

# *IP, an interesting phenomenon*

## The relevance of patents for the design-led start-up business

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**Abstract**—In their book, ‘The Smart Entrepreneur’, Clarysse, Kiefer explain how the lack of complimentary assets can hinder an entrepreneur’s market entry, and how “bottlenecks” in the value chain can be by-passed through focusing on niche markets [1]. Here Clarysse, Kiefer expand on Teece’s understanding of complimentary assets, which are thought of as the ‘additional resources and capabilities needed to bring a technology product to market’ [1]. Back in 1986 Teece analysed how these assets can increase or limit a company’s chance to succeed in the industry. David Teece has further defined appropriability as ‘the environmental factors... that govern an innovator’s ability to capture the profits generated by an innovation.’ [19] He refers to IP as one of the most important factors in relation to appropriability. This paper discusses the question to what extent access to exclusive IP in form of patents may strengthen a company’s appropriability regime and thus compensate for the absence of various complimentary assets.

Semi-structured interviews with business-minded design-inventors have revealed that designer-entrepreneurs commonly perceive patents and other exclusive IP as a necessary prerequisite for succeeding with their design business development. At the same time the interviewees have frequently expressed concerns about the costs involved in registering IP, and about the fact that their chances of successfully defending their patents in court may be limited due to the lack of available funds. This paper introduces an assessment chart that has been designed to map out key criteria that ought to be at the focus of attention of design-led start-up businesses. It will explain how the use of the chart can help to measure a businesses strengths and weaknesses with regards to individual assessment criteria, and how the results of the assessment can inform the designer-entrepreneur to what degree filing a patent may or may not be advisable.

**Keywords**—*intellectual property, design, entrepreneurialism, business development, exclusivity, appropriability, complimentary assets*

### **I. Introduction**

This study is looking at entrepreneurial initiatives, the development of which has been spearheaded by one or several designers. These business developments are usually accompanied by the designers’ keen interests in filing a patent. But is patenting really this important for the designer-entrepreneur? And if so, why is it so important? In their book, ‘The Smart Entrepreneur’, Clarysse and Kiefer claim that ‘Patents are particularly important when your business is not

close to market, because the exclusivity afforded by a solid patent can buy you some time by preventing competitors from encroaching on your idea while you develop applications.’ [1] One may want to contest this statement. After all a patent application sets the clock ticking. Within 18 months the invention is publicized and the business intention made clear to potential competitors. Even though competitors are not allowed to exploit the invention without the patent holder’s consent, they may be able to circumvent it through alternative technology solutions. Filing a patent application also entails a whole string of events, which cannot be delayed, and which entail costs. Within twelve months from filing a national application, a decision must be made whether or not to take the patent global, either through filing a PCT (Patent Cooperation Treaty) application, or through applying in foreign countries directly. Therefore the UK Design Council suggests to ‘Approach patenting with caution. Multinational cover is expensive and premature filing can do more harm than good’ [23]. Some patent attorneys advise to delay patent applications as much as possible, partly because the validity of a patent is limited to five years. Through renewals the lifespan can be extended to 20. However, every year counts in terms of commercial exploitation, and the period of possible exploitation is cut short if a patent is filed prematurely. An aspiring designer-entrepreneur may also wonder to what extent his or her patent can be enforced if challenged. Clarysse and Kiefer admit that ‘...a patent suit can cost \$10-15 million and drag on for several years’ [1]. This beckons the question as to what is the best IP strategy for a design-led start-up.

To shed some light on to this rather complex problem, this research seeks to identify under what circumstances a patent constitutes an effective means for start-ups to overcome competition, how one makes best use of IP in order to optimize the business development, and how patent applications are best timed to minimize costs and to mitigate risks. We also want to raise the question whether or not there are any alternative options to patents.

### **II. Case Studies**

In pursuit of these questions, 8 designer-entrepreneurs have been interviewed with respect to their experience with IP.

All 8 designers have been through a business incubation process of some kind. Three of the ventures were incubated by Design London, which was a 4-year joint initiative between the Royal College of Art (RCA) and Imperial College London (IC) starting in 2007. Design London was funded by the National Endowment for Science, Technology and the Arts (NESTA) and the Higher Education Funding Council for England (HEFCE), but closed in 2011. The other two ventures are currently incubated by the InnovationRCA Incubator.

### II.A. Concrete Canvas

“As a start-up you have no real value, you have to convince people. And, in order to do that, you have to build up lots of evidence such as winning competitions, and generating press attention, things like that, to build up credibility through different sources, and it is very difficult to do that if you don’t have protection of the idea, because the patent [idea], once disclosed, you are then unable to get a patent.” [40]



Fig.1 Concrete Canvas applied for slope protection

Concrete Canvas is a venture that spun out of the Royal College of Art in 2004. Thus it preceded the incubation schemes mentioned above. The two founders retained access to RCA premises following graduation, and, over the period of 6 months, worked with InnovationRCA, which was set up to strengthen the strive towards design innovation and entrepreneurialism at the college. They patented their prefabricated shelter in 2004, and, following the filing of a second patent, which was for impregnated fabric in 2006, Concrete Canvas secured around £200K through grants, competition awards and angel investments. According to Brewin having a patent ‘is absolutely vital. If people invest in a start-up, they want to see that there is the capability to protect the technology’. [40] However, having been commissioned to build a demonstrator of their military shelter but not being able to market it, due to the small scale of the venture, Concrete Canvas re-oriented towards trading the material per se. For this reason the company has relied on third parties to generate new ideas for using the material.

