issues can play a role when using the mentioned independent variables, and if so, these issues will be appropriately dealt with.

Univariate 'Use of IPR' model

For every single independent variable, a binary logistic regression is run on 'Use of IPR'. The results are shown in table 12 below.

As the table shows, in the univariate regression models six independent variables show a significant result, namely 'Higher education', 'Firm size', 'Founding year', 'Active industrial design', 'Innovation', and 'Specialized software'. Whether these variables will remain significant and others remain insignificant will be shown by the multivariate model. There are reasons for potential differences between the univariate and the multivariate results. First, independent variables can correlate, which may result in excluding some variables from the analysis. Second, when controlling for more effects one can more properly address the influence of different variables.

Now, the correlations between the independent variables will be examined in order to check for multicollinearity.

Table 12 Univariate binary logistic regression on 'Use of IPR'

Univariate binary logistic regressions on 'Use of IPR'	
Variable name	β
Age	0.023 (0.014)
Male	0.655 (0.430)
Higher education	1.569** (0.626)
Design related education	0.611 (0.389)
Firm size	0.478** (0.198)
Founding year	-0.040** (0.018)
Entrepreneurial experience	0.188 (0.448)
Active industrial design	2.387*** (0.434)
Spin-off	0.050 (0.354)
Nr. firms collaboration	-0.012 (0.213)
Cluster	-0.001 (0.001)
Innovation	0.971*** (0.361)
Specialized software	1.471*** (0.417)

Notes: *** correlation is significant at the 0.01 level, ** correlation is significant at the 0.05 level, * correlation is significant at the 0.10 level

Independent variables correlations

All independent variables included in this study are checked for correlation. This is done both by examining bivariate correlations as by examining the tolerance and Variance Inflation Factors (VIF's). As the full correlation matrix is very large, it is presented in appendix C. The matrix shows the presence of several significant correlations between independent variables. Whether these correlations will pose a problem for the multivariate analysis will be examined by means of the tolerance and VIF values.

These values are shown in table 15. According to Williams (2011) VIF values above 2.5 in combination with a tolerance factor below 0.40 can become problematic. This rule of thumb will be used for examining table 13.

Table 13 Collinearity statistics independent variables

Collinearity statistics		
Variable name	Tolerance	VIF
Age	0.482	2.074
Male	0.895	1.117
Higher education	0.743	1.346
Design related education	0.725	1.380
Firm size	0.787	1.271
Founding year	0.511	1.956
Entrepreneurial experience	0.815	1.227
Active industrial design	0.632	1.582
Spin-off	0.810	1.235
Nr. firms collaboration	0.911	1.098
Cluster	0.861	1.162
Innovation	0.878	1.139
Specialized software	0.576	1.736

The table shows no problematic tolerance and VIF values, which means that all these independent variables can be included in the multivariate model.

Multivariate binary logistic regression on 'Use of IPR'

Now the independent variables have been checked for multicollinearity, the multivariate model will be introduced. It is presented in table 14.

Before discussing hypotheses 7-9, some brief remarks will be made with respect to the control variables. The model shows that people that have completed a design related education are more likely to actively make use of IPR. This result suggests that during these educational programs, people acquire knowledge about IPR in the design sector (e.g. what can be protected, how can it be protected, and when should it be protected). Besides this variable, no other control variable shows to be significantly related to the use of IPR.

Table 14 Multivariate binary logistic regression on 'Use of IPR'

Multivariate binary logistic regressions on 'Use of IPR'	
Variable name	β
Age	0.010 (0.027)
Male	0.582 (0.576)
Higher education	0.221 (0.767)
<i>Design related education</i>	<i>0.983*</i> <i>(0.555)</i>
Firm size	0.366 (0.275)
Founding year	-0.026 (0.031)
Entrepreneurial experience	-0.214 (0.575)
<i>Active industrial design</i>	<i>2.723***</i> <i>(0.591)</i>
Spin-off	-0.047 (0.476)
Nr. firms collaboration	-0.299 (0.279)
Cluster	0.000 (0.001)
Innovation	0.425 (0.469)
Specialized software	-0.487 (0.623)

Note 1: *** correlation is significant at the 0.01 level, ** correlation is significant at the 0.05 level, * correlation is significant at the 0.10 level.

Note 2: the p-values corresponding to the independent variables are susceptible to an overestimation of their level of significance. Potential effects on the municipality level would make us underestimate the standard errors, and consequently overestimate the significance levels.

N = 185, Nagelkerke pseudo R-square = 0.384

Hypothesis 7: Industrial design firms make more use of IPR than web- and graphic design firms.

Sector specific characteristics may influence the role of IPR in the respective sector. In this report, it is argued that designs within the field of industrial design are more likely being protected than designs in the web- and graphic design sector.

The model on IPR use presented in table 14 shows that 'Active industrial design' is significantly related to this use on the 0.01 significance level. It therefore strongly supports the notion of intersectoral

differences with respect to IPR dynamics. Typical designs created in the industrial design sector arguably enjoy more benefits from legal protection. Therefore it is concluded that:

Strong support is found for hypothesis 7.

Hypothesis 8: Design firms that create radically new designs make more use of IPR.

It is argued that designs that strongly differentiate themselves from other designs are more valuable and are more likely being protected by IPR.

In the univariate regression model, the variable 'Innovation' shows to be significantly related to IPR use on the 0.01 level. In the multivariate model however, this significant relationship does not hold. Therefore:

No support is found for hypothesis 8

Hypothesis 9: Design firms in a cluster more often actively use IPR to protect their designs than design firms outside a cluster.

Firms located within a highly concentrated area of design firms have relatively much exposure to other design firms in a close proximity. As exposure is a prerequisite for copying to take place, firms within a cluster would have more incentive to protect their designs using IPR.

The use of IPR model does not find a significant relationship between clustering and the use of IPR. This result suggests that for choosing whether to protect a design, the concentration of other design firms in the same sector is of no (or little) influence. Therefore:

No support is found for hypothesis 9.

7.2.3 Design firm performance hypotheses

This section will cover hypotheses 10-14, which are focused on the performance of design firms. As for hypothesis 7-9, these hypotheses will be tested according to a total model, only this one aimed at explaining firm performance. Net monthly income of the founder is the main dependent variable, and it will be the one on which the hypotheses are tested. After examining the income model and the corresponding hypotheses, a second model using innovation as the dependent variable will be discussed. The aim here is to check whether the effects of independent variables are comparable, and if not, what kinds of differences are present.

The procedure for testing hypotheses 10-14 is equal to the procedure for testing hypotheses 7-9. Before presenting the multivariate ordinal regression model on which the hypothesis testing is based, two preliminary analyses are performed. Again first, univariate regressions will be run on income to examine the effects of the independent variables on income when they are singly included in the model. As with the IPR model, this enables us to check whether certain effects appear or disappear when more variables are accounted for. Second the correlations between the independent variables are discussed. This will provide more insight into the dynamics among these variables and can check whether multicollinearity issues can play a role in the multivariate regression model.

Univariate Income model

For every single independent variable, an ordinal regression is run on income. The results are shown in table 15 below.

Table 15 shows that 10 out of 18 variables are significantly related to income when these independent variables are singly included. These ten are: age, gender, firm size, founding year, active industrial design, spin-off, nr. firms collaboration, use of IPR, innovation, and specialized software. Whether these variables will remain significant and others remain insignificant will be shown by the multivariate model.

Now, the correlations between the independent variables will be examined in order to check for multicollinearity.

Table 15 Univariate ordinal regressions on Income

Univariate ordinal regressions on Income	
Variable name	β
Age	0.029** (0.013)
Male	1.282*** (0.340)
Higher education	0.329 (0.364)
Design related education	-0.262 (0.316)
Firm size	1.249*** (0.233)
Founding year	-0.058*** (0.017)
Entrepreneurial experience	0.595 (0.381)
Active web design	-0.258 (0.309)
Active graphic design	-0.379 (0.295)
Active industrial design	0.670** (0.310)
Spin-off	0.554* (0.298)
Nr. firms collaboration	0.475*** (0.175)
Nr. firms advice	-0.066 (0.167)
Cluster	0.000 (0.001)
Urbanization	7.737E-7 (5.239E-7)
Use of IPR	1.063*** (0.377)
Innovation	0.522* (0.307)
Specialized software	1.788*** (0.419)

Notes: *** correlation is significant at the 0.01 level, ** correlation is significant at the 0.05 level, * correlation is significant at the 0.10 level

Independent variables correlations

All independent variables included in this study are checked for correlation. This is done both by examining bivariate correlations as by examining the tolerance and Variance Inflation Factors (VIF's). First, the correlation matrix will be briefly discussed.

As is stated before, the full correlation matrix is very large. Therefore it is presented in appendix B. The matrix shows the presence of several significant correlations between independent variables. The most important correlations in light of the analysis at hand will now be briefly discussed.

The variable 'Use of IPR' is significantly correlated with the three specific design sectors, especially with the sector industrial design. This is in line with the findings regarding the IPR use of firms. In addition, 'Specialized software' is also correlated with the specific design sectors. Furthermore, age and founding year are strongly and significantly correlated.

Another strong correlation is found between clustering and urbanization. This finding shows that the number of design firms operating in the same specific sector as the firm at hand relatively equally scales with the number of inhabitants at the firm's location. This implies that these sectors are not particularly concentrated in space. Nevertheless, some areas in the Netherlands might enjoy a relatively high concentration of design firms of a certain type.

Whether these correlations will pose a problem for the multivariate analysis will be examined by means of the tolerance and VIF values. These values are shown in table 15. According to Williams (2011) VIF values above 2.5 in combination with a tolerance factor below 0.40 can become problematic. This rule of thumb will be used for examining table 16.

