

managing innovation — towards a business development model for design-led startups

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This paper discusses route-to-market principles for design-led startups in the context of innovation management. It critiques the common business model canvas for being a static model, where a dynamic time-based framework that allows for continuous planning, would be of better use. The success prospects of a startup business much depend on the management of development processes which lead to the acquisition of IP, financial assets, and complementary assets, a term coined by David Teece to articulate the 'additional resources and capabilities needed to bring a technology product to market' (Clarysse / Kiefer, p.80). The purpose behind the acquisition and management of assets is the strengthening of a company's appropriability regime, a term which sums up 'the environmental factors... that govern an innovator's ability to capture the profits generated by an innovation.' (Teece, 1988, p. 287). Using insights gained from a series of case studies conducted within the InnovationRCA incubator through semi-structured interviews, this paper presents an alternative business management model that can be used to assess and manage the business attributes of design-led startups over time. This paper reveals how the appropriability regime of innovative startups can be strengthened through effective and dynamic management of intellectual property in relation to other key assets.

Keywords: innovation management, appropriability, dynamic capabilities, design management, IP strategies, business model canvas

Introduction

In 1986 David Teece, a Professor at the Haas Business School, University of California, introduced the concept of the appropriability regime, a term to sum up the circumstances that affect a company's current or prospective market power (Teece, 1986, p. 287). The strength of the appropriability regime depends on complementary assets which can be acquired through either contracting or integration. Independent start-ups tend to lack access to assets other than knowledge and intellectual property (IP), in particular in the early stages when funding sources are scarce. How to harness their knowledge in pursuit of the acquisition of other assets, constitutes one of the key challenges.

Whether to rely on formal IP, on informal IP or on open innovation principles depends on how *tight* (i.e. strong) or *weak* the venture's appropriability regime is, and also on the degree of competition as well as the competitors' degree of market power. According to Teece, poor access to complementary assets suggests that IP is very important and vice versa (Teece, 1986, p. 297).

The objective behind strengthening the appropriability regime is to develop market control, to establish dominance within the value chain and to increase market power. Both market power and value chain control are closely linked, and both depend on access to complementary assets. In addition to the link between IP and other complementary assets, it is important to understand that the appropriability regime is never static or stable, no matter how strong or weak to begin with. As with IP, the value of which depends on a venture's ability to apply and implement it, the appropriability regime will be subjected to positive or negative changes during the venture's life cycle. So how can prospective developments surrounding IP in conjunction with complementary assets be framed in relation to time? The following inquiry sheds light into the criteria that affect the development of design-led start-up ventures.

InnovationRCA — a qualitative inquiry

This paper draws from a series of interviews conducted from 2012 onwards with designer-entrepreneurs at InnovationRCA, a design start-up incubator in London that emerged from Design London, a joint-initiative between Imperial College and Royal College of Art, London, that was backed

managing innovation — towards a business development model for design-led startups by The National Endowment for Science, Technology and the Arts (NESTA). Following Grounded Theory principles, the interview transcripts were scanned for references to business development aspects. This was done irrespective of existing theories, in order to highlight the ideas and perceptions that were shared amongst the designer-inventors. The process deployed here resembles the open coding principles described by Strauss and Corbin in their discussion of Grounded Theory methods (Strauss, Corbin, 1990, pp. 61-74).