To date (2013) Concrete Canvas holds 4 different patents in total, and over 40 including international filings. This provides the venture with a strong appropriability regime that has been further strengthened through the contractual arrangements, which Concrete Canvas entered with third parties. Peter Brewin stated that ‘It is very important to have a patent in place, because we need to go and talk to a lot of

customers, and there is a limit to what you can do under non-disclosure agreement... and also, it is important to generate a lot of press, and we were entering a lot of design competitions. So it was very important for us to have.’ [40] The first significant sales were secured in 2008, and the company broke even the year after. Whilst trading independently in the UK, Concrete Canvas rely on licensees in the US and Canada, where they also entertain R&D arrangements. Brewin explains that “... there is a certain amount of weight having some large multi-nationals standing behind you, as well, in terms of being able to protect our IP.”

Knowledge, experience, and the way this is shared and exchanged with customers can be an important development aspect. Brewin strengthens the fact that, ‘... when we are developing new applications and process them, quite often it will come from one of our distributors. He will have a customer who will have a problem which we are specifically very good for, or who thinks we might be, and then we support them technically and work with them to see what is a good solution to that problem, and develop all the details, how you employ it for that solution, and do an initial case study and from there you can develop a whole new application, and this is really because our technology solution is really a new plan for construction rather than a product in itself.’ [40] The latter statement further indicates that Concrete Canvas is a typical technology-push venture, which means that the idea surrounding the technology preceded its application. According to Brewin the technology push incentive existed from the outset, even during the phase when exploring the notion of a sheltering solution. During this early phase the company was helped by one of their suppliers, Walkerpac, who lent a disused factory to Concrete Canvas.

What the Concrete Canvas case highlights is that collaborative development arrangements including strategic partnerships and access to complimentary assets can be very beneficial to the development progress of a start-up, in particular when it comes to technology-push ideas, for which the market is usually unclear at the outset. Both aspects, collaboration and access to complimentary assets, depend on the availability of exclusive IP which secures the entrepreneurs position within the collaborative framework.

### II.B. Arctica



Fig.2 Arctica cooling system

Arctica was a venture that was amongst the second wave of incubatees at Design London. The inventors and original team members, Karina Torlei, William Penfold, Daniel Becerra and Mathew Holloway, met when studying Industrial Design Engineering at the Royal College of Art and Imperial College in 2006. During a networking event in October 2008 they joined forces with Matthew Judkins, who studied for MBA at the Imperial College Business School in London. Arctica is an environment friendly cooling system that does not use any toxic gases, 'requires less than 10% of the energy of a conventional air conditioning system, and can easily be installed in new or existing buildings.' [29] In the course of the night a thermal battery stores low temperature through freezing a phase-change material, which absorbs the warmth of the air indoors during the following day. This reduces temperatures to about 20-25 degrees Celsius. Running costs are very low, as are the costs involved in product servicing and maintenance. In October 2008 Arctica entered the Design London Business Incubator, from which it exited in May 2010. Later that year it was sold to Monodraught Limited. The system is now being sold under the name Cool-Phase®. The start-up team filed their first patent in February 2008, and their PCT 12 months later. All members parted with the venture following its sale, except Matthew Holloway and William Penfold, who worked for the acquiring company for a period of time.

Given its comparatively short development period, one is inclined to wonder, whether such a rapid success would have been possible without exclusive IP. Arctica established a strong appropriability regime through filing 3 patents, which they extended through PCT applications. However, the inventors found themselves confronted with a bottleneck in their downstream value chain. In the UK air conditioning systems are commonly fitted by so-called HVAC (heating, ventilation, and air conditioning) fitters and distributors. Selling Arctica directly to property developers was impossible. So a distribution channel, a key complimentary asset, could not be established here. The team consequently focused on a niche market and marketed their product to the owners of listed and period properties, where the installation of conventional air conditioning systems is either legally prohibited or technically difficult. Following some initial successful trials, which proved the viability of the product, Arctica were approached by Monodraught Lts. What Arctica had done, was to gain control over a larger section of the value chain through focusing on a market niche. This case makes it clear that it market strategies are just as important as IP protection. Nonetheless it is fair to say that without patent protection, Arctica could not have succeeded. Despite this success, Mathew Holloway is very critical of patenting regulations. He states that, 'if you are a small organisation and you try to develop something in a clever and innovative way, and you actually want to do something with it, it can be very difficult. ... It is not really about how good your invention is, it is about how much money you have.' [36] He refers to multi-national companies who accumulate extensive patent portfolios, which they trade on without ever generating a true

interest in exploiting any of their patents themselves. He further points out that 'A patent is ... only actually valid, once it is tested in court by another company. ... It works as a patent, but only to the point where someone challenges it. And then you have to spend the award money on legal fees.' [36] Holloway holds the view 'that the companies who file patents should be charged different amounts depending on what their revenues are, or something along these lines.' [36] We may conclude, that the chances for a patent to succeed on the market depends on the financial resources available to the IPR holder. This brings back to mind the question, at what point in time a patent ought to be filed, given that start-ups are very restricted in terms of finance. However, Mathew Holloway admits that 'Without filing a patent we would not have received any funding. Unfortunately it is expected by investors on the whole. Some incubators insist that you spend a certain proportion of your funding on IPR. There is a culture that a patent gives you credibility. It is worth for an early stage company having one as a marketing tool, if nothing else.' [36] He continues to state that a patent 'is your only 100% way of protecting your invention if you need to disclose it in some way, as NDAs are worthless.' [36]