The variable 'Active industrial design' has a VIF-value of 3.451 and a corresponding tolerance value of 0.291. Due to the problem of multicollinearity, this variable will be removed from the analysis. After having removed this variable, only 'Cluster' and 'Urbanization' could be problematic. The VIF value slightly above 2.5 in combination with the correlation coefficient of 0.653 are reason to exclude one of these variables. Since 'Cluster' is directly relevant for a formulated hypothesis, the variable 'Urbanization' is excluded from the analysis. The final tolerance and VIF-values are shown in table 17. These values show that there will be no substantial multicollinearity issues present.

Table 16 Collinearity statistics of all independent variables

Collinearity statistics		
Variable name	Tolerance	VIF
Age	0.469	2.134
Male	0.773	1.294
Higher education	0.670	1.492
Design related education	0.610	1.639
Firm size	0.690	1.449
Founding year	0.445	2.245
Entrepreneurial experience	0.777	1.288
Active web design	0.405	2.468
Active graphic design	0.367	2.723
Active industrial design	0.290	3.451
Spin-off	0.760	1.316
Nr. firms collaboration	0.865	1.156
Nr. firms advice	0.826	1.210
Cluster	0.389	2.570
Urbanization	0.419	2.389
Use of IPR	0.702	1.425
Innovation	0.825	1.213
Specialized software	0.480	2.084

Table 17 Collinearity statistics of final independent variables

Collinearity statistics		
Variable name	Tolerance	VIF
Age	0.476	2.100
Male	0.774	1.292
Higher education	0.679	1.472
Design related education	0.614	1.627
Firm size	0.705	1.418
Founding year	0.472	2.118
Entrepreneurial experience	0.780	1.282
Active web design	0.671	1.491
Active graphic design	0.518	1.931
Spin-off	0.768	1.301
Nr. firms collaboration	0.866	1.155
Nr. firms advice	0.841	1.190
Cluster	0.799	1.252
Use of IPR	0.763	1.311
Innovation	0.835	1.197
Specialized software	0.535	1.870

Multivariate ordinal regression on income

Now having discussed all relevant variables, the multivariate ordinal regression results will be presented. First, a model including all variables of table 16 is created. This model is presented in table 18.

Table 18 Multivariate ordinal regression on Income including all variables

Multivariate ordinal regression on Income including all variables	
Variable name	β
Age	0.009 (0.019)
Male	0.855** (0.408)
Higher education	0.119 (0.467)
Design related education	-0.079 (0.427)
Firm size	0.853*** (0.268)
Founding year	-0.044* (0.026)
Entrepreneurial experience	0.643 (0.458)
Active web design	0.782* (0.410)
Active graphic design	0.010 (0.441)
Spin-off	1.043*** (0.371)
Nr. firms collaboration	0.563*** (0.204)
Nr. firms advice	0.124 (0.189)
Cluster	0.002 (0.001)
Use of IPR	0.542 (0.454)
Innovation	0.052 (0.356)
Specialized software	1.111* (0.586)

Notes: *** correlation is significant at the 0.01 level, ** correlation is significant at the 0.05 level, * correlation is significant at the 0.10 level.

N = 138, Nagelkerke R-Square = 0.415

The table shows a model of which seven of these variables seem to have a significant relationship with income. One practical issue with respect to this model concerns the number of independent variables. Adding more variables tends to reduce the precision of the estimates (Williams, 2011). A rule of thumb is to have twelve cases per independent variable. As the number of valid cases is 138, the number of independent variables should be eleven. Of the 16 included variables, five are removed. The five variables that are removed are selected on their respective (high) p-values. The variables being removed are: 'Age', 'Nr. firms advice', 'Higher education', 'Design related education', and 'Active graphic design'.

The ordinal regression model after excluding these variables is presented in table 19.

Table 19 Multivariate ordinal regression on Income including a defined selection of variables

Multivariate ordinal regression on Income including a defined selection of variables	
Variable name	β
<i>Male</i>	0.882** (0.386)
<i>Firm size</i>	0.857*** (0.256)
<i>Founding year</i>	-0.048** (0.020)
<i>Entrepreneurial experience</i>	0.799* (0.416)
<i>Active web design</i>	0.811** (0.385)
<i>Spin-off</i>	1.055*** (0.331)
<i>Nr. firms collaboration</i>	0.523*** (0.192)
Cluster	0.001 (0.001)
Use of IPR	0.665 (0.434)
Innovation	0.034 (0.336)
<i>Specialized software</i>	0.979* (0.516)

Notes: *** correlation is significant at the 0.01 level, ** correlation is significant at the 0.05 level, * correlation is significant at the 0.10 level.

N = 143, Nagelkerke pseudo R-square = 0.410

Note that when 'Cluster' is defined in a dichotomous way (i.e. the earlier described dummy with a 80/20 split) no significant differences are observed. The same variables remain significant and the variable 'Cluster' remains insignificant.

Also note that when 'Firm size' is not transformed by means of a log-function, but is entered as the untransformed number of fulltime employees, the model gets slightly altered. Firm size is not significant anymore, and the 'Use of IPR' becomes slightly significant ($p = 0.099$). Note that the standard error is likely to be underestimated due to the possible multi-level data, which would make a p-value of 0.099 questionable.

The model presented in table 19 has a higher pseudo R-square value than the model with the untransformed variable 'Firm size'. This in combination with the theoretical argument of diminishing marginal returns on firm size forms the basis for choosing the model shown in table 19 as the main model for this analysis.

Evaluation of the model

Let us first evaluate the model as a whole. The first question is whether it is accepted to run an ordinal regression on this data. This can be checked by the test of parallel lines, which examines whether the independent variables should get a different β -coefficient for every category. For this data, the null hypothesis 'the slope coefficients are the same across response categories' is accepted, and thus instead of using a multinomial regression procedure it is valid to use an ordinal regression.

The second question is whether the model has added value. There are different statistics that can tell whether the model has added value in explaining the dependent variable. One of them is the so-called 'model fitting information'. This information tells us whether the model with predictors is significantly better than the model without predictors. Table 19 summarizes the information.

Table 20 Model fitting information

Model fitting information				
Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept only	447.143			
Final	376.038	71.105	11	0.000

This table shows us that the model with predictors is significantly better than the model without predictors. Following on this, we can examine the pseudo R-square, an indicator of the extent to which the model fits the data. The R-square value tries to indicate the percentage of variance being explained by the model. Three R-square measures are presented in the table below.

Table 21 Pseudo R-square

Pseudo R-square	
Cox and Snell	0.392
Nagelkerke	0.410
McFadden	0.159

The R-square value is especially helpful in comparing different models on the same data. This has also been done in this study. The differences in the models that have been run lie in two areas. First,

different link functions can be used (i.e. the left side of the equal sign in the model). In this model, the logit link function is used. As the dependent variable is somewhat skewed, as can be seen in figure 1, the negative log-log links function might provide a better fitting model. However, this and other link functions did not increase the R-square value and thus the default logit link function has been used. Second, different or transformed independent variables influence the R-square value. The variables 'Firm size' and 'Nr. firms collaboration' have been transformed by means of a log to better capture the mechanisms of these variables. Transforming variables cannot only influence the R-square value, but also their corresponding significance level.

Furthermore, also here it has to be noted that the p-values corresponding to the independent variables are susceptible to an overestimation of their level of significance. Potential effects on the municipality level would make us underestimate the standard errors, and consequently overestimate the significance levels.

Gender, firm size, the founding year, entrepreneurial experience, being a spin-off, the number of companies the firm has collaborated with, and the use of specialized software are significant contributors to the model. Note that in the multivariate model, 'Use of IPR' and 'Innovation' are not significant anymore. Before explicitly addressing hypotheses 10-14, the significant control variables will be briefly discussed.

Control variables

Gender is significant at the 0.05 level, which implies there is a substantial difference between men and women. Men seem to earn significantly more than women. A common argument is that employers bear an extra risk, because women are more likely to (temporary) quit their job due to pregnancy. As an employer has to invest in an employee, this increased risk among women is compensated by a smaller wage. However, the sector of design consists mostly out of one-man firms and other small firms, which dramatically lowers the power of this argument. Therefore, further research is needed to identify why men seemingly earn more than women in these sectors.

Firm size is also significantly related to the net income of the founder. Note again that the variable is transformed by a log function representing the diminishing marginal returns to scale. This results supports our view that certain benefits accrue to larger firms, such as scale advantages (e.g. being able to attract big well-paid projects) and combined expertise. However, one has to be careful inferring causal relationships in this context. It can also be the case that bigger firms have become bigger, because they have been performing better. Therefore, we will not draw hard conclusions about whether firm size is the cause, the result, or both.

The same argument can be made for the significance of the founding year. On the one hand, firms that have become more mature may have learned and improved their practices over time, which in turn positively influences their performance. On the other hand, the longer surviving firms are assumedly the better performing firms. Thus again, the age of the firm can be a cause, a result, or both.

Founders for which this firm is not their firstly founded firm have significantly higher incomes. This supports the view that besides competence in the field of design, also general skills and competences regarding entrepreneurship are needed and consequently influence firm performance.

Lastly, the model shows a positive effect of the use of specialized software on firm performance. When working in a relatively specialized type of design, relatively few other firms are capable of delivering a comparable design. In addition, a higher level of specialization may imply a higher level of complexity and difficulty. The results support the view that as the firm activity becomes more unique (and likely more complex), the firm can appropriate more financial resources.