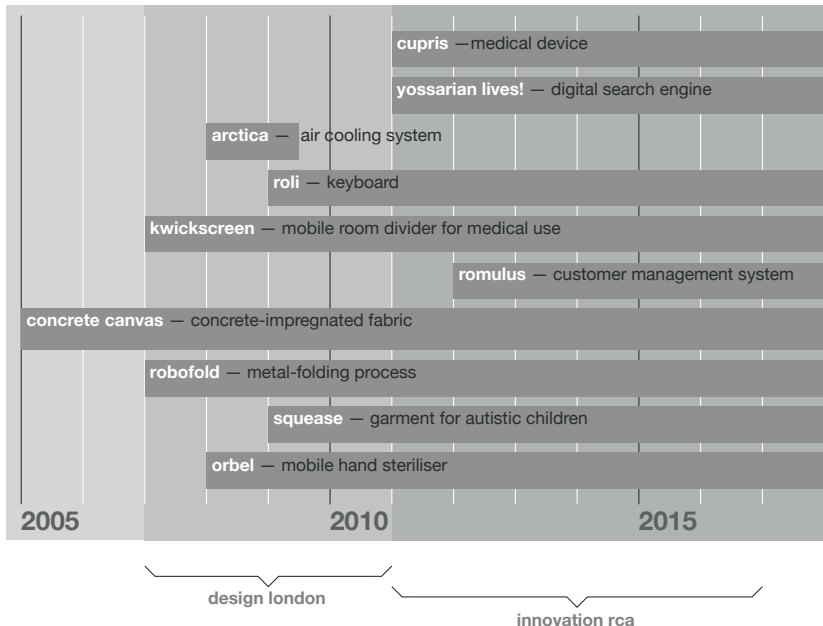


Figure 1 Life-spans of ventures that were investigated. Design London was superseded by InnovationRCA in 2011.

Step 1: Concept labelling — identification of significant

Notable issues, i.e. concepts mentioned by interviewees, were highlighted in the transcripts. Significant keywords and sentences were extracted, and listed in chronological order in spreadsheets under the heading *concepts*, keeping in mind the context within which the keywords

were used. It mattered, for example, whether words such as ‘insights’ or ‘learning’ were used in conjunction with ‘market’ or ‘technology’ or in general. Responses to directed questions were not included to reduce the risk of confirmation bias.

A value such as ‘timing’ was sometimes affixed to the concept term (e.g. patent) to ensure that the context within which the concept was articulated, was retained. The value was specified in consideration of the possibility that the emerging reference framework could be used for evaluative purposes. Where a concept was mentioned repeatedly in consecutive order, it was listed only once, and note was taken of the number of iterations.

Following this process, labels were assigned to the concepts in a separate column with consideration of the context within which the respective concept was mentioned. The labelling was done in preparation of the alignment of concepts. Terms like ‘insights’ or ‘learning’ would be labelled as ‘knowledge’, for example. Whilst the concepts were literal interview extracts, the labels used synonymous or semantically closely related terms to reflect the meaning of the corresponding concepts. Where possible the exact wording was retained. Changes were made only for the benefit of aligning similar concepts.

Step 2: Variable definition — categorisation of concepts

Following the labelling of concepts, a process of transcription was undertaken to further enhance the alignment of concepts that were articulated by different interviewees. In a process of abstraction, the concept labels were translated into meta variables and sub variables. For instance, the statement ‘We started in 2007, and we traded it in 2008’ was labelled as ‘business life-cycle’ (concept). The latter was subsequently translated into ‘business’ (meta variable) and ‘development stage’ (sub variable). To prevent an over-generalisation, an extension (value) such as ‘early stage’ or ‘established’ was also added in some cases.

Step 3: Organisation of variables

After the meta- and sub-variables were specified and copied into new spread sheets, one for each venture, with extensions assigned where appropriate, the labels, concepts and values were deleted, and the lists were arranged in order of the meta-variables. It emerged that all sub variables could be listed under a very limited number of meta-variables: assets, business, finance, IP, market, proposition, and team.

Step 4: Frequency analysis

After the meta- and sub-variables were clearly identified with respect to each individual venture in separate spreadsheets, the sub-variables from all interviews were subsequently transferred into one single spreadsheet where they were listed in a number of columns, each of which represented one of the ventures. The sub variables were vertically divided into seven groups representing the meta-variables. If a sub-variable was mentioned more than once during the interview, a term was entered that was representative of all relevant concepts, and the number of iterations was entered in the spreadsheet. Where a sub-variable was mentioned in different interviews through the same or similar terminology, the sub-variables were arranged horizontally in one row. In light of the sub-variables listed within each row, a summative keyword, a summative sub-variable so to speak, was entered into a separate column to better represent the variety of corresponding keywords found across all interview transcripts. This was done to enhance alignment of concepts across the range of interview transcripts. For examples, references to ‘competencies’ were listed under ‘knowledge / expertise’, as were all references to either of the latter two concepts.