### II.C. Roli Labs



Fig.3 The Seaboard designed by Roli Labs

Another venture that was part of the Design London incubator was Sea Labs, founded by Roland Lamb. SEA stands for Sensory, Elastic and Adaptive. The SEA Interface is a novel touch sensory system that can be moulded into various shapes, and enables the seamless transition between discrete and continuous input. It is capable of capturing three-dimensional gestures and gives the user a tactile feedback. Lamb entered the Design London Incubator in early 2011 with his first product, the Seaboard, a radically new musical instrument based on the design of a piano keyboard. The Seaboard's patent-pending concept enables performers, composers and producers to exert unprecedented real-time control of all the major characteristics of sound. Rather than simply hitting a key with the finger, the pressure can be altered in terms of location and intensity. Thus the pitch can shift seamlessly between notes. Volume and timbre can also be varied. Lamb spearheaded the product development from the start and is now managing director of Sea Labs with around 20 employees. Lamb confirmed that he 'found it very difficult to bear the costs of early patents.' [35] Nonetheless he managed

to file his first patent within about six months. For Lamb a patent was not only a way to secure exclusive access to the technology, it was also a way to underline the fact that he is fully committed to the project and willing to sustain his commitment long-term. This is thought to have helped to attract the interest of investors and collaborators. Lamb admits that a patent ‘is not always enforceable but this statement of commitment is relevant.’ [35] Unlike other design-entrepreneurs, Lamb managed to keep all equity to himself during the inception period. The seed funds obtained in conjunction with the Design London incubator scheme allowed him to pay his start-up team instead of shredding equity at the outset. Business partners were carefully chosen, and shares in equity has been reserved for investors. Despite this, Lamb’s employees seem rather content. Good recruitment and people management appear to be alternative options to secure a loyal and dedicated start-up team. Lamb acknowledges having encountered difficulties in finding the right business partners and approach during the initial stages of his business development. But he explains that ‘...through the process I learned a lot about IP, and about product design and about the relationship between IP, product design and entrepreneurship. So those things have all come together.’ [35] This point matches a comment made by IP expert Thomas Hoehn from Imperial College Business School who suggests to ‘take all the tangible assets and look at them all’. [33] Hoehn lists staffing, track records, reputation building and branding developments amongst possible selling points. In other words, there are different ways in which value can be appropriated from a design start-up initiative. Above all other criteria, Hoehn highlights the value of know-how, and emphasizes the fact that trade secrets are the most popular tactic in the UK for protecting intellectual property. Confidentiality agreements and secure employment contracts are needed, whilst employees also need to be given incentives to be encouraged to stay with the company

**II.D. Yossarian Lives!**

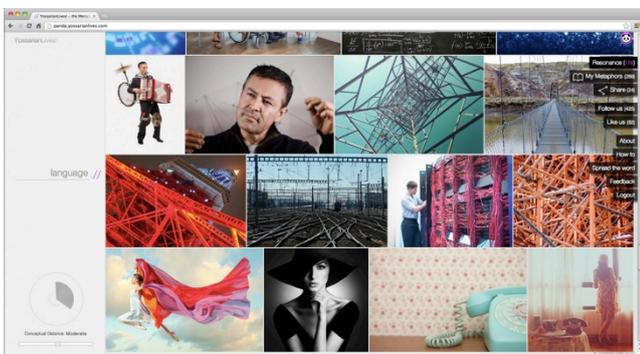


Fig.4 The Yossarian Lives! user interface generated in response to the search term “language”

Yossarian Lives! is a more recent ventures and a current members of the InnovationRCA Incubator. It differs from all

the others in that it is surrounding a software product. Yossarian Lives! is a metaphorical search engine that uses algorithms to generate results, which are not literally, but metaphorically linked to the search terms. Thus Yossarian Lives! assists users as a creative tool, capable of generating unexpected results, that trigger new thought processes within people’s minds. Due to the fact that the product is purely digital, it is impossible to patent in Europe. Instead the inventors, a team of three, J. Paul Neeley, Dan Foster-Smith and Katia Shutova, rely on secrecy in order to sustain exclusivity on the market. Key elements in the programming code are not shared. The search engine, the name of which is a reference to the main character in the novel Catch 22, is currently undergoing its first testing phase. Despite the need for secrecy, the team behind Yossarian Lives! has managed to secure a product development agreement with Getty Images. Through on-going developments, the team is hoping to produce a highly personalized search engines that breaks with the stereotypical functions of conventional search engines. Yossarian Lives! obtained the right to access Getty Images’ API (application programming interface) for access to their databases. This allows Yossarian Lives! to return every content from Getty Images’ collections, and every image sold through Yossarian Lives! searches generates royalties. Not only did the team manage to enter a setting within which their technology can be put to the test, they also succeeded in initiating a first income stream.

**II.E. Robofold**



Fig.5 Gregory Ebbs with some of his metal-folded objects

Robofold differs from all other ventures in numerous ways. Robofold holds a patent, but not for a product solution. In 2007 Gregory Ebbs, the company founder, patented the process to form metal directly with 6-axis industrial robots without requiring mold-tools. Ebbs explains that ‘the majority of the business is focusing on software developments, because that’s what tells the robot what to do.’ [41] The software cannot be patented within Europe. But the exclusive access to the process suffices to secure exclusivity. So ‘the hardware ... is where all the value is’. [41] Ebbs confirmed having extended the patent to various EU countries as well as to the US. In order to avoid shredding too much equity, Gregg chose

to pay for the patent filing and the maintenance himself, rather than to rely on the possible support through the RCA, where he graduated. The patent was necessary 'Because if we want to exit, ever, we need to have something to sell other than our order book.' [41] Despite its 5-year life-span, Robofold is still under development. Robofold stages workshops to train designers in the use of the technology. The software is made available for free. So not only the product is de-emphasised here, part of the production tools are made available, too. Only the key component, the process per se, is secured. Even though process patents are often regarded as comparatively weak, it appears impossible to by-pass it in this case.