Hypothesis 10: Design firms which are located in a cluster perform better than design firms outside a cluster.

Within clusters, firms can have better access to resources such as technology, information, inputs (e.g. potential employees, finance), customers, and channels, than they would have when operating in isolation. Also, transport- and transaction costs are typically lower. Third, local buzz, a phenomenon related to clusters, is said to be a potential source of inspiration for designers. Whether being located in a cluster actually influences firm performance has been tested by means of the regression model.

The model shows no significant relationship between clustering and income. Also when the cluster variable is dichotomized instead of being defined on a continuous scale, the effect remains insignificant.

No support is found for hypothesis 10.

Hypothesis 11: Design firms perform better when collaborating more with other design firms.

Collaboration can have several advantages. As described in the theory section, it can have advantages including useful knowledge exchange, reduced investment costs, and reduced uncertainty about doing business in an unfamiliar environment (both geographical and content related environments).

The analysis shows the variable 'Nr. firms collaboration' is a significant contributor in explaining income. Note that the variable is also transformed using a log function. This is done because the log of the number of companies a firm has collaborated with should better represent the reaped benefits of collaboration when collaborating with more and more firms. The results thus support the view that collaboration on average has a positive effect on performance. It has to be taken into account, however, that better performing firms might be more attractive to collaborate with and consequently collaborate more. Even though this mechanism might play a role, there have to be advantages for both parties to collaborate. Therefore, the results suggest that collaboration indeed has a positive effect on firm performance, and thus:

Strong support is found for hypothesis 11.

Note that the data in this study provides some insight into the potential mediating role of location on collaboration performance. When a distinction is made between collaborations with firms within the municipality and collaborations with firms outside the municipality, the number of non-local companies the firm has collaborated with shows to be significantly related to firm performance, whereas the

number of local companies the firm has collaborated is not. Further research could investigate whether well performing firms foremost have non-local collaborations, or whether these non-local collaborations provide additional benefits.

Hypothesis 12: Spin-off firms perform better than non-spin-off firms

When a designer leaves his company to start his own design firm, it will not be empty-handed. They gain knowledge, get to know new people, and they may have learned about multiple aspects such as client wishes, working routines, and advanced use of software. This knowledge and experienced can operate as useful inputs for their own founded firm.

The data supports the above described view. Founders that have been employed in wage labor in the design sector before founding their own firm significantly earn more. Therefore:

Strong support is found for hypothesis 12.

Hypothesis 13: Designers who protect their designs by means of intellectual property rights perform better.

The design sector is highly competitive. The designs that are created are the core of the designers business. These creations however, have the risk of being copied (by competitors). This hampers the maximum exploitation potential for the design firm. Therefore, protecting the designs by means of intellectual property rights can support design firms to fully exploit their designs.

The univariate regression model on income using 'Use of IPR' as the independent variable shows a significant result. However, when controlling for more variables, this effect eventually turns insignificant. This suggests it is not the use of IPR in itself that increases firm performance. Therefore:

No support is found for hypothesis 13.

Hypothesis 14: Design firms that introduce radically new designs perform better.

Innovation can be a source of competitive advantage. Therefore it is argued in this report that innovating firms are likely to perform better.

The multivariate ordinal regression model shows no significant relationship between income and innovation. This results suggests that in these sectors, innovation does not (directly) lead to a higher income.

No support is found for hypothesis 14.

7.2.4 Innovation model

Now having tested hypotheses 10-14 on income, it will be now examined whether the results are comparable when innovation is used as a performance measure.

Univariate Innovation model

As for the income model, first the univariate results will be examined. Again, it will provide a view of how the relationship between the independent variables and the dependent variable looks like, given that only a single relationship is being examined at a time. The table can be viewed in table 22. Note that 'Use of IPR' is not included, since the use of IPR is purely a consequence of innovation.

These univariate results show the presence of different significant relationships with Innovation compared to Income. In this preliminary analysis, the use of specialized software has the most significant relationship with innovation, which is in line with the view that the adoption of innovative inputs leads to innovation. Whether these relationships remain their effects when controlling for multiple variables will now be analyzed.

Table 22 Univariate binary logistic regressions on Innovation

Univariate binary logistic regressions on Innovation	
Variable name	β
Age	-0.015 (0.012)
Male	0.712** (0.345)
Higher education	0.014 (0.348)
Design related education	0.594* (0.317)
Firm size	0.217 (0.168)
Founding year	0.004 (0.016)
Entrepreneurial experience	0.140 (0.380)
Active web design	-0.468 (0.313)
Active graphic design	-0.152 (0.298)
Active industrial design	0.747** (0.305)
Spin-off	0.287 (0.297)
Nr. firms collaboration	0.333* (0.178)
Nr. firms advice	0.273 (0.185)
Cluster	-0.001 (0.001)
Urbanization	0.000 (0.000)
Income	0.227* (0.133)
Specialized software	1.156*** (0.397)

Notes: *** correlation is significant at the 0.01 level, ** correlation is significant at the 0.05 level, * correlation is significant at the 0.10 level.

Multivariate Innovation model

The innovation model will not include 'Use of IPR', which alters the tolerance and VIF values discussed before the multivariate regression model on income. Therefore, these values will be reexamined before creating the model for innovation (see table 23 and 24)

Table 23 Collinearity statistics without 'Use of IPR'

Collinearity statistics		
Variable name	Tolerance	VIF
Age	0.463	2.160
Male	0.853	1.173
Higher education	0.737	1.358
Design related education	0.666	1.503
Firm size	0.767	1.303
Founding year	0.475	2.107
Entrepreneurial experience	0.799	1.251
Active web design	0.401	2.496
Active graphic design	0.419	2.386
Active industrial design	0.313	3.196
Spin-off	0.766	1.305
Nr. firms collaboration	0.886	1.128
Nr. firms advice	0.860	1.162
Cluster	0.407	2.456
Urbanization	0.442	2.260
Specialized software	0.577	1.732

Table 24 Collinearity statistics final independent variables Innovation

Collinearity statistics		
Variable name	Tolerance	VIF
Age	0.463	2.160
Male	0.853	1.173
Higher education	0.737	1.358
Design related education	0.666	1.503
Firm size	0.767	1.303
Founding year	0.475	2.107
Entrepreneurial experience	0.799	1.251
Active web design	0.401	2.496
Active graphic design	0.419	2.386
Spin-off	0.766	1.305
Nr. firms collaboration	0.886	1.128
Nr. firms advice	0.860	1.162
Cluster	0.407	2.456
Urbanization	0.442	2.260
Specialized software	0.577	1.732

Table 22 shows that only the variable 'Active industrial design' is problematic. Therefore, this variable has been removed, which leads to the final collinearity statistics, shown in table 23, corresponding to the final set of independent variables with respect to the innovation model.

The multivariate binary logistic regression model is shown in table 25. Note that the sample size is 185, meaning that all of the 15 variables shown in table 24 can be included.

Table 25 Multivariate binary logistic regression on Innovation

Multivariate binary logistic regression on Innovation	
Variable name	β
Age	-0.005 (0.019)
Male	0.663 (0.410)
Higher education	-0.624 (0.445)
<i>Design related education</i>	<i>0.828**</i> <i>(0.415)</i>
Firm size	0.117 (0.217)
Founding year	0.007 (0.025)
Entrepreneurial experience	0.266 (0.463)
Active web design	-0.145 (0.406)
Active graphic design	0.026 (0.446)
Spin-off	-0.074 (0.375)
Nr. firms collaboration	0.217 (0.206)
Nr. firms advice	0.171 (0.209)
Cluster	0.000 (0.002)
Urbanization	0.000 (0.000)
<i>Specialized software</i>	<i>1.090**</i> <i>(0.542)</i>

Notes: *** correlation is significant at the 0.01 level, ** correlation is significant at the 0.05 level, * correlation is significant at the 0.10 level.

N = 185, Nagelkerke R-square = 0.16

Potential presence of municipal effects can lead to an underestimation of the standard error

The innovation model drastically differs from the income model. Here, the only significant contributors to the model are 'Specialized software' and 'Design related education', of which the latter is not significant in the income model. Firms using relatively more specialized software have more frequently reported to have introduced a radically new design in the last twelve months. This result suggests that firms that use more unique tools also create more unique designs. Respondents that completed a design related education program have also more frequently reported to have introduced a radically new design in the last twelve months. Designers that have been interested and occupied with design from a relatively early age might have another view on design, as well as potentially having another design mentality.

The variables that are significant in the income model are not of particular relevance here. This implies that radical innovation and income seem to be two different phenomena in this sector. Although radically new designs can incorporate a new functionality and can include lower production costs, the value of a design is still strongly related to its cultural and symbolic value. Therefore, expressing the value of design solely in monetary terms, efficiency, and effectiveness seems to miss out on an important aspect in this sector.

Furthermore, note that the concept of a radically new innovation is viewed from the design firm's point of view. The design being radically new for the firm does not mean that it is radically new for the market as such. The value of radically new designs can therefore strongly differ depending on the firm at hand. A large well performing firm introducing something radically new will more likely have more added value in its design than a small firm in its start-up phase radically innovating in light of the firm. Since radically new is not a hard single measure, it becomes more difficult to analyze its effect.

Another aspect that makes it difficult to analyze is related to the pay-off term of an innovation. When respondents report to have radically innovated in the last twelve months, it may well be the case that the firm will reap the benefits later. However, when going further back into time, it becomes more difficult to memorize and make an accurate assessment. Hence, it is a difficult concept to measure.

To recapitulate: when taking innovation as the performance measure, hypotheses 10-14 do not hold.