Step 5: Summative analysis

The aim behind this process of concept labelling was to lay the foundations for the development of a hypothetical framework of key concepts. During the final step, the meta-variables — team, proposition, IP,

finance, assets, market — were aligned horizontally at the top of a new single spreadsheet. The sub-variables were listed beneath, irrespective of the venture, in relation to which they came to mention. Formulas were used to calculate how frequently these sub-variables came to mention during all of the interviews combined, and the listings were arranged in such a way that the most frequent sub-variables were located at the top of the list, and the least frequent ones at the bottom. The meta-variable ‘business’, as well as their respective sub-variables were merged with ‘team’, since the corresponding sub-variables suggested that there was little conceptual difference between the issues that were addressed in both categories. It is important to highlight that this comparative study was not meant to be a statistically representative analysis. The number of cases used for this inquiry would not suffice. The investigation was merely aimed at developing a framework of references that are grounded in original data.

Step 6: Categorisation of variables

One could argue that all concepts are somewhat correlated. However, some may be more closely interlinked than others. To develop an overview over how the variables are related to one another, the meta variables developed in steps 1-5 were mapped in diagrammatically (figure 2, 3 and 5).

In a conversation about the relevance of IP in relation to investment for start-up ventures conducted in 2103, venture capitalist Txaso Del Palacio listed three key investibility criteria: team, target market, technology. Some of the transcribed summative sub variables fall neatly into these three categories:

- Knowledge / expertise / competencies as well as commitment, credentials etc. connect with the variable *team*
- Public relations, target audience, competitors etc. were concepts found under the variable *target market*. The prefix *target* was dropped since a lot of the concerns aired during the interviews preceded the selection of a target market / audience.
- Development pace / incentive, product development, as well as ideas / concept / novelty can be allocated to technology. The concept *technology* was replaced with the term *proposition*, so that its coverage could be extended to include non-technological design aspects. The ambition behind including design (in the sense of

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product language) was to not limit the inventive aspect to technology alone.

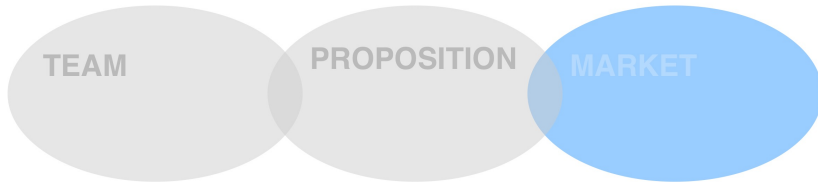


Figure 2 The alignment of the criteria within this venn diagram was due to a simple premise: a design team (or lone inventor) incepts a design proposition, which they (or he or she) seek(s) to take to market.

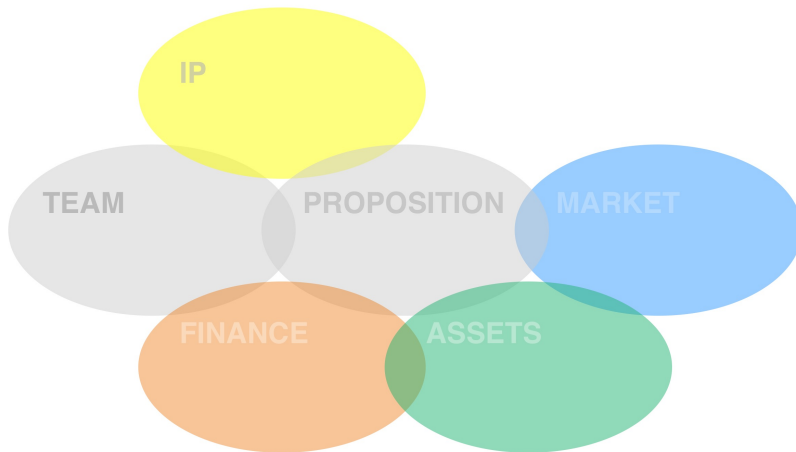


Figure 3 In response to the variables established through the interview findings, three categories needed adding. IP, finance and assets.