## II.F. Squease



Fig.6 The Squease vest with and without the hooded top

The team behind Squease has invented an inflatable pressure vest that can be hidden within a trendy hooded top. The product is aimed at people with sensory difficulties such as autistic children, who can use to Squease to reduce anxiety in public environments. Yossarian Lives! aside, Squease is the only venture within this range of case studies that has not got a patent on file. The founders tried to file a patent, but encountered difficulties, one of which related to the patentability of the idea. The principle of using pressure to reduce anxiety was already known. So there was an initial confusion about what precisely the patent should cover. The main novelty was the layout of the pressure elements. But there were doubts that this would suffice for succeeding with a patent application. The patent underwent various stages of iteration, but remained weak according to Sheraz Arif, one of the founders. The costs involved in continuing their patenting strategy as well as the potential risk of failing with their patent application were too high for the founders to sustain their confidence in the patent. In agreement with their investors, the team behind Squease decided to discontinue their patent

application. Arif admits that 'looking back, it was purely a mechanism for getting investment.' [42] To the question whether or not one has to have a patent in order to secure investment, Arif responds: 'I think it provides comfort. So if an investor asked whether we have a patent, we were able to say: It has been applied for. But very clear have the investor never said what is the patent for? What is the context? How can it be enforced?' [42] In line with other interviewees Arif raises questions about the legal value of a patent. He claims that 'if you have the money to invest in a patent as a start-up, you probably do not have enough money to enforce it later.' [42] However, the Squease pressure vest would be very difficult to reverse-engineer, due to the complexity in its design. Squease are not without competitors. But there are few in the field, and the market is still evolving. So chances for imitators to become a threat are very limited. Squease has developed a supply chain. Without that, and without a distribution network, imitators would always struggle to compete. So, instead of relying on exclusive IP, Squease can count on the complexity of their product as well as on their complimentary assets, i.e. their suppliers and distributors, in order to secure their market advantage. This is unusual for a design-led start-up, and mainly possible through the discovery of a new niche market. The first-mover advantage is sustained not through development pace, but through the market uncertainty, which makes it unattractive for imitators to compete. Squease are selling their product online, but have distributors abroad, including South Africa and Australia. As opposed to Concrete Canvas and Robofold, Squease was triggered by a demand-pull incentive. Studies of autism have raised the question how people can be helped. Instead of patenting, getting the infrastructure has been the priority here. To foster this, Squease have initiated a rental scheme that allows potential buyers to rent the product for a period of two weeks or more for a small fee, prior to making the purchase. If the product is then bought, the rental costs are taken of the purchase price. Liaising with customers does not only help to educate the market, it also keeps the team behind Squease motivated. Arif explains: 'We haven't got much market. We do sales reports, but we also have conversations with mothers who tell us about the impact on the child, and that has got a lot of long term... you know, when you hear a mum say: "My child can sleep now." Or: "He can now eat." It is really powerful feedback. That is valuable.' [42] Despite the limitations in the market size, Squease does not seem to far from break-even. Like KwickScreen, the founders shifted their focus very early on from IP to manufacturing and sales. KwickScreen, too, was demand-led from the outset. We can hypothesize that a demand-led venture is best advised to focus on product-development, manufacturing and sales, and not over-emphasize patents. A technology-push initiative on the other hand, may be more dependent on patents by comparison. What appears certain, is that the availability of complimentary assets, or the lack thereof, the nature of the novelty as well as various other development criteria are strongly interlinked. In order to establish under what circumstances a design-led start-up should or should not file for patent will require the

identification of these criteria, and an analysis that reveals how these criteria are interconnected.

### III. Preliminary conclusions:

Six out of eight design-led start-ups, who are being monitored in the context of this study, have filed one or several patents. One of the remaining two cannot patent due to the nature of the novelty involved. The other one has filed for patent, but had to let the patent lapse due to concerns about patentability and costs. Despite the high level of uptake, the financial implications in patenting have been highlighted as a problem by most interviewees. All of the interviewees except J. Paul Neeley from Yossarian Lives! have highlighted the need for a patent to source angel investment and/or to be accepted to an incubation scheme. However, none of the interviewees who hold a patent consider their patent to be an effective defense mechanism. This appears to be a contradiction, and it beckons the question why the designer-entrepreneurs value their patents. Greenhalgh and Rogers highlight three reasons, the discussion of which might help explain why patents are highly rated by entrepreneurs: Market power, licensing and signaling [10].

#### III.A. The signaling effect:

Although listed last, this was clearly the most dominant reason for the designer-entrepreneurs. Signalling investors and industries one's serious commitment to the business is most important to the aspiring designer-entrepreneurs. The latter also tend to benefit from an increase in confidence triggered by a patent application. This helps to negotiate favorable terms during fundraising and team building. Patents serve to signal not only serious intent, but also expertise. Greenhalgh and Rogers explain that patents 'undergo an external quality check, hence they act as good signals allowing firms to raise finance or attract talented employees.' [10] This much reflects the interviewees' responses, for who the signaling effect seems vital for fund raising initiatives. The fact that a patent is seen as an independent novelty-check also increases the entrepreneur's confidence, even though some have acknowledged that a patent is only valid once enforced in court.

#### III.B. Market power:

On balance the urge to increase market power appears to be the least significant incentive for designer-entrepreneurs. This comes as a surprise, as 'the ability to exclude others from using the underlying invention' [12] is seen from a micro-economic perspective as the key objective by many experts. However, the confidence in the patent system is very limited amongst all interviewees, none of who believe to be able to defend their rights in court. One of the interviewees, Denis Anscomb from KwickScreen has pointed out that multinationals would not be interested in a technology that is worth a few million dollars only. Thus there is no risk for infringement. One expert, Kristien De Wolf from Imperial

College, on the other hand has pointed out: 'Under the surface, and if you don't make too much money, nobody will care. The moment you do, everyone will snatch it from you if it is not protected.' [39] Put together, these two comments suggest that large firms remain uninterested in a technology that is underdeveloped. The fear of infringement through angel investors is also unjustified. 'The goal [of investors] is to invest, it is not to start their own companies, and they are not going to take your idea' [22] Nonetheless patents may help to discourage small-scale competitors from imitating the novelty. As a design-led firm grows, patents may become increasingly important to fend off larger competitors. At any stage, patent protection provide a safe-guard when it comes to R&D collaborations, as is evidenced in the case of Concrete Canvas.