7.2.5 Hypotheses testing summary

Fourteen hypotheses have been tested and discussed. Table 26 summarizes the results.

Table 26 Hypotheses summary

Hypotheses summary			
Topic	Hypothesis #	Description	Support
Location decision			
	1	Design firms in a cluster collaborate more than design firms outside a cluster.	No support
	2a	Design firms locate near their clients.	Some support
	2b	It is more important for industrial design firms to locate near their clients than it is for web- and graphics design firms.	No support
	3	Spin-off design firms locate near their parent company.	Strong support
	4	Web- and graphics design firms higher value the presence of attractive cultural amenities than industrial design firms.	Strong support
	5	Web- and graphics design firms more strongly prefer to be located in a reputable location than industrial design firms.	No support
	6	Design firms are founded at the education location of the founder.	Some support
Use of IPR			
	7	Industrial design firms make more use of IPR than web- and graphic design firms.	Strong support
	8	Design firms that create radically new designs make more use of IPR.	No support
	9	Design firms in a cluster more often actively use IPR to protect their designs than design firms outside a cluster.	No support
Firm performance			
	10	Design firms which are located in a cluster perform better than design firms outside a cluster.	No support
	11	Design firms perform better when collaborating more with other design firms.	Strong support
	12	Spin-off firms perform better than non-spin-off firms	Strong support
	13	Designers who protect their designs by means of intellectual property rights perform better.	No support
	14	Design firms that introduce radically new designs perform better.	No support

7. Conclusion and discussion

Summary

This study has analyzed different aspects concerning the role of location in the design sector. It has focused on location decision motives, the use of IPR, and firm performance of Dutch design firms. Fourteen hypotheses regarding these topics have been tested and discussed.

With respect to the location decision motives of founders of design firms, several interesting results have come up. Design firms hardly take the presence of other designers into account when deciding on a location. In addition, being located in a highly concentrated area in terms of the number of other designers does not lead to more collaboration among these design firms. Although the presence of other designers does not seem to be relevant for the location choice, the presence of clients seems to play a role to some extent. Furthermore, according to the results of this study, two main motives seem to be most important. These motives are the presence of friends, family, and acquaintances and second, the availability and affordability of premises. The first motive is strongly personally related. Especially one-man firms (can) take personal considerations into account. Many of them work at home, something that relates to the second motive. Working at home prevents the firm of having to invest many resources in firm premises. Besides this financial argument, many designers indicate to prefer working at home due to personal reasons (e.g. children at home). There is more to personal considerations than these two reasons. Although not further analyzed, many respondents indicated that the reason they located them at their location was because they lived there. This did not mean per se that they took proximity to family, friends, and acquaintances into account. Additionally, that the location where respondents live is related to where they locate their firm is also supported by data regarding the location of education. Of all respondents, 41.2% located their firm at the same location they have studied. Moreover, the spin-off mechanism described by Klepper (2002, 2005, 2007) shows to be prominently present in the design sector; 59% of the spin-off firms locates near the parent company.

This study thus challenges the central argument of Florida (2002), who argued that creative workers would be attracted by the presence of cultural amenities and a tolerant atmosphere. Consequently, these workers would locate themselves there and create economic activity in the creative sector. This study, however, does not find cultural amenities to play a big role. Of the 200 respondents, 158 reported the presence of cultural amenities to have played no role at all for the location decision. This result suggests that the mechanism described by Florida (2002) cannot be generalized to all constituents of the creative industry. Differences between specific sorts of creative industries exist, as is also shown in this study. Web- and graphic designers significantly higher rate the importance of the presence of cultural amenities than industrial designers. When differences with respect to this phenomenon differ within the design sector itself, differences with other types of creative industries are even more likely to exist.

Design firms typically try to fully exploit the value of their designs. One way to ensure that the firm has an exclusive position when it comes to exploiting its designs, is to protect the designs by means of intellectual property rights. When it comes to IPR, creative industries have other dynamics than for example traditional manufacturing sectors. IPR in the creative industries is a field that is relatively

unstudied. This study has made a contribution to this field; a model is created in an attempt to explain why some firms actively use IPR and others do not. The model shows that there is one major predictor with respect to the use of IPR, which is the sector in which the firm is operating. Industrial design firms significantly make more use of IPR than web- and graphic design firms. This result suggests that the typical value of an industrial design is higher than a web- or graphic design, which in turn makes it more worthwhile to protect it. This is in line with the notion that industrial designs typically take more resources (e.g. time, money) to create. Furthermore, it was hypothesized that as locations become higher concentrated in terms of design firms, exposure of firms' designs increases and therewith the chance of copying increases, resulting in a higher tendency to apply for IPR. However, clustering does not seem to influence IPR use.

The study has also analyzed whether location influences design firm performance, which is defined as the net monthly income of the founder. The results indicate that there is no cluster effect present. There is thus no support for the view that agglomeration economies play a significant role in this sector. Next to agglomeration economies, a second aspect by which location is related with firm performance concerns spin-offs. As the results of this study show, spin-off firms do significantly perform better than non-spin-off firms. Since spin-offs locate near their parent company, the location of the parent company gets strengthened by the spin-off. Following Klepper (2002, 2005, 2007), better performing firms also generally create more spin-offs. These two aspects sum up to an evolutionary mechanism, by which certain locations become and remain relatively well performing. It is then not the agglomeration economies that define the location influence on firm performance, but the location related passing on of aspects such as knowledge, social capital, and reputation. This study controls for both, and finds that only the spin-off mechanism has a significant relation with firm performance.

Besides the directly location related variables, other variables have shown to be significant contributors to the model explaining firm performance. These variables are gender, firm size, founding year, entrepreneurial experience, being active in web design, the use of specialized software, and the number of companies the firm has collaborated with. Note that the results suggest that firm performance is mostly related to experience, rather than to cluster advantages.

Furthermore, It was hypothesized that the use of IPR would have a positive relation with firm performance. In the univariate analysis, this relationship is present. However, in the multivariate analysis this seems not to be the case, suggesting it is not the IPR itself that increases performance, but other underlying aspects of the firm that determine whether the firm actively uses IPR in the first place.

It is also analyzed to what extent using innovation as a performance measure matches the results of using income. It can be safely said that the results do not correspond. This provides several insights. It illustrates the cultural and symbolic character of the sector. The value of design cannot be simply expressed in monetary terms, but also has a strong cultural and symbolic value. Innovation therefore, does not imply new functionalities and efficiency gains per se. In addition, innovation in the design sector is a concept difficult to grasp, because every new design can be interpreted as an innovation. Hence, measuring the concept is a difficult task.

Limitations

This study has several limitations. The main limitations will be briefly discussed.

The data concerning location motives brings a point of interest that should be taken into account. When respondents indicate that a certain aspect has not played a role for their location decision, it does not mean that the aspect does not matter. When the aspect in question is already (sufficiently) present at the location designers live and subsequently found their firm, the aspect might well not be consciously taken into account as it is a given that it is already present.

The hypothesis testing based on descriptive data that is used for hypotheses 2a, 3, and 6 has a limitation with respect to their method of analysis. Analyzing descriptive data is susceptible to arbitrary evaluations, since there is no objective way of saying which values or percentages can be regarded as high or low. Nevertheless, the data can provide support for the hypotheses.

Measuring the use of IPR in the design sector is not a straightforward task. Many designs such as web- and graphic- designs are automatically protected to some extent by copyright. In this sense, all designers 'use IPR'. However, automatically (and perhaps unconsciously) acquiring copyright and actively engaging in IPR are two distinct phenomena. Although the questions in this study are formulated in such a way that this distinction is made as clear as possible, a part of the complete spectrum of not using IPR until very actively using IPR can become a gray area.

Firm performance is mainly operationalized by taking the net income of the founder. Although this can be regarded as a relatively suitable indicator both in terms of theoretical validity and practical considerations, it is not perfect. First, some founders may invest more income back into the company than others. Second, once firms become larger than a one-employee firm, the relationship between firm turnover/profit with personal income may become less correlated. Third, it can be difficult for (design) entrepreneurs to provide a net monthly income as projects and payments can often have strongly differing time scales.

Innovation is a difficult concept in the design sector; there are many aspects making it difficult to measure innovation in this sector. Every design can be seen as something new, and thus as an innovation. For this reason, the term 'radical' is used in an attempt to grasp the more than incremental differences between designs. Next to this problem of defining innovation, there are other aspects making innovation hard to measure. A trade-off has to be made on the capability of memorizing and the time scale on which innovation is addressed. Going further back into the past may address more relevant (radically) new designs, but it requires the respondents to better memorize. Furthermore, innovation is approached from the firm's point of view, in the sense that radical innovation in light of the individual firm is central. Although this latter is better measurable than looking at innovation from a sector perspective, it brings the risk that imitation and innovation are put in the same category. A radical innovation for one firm might be standard business for another firm. In other words, while for some firms a new design might be classified as a radical innovation, it might be classified as imitation from a sector perspective. Moreover, the relationship between innovation and financial performance is difficult to identify due to two main reasons. One reason is that the pay-off period of an innovation is not the

same in every context; it can be as short as one week, or as long as a couple of years. Second, the value of design cannot be purely expressed in monetary terms. It entails a substantial symbolic and cultural value. Therefore, something new might not directly be worth more in terms of efficiency and functionality, but it might contain additional symbolic and cultural value.

A final caveat concerns the use of variables measured at the level of municipalities. Our data thus has a multi-level dimension, meaning that effects might be present at the level of the municipality. Because control variables related to municipal characteristics are not included, an underestimation of the standard errors in the regression analyses can occur.

