CHAPTER 6. DESIGN AND DESIGN FRAMEWORKS: INVESTMENT IN KBC AND ECONOMIC PERFORMANCE

This chapter addresses the nature and the economic impact of design by looking at design-related intellectual property and how businesses protect their knowledge based capital.

The chapter reviews the nature and various definitions of design and how design-related IP, specifically registered designs, relates to other formal IP mechanisms such as patents, trademarks, and copyright. It looks at the primary areas of design activity in a subset of OECD countries and investigates the similarities and differences of the constituent design IP regimes as well as the various treaties governing international design IP regulation. The review continues with an examination of how design-related IP functions in comparison to and in conjunction with other formal and informal IP protection mechanisms and what factors motivate firms to choose and appropriate combinations of protection mechanisms.

By examining historical patterns of design registrations in a variety of ways, this chapter identifies trends, at the national level, of how firms perceive the importance of design-related IP. Analysis of national origins of registrations in both the European Community and the United States provides an indicator of the activity of those countries' businesses relative to their proximities to the markets. It explores the existence of possible alternative indicators for design activity and of industry-specific variations across the sample set.

The chapter concludes with a review of input and output measures as stated in the limited set of studies that have endeavoured to establish or quantify the value and/or benefit of design and design-related IP. The studies, while clearly suggesting that design does have economic benefits, both at the firm and overall economic levels, largely use qualitative or subjective indicators because the data necessary for large-scale econometric analysis are generally not available.

This chapter is intended to be exploratory rather than comprehensive or conclusive. It should be considered as an initial step towards the possibility of a broader and deeper analysis of design-related issues.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities or third party. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

It should be noted that statistical data on Israeli patents and trademarks are supplied by the patent and trademark offices of the relevant countries.

Introduction

Design is the essence of all non-commoditised products—not only does it provide a means for differentiating products and services, but it also dictates the core user experience with those products and services. It goes beyond the pure aesthetics that we normally envision as the key to design, and encompasses features including the functionality and ergonomics behind every product. To that end, what is design? Where does technological development end and design begin? If there is no clear terminator, how do we quantify what is invention and what is design?

While these questions, among others, have occupied researchers and managers alike, few answers are apparent. As Afori so aptly put it, "A design is hard to define but is easily described." (2008, p. 1107). This reflects how automatically we view all the aspects of design; to the extent that we do not cognitively process them, so much as we simply experience them. Likewise, managers often overlook some aspects of design, and it is difficult to identify—let alone measure—all the elements of design inputs in a product. Is developing a better user interface a matter of engineering or design? Are engineers designers and vice versa?

Through the advent of the patent system, we tend to identify inventions as discrete packets, and while there are also means of codifying design elements, it is rare that all elements of design are equally as well defined and protected. Thus, there is that much less substance by which to measure design (Black and Baker, 1987, Hertenstein et al., 2005). Nonetheless, there is general recognition about design being a major contributor to the economic fortunes of companies and to the regional and national economies to which they belong (Hertenstein et al., 2005, Kotler and Rath, 1984, Walsh et al., 1992, Yamamoto and Lambert, 1994).

In this document, we explore the nature of design, with a focus on industrial design, and examine how firms protect their design-related intellectual property and how, if at all, that has changed over the last ten years. We review what measures there are for design inputs and outputs, and suggest future directions for evaluating the benefits of design to firms and economies.

Defining design and industrial design

Design was once perceived as a mere decorative craft; however, it has since been recognised as the intersection between technology and the user. Firms previously left the product to be defined by its function and thus produced goods that functioned well in reference to their defined purpose but made fewer allowances for how the user would interact with it. Design has since become a study of ergonomics, consumer psychology, sociology, human dynamics, art, and software engineering as well as service and technology innovation (Buchanan and Margolin, 1995). A large part of the literature acknowledges design as an important competitive tool, as well as an intangible factor that contributes in most cases to the value-added and success of companies.

Box 6.1. What exactly is design?

The word *design* is widely used and can mean different things. Everything that surrounds us can claim to be the work of design: from buildings to cars, from furniture to product packaging. Walsh (1996) claims "the term 'design' covers a wide range of activities: architecture, fashion design, interior design, graphic design, industrial design, engineering design." Nevertheless, the difficulty remains that design has been defined in many ways but no single definition has been universally accepted (Gemser and Leenders, 2001).

While they are generally similar in nature, the definitions of design used for legislative and/or regulatory purposes differ somewhat:

- **EU Council**: "*Design* means the appearance of the whole or a part of a product resulting from the features of, in particular, the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation." (European Commission, 2002)
- **OHIM**: "*Design* is an art and a science, it forms our homes and our workplace, and it is all around us, wherever we are. Design is the surface of the man-made environment." (OHIM, 2013a)
- **WIPO**: "An *industrial design* constitutes the ornamental or aesthetic aspect of an article. A design may consist of three-dimensional features, such as the shape or surface of an article, or of two-dimensional features, such as patterns, lines or colour." (WIPO, 2014b)

Scholars also provide a set of definitions that give different facets to design according to the dimension and the context in which it is placed.

As suggested by D'Ippolito (2014), the nature of how we think about and study design has evolved over the years through several different philosophies:

- ***Design as creation of artefacts***— Consisting of "studying, researching, and investigating the artificial made by human beings and the way these activities have been explored in academia or employed in manufacturing." (D'Ippolito, 2014, p. 29, Simon, 1969)
- ***Design as a problem-solving activity***—A process involving problem definition, solution generation, evaluation, and selection.
- ***Design as a reflexive practice*** and ***design as making sense of things***— The designer not only creates but also reflects upon the creation so as to learn, improve, and re-create (D'Ippolito, 2014, p. 29, Johansson-Sköldberg et al., 2013).
- ***Design as a key input to strategy***— is conceived as the means to increase the competitiveness of firms: "Design relates directly to the strategy of the firm. It seeks to optimise consumer satisfaction and company profitability through the creation of form, durability and values along with products environments, information, and identities." (D'Ippolito, 2014, p. 29, Kotler and Rath, 1984)

Design protections

Industrial design refers to creative activity that results in the ornamental or formal appearance of a product (Sharma et al., 2011). This appearance may include the "look and feel" of a product, and can extend to the on-screen depiction of a website. For the purpose of this document, the nature of design is entirely separate from function or technical merits. That is to say, that any inherent aspect of a design that has functional significance may be excluded from design protections. However, what happens when the design is functional? Consider the case of a company that makes automobile tyres; if it uses the same materials, the same construction, and the same technology for a new tyre design as it does for its other tyres—and for that matter, as its competitors use, as well—what sets its products apart? The tread design is a pattern with a unique outward appearance that differentiates it from other designs and products; however, the new tread design, while not necessarily using novel elements, may contribute significantly to the tyre's

ability to disperse water and adhere better to the road surface (Scalera et al., 2014). This may or may not bring design into "conflict" with patents, as patents must, as a basic requirement, have utility (i.e. function) unless the cognisant jurisdiction allows design patents. For example, In the United States, an article of manufacture (such as a tyre) may have both a utility patent (how it functions) and a design patent (how it looks). In the U.S., both design and utility patents may be obtained on an article if invention resides both in its utility and ornamental appearance. While utility and design patents afford legally separate protection, the utility and ornamentality of an article are not easily separable.

The aesthetic aspects that distinguish a product from others represent an opportunity for the producer, as product design gives an image and reputation to the company, and contributes to increase the firms' competitiveness and performance. For this reason, it becomes essential for enterprises to protect their design assets against copying by competitors and counterfeiters. However, some protections are similarly afforded under copyright and trademark protection (Brean, 2008). Copyright protects various artistic and software works, while trademark allows firms to indefinitely protect iconic elements that serve as representations that link firms with their brand and products (Jackson, 2014).

The protection of industrial design is a debated issue due to these conflicts regarding scope of protection and methods of enforcement (Lahore, 1971, Copinger and James, 1999). The reason is that "the industrial design is situated at the crossroads of art, technology, and the entire industry dedicated to attracting the consumer's attention. Legally speaking, design suffers from a hybrid nature since it has much in common with the three major intellectual property paradigms – copyright, patent and trademark laws—yet it does not exactly fit any one of them." (Afori, 2008, pp. 1107-1108) In the U.S., both design and utility patents may be obtained on an article if invention resides both in its utility and ornamental appearance.

The role of design: Product design and the design process

Design is a method whereby firms can add value to their products and services and differentiate themselves from their competitors (Rothwell and Gardiner, 1985). By bridging the gap between technological function and user experience, some argue that design spurs innovation (Kline and Rosenberg, 1986, Rothwell, 1992, Walsh, 1996). Since it is concerned with the outward—or "customer facing"—part of the product, design can be considered the most direct and impactful medium through which firms can communicate with customers (Verganti, 2003).

Given that it is difficult to assign a single clear definition of design since the term applies to a wide range of activities that can be at the one extreme "engineering" and at the other "art" (Lawson, 2006), it becomes even more difficult to categorise or measure design. As mentioned above, the role of design is often associated mainly with aesthetic aspects of the product, and sometimes, but not always, considered a key aspect of the product development process. Whereas some people consider design to be an activity, others think of it as a process and still others treat it as a philosophy (Krippendorff, 1989).

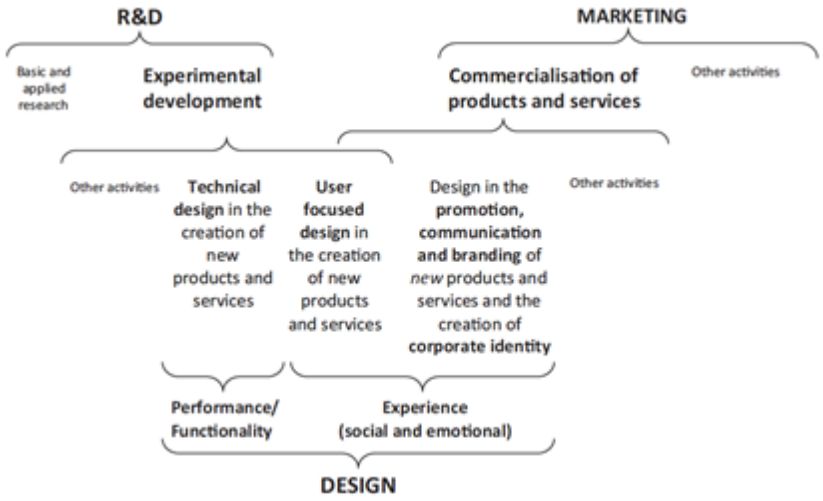
Design can be viewed as a communicator of the firm's quality image and product integrity (Yamamoto and Lambert, 1994), but design can have a variety of functions that vary from firm to firm or from process to process within the same firm. Perks *et al.* (2005) explores the role of design within the new product development (NPD) process and identifies three potential roles design can play:

1. Design as a functional specialism: in this category, designers concentrate mainly on design and with the aesthetic aspects of NPD;
2. Design as part of multifunctional team: here a team approach is used and the designers emerge as key players participating in NPD-related decision making along with other experts; and

3. Design as NPD process leader and a major force for innovation: the designer is the leader of the NPD process who drives and supports actions throughout it.

This is similar to Kotler and Rath (1984), who define design as "a strategic marketing tool" that seeks to optimise consumer satisfaction and company profitability. They propose three different "Design philosophies" to explain how companies incorporate design into the marketing planning process, from design-dominated companies, in which designers create without any marketing data to market-dominated companies, in which designers have to adhere closely to market research reports describing what customers want in the product.

Figure 6.1. Conceptualisation of design



Source: Moultrie and Livesey 2014

The design role is not even necessarily limited to new products and services: it could deal with other aspects of the business, such as communication and branding activities (Walsh, 1996). The British Standard guide to managing design (2005) draws a distinction between two aspects of design: the first concerns promotion and customer support that includes many elements such as advertising, packaging, promotional literature, etc. This is a design that communicates, promotes, and delivers products and services; the second concerns creation, communication and promotion of corporate identity and culture, therefore design reflects the "personality" of the organisation.

The Fourth Community Innovation Survey (CIS-4) considers design's role as a part of marketing innovation; Filippetti (2011), in fact, references the CIS-4 clarification on design, "a marketing innovation is the implementation of new and significantly improved design and sales methods to increase the appeal of your goods and services or to enter to new markets." (p. 9) In this case, design is considered as an output and not as a process or source of innovation, because, as mentioned by the OECD (2005), "marketing innovations include significant changes in product design that are a part of a new marketing concept. Product design changes here refer to changes in product form and appearance that do not alter the product's functional or user characteristics" (p. 49); but, in general, there seems to be a semantic confusion as to whether design is a process or an outcome (Bloch, 2011).

Design can play different roles within companies depending on the type of enterprise, and the importance that management chooses to assign to it. This will depend on the individual company's philosophy and the sector in which it operates, whether to limit design to the product or extend it to a

whole process. By integrating design into the entire process at an earlier stage of new product development, firms have been able to attain efficiencies, in both time and cost (Gemser and Leenders, 2001). Therefore, it often becomes complex to recognise and measure the weight and role that design plays in different firms. We will explore these issues further in the next sections of this report. Section 2 presents design protection regimes in the sample countries we will emphasise, Section 3 discusses IP-related issues, Section 4 explores trends in registered designs, while Sections 5 and 6 talk about measures of inputs and outputs, respectively.

Protecting design

Many industries are making significant changes in how they invest in and protect their design-related intellectual property. This section of the report will deal with the regimes of design IP in a sample of countries: Canada, France, Germany, United Kingdom, Italy, Japan, United States, South Korea, and China.

Design IP v. patents, trademarks and copyrights: Subset or complement?

It is important to differentiate design as a form of intellectual property, possibly distinct from other forms of intellectual property such as patents, copyrights and trademarks.

Various nations and governing bodies use different terms for design intellectual property: Registered design, registered community design, design model, design patent, industrial design, etc. For the purposes of this document, we will use registered design for the intellectual property right and design or industrial design to refer to the larger concept of design as an activity, practice, or element of bringing aesthetic or visual change to an otherwise commoditised product.

The registration of inventions having functional or technological utility beyond or without regard to aesthetics also has a number of mechanisms. These mechanisms—which are referred to under a number of designations such as patent, utility patent, petty patent, innovation patent, small patent, and utility model—will be largely treated in this report as *patents* unless otherwise stipulated.

For the purpose of this report, we will use the term trademark (as opposed to trade mark or trade-mark) to represent the visual elements that link an enterprise with its products and services. This can be indicative of both registered and unregistered trademarks; however, the general discussion will be concerned with registered IPRs.

Registered designs

Registered designs are granted by different jurisdictions as a form of formal intellectual property protecting ornamental properties, shapes, configurations, appearance, or pattern of an article of manufacture, and such designs must be both new and distinctive or original. Registered designs have different names in different countries or regions, including “community designs” or “design patents.” In the interest of consistency, we will use the term *registered design* in this report[271].

Different jurisdictions have different defined periods of time that registered designs may be enforced. In the case of the EU, registered designs last five years and are renewable multiple times for a total protection of 25 years (OHIM, 2013b). To qualify, there should be no prior design that is identical (and different jurisdictions may not even allow prior disclosure by the designer himself or herself), the design should be non-obvious, and the ornamental features of the design should be visible when the product is in use. Usually, registered designs are intended for aesthetic features. Parties infringing registered designs can be prevented from using / commercialising the design or otherwise punished to recoup damages (UK Intellectual Property Office, 2014a).

Patents

The registration of a patent gives the owner the right to exclude others from making, using, or selling an invention. A patent provides the holder with a limited monopoly over a defined period in exchange for contributing the underlying knowledge of the invention to the public state of the art. Although patent protection is a right granted by government, the enforcement of patent infringement is deemed a civil matter and must, in the vast majority of cases, be pursued at the expense of the patent holder. Patents are also referred to as *utility*, *functional* or *mechanical patents* in some jurisdictions. Patents often protect solutions to technological innovations that take the form of processes or products; however, in some jurisdictions they may also be in the form of business methods, software, or even living organisms. The base requirements for patenting an invention is that it must be novel, have utility, have some inventive step, be non-obvious, and must be replicable by someone skilled in the art.(WIPO, 2008)

Given that functional aspects of a device cannot be protected by design IP, patents serve a vital role in protecting the novel elements of products that also may have design context. Registered designs and patents are often filed for the same product, the former covering the appearance and the latter the function (Cook, 2007).