#### III.C. Licensing:

More important than market power, although less than the signalling effect, is the need for the designer-entrepreneur to be able to license the technology to third parties. Even if licensing agreements may be difficult to secure during the early stages of the business development, when the technology still needs to be proven, licensing is often a welcome opportunity to expand the business into territories, to which the designer-entrepreneur has no direct access. Concrete Canvas relies on a licensee when trading in the US, and Squease uses a distributor to trade in Australia. The business partner involved in trading Squease overseas, succeeded in getting the product approved as a medical device, which constitutes a significant milestone for the start-up venture. The company that trades Concrete Canvas in the US also entertains an R&D agreement with Concrete Canvas. Yossarian Lives! have expressed interest in filing for a US patent, should their business succeed in Europe. Patents are also thought to be essential when it comes to trade sales. Other assets such as branding elements, client relations, trade secrets can be valuable. As expressed by Gregory Ebbs from Robofold, to trade a developing business without exclusive access to the novelty involved, is thought to be rather difficult [41].

Greenhalgh and Rogers also state that secrecy, first-mover advantages and *complimentary assets* ... are generally more important than patents... [10]. However, it has to be said that the authors do not distinguish between micro-scale independent start-ups and spin-outs from established businesses. Secrecy are more useful to larger firms than for micro-scale start-ups, as secrecy prevents the designer-entrepreneur from articulating relevant ideas and concepts, the demonstration of which may be needed for fund-raising and team building. Yossarian Lives! relies on secrecy, due to the fact that software patents are unavailable in Europe. But Yossarian Lives! have a fully functional working demonstrator, and decided to rely on bootstrapping rather than equity investment. If equity funding is not necessary, the signaling effect is less important, which in turn means that patent protection becomes less important. Without a patent a designer-entrepreneur may also struggle to make use of a first-mover advantages because the technology is usually

underdeveloped and the designer-entrepreneur usually lacks the resources to integrate manufacturing and to take the technology to market independently.

It has emerged from the first round of case studies that most designer-entrepreneurs initially lack in business skills. Various interviewees have confessed that they underwent a considerable learning curve during their incubation period, and Kristien De Wolf has highlighted the lack in entrepreneurial skills amongst design graduates [39]. A study compiled at the Tanaka Business School confirms that 'Designers need to be equipped with the kinds of skills that enable them to work effectively in the modern business world' [20].

In addition to business skills, the novice designer-entrepreneur also lacks the access to important complimentary assets. In a keynote speech during a design congress in Tokyo in 2013, Professor Roos highlighted the fact that the vast majority of business founders are final year MA students, or first-year PhD students. This is why most designer-entrepreneurs are initially disconnected from the industries that are relevant to their inventions.

'Patents are particularly important when your business is not close to market, because the exclusivity afforded by a solid patent can buy you some time by preventing competitors from encroaching on your idea while you develop applications.' [1] So patents do not only strengthen the entrepreneur's market power as explained by Teece. They also give the designer entrepreneur some extra time to further develop their novelty, and to enhance his or her business skills as well as acquire the complimentary assets needed to take the novelty to market.

Teece has introduced us to the relationship between appropriability and control over complimentary assets. Both, a tight appropriability regime, as well as a tight control over complimentary assets facilitate the success of a business. Until access to the necessary complimentary assets can be obtained, the designer-entrepreneur must rely on appropriability, be this reliant on secrecy or patents. Conversely we can argue that the degree to which a patent strategy is recommendable, depends on the set of complimentary assets needed and the degree to which the latter are accessible to the designer-entrepreneur.

### **III.D. Appropriability factors:**

Prior to defining the most significant complimentary assets, it may be useful to distinguish between appropriability factors and complimentary assets more clearly. Some secondary sources count IPR towards complimentary assets. Considering that Teece listed IPR as a key appropriability factor, and that he arranged appropriability along an axis different to that of complimentary assets within a matrix, it seems not advisable to confuse IPR with complimentary assets. IPR within this study is considered as an appropriability factor. Specialist knowledge is too. Specialist knowledge can be protected through secrecy. Where neither secrecy, nor exclusive IPR is available, defense publications can be filed. The latter requires a sufficient level of exposure,

which is difficult to obtain for a start-up business. Therefore defense publications will be neglected within this study, whereas secrecy including trade secrets will be seen as a potential alternative to patents. The ambition behind the following juxtaposition between appropriability factors and complimentary assets, is to establish the circumstances under which patents are to be preferred over secrecy. At this stage it should also be noted that IPR is from hereon used synonymously with patenting and registered designs. Trademark protection on the other hand will be thought of as an element of branding, which will be discussed further down. Copyright is not considered, as it is rather difficult for start-ups to sue for infringement of copyrights.

### **III.E. Complimentary assets:**

To establish a conclusive list of complimentary assets is more difficult, as a wider range of issues needs to be taken into account here. To narrow down the number of aspects involved, we shall bear in mind the fact that this study is focusing at design-led start-up businesses. Teece explains that complimentary assets can be covered both through integration and through contractual arrangements. He further relates complimentary assets to market power. Both criteria suggest that complimentary assets are to be closely linked to environmental complexities and value chain control. The value chain aligns value-adding stakeholders who contribute to the product's journey to the market. Market players may sit upstream (towards the manufacturing end) or downstream (towards the end user) in relation to the position of the innovator. They may also be positioned next to the innovator, if a technology is licensed, for instance. The greater the area, that falls under the innovator's control, the greater the returns that can be captured by the innovator. The difficulty for the aspiring designer-entrepreneur is the lack of access to materials and manufacturing facilities (upstream value chain), and to trade channels (downstream value chain). Difficult to enter markets are termed as complex markets, which are controlled by incumbents. According to Clarysse/Kiefer, the more complex a market, the more advisable a patent is for a company. Therefore, assuming that the access to complimentary assets is mostly limited for design-led start-ups during the early development stages, market complexity is one key criterion for assessing the degree to which patenting is advisable.