Implications

It is commonly thought that as more designers are located in the same region, they collaborate more. Recent literature challenges this thought and highlights the highly competitive nature of the sector and its role in limiting collaboration between design firms (Reimer, 2008). This study has empirically tested whether this relationship between clustering and collaboration exists. As the results have shown, there is no direct relation between the two. Also when asking founders of design firms whether they have taken the presence of other designers into account when deciding on a location, most of them reported this aspect as being unimportant. This finding has an important policy implication. The results suggest that when policy makers attempt to strengthen the design sector, it might not be most efficient to over-commit to investments regarding stimulating and supporting collaboration between designers purely in clusters. This study does support the view that collaboration improves firm performance, but this applies to all design firms. In addition, combining former literature with the responses of this study, it can be reasonably said that design firms have a critical stance when it comes to collaborating with other designers and consequently selecting potential partners. When wanting to stimulate collaboration, it should not be forced upon designers, but an environment should be created in which potential future collaboration stems from the wishes and desires of the firms themselves. To what extent the focus in policy should lie on clusters obviously depends on the role of the policy makers in question. Cluster organizations like Brainport will have other goals than for example professional associations like the 'Beroepsorganisatie Nederlandse Ontwerpers (BNO)'.

This study finds support for the notion that personal considerations are dominant in the location decision of design firm founders. This finding that these personal considerations are the dominant motives has important implications. When wanting to attract design activity as a municipality or as a region, focus should lie on these considerations. This could translate into the following. Creating educational design programs or improve existing ones can attract design students, and in turn can create economic activity in this sector in the respective region. Furthermore, additional information regarding living location motives in general could be used in order to develop policy aiming at attracting design firms.

Another way of creating and attracting design activity is through the 'snowball' mechanism of spin-offs. As the results of this study show, 59% of the spin-offs locate near their parent company. Following the argument of Klepper (2005): if a municipality or region is able to attract a large well performing design firm, it becomes likely that more and better performing design firms will follow due to a cumulative

spin-off process. Furthermore, this study provides empirically based results that question to what extent being in a cluster is really advantageous. The traditional way of understanding clusters as a result of agglomeration economies does not seem to apply. Rather, an evolutionary explanation based on spin-offs dynamics may better explain geographic concentration in the design sector. For such a conclusion, however, a further longitudinal study would be required (Klepper, 2005).

The analysis on firm performance shows that firms that use specialized software perform better on average. It is also known that the design sector is a sector dominated by SME's. Thus instead of focusing policy (only) on a macro scale, it might help the design sector when initiatives are taken to improve the software skills of designers. A specific example can be the organization of workshops with respect to certain software packages. This would be a task suited for professional associations like the BNO.

As stated before, this study challenges the argument of Florida (2002). The fact that this argument is not generally applicable in the creative industries has important implications. Instead of putting all types of creative industries under one denominator, specific attention has to be paid to potential differences between the different sectors. I would state that creating one type of policy for all creative sectors is not recommendable. This finding is illustrated by the recent event that the creative industry, identified as one of the nine most potential sectors in the Netherlands (EL&I, 2011), experiences problems with coming up with one line of policy that would address the whole creative industry.

Further research

Further research could focus on multiple areas. With respect to location decision motives, future studies could go into more detail, in particular, on the role of personal considerations. Additionally, it can focus on living location motives to combine these insights in order to create a better understanding of designer mobility dynamics. Also, attention could be paid to the locating behavior of people through the course of their lives (e.g. moving away and coming back).

Further research could also further analyze the characteristics of collaborations that take place between different designers. This could create a better view of when collaboration is useful for designers, and when and with whom they collaborate. These findings could be used for stimulating and increasing successful collaboration in the sector.

The analyses in this study have found multiple significant effects on the use of IPR, income, and innovation. Further research could go into the specifics of these respective effects. For example, why do women earn significantly less than men in the Dutch design sector, or what specific skills or knowledge make founders with former entrepreneurial experience perform better.

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Appendix A: Questionnaire (Dutch)

ID respondent:

Plaats:

Naam enquêteur:

Tijd aanvang afname enquête:

Datum afname enquête:

Terugbelafsprak (Indien van toepassing)

Tijd:

Datum:

Goedemorgen/-middag/-avond, u spreekt met ... (naam enquêteur) ... van de Technische Universiteit Eindhoven. We zijn momenteel bezig met een landelijk onderzoek onder ontwerpers in Nederland. We zouden het erg op prijs stellen als u hieraan wilt deelnemen. Als u deelneemt en interesse heeft in de resultaten kunnen wij u deze naderhand opsturen.

→ *Zo nee:* Mag ik u vragen waarom u niet wilt deelnemen?

- Geen tijd
- Geen interesse
- Werk niet in de ontwerpsector
- Anders, namelijk.....

Non-respons

Non-respons:

Klopt het dat u werkzaam bent in de ontwerpsector?

→ *Zo ja*

Klopt het dat u actief bent in (type designsector).....? (meer dan 1 mogelijk)

- Web design
- Grafisch ontwerp
- Industrieel ontwerp

→ *Zo nee:*

(1) *Ik ben geen zelfstandig designer, en ook nooit geweest:*

“U valt helaas buiten onze doelgroep. Ik wil u bedanken voor uw medewerking.”

Geen designer

(2) *Ik ben geen zelfstandig designer meer; ik ben gestopt:*

“In welk jaar bent u gestopt?”

“Graag zouden wij u alsnog willen interviewen. Wij zijn dan geïnteresseerd in uw toenmalige ervaringen als zelfstandig designer.”

Bent u de oprichter van het bedrijf?

→ *Zo ja, volgende vraag.*

→ *Zo nee:* “Is de oprichter van het bedrijf aanwezig?”

- *Zo niet*: “Is het dan mogelijk om op een later tijdstip terug te bellen?”
→ *Zo ja*: (Noteer tijd en datum bovenaan deze bladzijde.)
→ *Zo nee*: Non-respons:

Non-respons

We doen een onderzoek onder ontwerpers in Nederland. In dit kader willen wij u enkele vragen stellen over uw huidige bedrijf en de zakelijke relaties van u en uw bedrijf. De beantwoording van deze vragen zal ongeveer 20 minuten duren. Komt dit u nu gelegen?

→ *Zo ja, volgende vraag.*

→ *Zo nee*: “Kan ik met u een terugbelafsprake maken?” (Noteer tijd en datum bovenaan)

- **ALGEMEEN** (titel niet uitspreken)

1. Niet vragen, geslacht: Man Vrouw

Allereerst zal ik u nu een aantal algemene vragen stellen over u en uw bedrijf.

2. **Wat is uw geboortejaar?** 19....

3. **Heeft u de Nederlandse nationaliteit?**

- Ja.
 Nee, anders namelijk

4. **Wat is de postcode van uw woonadres (bij twijfel van de respondent aangeven dat de 4 cijfers ook voldoende zijn)?**

5. **Wat is uw hoogst genoten opleiding?**

→ *Aan welk instituut heeft u deze opleiding voltooid?*

Zelf invullen:

- WO
 HBO
 MBO
 Anders, namelijk.....

Designgerelateerd?

- Ja
 Nee

6. **In welk jaar heeft u uw huidige bedrijf opgericht?**

7a. Heeft u hiervoor eerder een bedrijf opgericht?

→ Zo ja:

7b. Hoeveel van deze bedrijven behoorden tot de ontwerpsector?

7c. Hoeveel van deze bedrijven behoorden tot een andere sector?

8. Wat is de postcode van uw huidige bedrijf?

(Een check van de adresgegevens in de Gouden Gids.)

9a. Hoeveel medewerkers telt uw bedrijf, inclusief uzelf?

9b. Hoeveel van hen zijn full-time in dienst?

9c. Hoeveel van hen hebben een HBO/WO-opleiding voltooid?

10a. Hoeveel werknemers had u bedrijf 12 maanden geleden?

10b. Hoeveel van hen waren full-time in dienst?

11. Is het aantal klanten van uw bedrijf de afgelopen 12 maanden toegenomen, gedaald, of gelijk gebleven?

Toegenomen

Gedaald

Gelijk gebleven

Geen idee

12. Heeft uw bedrijf de afgelopen 12 maanden winst gemaakt?

Ja/nee

13. Wanneer we kijken naar een schaling van netto maandsalaris, zou u kunnen aangeven tot welke schaal u behoort?

<1000 euro

1000-2000 euro

2000-3000 euro

3000-4000 euro

4000-6000 euro

> 6000 euro

Nee, dat wil ik niet aangeven.

14. Heeft u voor het oprichten van dit bedrijf al in loondienst gewerkt in de designsector?

→ Zo ja: ga naar spin-offs

→ Zo nee: ga door naar HORIZONTALE RELATIES

-
- *SPINOFFS (titel niet uitspreken)*

15. a. **Bij welk bedrijf heeft u het laatst in loondienst gewerkt?**

Naam bedrijf:

b. **Waar was dit bedrijf gevestigd (toen u daar werkte)?**

.....

16. **Hoeveel jaar heeft u bij deze laatste werkgever gewerkt?**

Aantal:

-
- *HORIZONTALE RELATIES / MEDEDESIGNERS (titel niet uitspreken)*

We hebben het net gehad over de start van uw onderneming. Nu zou ik u graag enkele vragen stellen over de relaties die uw bedrijf met andere designbedrijven heeft.

Ten eerste zou ik u graag wat vragen over samenwerking met andere ontwerpers. Samenwerking definiëren wij als een gezamenlijke inspanning, ongeacht het zakelijke resultaat. Dit kan het geval zijn wanneer u als een consortium aan een opdracht werkt, als u werk uitbesteedt aan een mede-ontwerper, of als u gezamenlijke actie onderneemt op het gebied van promotie en marketing.