Utility models

A utility model, sometimes defined as “petty patent” or “innovation patent”, provides the right holder the right to prevent others from using or selling the protected invention for a defined period of time. The requirements for filing a utility model are significantly less stringent than those for filing a patent, as the size of the “inventive step” required must attain only a much lower threshold and what examination is done of an application is brief and more cursory. Given that the protection period (7-10 years, non-renewable) and the examination period are much shorter than that of a patent, utility models cost significantly less than patents. Utility models, however, are only issued by some national patent offices, such as Germany, China and Japan, and have a much more limited geographic scope. They also have more limited scope in protection since they are not examined for novelty and can be invalidated more easily (Thomä and Bizer, 2013). Companies generally see them as a much more convenient means of establishing priority for incremental inventions, using them more as a method of strategic disclosure than as an exclusionary right.

In the role of providing priority, firms often use utility models, with the full knowledge that they carry limited protection from infringement, in order to protect their freedom to operate. A utility model is a certified document that commits the invention to the larger body of prior art, thereby preventing others from patenting the invention (Peters et al., 2013). Since utility models are less costly and easier to obtain, they can be a more agile tool to use when the design of a product will inevitably change in a term that it much shorter than the life of a patent or when designers intend product intervals to be naturally short (Byma and Leiponen, 2006).

Trademarks

A trademark is any sign, word, logo, etc., used to distinguish products and services from competitors of the applicant. Trademarks indicate (visually) the source of the product or service. The term of trademark protection continues indefinitely until such time that the trademark either is abandoned or loses its distinguishing feature by becoming a generic term. The violation of trademark rights (passing off a good or service as someone else’s by using their trademark) is subject to trademark infringement. It could also be considered infringement if a trademark is not exactly the same but similar enough to cause confusion among consumers (Durkin and Schirk, 2011).

Trademark and design are often closely and indelibly interlinked in the minds of consumers (Miaoulis and d'Amato, 1978). For this reason, trademarks often figure strongly in product strategy. Design protection allows firms the time to establish an identity in relation to a product without the worry of imitation. If the product design endures as a symbol of the firm, then the firm can maintain trademark protection almost indefinitely (Brean, 2008).

Copyrights

A copyright protects the form of artistic creation by protecting authors' literary work or the output of creative artists in the form of music, films, paintings, images, computer software, etc. The owner has the exclusive right to distribute the work and reproduce, adapt, display, or perform it, or authorise others to do so. Copyright does not protect the underlying ideas, only the form of the creation (WIPO, 2008). For industrial designs that qualify as eligible copyrightable subject matter such as graphics, copyright protection may function equally well, given that the protection of a copyright extends 70 after the death of the owner; significantly longer than the maximum of 25 years afforded to registered designs. Many have argued that fashion design should be similarly protected under copyright (Holton, 2014, Lahore, 1971, Miller, 2014, Roth and Jacoby, 2009, Saidman, 2007, Stevens, 2012, Tsai, 2005, Xia, 2010). In some countries, copyright protection is not available for functional articles (such as fashion or automotive parts) even though aesthetically pleasing where the artistic features cannot be separated either physically or conceptually.

Software and internet webpage designs are, however, covered by copyright in many countries. The Court of Justice of the European Union recently ruled that while the functionality of a program cannot be protected under copyright, the reproduction of a part of a manual, whether that be in a printed manual, and online document, or an onscreen representation of a program itself, may constitute copyright infringement. This finding, and its subsequent enforcement by the Court of Appeal for England and Wales, sought to limit the scope whereby software developers could claim infringement and stifle competition (Gervais and Derclaye, 2012). However, it has resulted in a realisation that copyright alone is insufficient to protect software and must be complemented with registered designs to protect notable features of appearance as well as patents for functional innovations (Silverman, 2014).

Countries considered in the study

Canada. The Canadian Intellectual Property Office (CIPO) is the agency responsible for IP regulation and registration of patents, trademarks, industrial designs and copyrights in Canada. In Canada, industrial designs are defined as "the visual features of shape, configuration, pattern or ornament, or any combination of these features, applied to a finished article." Such a design may be of a common object that, in and of itself, has no functional novelty but does have an original appearance. The appeal to the eye is the key to novelty. An idea, a method of construction, the materials used in the construction of an article or the function of an article cannot be registered. In Canada, there is no time limit for registering an industrial design if the design has never been published but if it has been published, the registration must be within 12 months of publication. The exclusivity is for a period of five years, which can be renewed for an additional five years (Canadian Intellectual Property Office, 2001).

France. France has recently experienced significant growth in design IP. Although the Institut National de la Propriété Industrielle (INPI) is the national agency responsible for administering IP, much of the increase in applications has been filed under the broader Office for Harmonisation in the Internal Market (OHIM) or World Intellectual Property Organisation (WIPO)[272] schemes. The Compagnie Nationale des Conseils en Propriété industrielle (CNCPI), which represents patent attorneys in France, recommends companies and research centres bundle the various forms of protection available to them (patents, trademarks, designs and models, domain names, etc.) and encourages the development of an

"intellectual property culture" in France (Compagnie Nationale des Conseils en Propriété industrielle, 2014).

Regarding design IP in particular, French companies file approximately 7% of all community designs (see trends section below), which CNCPI feels is lower than what would be expected given the size of the French economy, "leaving foreign companies to monopolise protection in the design field." While French copyright law is strong, it is not able to protect designs in all circumstances. Thus French copyright for design protection may work for firms focusing exclusively on the French market, but "the informal nature of copyright protections and the difficulties in establishing priority dates for first use make it difficult for these firms to defend themselves in the face of infringement claims filed by firms empowered with the more formal rights of a registered design."(Compagnie Nationale des Conseils en Propriété industrielle, 2014)

Germany. Germany has the largest export economy in Europe. A high proportion of Germany's exports are manufactured products that rely heavily on design to differentiate them from cheaper, lower quality products. The latest relevant law on design regulation in Germany is the Regulation of 2 January 2014 for Further Modernisation of the Design Act and Introduction of the Invalidity Procedure in Design Matters. The German Patent and Trademark Office (DPMA) is national agency responsible for patents, utility models, registered designs, and trademarks. In the case of registered designs and utility models, the DPMA checks only if the application forms and definitions conform to the respective requirements; it does not examine the character of the invention or design itself nor does it test the novelty of the concept (DPMA, 2014).

United Kingdom. The system on intellectual property rights promoted by the United Kingdom seems to offer strong protection. In 2014, the UK Parliament amended the intellectual property laws with special attention to the protection of designs (HM Government, 2014).

A Registered Design in the United Kingdom can give rise to a valuable intellectual property right that can serve as a basis of an infringement action against other parties. The registration of a design requires that the design be new and have an individual character. The United Kingdom also excludes certain items from registration as a design if the design does not fall under the legal definition, if the design is offensive, if the design consists of certain protected flags and international emblems and if the design elements are solely dictated by the product's technical function (UK Intellectual Property Office, 2006).

Italy. Italy provides a designs protection in line with the harmonisation requirements of EU Directive 98/71/EC. The exclusive right takes effect from the date of filing of the application and has a validity of 5 years, renewable for other four terms of 5 years, up to a maximum of 25 years. The registration protects the appearance of a product, but there are no specific aesthetic requirements[273].

In accordance with the cumulus option provided by the EU Directive, the Italian IP code provides rules for the relationships to utility models and copyrights. While designs protect just the formal appearance, utility models protect the functional appearance. The same form can be protected both by utility model and by design at the same time, but the two IP rights cover different objects and scopes.

A registered design may also be eligible for protection under the law of copyright, but only for designs which meet two further requirements: creative character and artistic value. In this case, the validity of the protection is 70 years after the author's death, as per general copyright rules. The Italian IP code does not provide for unregistered design protection.

To enhance the use of design protection at the enterprises level, especially for SMEs, after the design registration fees, the renewal fees are due just from the second five-year period.

Japan. As the first country to ratify the Anti-Counterfeiting Trade Agreement (ACTA), Japan has generally had a proactive stance in intellectual property protection on the global stage (Office of the United States Trade Representative, 2012). Given Japan's evolution over the past half century from a low-cost producer to a developer of high technology and high-concept design goods, Japanese firms have taken leading positions on both patent and design registry lists. This is largely due to the benefits of the Designs Act. The Designs Act dates back to April 13, 1959, and it was amended with the revisions of Act No. 63 of 2011 (WIPO, 2014c). In addition to many of the protections afforded by other national patent laws, the Japanese law allows design registrations to be held secret for up to three years at the request of the filing party. There are also provisions by which designs may not be granted by the Japanese government, such as any design that is liable to injure public order or morality. Japanese law also acts in a manner similar to trademark protections as it prohibits any design that is liable to create confusion with an article pertaining to another person's business (Japan Patent Office, 2014). This differentiation is a *de facto* form of trade dress protection[274].

United States. In the United States, industrial designs are protected to varying degrees under design patent law, copyright law, and trademark and unfair competition law. For the United States Patent and Trademark Office (USPTO), a design consists of "visual ornamental characteristics embodied in, or applied to, an article of manufacture." As the design manifests itself in its visual characteristics, a "design patent" (US version of a registered design) application may concern itself with the "configuration or shape of an article, to the surface ornamentation applied to an article, or to the combination of configuration and surface ornamentation."(USPTO, 2012) Whoever invents any new, original, and ornamental design for an article of manufacture may obtain a patent therefor. The term of protection has been 14 years from the granting date. However, this term has been increased to 15 years from the granting date for applications that are filed on or after May 13, 2015.[275] There is an area of overlap between Copyright and Design Patent Statutes where an author/inventor can secure both a Copyright and a Design Patent. Thus, an ornamental design may be copyrighted as a work of art and may also be the subject matter of a Design Patent. It is the policy of the Patent and Trademark Office to permit the inclusion of a copyright notice in a Design Patent application, and thereby any patent issuing therefrom[276].

A design patent and a trademark may be obtained on the same subject matter. The U.S. courts have held that the underlying purpose and essence of patent rights are separate and distinct from those pertaining to trademarks, and that no right accruing from the one is dependent upon or conditioned by any right concomitant to the other. Accordingly, the use of trademarks in design patent application specifications is permitted under limited circumstances[277].

South Korea. The Republic of Korea has the Industrial Design Protection Act or Act No. 951 of December 31, 1961, as amended up to Act No. 9764 of June 9, 2009 (WIPO, 2014a). Design includes the "shape, pattern, colour or a combination of these in an article that produces an aesthetic impression in the sense of sight." The term of protection is 15 years from the granting date. Two categories of design applications are available in South Korea: normal examination designs (substantive) and non-examination designs (non-substantive). Non-examination designs are restricted to two-dimensional products such as wrapping paper and/or those with a short life cycle, for example fashion-dependent goods such as clothing (IP Australia, 2014).

China. China's rapid economic rise led to it joining the World Trade Organisation (WTO) in 2001, and this has contributed to major reforms in its intellectual property laws. Since then, China has introduced legislation covering every aspect of the protection of IP. Chinese authorities have traditionally relied heavily on the local registration characteristics and history of an item, whereby designs and trademarks commonly known in other parts of the world were registered in China by parties other than the recognised owners, because there was no evidence inside the Chinese domain. China has, however, put great effort into conforming to international norms and treaty standards.

As has been the case in other countries, the importance of reciprocal protection of IPRs grows as the country generates more of its own IP. China's emergence as a developer of design and technology intellectual properties has brought about stronger enforcement of rights for IPRs held by both foreign and domestic entities. Enforcement methods in China can vary from civil prosecution to governmental administrative action and customs seizure for cases of wilful infringement (UK Intellectual Property Office, 2014b).

The EU. The European Union established the Office of Harmonisation in the International Market (OHIM), a central agency for the administration of trademarks and designs, in 1994 (European Commission, 1994). The collective protection of design within the EU started in 1998 through the Design Directive followed by the Design Regulation of 2001 with the eventual purpose of a European design intellectual property regime. The Directive on the Legal Protection of Designs (European Commission, 1998) sets minimal standards for the eligibility and scope of protection for industrial design across Europe, but also provides leeway in allowing member states to independently regulate registration, renewal, and invalidation of design IP within their own borders so long as it meets those minimal standards. The necessity of a single form of design protection that would allow goods embodying designs to circulate inside the internal market led the EU to enact the Community Design Regulation (CDR) in 2002. The CDR introduced the concept of Registered and Unregistered Community Designs (RCD and UCD, respectively). While both enable the holder the ability to protect their design throughout the EU, the UCD is of a shorter duration (3 years) and offers only limited protection against duplication, whereas the RCD offers protection for a period of five years from the date of filing and can be renewed every five years for a maximum of 20 years of protection. The other main difference between RCD and UCD is that RCD aims to protect against both deliberate copying and the independent development of a similar design. UCD only prevents intentional copying; if a second designer can demonstrate that she or he had no prior awareness of the existence of the protected design and had created the design independently, there are no grounds for infringement. Nevertheless, both forms of design protection have to meet the same conditions to be valid (OHIM, 2013b).

It is interesting to note that Art. 8 (1) of the CDR states that "Community design shall not subsist in features of appearance of a product which are solely dictated by its technical function." This language is common in design legislation so as to preclude the use of registered designs as *de facto* patents (European Commission, 2002).

Major design areas

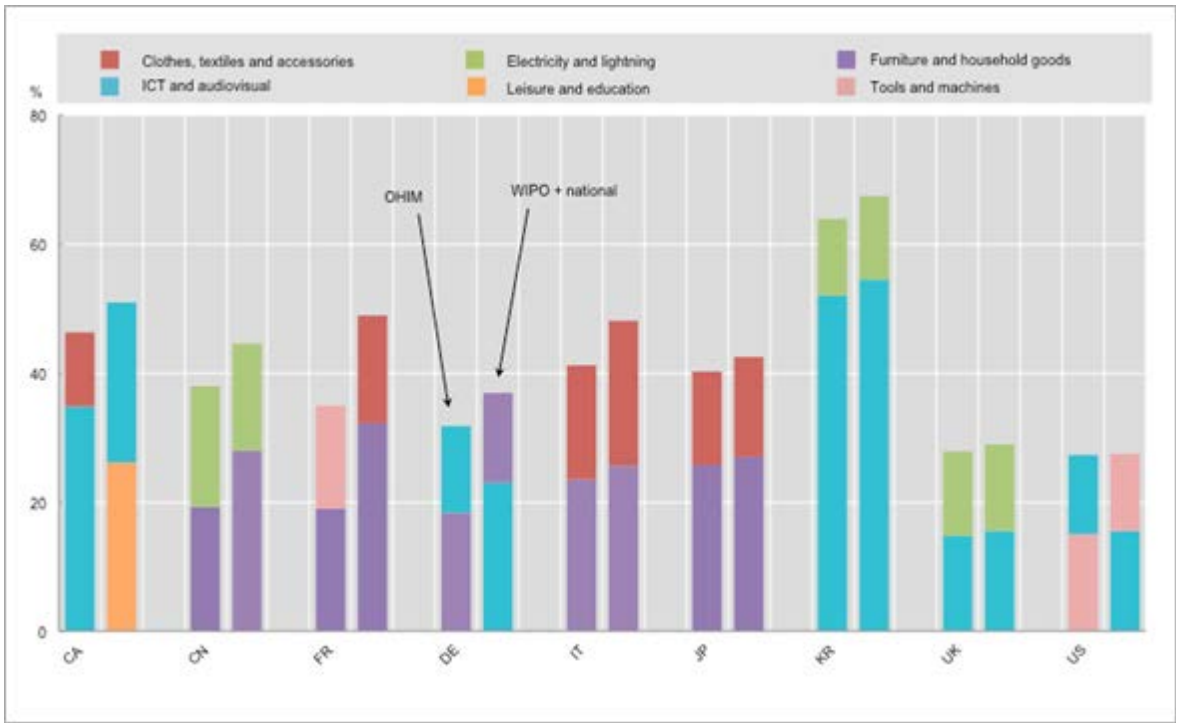
Registered designs are classified using the Locarno system, except in Canada. The Locarno Agreement of 1968 established a means for classifying registered designs. This allows all participating countries to use a common framework for indexing the nature of designs submitted. This benefits all by allowing for easier search for establishing novelty. The classification system reflects the function of the object being classified, and while this is similar in nature to the system of classifying patents, there is no concordance between the two. Thus, a product may have a Locarno number that is vastly different from patents describing the component parts therein. Likewise, the Locarno number speaks to the function of the design being registered, not the industry wherein the object will be marketed, so Locarno classifications may not be an accurate mapping of how designs are representative of certain industries. Although Canada and the US (for U.S. design patents issued after May 6, 1997) are not signatories of the Locarno Agreement, the US does assign Locarno classification numbers in addition to their own classification codes so as to facilitate international searches.