Step 7: Mapping of variables

As explained above, keywords have been gathered and organised as part of the concept coding prescribed by Strauss and Corbin. Instead of continuing the use of the term concept, this paper from here-on refers to *variables*. The reason for this is two-fold:

- *The concepts gathered through the interviews specify uncertainties which the designer-entrepreneur needs to manage over time. A variable, as opposed to a concept, is by default changeable. The anticipated framework is to be designed to manage change, and to develop the design business attributes in such a way that the business can be established, and a foundation for stability and long-term growth be built.*
- *The second reason for using the word variable instead of concept is to be able to connect the framework development process with John Creswell's idea of theory positioning (Creswell, 2014, pp.51ff). Creswell discusses the correlations between independent variables, intervening variables, and dependent variables (Creswell, 2014, p.56).*

Most of the key concerns unveiled during the interviews with the nine designer-entrepreneurs can be mapped against the three criteria mentioned by Del Palacio (see step 6). However, some rather prominent issues cannot be allocated to any of the three areas. The majority of the latter relate to IP and financial matters on the other. Del Palacio's articulated the three criteria in response to what investors are looking for, i.e. she discussed them in relation to finances. After adding IP and finances as fourth and fifth meta variables, and the vast majority of summative key terms gathered can be accommodated (see figure 4). One area that was less frequently discussed during the interviews was that of assets (see figure 4). Although some designer-entrepreneurs entered strategic partnerships in order to access complementary assets, this area did not come to mention as often as any of the others. Since assets, be they complementary or integrated, are of critical significance according to Teece, this has been added as a sixth meta variable that is of significance to the business development.

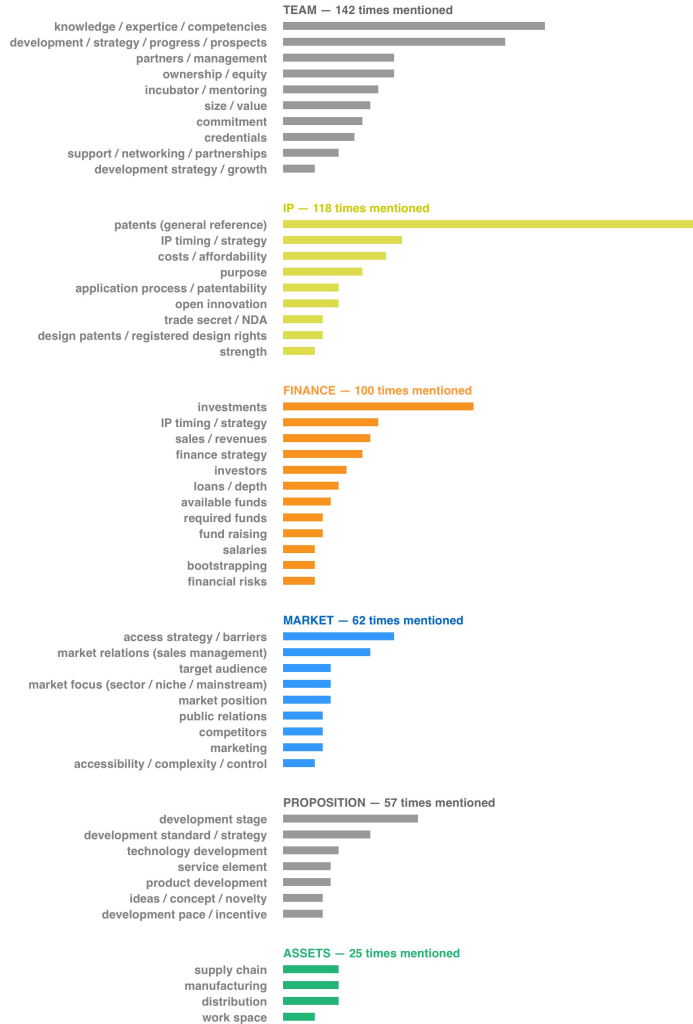


Figure 4 *The variables mentioned during the interviews are listed in order of frequency here. It is clear that team and IP dominate the designer-entrepreneur' thinking, shortly followed by finance (see also figure 33b). Assets came to be mentioned much less frequently.*