17a. Met hoeveel andere ontwerpbedrijven heeft u de afgelopen 12 maanden samengewerkt?

Aantal:

17.b Hoeveel samenwerkingen heeft u met deze bedrijven gehad in de afgelopen 12 maanden?

Aantal:

→ Als het meer dan 0 is:

17c. Hoeveel van deze bedrijven waren in dezelfde gemeente gevestigd?

18. In de afgelopen 12 maanden, naar hoeveel mede-ontwerpers bent u toegegaan voor zakelijk advies?

Aantal:

19. Beschermt u uw designs en bedrijf door middel van intellectueel eigendomsrechten zoals copyright, modelrecht en handelsmerk? (meerdere antwoorden mogelijk)

- Copyright
- Modelrecht (design right)
- Handelsmerk (trademark)
- Nee (ga door naar 'zo nee')

Als ze aangeven dat ze wel intellectueel eigendomsrechten gebruiken, per type recht vragen waarom ze het gebruiken en hoe vaak:

→ *Zo ja copyright:*

Welke van de volgende redenen om uw designs te beschermen d.m.v. copyright zijn op u van toepassing? (mogelijk meer dan 1)

- Voorkomen van kopiëren
- Gebruik voor promotie naar klanten toe
- Extra geld verdienen (bijvoorbeeld door licenseren)
- De concurrentie doet het ook
- Anders, namelijk.....

Hoe vaak beschermt u uw ontwerpen d.m.v. copyright?

- Altijd
- Meestal
- Soms

→ *Zo ja modelrecht:*

Welke van de volgende redenen om uw designs te beschermen d.m.v. modelrecht zijn op u van toepassing? (mogelijk meer dan 1)

- Voorkomen van kopiëren
- Gebruik voor promotie naar klanten toe
- Extra geld verdienen (bijvoorbeeld door licenseren)
- De concurrentie doet het ook

Anders, namelijk.....

Hoe vaak beschermt u uw ontwerpen d.m.v. modelrecht?

- Altijd
- Meestal
- Soms

→ *Zo ja handelsmerk:*

Welke van de volgende redenen om uw bedrijf te beschermen d.m.v. een handelsmerk zijn op u van toepassing? (mogelijk meer dan 1)

- Voorkomen van kopiëren
- Gebruik voor promotie naar klanten toe
- Extra geld verdienen (bijvoorbeeld door licenseren)
- De concurrentie doet het ook
- Anders, namelijk.....

→ *Zo nee:*

Welke van de volgende redenen om uw designs niet op deze manier te beschermen zijn op u van toepassing? (mogelijk meer dan 1)

- Hoge kosten van de aanvraag
- Te weinig tijd om hier mee bezig te zijn
- Ik ben niet goed bekend met intellectueel eigendomsrechten
- Geen verwachting dat anderen designs 'stelen'
- Ik heb er nooit aan gedacht
- Anders, namelijk.....

• **LOCATIEKEUZE** (titel niet uitspreken)

20. **Ik ga nu enkele redenen opnoemen waarom bedrijven zich ergens kunnen vestigen. Kunt u aangeven in hoeverre elk hiervan: geen, een kleine of een grote rol hebben gespeeld bij de locatiekeuze van uw huidige (/laatste) eigen bedrijf?**

	Geen rol	Kleine rol	Grote rol
1. Aanwezigheid van andere designers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Beschikbaarheid geschoold personeel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Beschikbaarheid en betaalbaarheid bedrijfsruimte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Reputatie als designstad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Afzetmarkt/klanten	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Inspirerende omgeving	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Aanwezigheid culturele voorzieningen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Aanwezigheid van snel internet (20 Mbit down of meer)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Aanwezigheid van familie, vrienden, en kennissen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

→ *Als klanten een kleine of grote rol spelen:*

U heeft aangegeven dat uw klanten een rol spelen bij uw locatiekeuze. Zou u kunnen aangeven in hoeverre de komende aspecten van belang zijn voor het vestigen in de buurt van klanten?

	Geen rol	Kleine rol	Grote rol
1. Face-to-face contact met bestaande en mogelijk nieuwe klanten	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Bereikbaarheid van uzelf en uw bestaande en mogelijk nieuwe klanten	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Transportkosten	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Opbouwen lange termijnrelatie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- **ICT-ADOPTIE** (*titel niet uitspreken*)

Ik zal u nu wat vragen stellen over het ICT-gebruik in uw bedrijf.

Q1. Heeft uw bedrijf een website? (Alleen vragen wanneer de GG niks vermeld heeft staan)

- Ja
- Nee

Q1-b. Zo ja: wat is de URL van uw website?

URL:

Q2. Over wat voor (download) snelheid internet beschikt uw bedrijf?

- <2 Mbps
- Tussen 2 en 10 Mbps
- Tussen de 10 en 50 Mbps
- Boven de 50 Mbps
- We hebben geen internetconnectie
- Geen idee

Q3-a. Maakt u bedrijf gebruik van de volgende technologieën voor zakelijk gebruik, en zo ja maakt u er dagelijks, wekelijks, of maandelijks gebruik van?

- Scanner
- Fax
- Teleconference (Videoconference, dataconference)
- Voice mail
- Voice over IP zoals mogelijk is met bijvoorbeeld Skype en MSN Messenger
- Social Networks (Facebook, Twitter, Linked In)
- Documenten Management Tools, waarmee documenten geüpdate en gedeeld kunnen worden zoals Dropbox
- (O Electronic Meeting Systems (**something like SecondLife?**))
- Elektronische kalender

Q3-b. Welke softwarepakketten gebruikt uw bedrijf? (aanvinken welke ze opnoemen i.p.v. ze allemaal af te gaan, desnoods schrijf je ze even op om vervolgens te kijken waar het pakket staat in de lijst zodat het gesprek vloeiend blijft verlopen. Nieuwe pakketten sowieso opschrijven voor de 'andere technologievraag', dus opschrijven is eigenlijk altijd verstandig)

Web Designers:

- Markup languages (HTML, XHTML, XML)
- Style Sheet Languages (CSS and XSL)
- Client side scripts (JavaScript)
- Server side scripting (PHP and ASP)
- Database technologies (My SQL Postgre SQL)
- Multimedia Technologies (Flash and Silver light)

Industrial Designers:

- Illustrator
- Photoshop
- Solidworks
- Alias
- Pro/E
- Rhinoceros
- MS Office
- Alias Sketchbook
- Corel Draw
- AutoCAD

Graphic Designers:

- Print Workshop 2009
- Design & Print Business Addition
- Publishing Studio
- Print Shop Delux
- Print Master-Broader Bund
- Microsoft Publisher
- Print Shop Pro Publisher
- Print Artist

- Page+X3, Serif
- Adobe Creative Suite

Q4. Kunt u aangeven of ICT geen rol, een kleine rol, of een grote rol speelt in de volgende taken:

	Geen rol	Kleine rol	Grote rol
1 Het onderhouden van de relaties met klanten	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2 Het onderhouden van de relaties met toeleveranciers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3 Het onderhouden van de relaties met andere designers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4 Het opslaan, ophalen, en verspreiden van kennis en informatie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q5. Kunt u aangeven in welke mate de volgende werkwijzen en routines op uw bedrijf van toepassing zijn?

Niet- Enigszins-In grote mate-Nvt

(Bij meer dan 1 medewerker)

1. Biedt uw bedrijf in-house training aan, aan medewerkers?

(Bij meer dan 1 medewerker)

2. Kunnen medewerkers in uw bedrijf werktuig gebruiken voor leeractiviteiten?

(Bij meer dan 5 medewerker)

3. Worden medewerkers in uw bedrijf doorgeroteerd in termen van functies?

(Bij meer dan 1 medewerker)

4. Hebben de medewerkers in uw bedrijf flexibele werkuren?

(Bij meer dan 1 medewerker)

5. Worden medewerkers in uw bedrijf beloond/betaald op prestatie?

6. Houdt u bedrijf up-to-date financiële informatie van het bedrijf bij?

(Bij meer dan 1 medewerker)

7a. Kunnen medewerkers in uw bedrijf van thuis uit werken?

7b. Zo ja, hoeveel dagen per week maximaal?

Q6. Heeft uw bedrijf de afgelopen 12 maanden een radicaal vernieuwd design geïntroduceerd?

Ja

Nee

Q7. Heeft uw bedrijf de afgelopen 12 maanden nieuwe of substantieel vernieuwde interne processen geïntroduceerd?

Ja

Nee

**Dit waren alle vragen die ik u wilde stellen. Hartelijk dank voor uw medewerking.
(Ruimte geven voor eventuele toevoegingen vanuit de designer)**

E-mailadres noteren wanneer ze geïnteresseerd zijn in de resultaten van het onderzoek.

E-mailadres:

Appendix B: Questionnaire (English)

ID respondent:

Location:

Name interviewer:

Starting time interview:

Date interview:

Appointment to call back later (*If applicable*)

Time:

Date:

Good morning/-afternoon/-evening, you're speaking with ... (name interviewer) ... from the Eindhoven University of Technology. We are currently working on a national research program concerning designers in the Netherlands. We would appreciate it if you would participate. If you participate, and if you are interested, we can send you the results afterwards.

→ *If no:* May I ask you why you do not want to participate?

No time

No interest

Don't work in the design sector

Other, namely.....

Non-response

Non-respons:

Is it right that you are active in the design sector?