Figure 6.2. The top design categories for each country in our sample as ranked by the count of industrial designs filed at OHIM or through national and international routes, respectively, from 2009-2011 illustrates the top two Locarno classes of industrial designs by the representative countries in our sample.

In the first column for each country is the listing of RCDs applied for through OHIM for protection within the EU, whereas the second column is the combined listing of national and WIPO international filings. We can see that there are five major categories:

- Clothes, textiles and accessories
- Electricity and lighting
- Furniture and household goods
- ICT and audio-visual, and
- Tools and machines

Figure 6.2. The top design categories for each country in our sample as ranked by the count of industrial designs filed at OHIM or through national and international routes, respectively, from 2009-2011



Source: OECD Science, Technology and Industry Scoreboard 2013.

Although leisure and education was Canada's top category for non-EU registrations, the category did not rate as highly for any other country and did not amount to a significant portion of overall application filings. Therefore, we excluded it from the list.

This informs us that design is a strong element in the consumer goods arena, specifically for products we might assign to the categories of fashion and decor—industries that have long been associated with design. Information and communications technology, on the other hand, is not one that we consider immediately as a design domain; however, within that domain is the subclass of "Screen displays and icons", wherein any representation of an electronic control interface would be registered.

Commonalities of design IP regimes

Table 6.1 gives a summary of design IP regimes across the sample countries. All nine countries have laws and regulation that rule and protect industrial design. While there are differences across the various definitions and enactments of design protection, there are also a number of notable similarities. Specifically, the OHIM and various countries of the EU share many commonalities. This stems from the fact that EU Directive 98/71/EC obliged each of the EU Member States to harmonise the substantive rules on the protection of industrial design in an effort to establish uniform laws in a sector characterised in the past by a diversity of approaches.

The definition of design varies from system to system: there are countries where the definition is complete and exhaustive, such as Japan, UK, France and Italy, countries where the definition is, in the view of some, more ambiguous or simplistic (USA, Germany, Canada, Korea and China). Where the definition of design is not as clear as the protection rules, interpretative problems have led to difficulties of application.

Table 6.1. Representation of similarities and differences of design rights across sample countries

Comparison of Design IP Regimes

Country	Country designation code	Name	Definition of Design				Term of Protection		Substantive examination	Accession of Treaty		Online application	Multiple applications	Unregistered Option
			part	whole	method	Symbols / Graphics	F = from filing G = from grant	Years x number of terms		Locarno Agreement	Hague Agreement			
Canada	CA	Industrial Design		●		●	G	5 x 2	●			●		
China	CN	Design Patent		●			F	10	●	●		●		
France	FR	Designs and Models	●	●	●	●	F	5 x 5		●	●		●	
Germany	DE	Designs	●	●		●	F	5 x 5		●	●	●	●	
Italy	IT	Design and Model	●	●		●	F	5 x 5		●	●	●	●	
Japan	JP	Design	●	●		●	F	20	●	●		●		
Korea	KR	Design	●	●		●	F	15	●	●	●	●	●	
UK	UK	Registered Design	●	●	●	●	F	5 x 5	●	●			●	●
US	US	Design Patent	●	●		●	G	14/15	●		●	●		
EU	OHIM	Registered Community Design	●	●	●	●	F	5 x 5		●		●	●	●

Source: authors' compilation.

Note: The United States Senate gave advice and consent to ratification of the Hague Agreement on 7 December 2007. On 18 December 2012, title I of the Patent Law Treaties Implementation Act of 2012 was enacted to implement the provisions of the 1999 Geneva Act of the Hague Agreement Concerning the International Registration of Industrial Designs ("Hague Agreement"). (Public Law 112-211, Dec. 18, 2012). Specific implementing provisions are found, for example, in 35 USC 381-390. On 13 February 2015, the United States deposited its instrument of ratification for Geneva Act of the Hague Agreement. On 2 April 2015, the U.S. Patent and Trademark Office published its final rule to implement the Hague Agreement. 80 Fed.Reg. 17,918 (Apr.2, 2015). The treaty will go into effect on 13 May 2015 with respect to the United States. As previously noted, U.S. design patents resulting from applications filed on or after 13 May 2015 will have a 15 year term.

The terms of protection generally range around 20-25 years. Even though each county may have its own definition of industrial design and the term of protection, there is a debate about the appropriate model for design IP harmonisation, especially the line between copyright and design rights. One side of the debate proposes that since design focuses on the visual impact of a product, it is much closer to creative

work than invention, so copyright law could be suitable for design protection as compared to other intellectual property forms (Rahman, 2014, Afori, 2008).

Encouraging protection of design

As design allows firms to differentiate themselves and their products, thereby allowing them to appropriate superior value compared with more "commoditised" product or service, protection of design rights may give incentives to innovate and invest in design in both manufacturing and service industries.

International treaties and industrial design

Different international treaties concern standardisation of intellectual property rights; however, there is not a clear definition of their legal protection with regard to design (Suthersanen, 2010) because different jurisdictions have differing classifications of industrial design and the debate over the nature of design is still open. Nevertheless, industrial design is mentioned in different international treaties.

The Berne Convention: The Berne Convention was the first major international copyright treaty, became effective in 1886 and defined industrial design as an artistic work (Schickl, 2013). Industrial design is not specifically regulated under the Berne Convention, but it is conceived as a "work of applied art" [Art. 2(1)] and leaves it to the discretion of member countries whether they want to protect industrial design as applied art [Art. 2(7)]. The convention provides reciprocal rights for protection of industrial designs, such that if an industrial design is protected under the laws of one signatory country, it shall receive the same protection under similar legislation in other signatory states. If a signatory state's law does not pronounce on the protection of industrial design, the Berne Convention offers protection under copyright law, as it considers industrial design to be artistic work (Schickl, 2013).

The Paris Convention: The first international treaty for the regulation of patents, the Paris Convention was signed in 1883 and the last revision was made in 1967 (Schickl, 2013). Under the Paris Convention, industrial design was dealt with as industrial property and was accorded a patent-like protection. It stipulated that nationals of contracting states must be afforded equal rights of protection as nationals of other contracting states in those jurisdictions. An applicant can file separate applications with each office directly to obtain protection in multiple jurisdictions, but gains protection from the time the first application was filed so long as the follow-on applications were filed within 12 months for patents and utility models, 6 months for industrial designs and trademarks. It also stipulated that industrial designs must be afforded protection in a contracting state even if products derived from those designs were not manufactured in that nation (WIPO, 2014d). This was an effort to lower barriers trade.

The TRIPS Agreement: The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) is administered by the World Trade Organisation (WTO) and became effective in 1994. The TRIPS does not provide a definition of industrial design but merely defines the requirements and scope of its protection. Language of the TRIPS Agreement is relatively sparse regarding industrial designs. Nonetheless, it does integrate design rights into the larger canon of law providing global protection of intellectual property. It also establishes a minimum of ten years of protection for an industrial design that meets novelty and other requirements.

The Hague Agreement: Concluded in 1925 and revised in 1999, the Hague Agreement provided for a single point of application for members of all signatory states. It establishes an initial five-year protection period for industrial designs at the international level, with the possibility of multiple renewal periods. The advantage is that design owners can obtain protection for their designs with a single registration, thereby minimising formalities and expense. An applicant can obtain protection for up to 100 industrial designs for

products belonging to one and the same class and in multiple jurisdictions with a single application filed through WIPO.

The above agreements and treaties provide holders of design-related intellectual property with a coherent set of rules and regulations whereby they can expect to receive fair and unbiased treatment so long as they work within the established system of a member state.

Differences between IP regimes

Despite the implementation of various treaties and harmonisation efforts, there still remain many differences between the regimes of the various sample countries.

German and French courts seemingly tend to be quick and proactive in protecting design IP. This is largely due to the fact that the German and French laws assign greater weight to the authors' and inventors' rights. In Italy, in the field of industrial law the use of summary (or urgent) proceedings is statistically very frequent. It is characterised by the full freedom of forms, though with due discussion between the parties and greater speed of the decision. In most cases, the urgent decision is not followed by an ordinary trial process. German design owners tend to be more aware of the options available for design IPR and thus make higher use of the system whereas UK innovators tend to opt for other means of protecting their designs such as confidentiality agreements, lead-time and brand awareness (BOP Consulting, 2011).

One issue with the need to be first-to-market is that it tends to result in shorter product lifecycles. Short product cycles in conjunction with arduous application processes can also deter design owners from registering their IP. This has been identified as one reason for the low rate of design IP adoption in the United Kingdom (BOP Consulting, 2011). In an effort to combat a similar issue and to aid its prominent fashion industry, the French IP office introduced a simplified procedure for registering designs (BOP Consulting, 2011). The changes appear to have had significant influence, both on design owners' perception of the system and on filing rates. In Italy the IP code envisages special provisions to address issues related to the short life cycle of a product and the processing time for the design application: the the exclusive right takes effect from the date of filing of the application so the designs holder has the right to base a legal action from the filing application date.

In China, patents and trademarks registered in other countries are not afforded mutual protection as defined under international treaties, as mentioned above. This is because China's trademark and patent regimes rely on filing as a means of establishing priority; evidence of prior use or invention carries less weight than an application filing. For this reason, China has not always recognised the existence of a design outside the country as grounds for invalidity. This has led to a number of cases, most notably in the copyright and trademark realms but also in the design realm, in which companies with recognised designs, brands, or trademarks have seen IP disputes arise when attempting to enter the Chinese market. While there are valid appeals processes, those processes are costly, time consuming, and—as with any legal process—uncertain. (Canadian Trade Commissioner Service, 2014).

The differences between the intellectual property regimes among the sample countries can be attributed to several factors—from cultural, to political, to economic orientation of the sample states. An example could be the differences in the design IP regimes of France, Germany, and the UK. Up until recently, infringers faced more severe sanctions in Germany than in the UK. The received wisdom at the time was that France and Germany had laws and courts that placed a higher importance on the rights of authors or inventors. Furthermore, the cost of enforcement of those rights had been consistently lower in France and Germany than in the UK, which required a civil process (BOP Consulting, 2011). However, in 2014, prompted by the Hargreaves report (2011), the UK followed suit and declared that the intentional copying of a registered design would now be subject to criminal prosecution (HM Government, 2014). The

UK law, however, did not stipulate that the underlying design IP must be re-examined, nor did it make the criminal conviction subject to the ultimate validity of the infringed IP.

Participation in global value chains and trade can also be significantly shaped by differences in IP regimes. For example, if a design protected in a specific country is not necessarily protected in another country, there will be no rights to claim against design infringement in the country where a design is not protected. On the other hand, enterprises with significant design rights in a country of origin may opt to not expand to another country because of the lack in protection of design-related IP.

The differences in the term of protection also may influence intellectual property strategies of owners. The different terms structures may mean that the design IP is no longer protected in one jurisdiction while at the same time being valid in another. The enterprise that owns the design-related IP could therefore be subject to additional expenses to resolve the situation. Infringement of design will no longer be protected after the term has run out in one of the jurisdictions in which the owner operates.

Design IP complementarities

IP protection mechanisms allow the inventor/innovator to appropriate most of the returns from the initial innovation investment by excluding third parties from using the property. As such, the overriding role for protection mechanisms is to ensure exclusivity, thus, *appropriability* is the primary a concern for inventors. With regard to design, the output of inventive activity is often a non-excludable form of knowledge based capital (KBC). In the absence of an effective formal IP system, invention and innovation may be stifled if firms are unable to use IP protection mechanisms.

Across most legal jurisdictions, several IP protection mechanisms exist to exclude third parties from appropriating innovation (Rammer, 2002). These mechanisms can be grouped into two broad categories. The first is formal protection mechanisms, which rely on regulatory systems to protect IP. Formal IP protection mechanisms encompass a range of legal mechanisms such as patents, trademarks, industrial designs, utility models, and copyright (Rammer, 2002). These formal protection mechanisms act as incentives for innovators to invest in technology development, generate new knowledge, and foster diffusion (Rammer, 2002). As these have been discussed in the prior sections, we will not treat them further here.

The second category of protection mechanisms falls under the category of informal protection instruments. The mechanisms are primarily extra-legal measures not enforceable through formal regulatory mechanisms. Unlike formal mechanisms, enforcement is not guaranteed by the state (Rammer, 2002). Informal mechanisms can encompass a range of strategies, tacit knowledge, confidentiality agreements, lead-time (first mover advantage), or complexity (of design) that are defined as “alternative” or informal IP.

Informal protection mechanisms

Firms may choose from a range of “alternative” or informal appropriation mechanisms, such as lead-time, complexity, tacit knowledge, or confidentiality agreements to bundle with design IP. Informal protection is relatively weak compared to formal protection when it comes to enforcement through the legal system, but it can be highly effective, lower cost, and in some cases may carry less risk of “inventing around.” (Hall et al., 2012)

Lead-time

Lead-time—otherwise known as “product first to market” or “speed to market”—is the advantage provided by getting to market ahead of the competition. This practice allows firms to gain an early market-

share and establish themselves as market leaders. Quite often, this results in a firm establishing its product as the de facto market standard. All of these advantages provide the leading firm superior opportunities to appropriate value. By establishing itself as the market leader or the exemplar after which all other products are measured, the leading firm will be able to appropriate superior rents even when the product market becomes commoditised by imitators (Boldrin and Levine, 2013). Given a hypothetical situation wherein there was a total absence of intellectual property protection such that unlimited duplication would carry penalty, the manufacture of duplicates would nonetheless require time. Before a competitive equilibrium would be reached, the leader would be able to charge a price premium. Despite both the theoretical and practical advantages provided by lead time, it is difficult to quantify—since build-quality, brand value and consumer perception all factor in to the price advantage—and also hard to qualify since interviews and surveys often suffer from ex ante or ex post biases.

By analysing the relevant importance of different appropriability mechanisms as reported by respondents from Germany, Belgium, Denmark, Luxembourg, Ireland, Norway and the Netherlands, Arundel (2001) finds that Lead-time is deemed to be the most effective mechanism by far for appropriating value from innovations. This is by far the most important factor, with secrecy, design complexity, patents and design registration following in order of decreasing relevance.

Complexity

Complexity of design is classified as an informal method of protection. Ichijo (2007) illustrates this for some consumer electronics products: Sharp put tremendous efforts into making imitation of its LCD TV sets time consuming and difficult. While the complexity factor may appear to be only relevant to the realm of technology products, it should be noted that complexity has been the hallmark of designers and craftsmen for centuries. The technique of engraving fine intersecting and overlapping lines on the plates of banknotes or stamps, also known as guilloche, is an example of complexity that was also used by manufacturers of jewellery, fine art craft works, timepieces, and weaponry in order to provide a superior appearance and set them apart from simple imitations (see Samuelson and Scotchmer, 2002 for further details and examples).

Tacit knowledge

Tacit knowledge is knowledge that is difficult to codify and transmit without high interaction between the transmitter and receiver of the knowledge. While many elements of a design may be evident from the appearance of it, this does not necessarily mean that competitors have the knowledge or abilities to recreate the product expressing that design. Studies have provided evidence that, in general, firms place a low value or importance on formal IPRs such as patents or registered designs (Cohen et al., 2000, Gemser and Leenders, 2001, Hall et al., 2012). While many employers may see this as a call for secrecy and restriction on employees, most firms view their knowledge workers as vital resources who are directly tied to firm success by virtue of, among other factors, their tacit knowledge. In order to protect their resources, these firms tend to rely more on rewards and incentives than on restrictive measures. By building a lasting relationship with their knowledge workers, whether employees or contractors, they contribute to the company's ability to maintain its competitive advantage.

Confidentiality agreements

Both lead-time and complexity involve elements of secrecy or confidentiality, the failure of which would allow competitors to pre-empt or imitate the as-yet unreleased product. While the nature of design is that the design elements may be fully revealed in the product once it is released, the key to value appropriation is to maintain the advantage that informal factors allow. By using such things as non-disclosure agreements, non-compete agreements and intellectual property assignment agreements, firms

can protect and control the information about impending products that the techniques that were used to produce them. This becomes more important as firms engage in larger sets of collaborators, suppliers, contractors, and distributors in order to address larger markets. Whereas at one time such matters would be taken care of with an oath and a handshake, in this era one must rely upon tangible documents in order to uphold and enforce such agreements. For this reason, even in pure design service industries and others that may not rely heavily on technological innovations, non-disclosure agreements are ubiquitous.