## **IV. Hypothesis**

Each of the start-ups examined within this study so far differs from the others slightly in terms of the situation they are in. But all of them, regardless of their current development stage, seem to treasure the value of a patent. Patents can strengthen a company's appropriability regime and smoothen a start-up's route to market. The success of a design-led start-up depends on a number of factors, not just patents. But the value of a patent depends on the constellation of these factors, which in turn are largely inter-dependent. Understanding how exactly these aspects are interlinked, and how they connect

with the benefit of a patent, may help the designer-entrepreneur establish to what extent patenting is recommendable.

**Assessment criteria for evaluating the recommendability of patent applications:** Following the analysis of interviews and relevant literature sources, ten key criteria have emerged as particularly significant for assessing the degree to which patenting is advisable for a design-led start-up.

1. **The nature of the novelty**
2. **The profit potential**
3. **The expected lifespan**
4. **The risk of failure**
5. **The market proximity**
6. **The market complexity**
7. **Brand recognition amongst the target audience**
8. **Investment needs**
9. **The development incentive**
10. **Level of entrepreneurial skills**

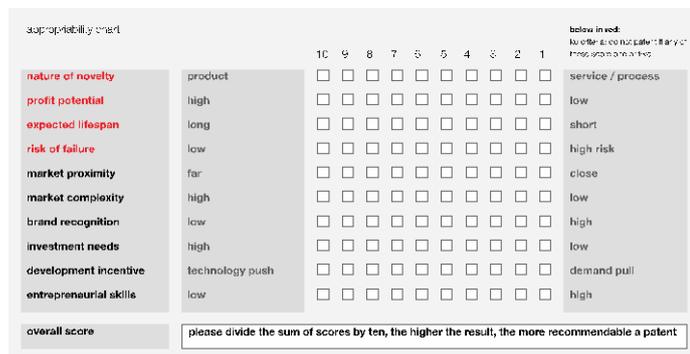


Fig.7 appropriability chart

## The assessment criteria explained and discussed

### 1. The nature of the novelty

**Definition:** Is the novelty predominantly product based, or service-, process-, or software based?

**Discussion:** Patents work best for products. Service design solutions are difficult to protect. Although they can be patented as process patents in the US, the confidence level in relation to process patents is significantly lower than product-related patents. The same applies to software solutions, which according to Clarysse / Kiefer remains ‘a sticky area of IP’ [1]. Patenting software solutions within Europe is not possible, and software patents may prove weak within the US. It is important to stress that a start-up may be built around a combination of novelties some of which may be service- or software based, and others which may be product-related. Cupris is a good example that highlights that over time the product element may become less important than the service element, or the software component, which in this case would be the database, to which patients will be given access. Depending on the entrepreneurs’ priorities the patent

application may consequently turn out more or less important. One must also bear in mind the possibility of a priority shift. Clarysse/Kiefer describe how TomTom evolved from a service-based business into a product-based venture. The authors speak of a ‘transitional’ start-up here [1]. Note that process innovations that are connected with ‘organizational change within the firm’ [10], are not included to the category of process innovations within this study, for two reasons:

- A) They do not constitute a commodity that can be traded.
- B) Within design-led start-ups, organizational processes tend to be subject to development anyway.

### 2. The profit potential

**Definition:** What are the expected returns? How cost-intensive will the business/product development be?

**Discussion:** It is likely for entrepreneurs to over-estimate the anticipated returns. Wishful thinking often undermines dispassionate and realistic evaluations. More or less inflated forecasts are often used to persuade investors to consider a smaller share. Nonetheless it is important to be realistic in the planning. If the possible returns are modest, filing for patent may not be worth it, as the expenses of maintaining a patent can outweigh the returns and thus limit the profitability of the business. In reference to IPAC (2003) and to the Gower Review (HM Treasury 2006), Greenhalgh and Rogers list costs for patent application and renewal as £3,500 for England and Wales and provide a range of £200K-£1m for patent litigation costs in those countries. In the US litigation costs are thought to be much higher, between £1m and £2m [10]. The problem highlighted by Sheraz Arif from Squeeze is that it is virtually impossible to predict the costs involved in developing the business from the start. At the outset the designer-entrepreneur is unlikely to know where and how to get the novelty produced, let alone how much this will cost. Conversely market studies are usually needed to establish a realistic unit price and estimate the potential market penetration. To justify patent protection, there must be the potential for high growth.

### 3. The expected lifespan

**Definition:** For how long for can sales be sustained?

**Discussion:** If the life cycle of a novelty is very short, it may not be worth filing for patents, because a patent application is a lengthy process. Until a patent is granted, an invention cannot be defended in court, and a pending patent application is little more than a defence mechanism and a potential bargaining chip. Conversely, if the expected lifespan of a novelty far exceeds 20 years, secrecy may be preferable to patenting. As a patent cannot be extended beyond 20 years (pharmaceuticals aside), the invention becomes accessible to all and the monopoly advantage is lost thereafter. However,

given the range of products and markets observed in conjunction with the case studies, this study assumes that a lifespan of over 20 years is highly unlikely for design-led innovations. Therefore we can argue generally that the higher the lifecycle of an innovation, the more recommendable a patent application will be. When trying to assess the potential lifespan of a novelty, we need to bear two things in mind: A) sales are unlikely to stop abruptly. They tend to gradually phase out, and, at some point in time, hit a threshold when trade ceases to be viable. This can happen either through shrinking number of sales, or through a reduction in price that can be used to counteract the reduction in demand, or both. B) If the novelty of a product or service is beginning to decline, it is possible to extend the viability through continued incremental innovation. In other words, complimentary follow-on patents may help to sustain the competitiveness of a product. A constantly growing patent portfolio may be cost-intensive. But the financial implications will be covered further down.