→ *If yes*

Is it right that you are active in..... (type design sector).....? (more than 1 possible)

Web design

Graphic design

Industrial design

→ *If no:*

(1) *I am no self-employed designer, and I have never been one:*

“Unfortunately you do not belong to our target group. I would like to thank you for your cooperation.”

No designer

(2) *I am no self-employed designer,; I have quit:*

“In what year have you quit?”

“We still would like to interview you. We are interested in your experiences as a self-employed designer at that time..”

Are you the founder of the firm?

- *If yes, next question.*
- *If no: "Is the founder of the firm momentarily present?"*
- *If not: "Is it possible to call back at a later moment in time?"*
 - *If yes: (Note time and date at the top of the questionnaire.)*
 - *If no: Non-response:*

O Non-response

We are researching designers in the Netherlands. In the light of the research we would like to ask you some questions regarding your current company and the business relations of you and your company. Answering these questions will take approximately 20 minutes. Would it be possible at this moment?

- *If yes, next question.*
- *If no: "Could I call you back at a later moment in time?" (Note time and date)*

- **General** (*Do not enounce the title*)

1. *Do not ask, gender:* Male Female

First, I will ask you a couple of general questions about you and your firm.

2. **What is your year of birth?** 19....

3. **Do you have the Dutch nationality?**

- Yes.
- No, namely

4. **What is the postal code of your living address (in case of doubt tell him/her the four numbers are sufficient)?**.....

5. **What is your highest enjoyed education?**

→ *In which institute did you enjoy this education?*

Fill in yourself:

- WO
- HBO
- MBO
- Other, namely.....

Design related?

- Yes
- No

6. **In what year did you found this firm?**

7a. **Have you founded a firm before?**

→ *If so:*

7b. **How many of these firms belonged to the design sector?**

7c. **How many of these firms belonged to another sector?**

8. **What is the postal code of your current firm?**

(A check of the information provided by the Yellow Pages)

9a. **How many employees does your firm count, including yourself?**

9b. **How many of them work fulltime?**

9c. **How many of them have completed a HBO/WO education?**

10a. **How many employees did your company have twelve months ago?**

10b. **How many of them were working fulltime?**

11. **Did the number of clients of your firm in the past twelve months increase, decrease, or stayed the same?**

Increase

Decrease

Stayed the same

No idea

12. **Did your firm make profit in the last twelve months?**

Yes/no

13. **When we look at a scale of net monthly income, could you indicate to which category you belong?**

<1000 euro

1000-2000 euro

2000-3000 euro

3000-4000 euro

4000-6000 euro

> 6000 euro

No, I do not want to give an indication.

14. **Have you been employed in wage labor in the design sector before founding this firm?**

→ *If yes:* continue to SPIN-OFFS

→ *If no:* continue to HORIZONTAL RELATIONS

-
- *SPINOFFS (do not enounce the title)*

15. a. **In which company were you last employed in wage labor?**

Name company:

b. **Where was this company located (when you were employed there)?**

.....

16. **How many years did you work for this firm?**

Number of years:

-
- *HORIZONTAL RELATIONSHIPS / FELLOW DESIGNERS (do not enounce the title)*

We just discussed the start of your firm. Now I would like to ask you a couple of questions regarding your relationships with other design firms.

First, I would like to ask you about collaboration with other designers. We define collaboration as a collective effort, regardless of the business result. This can be the case when you work on a project as a consortium, when you outsource design work to fellow designers, or when u take collective action in the field of promotion and marketing.

17a. **With how many other design firms have you collaborated in the last twelve months?**

Number:.....

17.b **How many collaboration have you had with these companies?**

Number:

→ If more than 0:

17c. **How many of these firms were located in the same municipality?**

18. **In the past twelve months, how many fellow designers have you approached for business related advice?**

Number:

19. Do you protect your designs and company by means of intellectual property right such as copyright, design right/ design patents, and trademarks? (more than one answer possible)

- Copyright
- Design right
- Trademark
- No (continue to 'if no')

If they do use IPR, ask them why and how often they use it for every form of IPR:

→ *If yes copyright:*

Which of the following reasons to protect your designs by means of copyright are applicable to you? (possibly more than one)

- Prevent copying
- Promotional use
- Create extra income (for example by licensing)
- The competition does so
- Other, namely.....

How often do you protect your designs by means of copyright?

- Always
- Most of the times
- Sometimes

→ *If yes design right:*

Which of the following reasons to protect your designs by means of design right are applicable to you? (possibly more than one)

- Prevent copying
- Promotional use
- Create extra income (for example by licensing)
- The competition does so
- Other, namely.....

How often do you protect your designs by means of design right?

- Always
- Most of the times

Sometimes

→ *If yes trademark:*

Which of the following reasons to protect your firm by means of a trademark are applicable to you? (possibly more than one)

- Prevent copying
- Promotional use
- Create extra income
- The competition does so
- Other, namely.....

→ *If no:*

Which of the following reasons not to protect your designs by means of copyright are applicable to you? (possibly more than one)

- High cost of application
- Not enough time to engage in IPR
- I am not familiar with IPR
- No expectation that others will steal the design
- Never thought of it
- Other, namely.....

• **LOCATION DECISION** (*do not enounce the title*)

20. I will now mention several reasons why firms can locate themselves at a certain location. Can you indicate for every reason whether it played no role, played a small role or played a big role in the location decision regarding your firm?

	No role	Small role	Big role
1. Presence of other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Availability educated personnel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Availability and affordability of firm premises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Reputation as design city	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Presence of clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Inspiring environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Presence cultural amenities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Presence fast internet connection (20 Mbit download or more)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Presence family, friends, and acquaintances	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

→If clients played a small or big role:

You indicated that clients played a role in your location decision. Could you indicate to what extent the following aspects are of importance for locating near clients?

	No role	Small role	Big role
1. Face-to-face contact with existing and potential new clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Accessibility of yourself and your existing and potential clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Transport costs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Building long-term relationship	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

• **ICT-ADOPTION** (do not enounce the title)

I will now ask you several questions about the use of ICT in your firm.

Q1. Does your firm has a website? (Only ask when the YP has not provided one)

- Yes
- No

Q1-b. If yes: what is the URL of your web page?

URL:

Q2. What (download) speed is your internet connection?

- <2 Mbps
- Between 2 and 10 Mbps
- Between 10 and 50 Mbps
- Above 50 Mbps
- We do not have an internet connection
- No idea

Q3-a. Does your company make use of the following technologies in a business related way, and if so, do you use it daily, weekly, or monthly?

- Scanner
- Fax
- Teleconference (Videoconference, dataconference)
- Voice mail
- Voice over IP software such as Skype and MSN Messenger
- Social Networks (Facebook, Twitter, Linked In)

- Documenten Management Tools, with which documents can be updated and shared such as Dropbox
- Electronic Meeting Systems)
- Electronic agenda

Q3-b. Which software packages does your company use?

Web Designers:

- Markup languages (HTML, XHTML, XML)
- Style Sheet Languages (CSS and XSL)
- Client side scripts (JavaScript)
- Server side scripting (PHP and ASP)
- Database technologies (My SQL Postgre SQL)
- Multimedia Technologies (Flash and Silver light)

Industrial Designers:

- Illustrator
- Photoshop
- Solidworks
- Alias
- Pro/E
- Rhinoceros
- MS Office
- Alias Sketchbook
- Corel Draw
- AutoCAD

Graphic Designers:

- Print Workshop 2009
- Design & Print Business Addition
- Publishing Studio
- Print Shop Delux
- Print Master-Broader Bund
- Microsoft Publisher
- Print Shop Pro Publisher
- Print Artist
- Page+X3, Serif
- Adobe Creative Suite

Q4. Could you indicate whether ICT plays no role, a small role, or a big role in the following tasks:

	No role	Small role	Big role
1 Maintaining relationships with clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2 Maintaining relationships with suppliers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3 Maintaining relationships with other designers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4 Storing, retrieving, and diffusing knowledge and information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q5. Could you indicate to what extent the following working practices and routines are applicable on your company?

Not- Somewhat-To a large extent-N/a

(For more than 1 employee)

1. Does your company provide in-house training to its employees?

(For more than 1 employee)

2. Can employees use working time for learning activities?

(For more than 5 employees)

3. Are employees in your firm being rotated in terms of functions?

(For more than 1 employee)

4. Do employees have flexible working hours?

(For more than 1 employee)

5. Are employees in your firm being paid according to performance?

6. Does your company keep track of up-to-date financial information of the firm?

(For more than 1 employee)

7a. Can your employees work from home?

7b. If so, what is the maximum number of days per week?

Q6. Has your company introduced a radically new design in the last twelve months?

Yes

No

Q7. Has your company introduced substantially new or renewed internal processes in the last twelve months?

Yes

No

**These were all the questions I wanted to ask. Thank you very much for your cooperation.
(Space for potential remarks from the respondent)**

Write down the e-mailaddress when they are interested in the results of the research.