Factors explaining selection of IP protection mechanisms

Various factors go into the strategic decisions surrounding the choice of IP mechanisms a firm uses to protect its innovations and extract superior rents. Teece (1986) explains that a mixture of three factors drives profits: appropriability regimes, complementary assets, and how strong the dominant paradigm is in the market sector in which the firm operates. The appropriability regime is the integrated network of formal and informal protection mechanisms as discussed above. A tight appropriability regime will make it harder for competitors to imitate the product, providing obstacles or penalties that act as barriers and allow the firm to retain greater profits (Teece, 1986).

Complementary assets represent all of the elements throughout the value chain that a company needs to develop, manufacture, and successfully market a product. This can include access to components, manufacturing facility, upstream or downstream supply chain, distribution, marketing, sales and support networks. Complementary assets can also mean access to knowledge stocks, IP, or talent. In a good scenario, a firm has access to all, but exclusive access to some of them—thereby creating a bottleneck that a competitor must overcome. Teece (1986) cautions that even when a firm has the full advantage of a strong appropriability regime in its favour, if it cannot muster the full value chain of complementary assets, it would be at a market disadvantage.

There is also the issue of dominant paradigm. Consider Tesla Motors, the maker of the well-received electric cars. Tesla had a strong IP portfolio, with both patents and design rights, as well as informal protection mechanisms. The industry had, however, two dominant paradigms that the company had to overcome: the support (fuel) structure was for gasoline vehicles, and in most states in the US it is illegal for automobile manufacturers to sell directly to the consumer. Tesla has worked to establish networks of widely spaced charging stations to overcome the former and continues to work on challenging the laws that restrict their abilities in the latter case. This shows that there is not just one key condition for success and that firms must take a more strategic approach to integrating formal and informal mechanisms into its IP decision process.

There have been few studies examining the integration of design IP with different formal and informal mechanisms. Examining data from the French portion of the CIS-3 survey, Mairesse and Mohnen (2004) compared the level of use of various protection mechanisms by manufacturing and service firms. Patents, secrecy, and design registration all fell consistently behind trademarks, complexity, and lead-time in terms of frequency of use (Mairesse and Mohnen, 2004). Baldwin *et al.* (1999) also investigated firms' usage of IP mechanisms through a direct survey of businesses in the communications, financial services, and technical business services sectors. They found that less than half of the respondents made use of any IPRs. Of those that did make use of IPRs, copyrights and trademarks were the predominant tool used. Lead-time and complexity were considered far more useful than any of the formal mechanisms.

These studies used survey methodology to assess the importance or usage of various IP protection mechanisms. Survey methodology makes it difficult to accurately measure the level of integration or the effectiveness of any given part of an integrated strategy. However, it is clear from these reports that design IP does not play a pivotal role in the IP strategies of the respondents or their firms. Part of the issue may be the perception on the part of the manager that seeking design rights is too costly in terms of time or money,

or that the ownership of IP brings with it liabilities and the potential for infringement actions. On the other hand, managers may also be attributing success to lead-time and complexity and downplaying the advantages provided by design IP. Moreover, none of the studies took into account that, in Europe at least, unregistered design is a passive right that either was not given as options or was not considered by respondents.

Trends in design outcomes, with a focus on registered designs

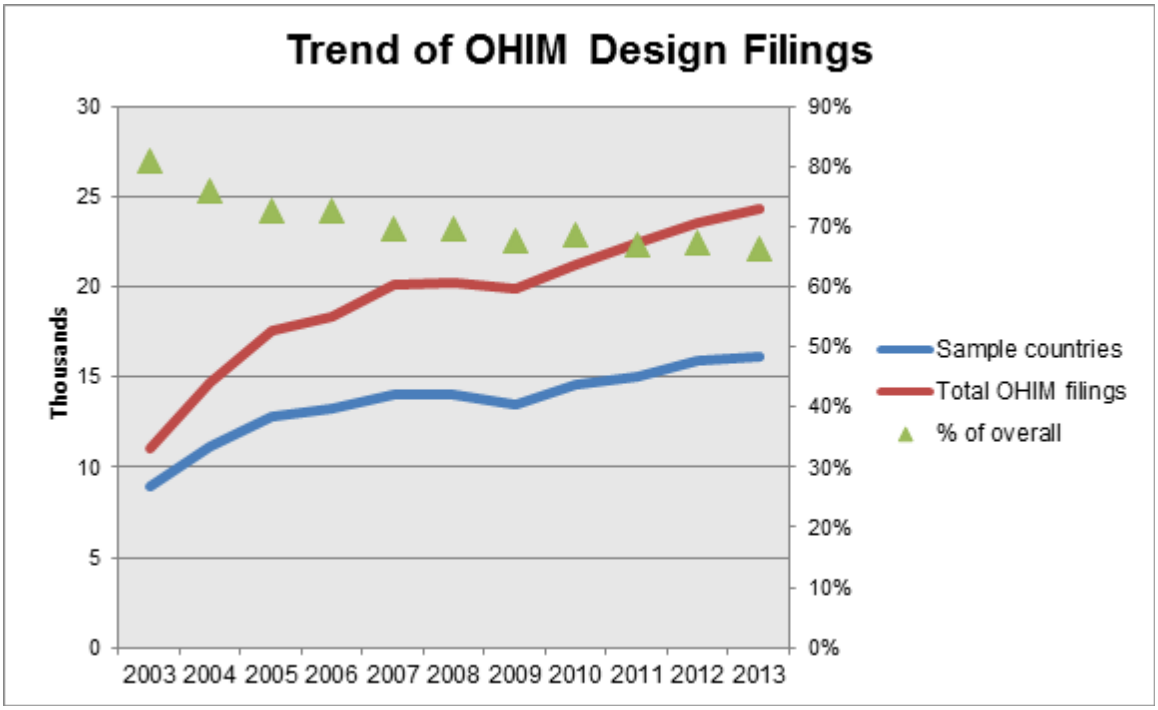
In this section, we will examine trends in registered designs. Below, we discuss the incidence of registered design activity at the national and sectorial levels and describe whether and how some of this activity has changed over time. We describe the activity of firms based in each country of our sample as well as overall activity within each country. We then examine the primary sectors within each country. Finally, we look at some of the top designers at the firm level and describe their IP bundling strategies.

To examine the overall trend of design registration without risk of overlapping registrations we are using data from OHIM and the USPTO. While WIPO is yet another registry of design IP, given that only a portion of our sample set are signatories of the Hague Agreement, there is a certain amount of irregularity in WIPO participation wherein design holders may register both with WIPO under the Hague Agreement and under other national protection mechanisms. It is for this reason that we focus on design IP filed solely within the EU and US.

Overall trend of OHIM filings

Given that design regulation started under OHIM in 2002, we have the opportunity to see the early stages of this regime. Given that the countries in our sample comprise the core of the European economy, it is to be expected that in the early stages of OHIM's development, they formed the highest percentage of filings. However, as OHIM has become more established we see an increasing percentage of filings coming from other actors. Nonetheless, we also see that the countries in our sample dictate the trend and contribute the greatest proportion of filings.

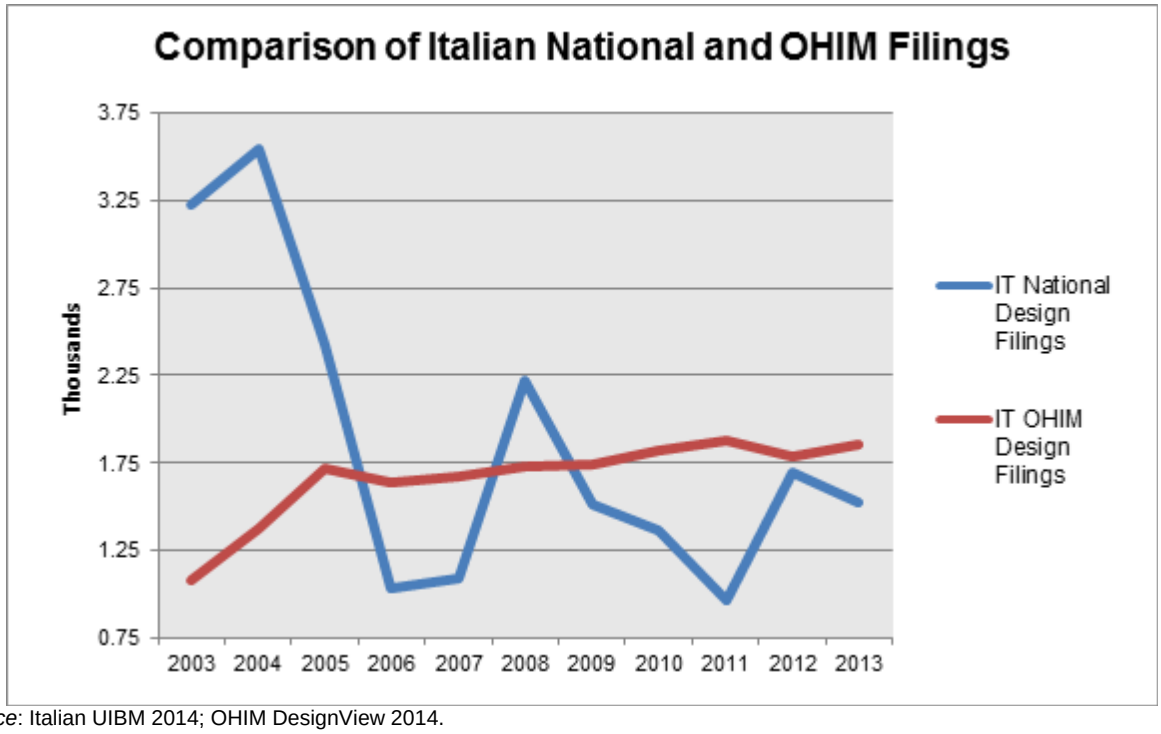
Figure 6.3. The trend of overall design filings through OHIM



Source: OECD StatExtracts, 2014.

In Figure 6.3 we see that the overall trend of design registrations is increasing, albeit at a decreasing rate compared to the early period. Much of the rapid increase was because of the initial adoption and diffusion of the OHIM system. In Figure 6.4, we see the example of Italy, wherein national filings in 2003-2005 were higher than OHIM filings of Italian origin, but as Italian OHIM filings increased there was a coincidental decrease in filings at the national patent office of Italy. This indicates a relatively rapid adoption of the OHIM system of protecting designs as design owners seek the broader geographical coverage provided by OHIM. However, we also note a relatively consistent amount of design registrations with the national office. This is, in part, due to the unique situation wherein Italy's laws provide the same national protection for designs along as for copyright. This provides incentives for firms to file in parallel so that they can enjoy this extended protection even after design protections under the OHIM regime have expired.

Figure 6.4. Italian filings nationally and through OHIM



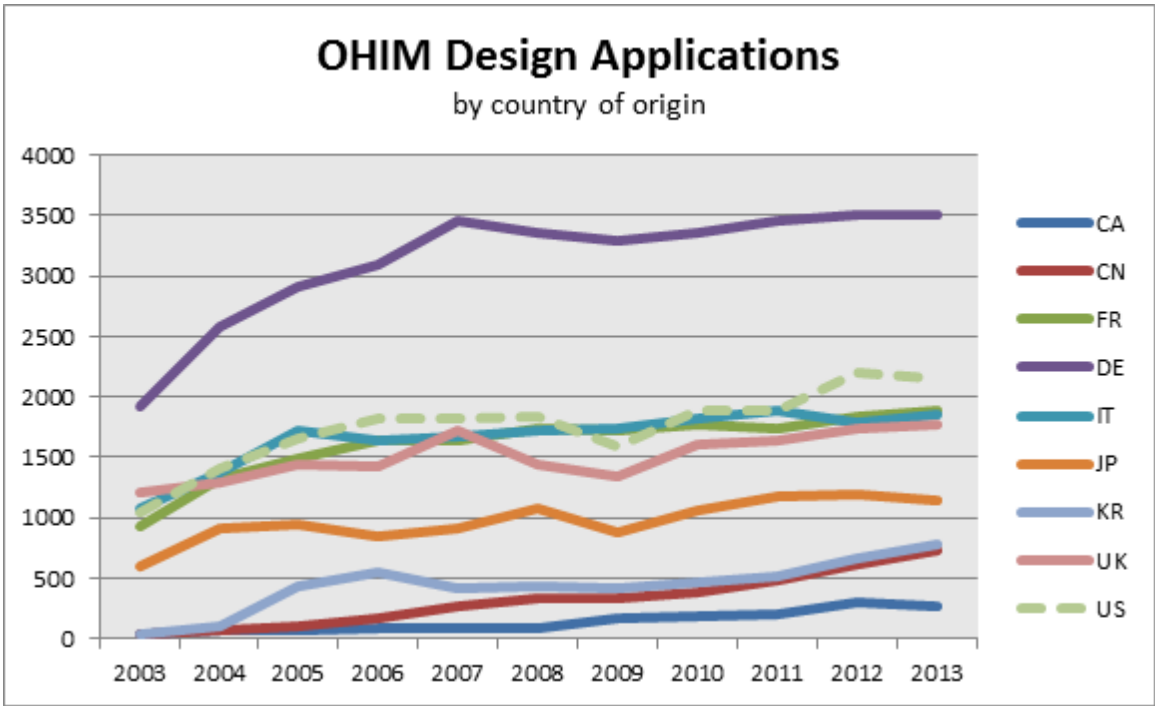
Source: Italian UIBM 2014; OHIM DesignView 2014.

Nonetheless, in Figure 6.4 we do observe that the overall rate of filings have decreased in Italy from an initial peak in the sampling period, decreasing drastically and then settling out at a relatively steady pace. This slow but steady rate of increase is what we have seen across the overall sample set. This may be an indication that the adoption of design IP has reached a stable state and the growth in design registrations is primarily a reflection of the overall growth of the economy.

Registered designs emanating from the sample countries—trends

As noted in the previous section, in Figure 6.5 we see a gradually increasing trend in applications for design registrations in many of the sample countries. This represents the supply of overall stock of design IP for the European community. Although this stock of IP is being constantly replenished, there is also the depletion of stock due to designs reaching their expiration or, since registered designs must be renewed every five years, the choice of owners not to renew.

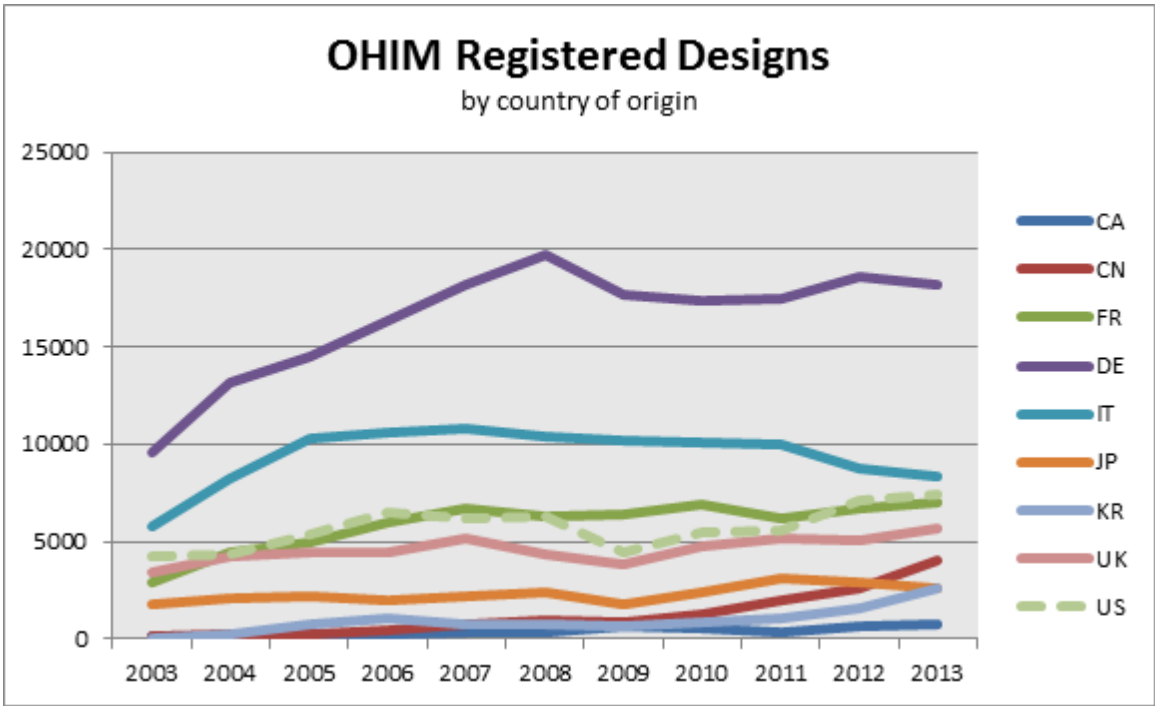
Figure 6.5. OHIM Design Applications by country of origin



Source: OECD StatExtracts 2014.