#### **4. The risk of failure**

**Definition:** How likely is it for the business to become profitable?

**Discussion:** Qualitative indications for the kinds of risks involved can be extracted from the SWOT assessment (Strength, Weaknesses, Opportunities and Threats). To put a quantitative overall measure is much more difficult. At the outset, the level of risk will usually be rather high. Depending on the nature of the product, number and strength of potential competitors, funding and sales strategies etc., the risk will be mitigated over time. One way to rate this criterion is to try to assess the level of confidence in the business in a dispassionate manner. Another way to look at it would be to put oneself into the position of an investor, and establish to what extent the risk would discourage investment. The higher the risk, the less recommendable a patent application will be.

#### **5. The market proximity**

**Definition:** How long will it take to initiate sales? How long will it take to break even?

**Discussion:** If sales have started or are immanent, a patent may not be needed. One of the main reason for the designer-entrepreneur to invest in a patent is to gain time that is needed to analyze the potential target markets, to further develop the product, and to source means of manufacturing. The need for a patent is further reduced if the break-even point has been reached and the business supports itself. However, if licensing is part of the market strategy, then patents may still be essential. It is important to remain realistic with ones assumptions regarding market proximity. This study focuses on design-led start-ups, which often evolve around the work of graduating students. To have close contact with the target markets is unlikely for the aspiring designer-entrepreneur who is just about to exit academia. After all, most of the inventions examined within this study

were often underdeveloped at the point of inception. A patent may buy some time, whereas the requirement for a patent may be seen as limited, if the innovation is close to market.

#### **6. The market complexity**

**Definition:** Who will be part of the value chain? Are there any barriers to entry?

**Discussion:** Clarysse / Kiefer describe a complex sales process as 'one whereby prospective customers are large organizations with lengthy, multi-stage decision making processes' [1]. Such markets are difficult to penetrate, as Peter Brewin from Concrete Canvas confirms when admitting that 'it is difficult as a small company to supply the shelter into NGOs and the sanitarian sector'. In line with this Kristien DeWolf explains: 'As soon as a market is more complex..., or your route to the customer is more complex, the more you will need to patent. Then you can ask the question: When exactly do you need it? And when is it relevant?' [39] Arctica managed to by-pass the incumbents who were blocking their access to the market. Without a patent, this would have been impossible. What the Arctica case reveals, however, is the fact that the market complexity is not always obvious at the outset, which might be yet another reason why the majority of designer-entrepreneurs are initially drawn towards the patent protection. The more complex the market environment, the greater the need for a patent.

#### **7. Brand recognition amongst the target audience**

**Definition:** To what degree does the target audience recognise and value the novel business, respectively its product or service.

**Discussion:** Independent start-ups are unlikely to be able to rely on brand recognition in order to promote their innovation. Most design-led start-ups do not trade directly to end-users. The Seaboard that is traded by Roli Labs is the only exception amongst the case studies above. Design-led start-ups usually supply to other businesses or trade via distributors. Brand recognition can be enhanced through the selection of the company name, product names, through registered or unregistered trademarks, urls, and message statements such as catch phrases or slogans. Most design-led start-ups are rather good at designing their own trademark. However, brand reputation relies not only on recognizability, it derives from client/customer experience. Therefore it is not likely for a start-up to establish strong brand credentials during the early stages of its live span. It often takes a year or two, sometimes longer, to secure the first sale. The level of customer satisfaction in connection with the corporate identity generates the brand value. Therefore brand recognition is likely to be low in the beginning and to improve gradually over time. Over time the value of a brand can become more important for the sales than patent protection. Therefore the strength of a brand can reduce the need for patent protection, provided that freedom to operate

is given. But this commonly applies mainly to established businesses.

## 8. Investment needs

**Definition:** The level of funding needed to reach break-even including salaries.

**Discussion:** Assessing the funding requirements is as difficult as judging the profit potential at the outset. Some of the interviewees have secured a high level of independence by lowering their expenditure. Txaso Del Palacio, a venture capitalist, points out that ‘many of the ideas which come from entrepreneurs are not very capital consuming’ [22], so investment may not be needed. Investment needs can range from zero to several hundred thousand pounds. There are different ways of securing seed funding. The most common are:

- A) Funds obtained in conjunction with an incubation scheme, which sometimes requires shredding equity
- B) Competition awards, which usually do not require any equity in return
- C) Angel investment, which definitely requires sacrificing equity

All ventures except Yossarian Lives! have highlighted the benefit of patents when it comes to securing angel investment. The benefit of patent protection in relation to competition schemes has been highlighted by Peter Brewin from Concrete Canvas. Various interviewees have expressed the view that having a patent has helped to get accepted into an incubation scheme. It must be acknowledged that these are the subjective views of a range of designer-entrepreneurs. The feedback received from business coaches in relation to the relevance of patenting differs. Some say it matters, other claim it does not. Del Palacio has pointed out in an interview that none of the 14 ventures within her portfolio rely on patents [38]. However, the description of a sample of these start-ups suggests that the founders here are more closely connected with the industry than the design graduates, who have been interviewed in conjunction with this study. Therefore, the designer-entrepreneur needs to communicate the ideas, as opposed to the entrepreneur that comes from industry, who can rely on complimentary assets, such as the market positioning in order to secure sales.

Contrary to the view of the designer-entrepreneurs, conveying ideas to investors does not bare any risks according to Del Palacio. Taking ideas to market is not the investor’s line of business. But entering strategic partnerships with incumbents can be very problematic without a patent protection according to Kristien DeWolf. So, if production can be integrated or outsourced without risk and need for external investment, then patenting is usually not needed. If, on the other hand, equity investment is required, a patent is of benefit to the designer-entrepreneur.