E-mailaddress:

Appendix C: Correlation Matrix independent variables

Correlations

		Age	Male	Higher education	Design related education	Firm size	Founding year	Entrepreneurial experience	Active web design	Active graphic design	Active industrial design	Spin-off	Nr. firms collaboration	Nr. firms advice	Cluster	Urbanization
Age	Pearson Correlation	1	.049	.146 [*]	-.087	.040	-.620 ^{**}	.206 ^{**}	-.195 ^{**}	.132	.045	.064	-.179 [*]	-.174 [*]	.167 [*]	.087
	Sig. (2-tailed)		.498	.043	.228	.581	.000	.004	.006	.064	.527	.372	.012	.015	.019	.227
	N	196	196	194	195	195	194	194	196	196	196	196	195	195	196	196
Male	Pearson Correlation	.049	1	.018	-.136	.084	-.075	.107	.079	-.285 ^{**}	.146 [*]	-.024	.068	-.034	-.098	.002
	Sig. (2-tailed)	.498		.805	.056	.238	.296	.135	.267	.000	.038	.736	.343	.634	.165	.975
	N	196	200	197	198	199	198	198	200	200	200	200	199	199	200	200
Higher education	Pearson Correlation	.146 [*]	.018	1	.266 ^{**}	.132	-.119	.228 ^{**}	-.150 [*]	-.114	.227 ^{**}	-.087	.030	.012	.058	.205 ^{**}
	Sig. (2-tailed)	.043	.805		.000	.066	.096	.001	.036	.110	.001	.222	.681	.869	.416	.004
	N	194	197	197	197	196	195	195	197	197	197	197	196	196	197	197
Design related education	Pearson Correlation	-.087	-.136	.266 ^{**}	1	-.007	-.012	.066	-.176 [*]	.254 ^{**}	-.021	.273 ^{**}	.020	.165 [*]	.150 [*]	.196 ^{**}
	Sig. (2-tailed)	.228	.056	.000		.927	.863	.361	.013	.000	.768	.000	.780	.021	.035	.006
	N	195	198	197	198	197	196	196	198	198	198	198	197	197	198	198
Firm size	Pearson Correlation	.040	.084	.132	-.007	1	-.182 [*]	.020	-.171 [*]	.010	.165 [*]	.179 [*]	.191 ^{**}	-.043	.041	.150 [*]
	Sig. (2-tailed)	.581	.238	.066	.927		.010	.780	.016	.890	.020	.011	.007	.546	.561	.034
	N	195	199	196	197	199	197	197	199	199	199	199	198	198	199	199
Founding year	Pearson Correlation	-.620 ^{**}	-.075	-.119	-.012	-.182 [*]	1	.074	.216 ^{**}	-.053	-.066	-.006	.028	.227 ^{**}	-.080	-.128
	Sig. (2-tailed)	.000	.296	.096	.863	.010		.305	.002	.459	.357	.928	.692	.001	.265	.072
	N	194	198	195	196	197	198	196	198	198	198	198	197	197	198	198

Entrepreneurial experience	Pearson Correlation	.206**	.107	.228**	.066	.020	.074	1	-.098	-.057	.096	.017	-.113	-.023	.117	.113
	Sig. (2-tailed)	.004	.135	.001	.361	.780	.305		.169	.422	.179	.816	.112	.747	.100	.112
	N	194	198	195	196	197	196	198	198	198	198	198	197	197	198	198
Active web design	Pearson Correlation	-.195**	.079	-.150*	-.176*	-.171*	.216**	-.098	1	-.119	-.579**	-.158*	-.086	-.040	.011	-.170*
	Sig. (2-tailed)	.006	.267	.036	.013	.016	.002	.169		.092	.000	.026	.225	.577	.877	.016
	N	196	200	197	198	199	198	198	200	200	200	200	199	199	200	200
Active graphic design	Pearson Correlation	.132	-.285**	-.114	.254**	.010	-.053	-.057	-.119	1	-.472**	.295**	-.055	.117	.392**	.049
	Sig. (2-tailed)	.064	.000	.110	.000	.890	.459	.422	.092		.000	.000	.439	.101	.000	.487
	N	196	200	197	198	199	198	198	200	200	200	200	199	199	200	200
Active industrial design	Pearson Correlation	.045	.146*	.227**	-.021	.165*	-.066	.096	-.579**	-.472**	1	-.075	.078	-.081	-.215**	.116
	Sig. (2-tailed)	.527	.038	.001	.768	.020	.357	.179	.000	.000		.292	.271	.258	.002	.101
	N	196	200	197	198	199	198	198	200	200	200	200	199	199	200	200
Spin-off	Pearson Correlation	.064	-.024	-.087	.273**	.179*	-.006	.017	-.158*	.295**	-.075	1	.069	.065	.155*	.025
	Sig. (2-tailed)	.372	.736	.222	.000	.011	.928	.816	.026	.000	.292		.330	.364	.029	.730
	N	196	200	197	198	199	198	198	200	200	200	200	199	199	200	200
Nr. firms collaboration	Pearson Correlation	-.179*	.068	.030	.020	.191**	.028	-.113	-.086	-.055	.078	.069	1	.162*	-.063	.007
	Sig. (2-tailed)	.012	.343	.681	.780	.007	.692	.112	.225	.439	.271	.330		.022	.377	.921
	N	195	199	196	197	198	197	197	199	199	199	199	199	199	199	199
Nr. firms advice	Pearson Correlation	-.174*	-.034	.012	.165*	-.043	.227**	-.023	-.040	.117	-.081	.065	.162*	1	.025	.013
	Sig. (2-tailed)	.015	.634	.869	.021	.546	.001	.747	.577	.101	.258	.364	.022		.725	.854
	N	195	199	196	197	198	197	197	199	199	199	199	199	199	199	199
Cluster	Pearson Correlation	.167*	-.098	.058	.150*	.041	-.080	.117	.011	.392**	-.215**	.155*	-.063	.025	1	.653**
	Sig. (2-tailed)	.019	.165	.416	.035	.561	.265	.100	.877	.000	.002	.029	.377	.725		.000
	N	196	200	197	198	199	198	198	200	200	200	200	199	199	200	200
Urbanization	Pearson Correlation	.087	.002	.205**	.196**	.150*	-.128	.113	-.170*	.049	.116	.025	.007	.013	.653**	1
	Sig. (2-tailed)	.227	.975	.004	.006	.034	.072	.112	.016	.487	.101	.730	.921	.854	.000	
	N	196	200	197	198	199	198	198	200	200	200	200	199	199	200	200

Use of IPR	Pearson Correlation	.115	.109	.194**	.113	.175*	-.165*	.030	-.284**	-.176*	.439**	.010	-.004	-.050	-.060	.162*
	Sig. (2-tailed)	.107	.124	.006	.114	.013	.020	.676	.000	.013	.000	.888	.955	.486	.397	.022
	N	196	200	197	198	199	198	198	200	200	200	200	199	199	200	200
Innovation	Pearson Correlation	-.091	.148*	.003	.135	.093	.019	.026	-.107	-.036	.176*	.069	.135	.109	-.039	.062
	Sig. (2-tailed)	.208	.037	.969	.060	.194	.790	.714	.135	.610	.013	.336	.059	.128	.582	.384
	N	194	198	195	196	197	196	196	198	198	198	198	197	197	198	198
Specialized software	Pearson Correlation	.028	.228**	.115	.033	.321**	-.210**	.010	-.313**	-.321**	.545**	-.011	.067	-.076	-.164*	.092
	Sig. (2-tailed)	.697	.001	.110	.651	.000	.003	.890	.000	.000	.000	.876	.351	.290	.022	.197
	N	193	197	194	195	196	195	195	197	197	197	197	196	196	197	197

Correlations

		Use of IPR	Innovation	Specialized software
Age	Pearson Correlation	.115	-.091	.028
	Sig. (2-tailed)	.107	.208	.697
	N	196	194	193
Male	Pearson Correlation	.109	.148*	.228**
	Sig. (2-tailed)	.124	.037	.001
	N	200	198	197
Higher education	Pearson Correlation	.194**	.003	.115
	Sig. (2-tailed)	.006	.969	.110
	N	197	195	194
Design related education	Pearson Correlation	.113	.135	.033
	Sig. (2-tailed)	.114	.060	.651
	N	198	196	195
Firm size	Pearson Correlation	.175*	.093	.321**
	Sig. (2-tailed)	.013	.194	.000

	N	199	197	196
Founding year	Pearson Correlation	-.165 [*]	.019	-.210 ^{**}
	Sig. (2-tailed)	.020	.790	.003
	N	198	196	195
Entrepreneurial experience	Pearson Correlation	.030	.026	.010
	Sig. (2-tailed)	.676	.714	.890
	N	198	196	195
Active web design	Pearson Correlation	-.284 ^{**}	-.107	-.313 ^{**}
	Sig. (2-tailed)	.000	.135	.000
	N	200	198	197
Active graphic design	Pearson Correlation	-.176 [*]	-.036	-.321 ^{**}
	Sig. (2-tailed)	.013	.610	.000
	N	200	198	197
Active industrial design	Pearson Correlation	.439 ^{**}	.176 [*]	.545 ^{**}
	Sig. (2-tailed)	.000	.013	.000
	N	200	198	197
Spin-off	Pearson Correlation	.010	.069	-.011
	Sig. (2-tailed)	.888	.336	.876
	N	200	198	197
Nr. firms collaboration	Pearson Correlation	-.004	.135	.067
	Sig. (2-tailed)	.955	.059	.351
	N	199	197	196
Nr. firms advice	Pearson Correlation	-.050	.109	-.076
	Sig. (2-tailed)	.486	.128	.290
	N	199	197	196
Cluster	Pearson Correlation	-.060	-.039	-.164 [*]
	Sig. (2-tailed)	.397	.582	.022

	N	200	198	197
Urbanization	Pearson Correlation	.162*	.062	.092
	Sig. (2-tailed)	.022	.384	.197
	N	200	198	197
Use of IPR	Pearson Correlation	1	.195**	.265**
	Sig. (2-tailed)		.006	.000
	N	200	198	197
Innovation	Pearson Correlation	.195**	1	.214**
	Sig. (2-tailed)	.006		.003
	N	198	198	197
Specialized software	Pearson Correlation	.265**	.214**	1
	Sig. (2-tailed)	.000	.003	
	N	197	197	197

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).