These trends are depicted in Figure 6.6. Although we see the rate of applications increasing, the stocks appear to be levelling out or decreasing, especially for the dominant countries Germany and Italy.

Figure 6.6. OHIM Registered Designs by country of origin

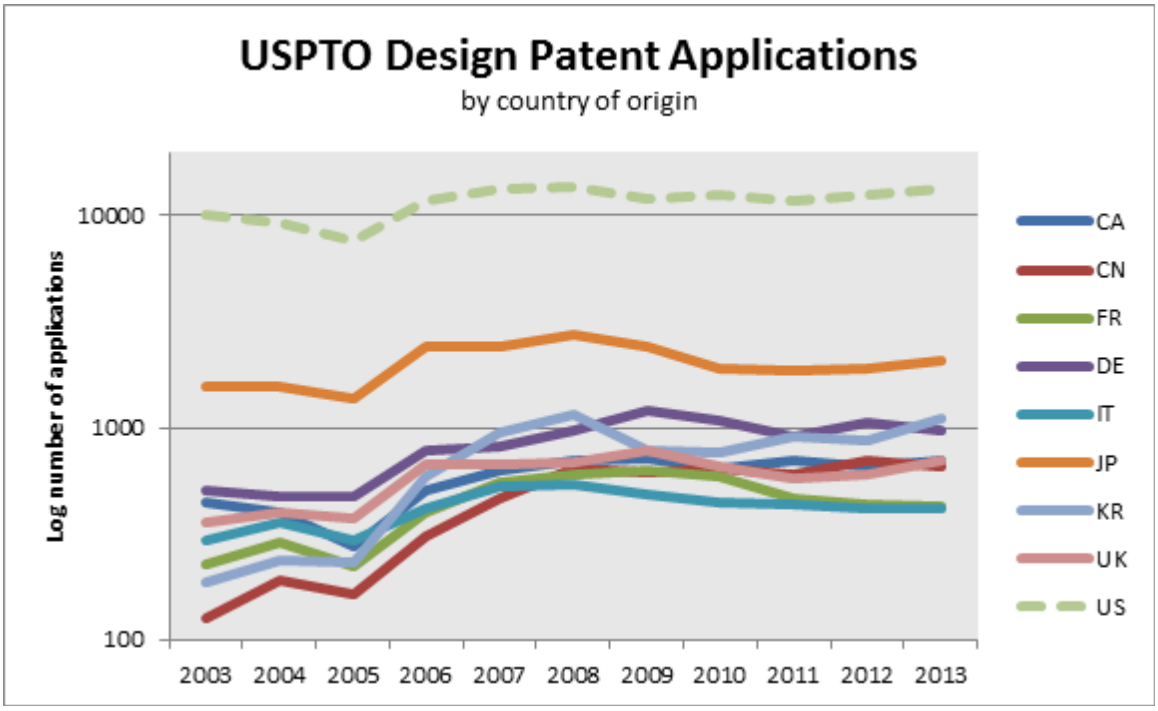


Source: OECD StatExtracts 2014.

In this figure, we note a slight growth trend over the ten-year period, but not very rapid growth, with two notable exceptions. For Korean registrations, if one examines the designs closely, the vast majority of them are in the area of consumer electronics in recent years and most of them emanate from one firm: Samsung. Samsung's rise to prominence in consumer electronic design (rather than pure outsourced manufacturing of the past) thus accounts for much of the growth in Korean registrations, whereas other sample countries tended to have a more stable registration patterns, probably due to the more stable importance of design in their economies. Likewise, China is seeing a robust growth in the number of registered designs as it shifts from a outsourced manufacturing economy to a design and production model in its own right.

The other major market for design protection is the United States by filing through the USPTO. Given the size of the US market, it is clear that the dominant contributor to US design patent registrations is the US. Figure 6.7 shows the importance of US firms in the design market.[278] What is also notable, although not surprising, is that Japan figures so prominently. Given that the US is one of Japan's primary export markets, it is only sensible that Japanese firms protect the designs of their products there.

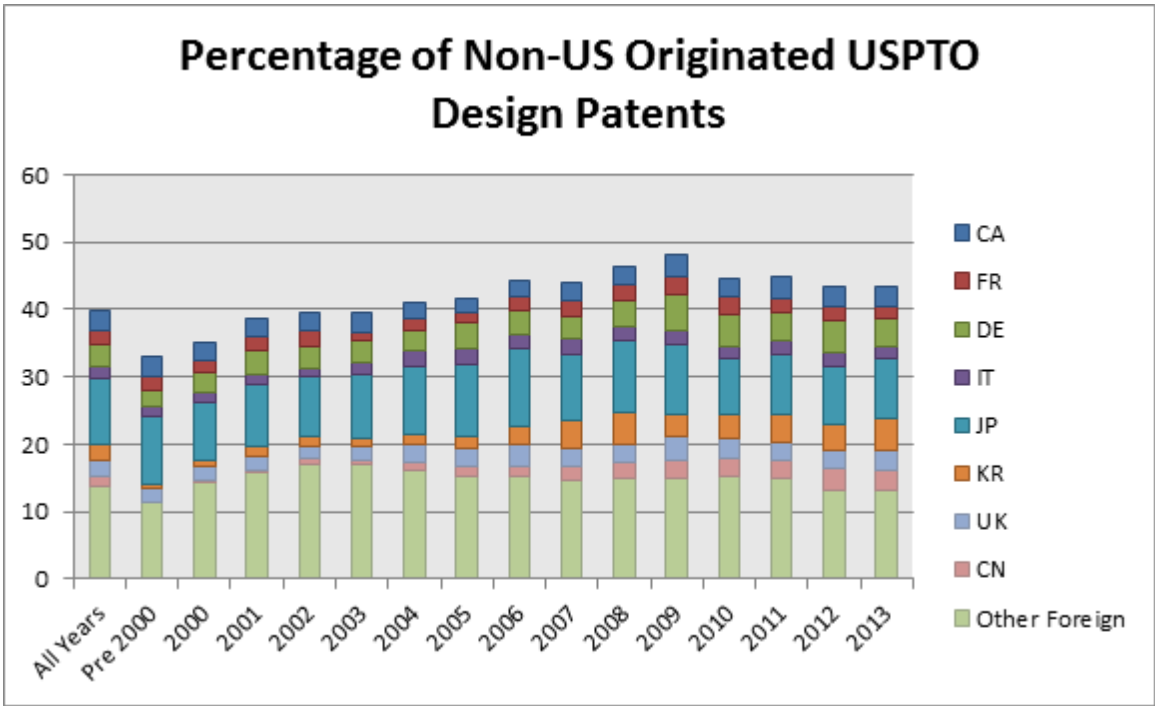
Figure 6.7. USPTO filings (log count, adjusted axis) for design patent applications from the sample set



Source: USPTO PTMT 2014.

There is, however, a greater subtlety to the dynamics of design registration in the US market if one excludes the dominant US input. Figure 6.8 shows the relative proportion of design registrations by non-US applicants. While Japan figures prominently, Germany and Korea—also major exporters to the US—are strongly involved in design registration; however, the combined input of all other nations not selected in this sample create a mass of design IP greater than that of any one of these major players. This indicates that the market for design IP is both diverse and active.

Figure 6.8. Non-US participation in USPTO design patent registrations

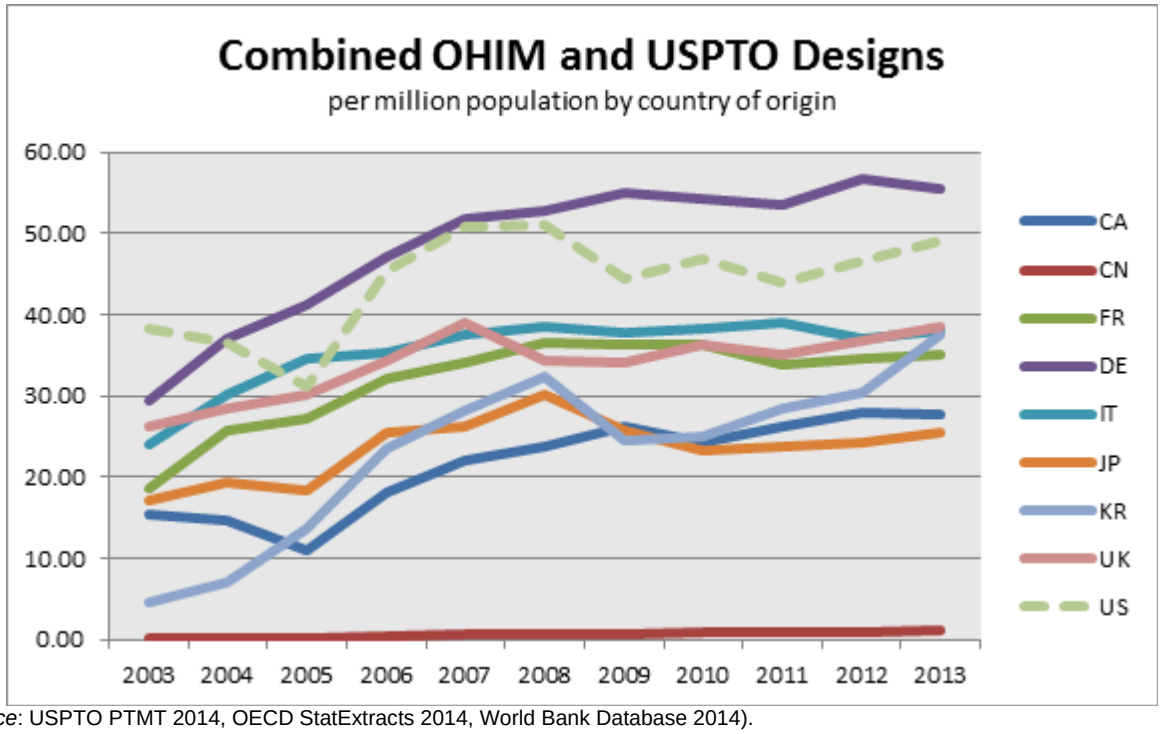


Source: USPTO PTMT 2014.

Resource-based estimates of design output

The indicators we are examining have, so far, been represented on a per nation basis; however, the relative positioning of the nations in terms of design-related registrations tells us as much about their relative Gross Domestic Product (GDP) as it does about the design capacity of the nation. We thus sought a means whereby we could normalise these data in order to bring them into context relative to the inherent resources of the nations. As mentioned earlier, the GDP indicators are not significantly different from the traces we have here, so we sought other means. Since designs are commonly registered by firms, we could examine the data in that manner; however, the data on number of total enterprises by nation is incomplete—both in terms of the nations we are examining and in terms of the years reported if the data are available—such that we could not generate representative indicators. In addition, the variance in firm sizes across nations, and thus the relative count of firms, might introduce additional error factors. Given that design is a human artefact (Krippendorff, 1989), the population of any nation may be a good measurable resource for design generation. For this reason, we feel it most appropriate to examine the relative outputs of each sample country relative to its population. This weighting method can thus express the innovative design output not on the basis of sheer brute force, but instead by the engagement of the population.

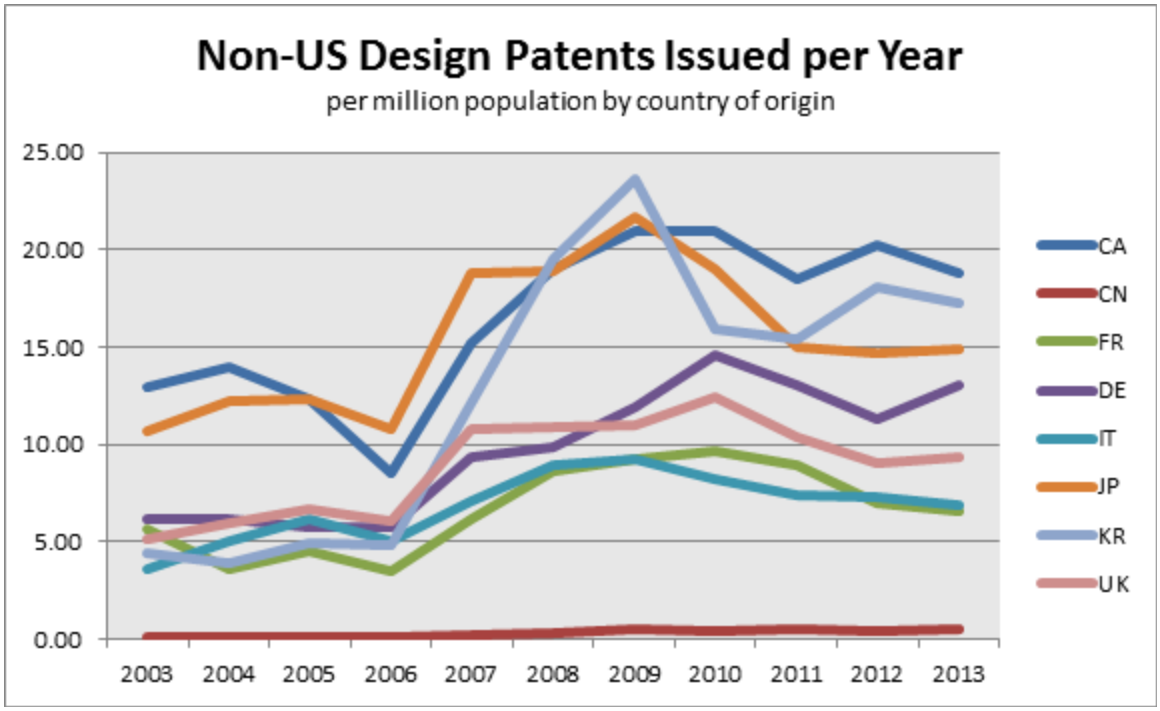
Figure 6.9. Combined OHIM and USPTO design stocks by country of origin per million population



Source: USPTO PTMT 2014, OECD StatExtracts 2014, World Bank Database 2014).

Although we saw in Figure 6.8 that the US is the dominant leader in design279, when the populations of those countries are factored in and registrations in both the US and the EU are taken into account, as seen in Figure 6.9., the picture changes dramatically. The US falls behind Germany in designs per capita, remaining just above Italy, France, and the UK. The latter group of countries have approximately the same activity as Korea when normalised by population. Given the massive population of China, it is not surprising that its design activity is less pronounced when normalised.

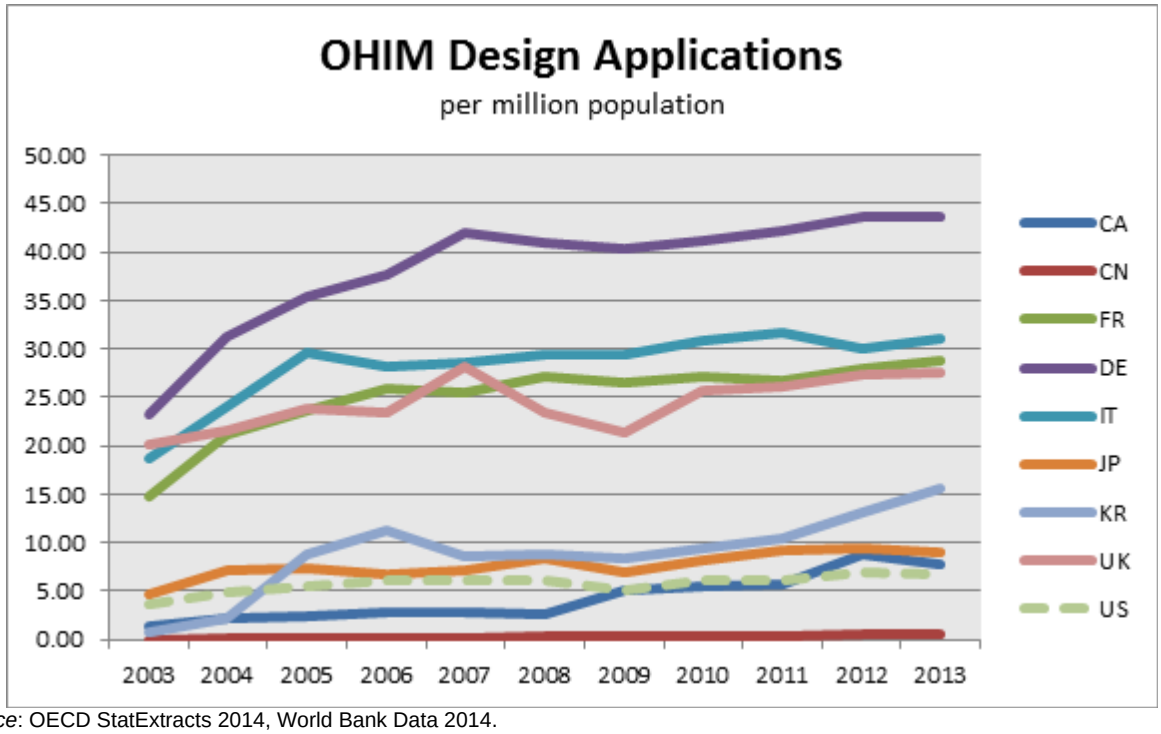
Figure 6.10. Per capita design output as measured by non-US originated design applications made to the USPTO



Source: USPTO PTMT 2014, World Bank Data 2014.