## 9. The development incentive

**Definition:** Is the business demand-pull or knowledge-push?

**Discussion:** Joseph Schumpeter introduced the juxtaposition between technology-push and demand-pull strategies. Fact is that the designer-entrepreneur usually does not choose freely here. The initial ideas tend to evolve more or less unexpectedly from daily design practice or observations. If the inspiring activity predominantly involves researching a particular problem that demands a solution, such as autism in the case of Squease, then we usually get to see a demand-pull initiative. On the other hand, if the reflective process focuses on materials or objects as in the case of Robofold or Concrete Canvas, we are more likely to witness the birth of a technology-push solution. To put it somewhat differently, a knowledge-push approach generates a product or a service concept, which might serve a range purposes. A demand-pull approach focuses on one particular problem, for which a range of products or services may provide a solution. Conversations with industry experts have revealed that there are conflicting views on how these two categories are best separated. This is partly due to the fact that the emphasis of a business can shift over time. A design entrepreneur may, for example, come up with a product idea, only to find out that it is not the best possible solution to a particular problem. He or she may then contemplate alternative products which better serve the purpose. Here a technology-push approach converts to a demand-pull. If the designer’s way of thinking oscillates between the two paradigms during the ideas stage, the categorisation of the approach may be particularly difficult. Clarysse/Kiefer accept that ‘entrepreneurial opportunities do not always fit neatly into one category; even those that fit fairly clearly in one category contain elements of the other.’ [1] The reason why it is useful for the designer-entrepreneur to establish clarity about the approach is that demand-pull initiatives tend to be closer to market than technology-push solutions, for which markets may need to be found, or in the least, examined. ‘Demand-pull are consumer-orientated, and are going intuitively to a market that is much easier to reach.’ [39] This means that for a demand-pull initiative, there is less a need for a patent than for a technology-push solution. What appears even more important is the fact that a demand-pull incentive is more likely to receive competition from companies who have alternative solutions to the same problem. In other words, securing a patent for a design solution is less valuable if alternative designs are likely to serve the same purpose.

## 10. Level of entrepreneurial skills

**Definition:** To succeed in business a designer must have a set of skills that goes well beyond design expertise. From filing accounts to managing sales, the range of skills is considerably wide, which makes it difficult to assess to what extent they are existent.

**Discussion:** Various design entrepreneurs, who were interviewed in conjunction with this study, have highlighted

the fact that they had a lot to learn, in particular in relation to business management, and marketing. Sheraz Arif from Squease highlights the steep learning curve and explains how his team had to learn 'corporate governance' and to 'communicate to the investors in a timely fashion' [42]. Roland Lamb from Roli Labs also confirmed that he 'learned a lot about IP, and about product design and about the relationship between IP, product design and entrepreneurship' [35]. Serial entrepreneurs such as Paul Thomas from Cupris, who was previously involved in the business development surrounding the Mu folding plug, and Plumis, a domestic fire sprinkler, will have an advantage in terms of business experience. However, Thomas still admits to occasional difficulties in the decision-making process. Ventures, the start-up team of which comprises a person with a finance or business background, such as KwickScreen, are at an advantage over purely design-led start-up teams, although it has to be said that the feedback obtained from interviewees suggests that a lot of interdisciplinary start-up teams have struggled to keep frictions within limits. Differences in attitude and personal priorities can lead to instability and hinder progress. Generally speaking designers lack entrepreneurial skills and attitudes at the outset of their entrepreneurial journey. Whyte and Bessant list brokerage, managing client relations and the management of supply chain amongst the 'new complimentary skills' needed for innovative practice [20]. Depending on the degree to which a team or an individual designer lack in business skill, patenting may be advisable, because a patent application as this increases the timeframe within which skills can be developed, prior to introducing a product to the market.

## V. Summary:

The appropriability chart has been designed to measure the potential need for patents to strengthen the appropriability regime of a design-led start-up business. The individual criteria can be rated on a score from 1 – 10. The higher the average score, the more recommendable filing a patent application will be. If the average score is 5 or less, we may assume that patenting is generally not advisable.

There are some criteria, which need to be treated with extra caution: If any of the criteria 1-4 score 1 or 2, patenting is probably not advisable. If the profit potential is very low, for example, investing in a patent is unlikely to pay off. If the overall risk is extremely high, due to bottlenecks in the value chain, for example, patenting may again not be advisable. Other criteria may counterbalance each other. A designer-entrepreneur may have a venture that benefits from strong brand recognition amongst the target audience, which suggests that a patent may not be required. But if the venture is far from market, the patent protection may still be beneficial because it extends the duration of exclusive access to the innovation.

Assessing each of the criteria is a highly subjective process. If there is a start-up team, it may be useful for each member to complete an independent score sheet, in order to

establish the average rating for each of the criteria, and to discuss the scores if discrepancies are very high.

Another point that needs addressing is the fact that the value rating is likely to change over time. A designer's entrepreneurial skills, for example, should improve over time, whereas investment needs may increase or decrease depending on the circumstances. Erroneous assumptions can be rectified through repeating the assessment periodically. Therefore it is advisable to repeat the assessment from time to time. Thus the chart may further reveal changes in the business condition, which is likely to require IP strategic adjustments. Periodical changes in the rating can reveal development needs, as well as growing strengths and weaknesses. Therefore the chart is hoped to help the aspiring designer-entrepreneur to orientate, and to assess the progress made over time. The chart is still due to undergo field-tests. It may prove to be ill-defined, in need of adjustments or perfectly sound. Either way it is hoped that the chart will be useful for designer-entrepreneurs in their assessment of business development needs.

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