Korea's designs per capita become even more pronounced when one considers the US market alone and excluding the overwhelming inputs of the US. In Figure 6.10.we see that, although Japan does retain a leading position in terms of per capita output, Canada and Korea are strong in registering designs in the US market. Given Canada's proximity to the US, it is not surprising that this would be a natural market for the design output of its relatively small population. Korea, on the other hand, with its powerhouse firms in the audio-visual (televisions, computer displays, etc.) and telecommunications (mobile phones, tablet computers, etc.) fields, also has a strong stake in the US consumer market despite its geographic distance from them.

Figure 6.11. OHIM design applications by country of origin per capita



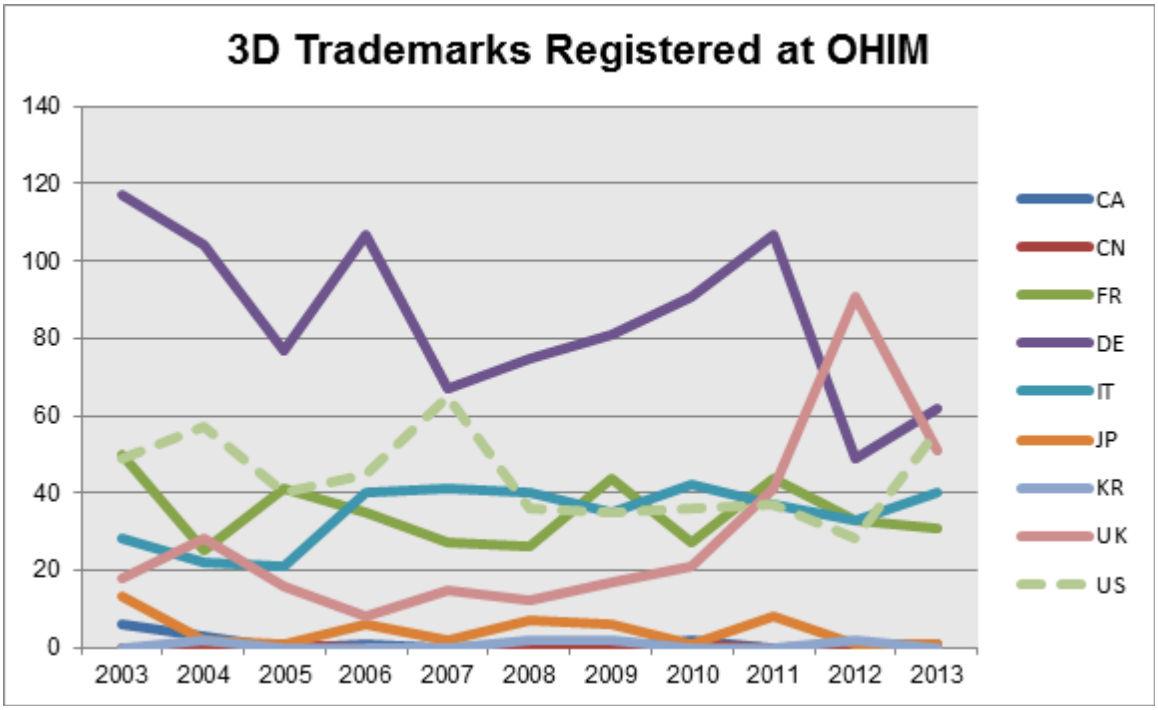
Source: OECD StatExtracts 2014, World Bank Data 2014.

Looking at the trend in relation to OHIM design applications when normalised by population, we observe that German designers continue to dominate the space, while the rest of the European countries (Italy, France, and Britain) remain clustered together, with a distinct lead over the non-European countries. Much like the US, which dominates the North American market, the European players tend to focus primarily on their home ground. Part of this is the simple fact that sales and exports are highly dependent upon proximity and familiarity. Nonetheless, even in the European marketplace we see Korea making definite gains and establishing itself as a rising power.

Alternative indicators of design activity

As previously stated herein, design is intrinsically linked to brand identity and the firms that own the brands. Since trademarks can be words, statements, images or other elements, there is significant debate as to whether they are a valid representation of design (Durkin and Schirk, 2011, Jackson, 2014, Miaoulis and d'Amato, 1978). Trademarks can, however, be used to protect three-dimensional designs, and given the longer protection of a trademark, the registration of three-dimensional trademarks could be an indicator of those designs that firms may consider to be more significant or longer lasting. Other than articles describing the legal frameworks under which three-dimensional trademarks can be implemented or how they may conflict with design or other laws (Khoury, 2008, Li, 2012), there is no evidence that the value proposition of these marks as perpetuating or representing design has been examined in literature. In light of the consideration that this may, at some point, be an avenue for future research, we include here an analysis of three dimensional trademark filings from 2003-2013.

Figure 6.12. Registration rates by country of origin of three-dimensional trademarks



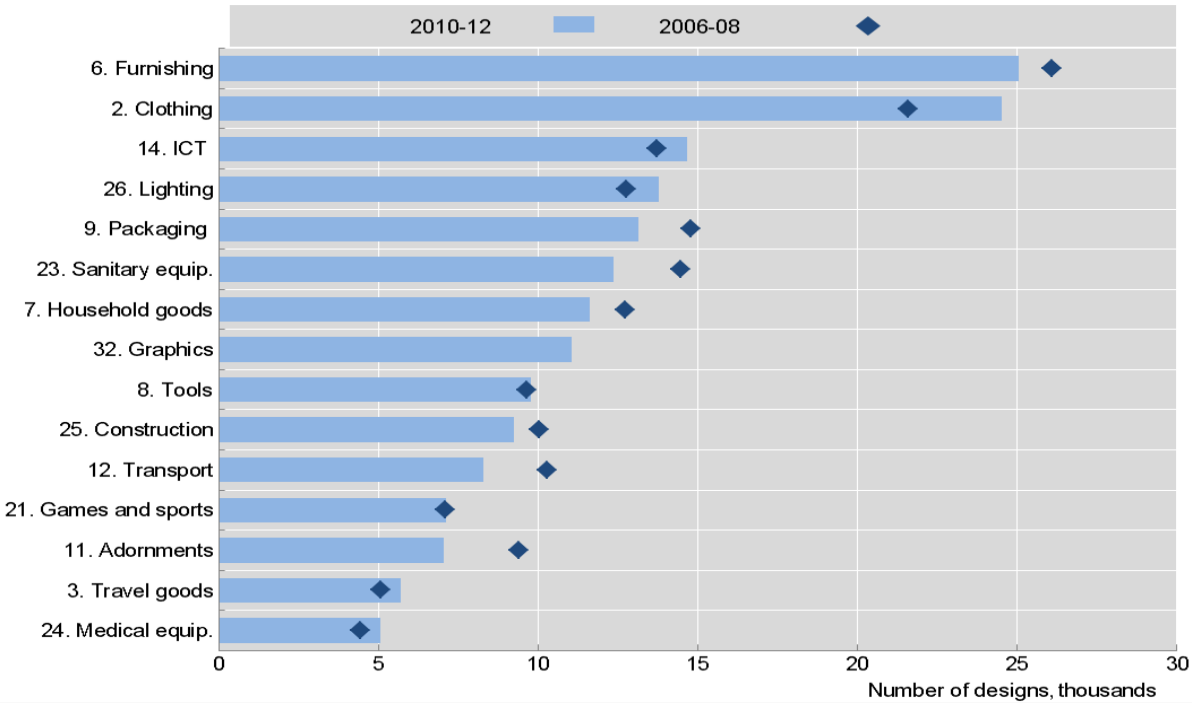
Source: OECD StatExtracts 2014.

Indications are that the quantity of three-dimensional trademarks filed annually is too low to establish any current trend, as seen in Figure 6.12. It does appear that Germany has previously been a frequent source of registrations.

The major sectors in which designs are registered

Figure 6.13. is reproduced from the OECD Science, Technology, and Industry Scoreboard (OECD, 2013, p. 192) and shows the number of registered designs for the periods 2006-2008 and 2010-2012. Sectors are identified on the basis of a taxonomy using information about the Locarno class in which designs are registered. Please note that as mentioned above, the figure does not represent the sectors in which the firms actually compete, but rather in which they register their designs. For example, if an airplane manufacturer registered a design on a new seat, this would be classified as "furnishing" and not "air frame manufacturing."

Figure 6.13. Number of OHIM registrations by Locarno Classification

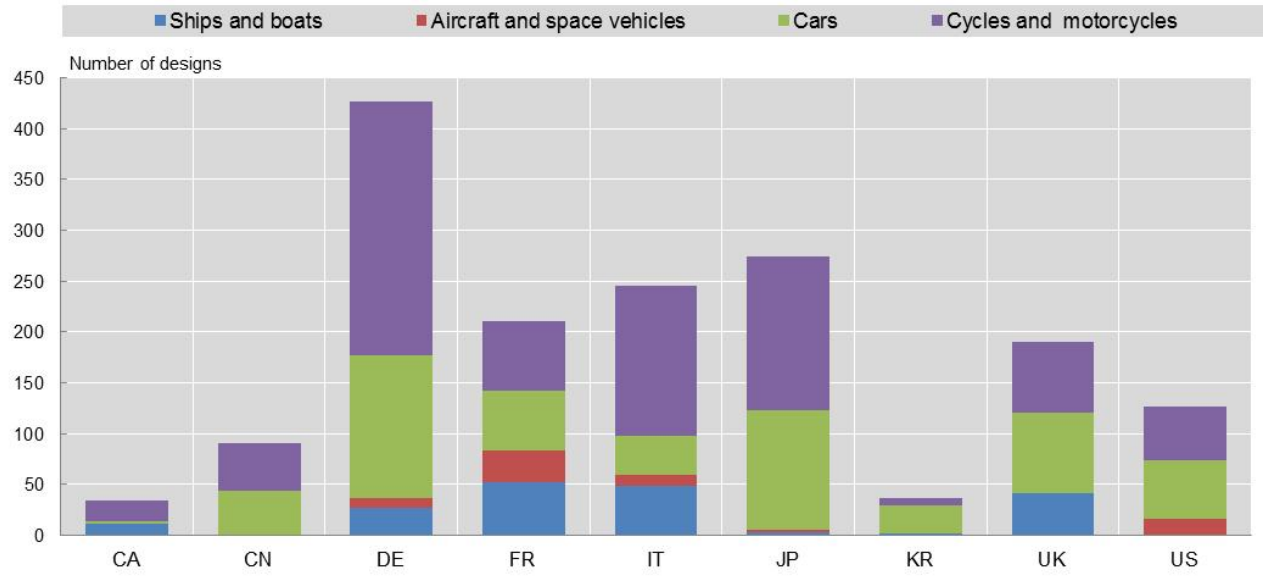


Source: OECD StatExtracts 2014.

Note that the figure represents total designs registered; therefore, it should be expected not to have too much movement between the two periods, as the only difference would be new registrations minus expired registrations. Still, we see net inflows (growth of registrations) in clothing, ICTs, lighting, travel goods, and medical equipment. We see net outflows in furnishing, packaging, sanitary equipment, household goods, construction, transport, and adornments.

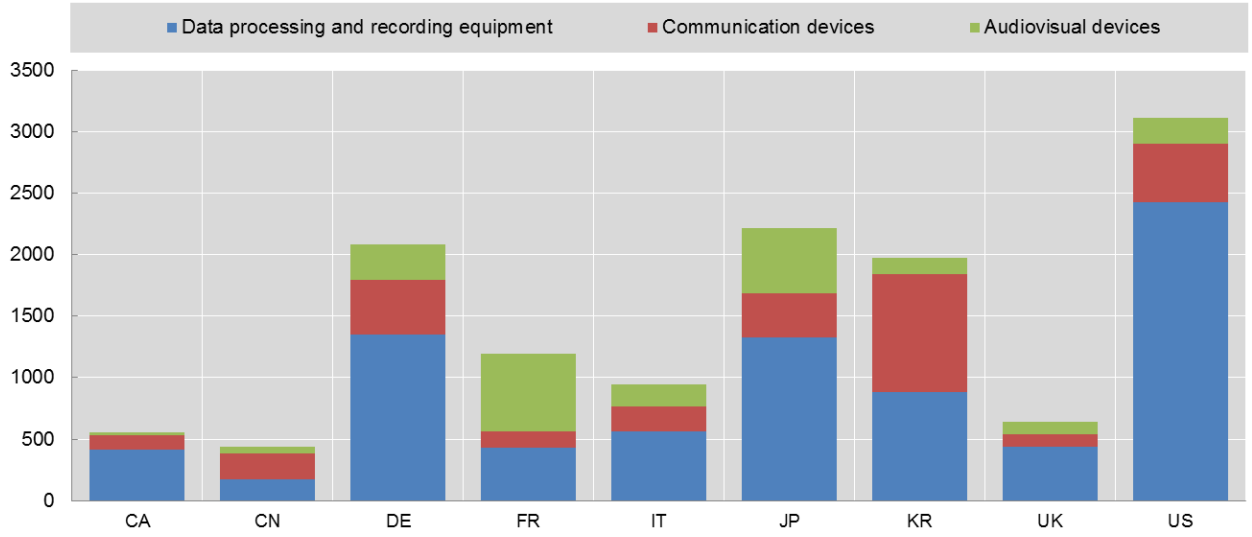
Regarding the participation from the sample countries in these sectors filed with OHIM,[280] the OECD examines two major sectors more closely: transport, and ICTs, as shown in Figure 6.14. and Figure 6.15. Transport is divided into ships/boats (top countries: France, Italy, UK), aircraft / space (France, USA, Italy), cars (Germany, Japan, UK), and cycles / motorcycles (Germany, Japan, Italy). The ICT sector is divided into data processing / recording equipment (top countries: USA, Germany, Japan), communication devices (Korea, USA, Germany), and audio-visual devices (France, Japan, Germany). Among the other countries, Canada is fairly active in ships, motorcycles, data processing equipment, and communication devices. China is fairly active in cars, motorcycles, and all the ICT sectors.

Figure 6.14. OHIM transport-related registered designs, 2010-2012



Source: OECD STI Scoreboard 2013.

Figure 6.15. OHIM ICT and audiovisualrelated registered designs, 2010-2012



Source: OECD STI Scoreboard 2013.

Firm-level activity

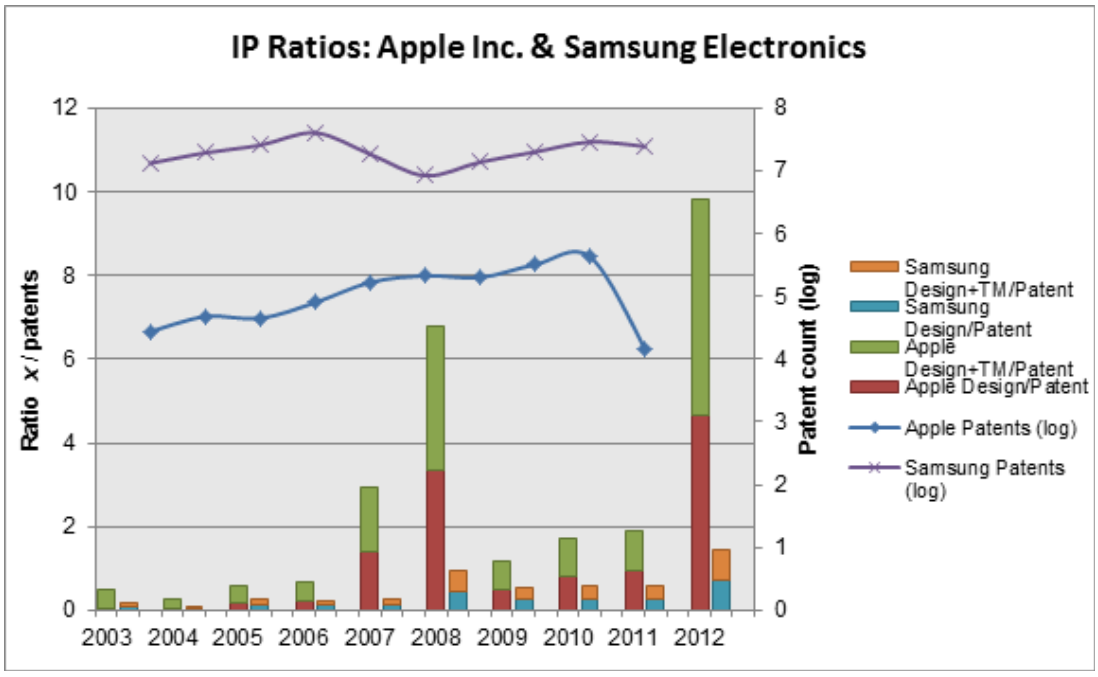
Of course, most of the activity for registered designs actually takes place at the firm level and most of the statistics we have discussed so far have been aggregated up to the country level or grouped by sector in which the design was registered. In this section, we look more closely at trends in firm-level registered design activity.

Bundling designs and patents (and possibly other forms of IP)

Whether for the fact that design can be expressed in a multitude of ways or that firms seek multiple avenues to protect their knowledge-based capital, it is recognised that covering a singular design or invention with multiple IPRs is prudent (Silverman, 2014). This practice, known as "bundling" IPRs, can provide a more solid or longer-lasting protection of designs. While it is difficult to identify bundles without painstaking, record-by-record analysis, it may be possible to identify bundling tendencies through the analysis of trends in firms' accumulation of various ratios of IP.

In an effort to illustrate and explore this activity, we undertook a comparative analysis of two firms that have competed strongly against each other. These are two of the largest firms by market capitalisation of two countries in our sample, Korea and the US. The two companies, which have carried on a well-publicised series of lawsuits over the various merits, or lack thereof, of registered designs as well as technology patents, are Apple Inc. and Samsung Electronics Co., Ltd. While the relationship between these two companies is complex and multidimensional, given that they have both a competitive as well as a supplier/customer relationship, matters came to a head shortly after Apple introduced the iPhone in 2007. Apple claimed that Samsung products were intentional imitations of the highly successful iPhone, and later iPad, designs (Cusumano, 2013).

Figure 6.16. Ratios of design, trademark and patent registrations for Samsung and Apple over a 10-year period



Source: OHIM DesignView 2014, OHIM TMview 2014, Questrel Intellectual Property Portal 2014.

In Figure 6.16. note that for the period 2003-2006 both companies had a relatively low ratio of designs to patents. Apple added a significant number of designs to its portfolio in 2007 just ahead of the iPhone release, and it also increased its collection of trademarks. Samsung, meanwhile, continued to maintain its previous pattern of design, trademark and patent filings[281]. Samsung did commit itself to capturing a significant portion of the smartphone market. By 2010, Samsung had released the first of its Galaxy smartphones and immediately drew the attention of Apple. We see some evidence that Samsung began bundling more in 2008, and that Apple, fresh off of registering numerous designs and trademarks

after the release of the iPhone and iPhone 2, continues to show significantly increased tendencies to bundle. Included in this chart is a trend line of patenting activity for each firm, which tells us that the rate of patenting did not decrease; in fact, patenting activities of both companies tend to increase consistently[282]. Given that patents are in the denominator of each ratio, and given that patenting is generally increasing, this means that since 2007 Apple's rate of increase in design registration and trademarking—in most years, each of those activities individually—is in excess of the rate of increase in the patents filed by the firm. Furthermore, the rate of bundling has generally been accelerating since 2009.

While we acknowledge that, given the 18-month (or more) blackout period that utility patent applications[283] are subjected to, patents are a lagging indicator, we argue that the nature of patents requires that they be filed significantly sooner than design registrations or trademarks, which may be filed just prior to or even after the initial release to the public. This may result in much of the lag time between patent filing and publication being negated. In any case, the overall increasing rate of patenting, even if lagged, does not account for the greater increase in design and trademark registration activity. By all appearances, both Apple and Samsung have altered their behaviour and have adopted some bundling tendencies.

Measures of design inputs

The general protocol for R&D input measures is the "Frascati Manual" (OECD, 2002). However, the Frascati Manual takes a narrow view of design inputs (see paragraphs 22, 79, 84, and 110), according to some (e.g. Moultrie and Livesey, 2014). Under that protocol, some design-related activities might be excluded. Thus, there is a paucity of research connecting design investments or activity or inputs with performance outputs.

Classification of input measures

However, in this section, we would like to take the small number of articles that exist on design activity and classify them by their input measures (see Table 6.2.).

Design orientation by observation of organisation structure

These inputs are subjective measures that examine the internal organisation of the firms and where the design function fits into it, if at all. In an examination of design orientation of firms, Black and Baker (1987) measure greater design involvement within the NPD process in interviews with 61 executives in Scottish engineering and industrial textile companies. They use the presence of an "aesthetic design" or industrial design group at all as a proxy for "design orientation." Ones with aesthetic design groups (very few) are thought to be more design-oriented. In contrast, most of the small companies in their sample have an "engineering design" group. The authors also measure whether the Managing Director of the company had personal involvement in the design process or not. Similarly, Walsh *et al.* (1992), studying 100 firms in different sectors worldwide, uses the existence of formal design activity, and whether such activity is located inside marketing or engineering, as a measure of "design consciousness."

Perceptual measures

In several cases, researchers simply ask managers to rate their investment qualitatively as growing or shrinking, or other perceptions of the firms' investments. For example, Chiva and Alegre (2009) survey 182 ceramic tile manufacturers in Spain and Italy in which they asked managers to rate their perceptions about whether investment in design in the respondent's company had increased or decreased (Chiva and Alegre, 2009). Likewise, Dickson *et al.* (1995) surveys over 200 CEOs of rapidly growing companies listed in *Inc*. magazine's list of rapidly growing companies and asks them to rate their design activity in several different categories, such as product/service design or packaging design on a range from "greatly decreased" investment to "greatly increased" investment.

Table 6.2. Input measures of design as sampled in literature (Authors' compilation)

Reference	Measure	Category	Details
Black and Baker 1987	Design involvement within NPD	Design orientation	In interviews, existence of an "aesthetic design" group
Walsh *et al.* 1992	Design consciousness	Design orientation	The existence of formal design activity in 100 companies, and whether such formal activity is located inside marketing or engineering
Roy and Potter 1993	Costs of design work	Actual expenditures	Survey of 221 UK SMEs in manufacturing (cross-industry) that received a government grant to employ a professional design consultant answering questions about total expenditures
Dickson *et al.* 1995	Investment in design	Perceptual measures	Survey of 201 CEOs listed in the Inc 100 or Inc 500. Answer to several questions in a five-point Likert scale from "greatly decreased" to "greatly increased" (over the three-year period): A. Product/Service design. B. Packaging design. C. Advertising design. D. Store design. E. Factory design. F. Office Architecture/Design.
Sentance and Clark 1997	Design activity	Actual expenditures	Survey of 800 manufacturing firms (cross industry) reporting expenditures on seven categories of design (market research, product development and improvement, appearance design, technical design, process/systems design, engineering design and graphic/brand design) as a percentage of sales in five levels (<1%, 1–2.9%, 3–4.9%, 5–9.9%, >10%), aggregated up to national level estimates.
Gemser and Lenders 2001	Industrial design intensity	"Objective" measures	Survey of 27 Dutch manufacturing firms in home furniture or precision instruments factor-analysing answers to: A. What percentage of NPD products use design expertise. B. The number of design awards or prizes. C. The number of temporarily employed design interns or design-school students. D. The average expenditure on product appearance during NPD projects.
Hertenstein *et al.* 2001	Design effectiveness	Perceived effectiveness	Expert panel ranked 51 firms (cross-industry) by how "effective" they were in design within each industry sector
Design France 2002	Investment in design	Actual expenditure	Survey of 637 SMEs in the manufacturing sector asking questions "How much do you estimate you spent on design in 2000 in your company?" With different levels of expenditures (<150 KF [thousands of French Francs], between 150 KF and 300 KF, and > 300 KF) and across four different categories (product, packaging, graphic, and architectural).

Reference	Measure	Category	Details
Hertenstein *et al.* 2005	Industrial design effectiveness	Perceived effectiveness	Expert panel of 138 experts ranked 93 manufacturing firms (nine sectors) on how "effective" they were, considering factors such as: Quality of the firm's design program (e.g., number of design awards, peer recognition); Quality/excellence of design evidenced in the firm's products, collateral marketing materials, etc. (e.g., their opinion of the firm's design of products and materials); and importance placed on the firm's design program (e.g., large investment in design).
Galindo-Rueda *et al.* 2008	Design investment	Actual (estimated) expenditures	Expenditures estimated at a national (UK) level based on occupations involved in design and industries in which design is important, and then estimating how much was spent in-house vs. contracted out by extrapolating to the whole economy
Chiva and Alegre 2009	Design investment	Perceptual measures	Survey of 182 Italian and Spanish ceramic tile producers. Answer to question "How much has your company increased or decreased its investment in design over the past three years?" with a seven-point Likert scale ranging from "greatly decreased" to "greatly increased."
Moultrie and Livesey 2014	Design spending	Actual expenditures	428 firms answering questions about their total design expenditures, both in-house and outsourced, with a "precision estimate" at five levels (within GBP 1K, 10K, 50K, 100K, and "can't estimate"). The total design expenditures were divided into four categories: Technical design of products and services; Design of the user experience for products and services; Design of promotional materials for specific products and services; and Design to develop and promote corporate identity.

Actual expenditures

Several studies have attempted to ask for or estimate the actual amounts spent on, or invested in, design, and this is the largest category of work related to design inputs. Moultrie and Livesey (2014), for example, work to develop a framework for the measurement of design investment and to evaluate this framework in a pilot survey, with the purpose of refining a set of valid measures. They end up performing a survey in which they asked for both expenditures on design, plus a "precision" of the estimate (how comfortable the respondent was with his/her estimate of expenditures). Total design expenditures are divided into four categories: Technical design; User experience design; Graphic design of promotional materials; and corporate identity design. They carry out their study on a sample of 428 firms, finding that investment in design is around 4% of turnover (total sales) with 81% of all design investment being in "technical design," focused on functionality and performance of new products and services.

Galindo-Rueda *et al.* (2008) estimate the total expenditure on design in the UK by breaking the analysis into "outsourced" vs. "in-house" architectural and engineering design services. To do this, they analyse the industries in which new design might be one of the key objectives. Further, they examine occupations in which design is mentioned as part of the description of the occupation. When these are

merged, the authors reveal that almost 300,000 employees in the UK are involved in the in-house design process. Supply-use (input-output) tables are used to estimate the amount of total expenditures on design, which is estimated at GBP 44 billion in 2004, of which GBP 27 billion could be considered in-house and 17 billion to be "purchased." Some of this could be considered "investment" in that it could lead to knowledge-based capital or other intangible assets; the authors estimate this investment to be 50% of total design spending, although this number is based on surveys of managers and actually is bounded by 9% on the lower end and 86% on the upper, a very wide range "too wide for comfort." (Galindo-Rueda et al., 2008, p. 17)

A few years before that, Sentance and Clark (1997) attempted a similar estimate of national (UK) design activity but based on a survey of design expenditures in seven different categories as a percentage of sales in manufacturing companies. The authors estimated that manufacturers spent more on design (GBP 10 billion) than on R&D (GBP 7 billion) in the prior year, although they acknowledge the lack of precision in their categorisation scheme. In France, Design France (2002) performed a survey of over 600 small and medium-sized French manufacturers. The respondents were asked to give actual expenditures in the prior year but rounded into three "bucket" levels: less than 150 000 French Francs (approximately EUR 23 000), between 150 KF and 300 KF, or greater than 300 000 French Francs (approximately EUR 46 000). These were further categorised by product, packaging, graphic, and architectural design so there would be one range for each of the four categories. In the UK, the UK Community Innovation Survey asked one question on design inputs: what is the firm's total expenditure on design? Roy and Potter (1993) surveyed a group of 221 firms in the UK that had taken advantage of a government scheme to subsidise the hiring of a designer to find out how much the companies had spent in total on the project and how much they had spent on design so they could estimate the return to design investment.

"Objective" non-pecuniary measures

Objective non-pecuniary measures refer to measures that are not based on actual expenditures, but are not entirely perceptual, either. We put "objective" into quotes the first time because we understand that almost all data obtained from people is actually subjective to one degree or another, but here we draw a distinction between firms reporting numbers and reporting perceptions / agreements with statements. For example, Gemser and Leenders (2001) measure design activity using a multi-item survey, which they refer to as "industrial design intensity"—not to be confused with the "intensity" of Moultrie and Livesey (2014), who refer to the more standard intensity as total expenditures divided by total sales. They ask respondents as to what percentage of R&D projects professional design expertise was employed; how many design prizes the firm had won [which is partly an output measure, not an input], the number of temporary design interns / design school students currently employed at the firm, and the average expenditure devoted to "product appearance." Factor analysis revealed that all of the above items loaded onto a single factor that the authors called "industrial design intensity."

Perceived effectiveness of design as rated by a third party

This last set of projects is somewhere between inputs and outputs in that design activity is not directly measured, but rather design performance itself is measured and then correlated with firm performance (see section 6 below). Hertenstein *et al.* (2001, 2005) had expert panels evaluate firms on the effectiveness of their design functions. Herenstein *et al.* (2001) employed experts to rate firms on their effectiveness and was able to divide companies into two groups: 26 firms that had more effective design functions and 25 that had less effective design functions. In a similar research design, Hertenstein *et al.* (2005) was able to mobilise 138 experts (design managers attending the Design Management Institute conference) to rate almost 100 firms and sort them into the same two groups as before: effective vs. ineffective design based on perceived visibility, quality, and investment.

Sector-specific indicators

There have been numerous studies done on business and innovation practices in some of the design-intensive sectors, but there have been relatively few that have been able to come up with sector-specific indicators that could be used on a large-scale. Even in industries that might be considered design-driven, such as architecture, clothing and furniture design, or industrial design, there are significant activities such as marketing, project management, or product implementation that tend to muddle the ability to look at revenues and outputs directly. In product-oriented and technology-oriented firms, this becomes even more obscure. Similarly, the advent of web development makes it difficult to see what costs are allocated to a specific product or service, and which of those costs should be considered development versus maintenance.

Design experts have indicated that a common notion is to protect IP by way of "thematic design," whereby the appearance or form of a product is repeated across the full spectrum of user experience. Thus, one would expect design elements to be repeated across categories. Since applicants are commonly allowed to file multiple designs in the same application so long as the designs are all within the same Locarno class, the practice of thematic design would result in multiple applications by the same applicant at the same time. One could postulate that such applications would likely fall on the same date for the same applicant and include at least one application under Locarno class 14, subclass 4. Given that thematic design has not been widely studied, this may be a fertile area of research. This would allow us to segregate product-oriented design from pure web-based design.

Measurement of design outputs

Some firms contend that design is the key differentiator permitting them to appropriate value over and above that of a hypothetical commoditised version of their product. Some of the studies mentioned in the prior section also attempted to correlate design inputs with different types of outputs, mainly centred on firm performance. In this section, we review those output measures, grouping them into categories. In addition to the firm-level analysis, we also discuss the small number of papers that aggregate to a higher level of analysis.

Table 6.3. Output measures of design at the firm level (Authors' compilation)

Reference	Measure	Category	Details
Black and Baker 1987	Sales growth rate	Self-reported objective financial information	Companies' sales growth (four-year average from 1982–1985) was obtained via interviews and cross-checked against published figures
Walsh *et al.* 1992	Profit margin	Perceived performance; Self-reported objective financial information;	Return on assets, profit margin, sales growth.
Roy and Potter 1993	Commercial success	Perceived performance	Whether the company produced a new or redesigned product; whether the company produced new packaging or graphics, sales, profit margins on all projects; whether there were indirect benefits such as learning to manage designers better; as asked in a survey.
Dickson *et al.* 1995	Importance	Perceived performance	Perceptual questions on the importance of design knowledge for current employees, for future MBA students, and for the competitiveness of US firms, as answered in a survey.

Reference	Measure	Category	Details
Gemser and Leenders 2001	Company performance	Perceived performance	Perceived performance relative to competitors on a five-point scale from lowest 20% to top 20% in quintiles for profit, profit growth, and sales growth, as asked on a questionnaire.
Hertenstein *et al.* 2001	Financial performance	Self-reported objective financial information; Market-based financial performance measures	Financial data from COMPUSTAT and SEC filings for all 51 companies from 1995-1999, including cash flow relative to sales and assets; income relative to sales and assets; growth in sales, income, and cash flow; and total stock market value relative to the S&P 500.
Design France 2002	Return on investment	Perceived performance	How long it would take to recoup the investment in design (perceived), as asked in a survey.
Design Council 2005	Stock market performance	Market-based financial performance measures	Total stock market performance for the 61 firms in the "design index" firms in absolute terms and relative to the FTSE (UK broad index) from 1995–2004, inclusive.
Hertenstein *et al.* 2005	Corporate financial performance	Self-reported objective financial information; Market-based financial performance measures	Financial data from COMPUSTAT and SEC filings for all 51 companies from 1995-2001, including cash flow relative to sales and assets; income relative to sales and assets; growth in sales, income, and cash flow; and total stock market value relative to the S&P 500.
Chiva and Alegre 2009	Firm performance	Perceived performance	Respondents were asked to rate their company's performance in a survey, on a seven-point scale in which 1 was the lowest relative competitiveness, and 7 was the most competitive.
Design Council 2009	Protecting IP; Success	Design intellectual property; Perceived performance	Use of different forms of IP to protect designs; Perceptions on achieving business objectives via design; perceptions on the link between design and profitability; perceptions on the importance for the country as a whole; as answered in a questionnaire in the UK.

Benefits to the firm

In this section, we review the literature on firm performance as it has been related to various forms of investment or activity in design. The articles are mainly the same ones discussed in the prior section on measuring design inputs in the cases (majority) in which the articles were concerned with the performance implications of design activity and not just measuring design investment in a vacuum. We categorise the benefits to firms in terms of "objective" vs. subjective data, and within objective, whether the data are provided directly by the managers, or whether filtered through external evaluations. (As mentioned above, we put "objective" into quotes the first time round.) Most of the research on design in this area involves classifying firms into high vs. low design groups and then comparing performance information between the two groups. Thus it is difficult to assess causality, as several of the authors admit.

Self-reported objective financial information

One of the most common measurements undertaken by researchers has been objective firm performance data, sometimes solicited directly from managers responding to surveys, and other times via archival studies (which are often based on surveys). Design orientation of firms was examined by Black and Baker (1987), who use the company sales growth rate as measure of success, stating that successful

companies have greater design involvement within the NPD process and consider design as a source of competitive advantage. Firms were classified into three groups: high, medium, and low average sales growth over the prior four years. These three groups were compared and contrasted along several perceptual dimensions as discussed in Section 5 above. There are not many obvious differences between the three groups in terms of design orientation, except in the following cases: when marketing personnel are involved in the prototype evaluation stage; when engineering design personnel are involved in the design stage; and pretty much any time aesthetic design personnel were involved in any of the five stages. In fact, most companies did not have an aesthetic design function and the ones that did tended to be in the high growth category of firm. The authors conclude that aesthetic design's involvement in the NPD process can be highly advantageous for firms.

Hertenstein *et al.* (2001) find that the more effective design companies as defined above in Section 5.1.5 enjoy better financial performance, which includes standard financial ratios, higher returns on sales, returns on assets, sales growth, net income, and cash flow, along with stock market value (see below). The authors divide the 51 companies into two groups of firms: those perceived by a panel of experts to have highly effective design activity and those perceived to have less effective design activity. Based on the financial measures mentioned above, the authors propose that firms that have effective industrial design may earn positive returns on investment in industrial design.

Design intellectual property

Given the many forms that designs take, it is often difficult to unbundle design from innovation and invention. Registered designs and similar forms of design-related IP provide us with some ability to measure design. The Design Council (2009) found that 85% of UK businesses felt that design was a significant part of their business model, but 66% of respondents took no measures to protect their intellectual property, design or otherwise. Only four per cent of respondents used registered designs, while another four per cent used unregistered designs. Working under the presumption that those firms using design protections are a subset of the businesses that consider design important, we can conclude that just over 90% of them do not use formal design protection measures. In the above-mentioned study, the use of copyright and trademark protection utilisation far outstrips that of design protection (at 26% and 12%, respectively: see Section 4 above on bundling); however, those mechanisms may not be used exclusively by design-exposed firms and thus are more uncertain indicators of design. More firms, on the other hand, used formal design IP protection than used patents (3%) in the Design Council study. The ratio of usage provides an interesting clue to the assessment of participation in the design IP realm, given that the United Kingdom allows for unregistered designs. One could extrapolate that, in those countries where there is not an option of an unregistered design mechanism, the credible number of *bona fide* design IP holders may be at least twice the number reflected by actual holders of design IP. These data, however, do not identify the quantity of design IP held, only the participation rate within a sample population.

Market-based financial performance measures

Market-based financial performance measures are based on third party assessments of company performance. Stock market performance, or market value, or the related Tobin's *q*, are common measures used in business research. Tobin's *q* is a measure of the value of a firm expressed as the ratio of its knowledge based capital over the replacement cost of its tangible assets. Knowledge based capital (KBC) relates to the perceived value of the firm as judged by the price represented in the stock market while the replacement cost could also be seen as the cash value of all assets and liabilities held by the firm (Villalonga, 2004). From an empirical point of view, Tobin's *q* functions as a good proxy for the KBC of firms because of the accounting treatment of KBCs (Gu and Lev, 2001). Lindenberg and Ross (1981) find that the Tobin's *q* of firms in R&D- or advertising-intensive industries are abnormally high. This would indicate that some part of the market value is driven by the added element of intellectual property. It is,

therefore, not uncommon in studies using Tobin's *q* as a performance indicator to "adjust" the denominator to account for the presence of "tangible" KBC (Hall, 1993, Villalonga, 2004).

Relating these measures to outcomes in the design literature, in a study by the UK Design Council (2005), companies that were "effective users of design" outperformed the UK stock market (FTSE 500 index) by more than 200% between 1994 and 2004. The study selected companies for inclusion in the "design index" primarily based on their being nominated for and winning design-related awards, such as Design Effectiveness Awards, D&AD Awards, Interbrand, Millennium Products, and Panel Nominations. The study concluded that companies that focused on product design not only substantially outperformed their competitors during good economic times, they also fared significantly better (in terms of stock market performance) during economic downturns and recovered market share more quickly.

Hertenstein *et al.* (2005) confirmed "good industrial design is related to corporate financial performance and stock market performance even after considering expenditures on industrial design." The methodology is similar to Hertenstein *et al.* (2001) with more experts and hence more firms rated on "good industrial design." The authors find that stock market returns relative to the S&P 500 index are higher for the firms rated as having good industrial design, and all other financial measures follow suit in terms of a positive association between good industrial design and financial performance when looking at the aggregate seven-year window. In other words, "design pays for itself" (Wong, 2009).

Perceived performance

Gemser and Leenders (2014) find that there is a positive association between industrial design intensity and firm performance. To measure business performance, they asked managers to rate their firm's performance over the prior three year period and score their firms' profit, profit growth, and sales growth in quintiles relative to competitors. Then to explore the perceived value of industrial design investments, the managers involved rated the impact of industrial design investments on specific product performance measures, and as a result, they found higher benefits of industrial design investments for companies that invest considerably in it than companies investing little in industrial design. The authors state that company performance is positively related to industrial design intensity, and the impact of design investments on company performance is more considerable in precision instrument firms where the strategy of investing in design is emerging, rather than in the furniture industry where this strategy is quite mature. However, they find positive associations in both sectors. Dickson *et al.* (1995) provide descriptive statistics of *Inc.* 100/500 CEOs' perceptions about the importance of design. 49% of the CEOs assert that it is important that all managers be knowledgeable about design, and 46% think that it would be important for MBA students to study design. Furthermore, 43% of the CEOs disagree with the statement that managers in general have enough design knowledge to make design decisions.

Walsh *et al.* (1992) find a positive relationship between design consciousness and perceived success in firms along several performance dimensions. The 100 firms were divided into two categories, those more vs. less "design conscious" as described above in Section 5. Across both industry sectors studied, return on assets was higher in the design conscious group. Sales growth and profit margin had more mixed results with design consciousness associated with higher performance in one of the two industry sectors. Chiva and Alegre (2009), in a survey of ceramic tile producers in Spain and Italy, demonstrate an association between design investment and firm performance, where firm performance is a perceptual measure based on the performance of the firm relative to competitors. The authors also discuss the mediating role of "design management" as defined by Dickson *et al.* (1995) and discussed in Section 5 above. The authors interpret the results as indicating that higher design investments lead to better design management skills, which then lead to higher firm performance. This interpretation could be the basis for a link between design and competitive advantage.

Roy and Potter (1993) collected costs, sales, and profit data, along with whether the firm produced anything new or redesigned products in a survey of 221 companies that were able to take advantage of a government scheme to receive some design help in their projects. They were able to reconstruct the profitability of each of the projects to examine the returns on design investment, and find that 50% of the projects could be considered a "complete success" given that they were profitable and that there were some indirect benefits, such as managers learning how to manage the design function better. 10% were commercially successful but had fewer indirect benefits. And 21% were break even or had small losses, but exhibited indirect benefits. The authors conclude that inexperienced SME manufacturers can benefit from professional design help.

The Design Council (2009) study mentioned above also asked respondents whether they believed that design helps achieve business objectives, and 23% of respondents felt that it contributed "a lot more" than in the past. Respondents were also asked whether they felt there was a link between design and profitability, and 59% of respondents agreed with that in contrast with 13% who disagreed. Design France (2002) asked respondents how long it would take to pay back their investments in design. Recall from Section 5 above that there were four categories of design: product, packaging, graphic, and architectural (interior). Respectively, respondents said that it would take less than one year 24%, 29%, 31%, and 27% of the time for the different categories. For 1-2 years, the percentages were: 38%, 39%, 33%, and 25% respectively. Thus the modal payback times were: for products, more than one year; for packaging, 1-2 years; for graphic, more than two years; and for architectural, more than two years.

Benefits to the country/region

In contrast with the input measures, which have seen work at multiple levels of analysis, including the national level, output measures in terms of benefits at the national level have been less studied, other than asserting that as it appears to be useful for firms to undertake design investment, it must aggregate up to higher levels of analysis. Some authors find design to be increasingly important for national competiveness in the global economy (Hargreaves, 2011, Hertenstein et al., 2005, Monseau, 2012, Moultrie and Livesey, 2014). Governments, particularly in Europe and Asia, as well as some corporations (Wong, 2009), are becoming considerably more aware of the effects of design on market performance. Although comparable data on national design industries are relatively hard to collect, making reliable comparisons between nations difficult, several studies have linked business success to the use of design (Hertenstein et al., 2005), as discussed above. Further, the Design Council (2009) study asked respondents (representing firms) in the UK whether they thought that design was "integral to the country's future economic performance," and 52% of respondents agreed with that statement (71% of manufacturers), whereas only 16% disagreed with it. Likewise, Dickson *et al.* (1995) asked similar questions with a US sample and 71% of *Inc*. 100/500 CEOs agreed that "design issues will be of increasing importance for U.S. firms' competitiveness in the coming decades."

De Rassenfosse (2013) investigated the information content of investment in brand equity and design. He finds that carrying out an analysis on an unbalanced panel of 32 countries (from 1980 to 2010), brand equity investment is a powerful predictor of trademark applications, but he found a weak relationship between investment in architectural and engineering design activities and the demand for design rights. Two different interpretations were proposed: the first is that the use of design rights is an inappropriate measure of design activity; the second is that the investment series fail to capture design activity, because no effect on the demand for design rights was observed. De Rassenfosse concludes, "While registered design rights may not be a perfect indicator of design activity, they capture one important dimension of design assets, namely assets with higher-than-average market value." (de Rassenfosse, 2013, p. 18).

Conclusion

Design is a complex activity that touches on many parts of a commercial endeavour. It has proven difficult to measure and assess precisely because it touches on so many areas of the organisation: aesthetics, engineering, product development, marketing, advertising, and so on. In this document, we explored the nature of design, with a focus on industrial design, and examined how firms in nine different countries protect their design intellectual property. We related designs to traditional forms of intellectual property and discussed the role and origin of the registered design as another tool in the toolbox of management. Certain sectors are more popular than others for registered designs, and we reviewed the most popular classification sectors and noted how they vary from country to country, from ICTs in Korea and Japan to furnishings / household goods in several European countries. We also brought forward several other commonalities and differences between the IP regimes for design in the sample countries. We also discussed bundling design with non-IP complements and why some firms would want to pursue such strategies.

In the next part of the report, we reviewed trends in design IP, mainly in registered designs, but also in 3D trademarks. Over the last ten years, there has been a steady upward trend in registered designs, but there are plenty of fluctuations from year to year as old design protections expire and new ones enter the system via new applications. One gets the impression that design protection is making a steady march toward wider adoption and diffusion.

In truth, the measurement of design remains an elusive goal, given the difficult-to-define nature of the elements of design, both as to what constitutes design input as well as what portion of a final product's value can and should be attributable to industrial design. Thus the last two sections of the report were devoted to how design inputs and outputs are manifested in the literature. We began with different studies' measurement of design investment or design activity. There has been no consensus in the literature, with researchers doing everything from requesting specific figures for the amount spent on design, to perceptual measures of design efforts within the firm, to expert ratings of firm efforts. We also examined the output side of the equation, mainly referring to firm-level benefits listed in the body of literature we reviewed, and here the dominance of perceptual firm performance measures is quite striking. We noted in the report that the most popular research design to assess the impact on design first categorises companies into high vs. low design activity, and then correlates these groups cross-sectionally with perceived performance benefits. While this work was necessary to lay the groundwork and stimulate interest in the subject, it is clear that the causality and identification issues need to be tackled in future research.

In addition to future work with new research methodologies, we may find, on the other hand, that this is a field prime for the application of fuzzy logic, where approximate ranges of values can be integrated into analyses of very large samples to derive estimates with large standard errors at the firm-level, but more robust estimates at the industry, regional, or national level. Certainly, aggregation to higher levels of analysis is another open challenge for design scholars. In any case, there is abundant work for academics, managers, and policy-makers to do in understanding this exciting topic.

NOTES

271 There are also unregistered designs which afford some protection but whose terms are shorter. In this report, we will focus on the registered designs.

272 Created in 1967, WIPO is one of the specialised agencies of the United Nations and its mission is to lead the development of a balanced and effective international intellectual property (IP) system that enables innovation and creativity for the benefit of all member countries.

273 Multiple designs are allowed in one application if they concern products in the same class, without upper limit for number of designs. There is no period of secrecy, except upon a request by the applicant in order to forbid the accessibility, for a maximum of 12 months from the date of filing or the date of priority.

274 Trade dress is an extension of most trademark laws that extends the protection of a trademark to simulacra or representations imitating a look that may nonetheless have different content.

275 This term change was part of the United States implementation of the Geneva Act of the Hague Agreement. See *Title I of the Patent Law Treaties Implementation Act of 2012* (Public Law 112-211, December 18, 2012).

276 See USPTO Manual for Patent Examining Procedure (MPEP) § 1512.

277 See MPEP § 608.

278 Given the dominant role of the US in registration activity with the USPTO, on a normal (linear) chart the other nations in the sample are agglomerated at the bottom of the plot; we therefore felt it better to represent it on a logarithmic scale. So as to better indicate relative activity levels, we also trimmed the vertical axis. It is important to note that the number of US filings is a full order of magnitude greater than all of the other sample countries except for Japan.

279 This is true because the sum of the shares of non-US-originated patents is below 50% throughout the period concerned. Simple arithmetic tells us that US companies must account for the remaining percentage, which is always above 50% and well above the individual share from any other country.

280 OECD Scoreboard, 2013, pp. 193-194, plus supporting data linked to the report.

281 It should be noted that Samsung has a far more diverse product line, including appliances, televisions, and computer monitors, as well as component-level products such as LCD screens, integrated circuits, and memory chips, for which Samsung also obtains various forms of IP protection. So the advent of a single competitive race, while possibly changing behaviour, will not have as dramatic effect as it would on a company with a much narrower product focus such as Apple.

282 The drop in patenting by Apple at the end of the series may be an artefact of Apple's tendency towards secrecy that sees the firm taking unusual measures to delay publication or granting of patents. So we may be seeing delayed reporting of patent filings beyond the normal 18-month blackout period.

283 In the US, design patent applications are not subject to publication (see 35 U.S.C. 122(b)(2)).

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