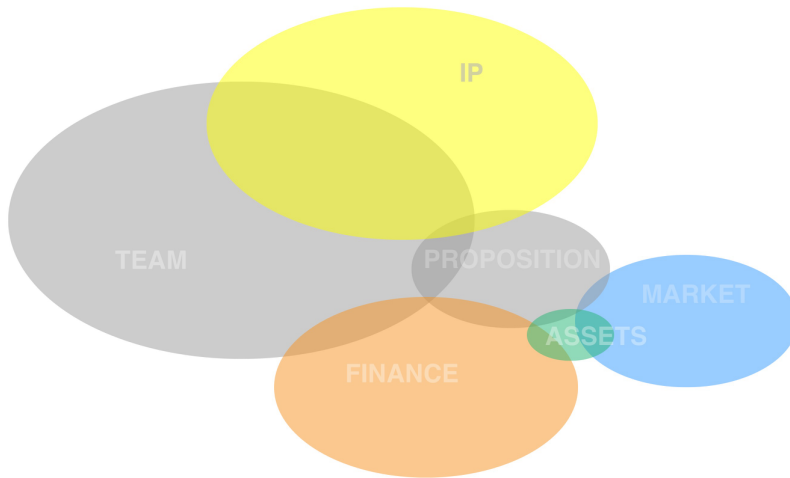


Figure 5 This diagram reflects the number of times which individual meta variables were addressed during the interviews conducted. The primary concerns of early-stage designer-entrepreneurs are very obvious.

The interviews with the designer-entrepreneurs were semi-structured, which means that there were some guiding thoughts and questions. However, the vast majority of questions were open and interviewees were free to speak at length about issues of concern without being interrupted. This means that the data collected is representative of their key concerns at the time. One also needs to bear in mind that all designer-entrepreneurs were at some point connected with the same design-business development incubator — Design London / InnovationRCA — and certain attitudes and priorities are likely to have been nurtured. For those two reasons, an above-average coherence would be expected. Despite this set of circumstances, a degree of communalities between the different ventures is undeniable (see figure 5). In particular, the concerns surrounding finances, equity investment and IP, were prominent, although not all interviewees were equally positive about IP.

Step 8: Identifying properties and dimensions

For identifying the interdependencies between variables, the time factor needs to be brought back into equation. Creswell specifies the temporal order of variables as one of the two distinguishing characteristics (Creswell, 2014, p.52). The other characteristic is the measurement or observation that relates to an individual variable. As expressed earlier, it is highly likely that the significance of individual variables may change over time. This would mean that the dependencies change as the venture develops. This in combination with the fact that more than one independent variable determine individual dependent variables, means that the framework to describe the design business start-up development needs to be multilinear. Using a multi-dimensional approach, it is possible to speculatively map out the way in which the meta-variables correlate over time. With respect to the development areas highlighted above, we can not only identify numerous subcategories which correspond to some of the sub-variables (see figure 6), there are also potentially strong dependencies.

Insights: towards a framework

Using the six meta variables established in steps 1-7, we distinguish between primary and secondary variables. The team, the knowledge held in relation to the proposition, and the proposition itself constitute primary variables which are strongly interlocked. Finance needs, the market and the non-financial assets constitute the secondary variables, which largely unknown to the team in the beginning. The ultimate goal is business growth. The secondary variables which depend first and foremost on the primary variables, can be broken down into several sub-variables, which in combination determine the venture's development potential. These can be mapped as shown in figure 6.



Figure 6 The six meta variables developed in steps 1-7, can be mapped out, and the most significant sub variables can be allocated. The team, the knowledge held in relation to the proposition, and the proposition itself constitute a primary set of independent variables which are strongly interlocked.

The aim of this study is to establish the predominant startup development characteristics, i.e. the way in which capabilities are developed and acquired over time. This means that the variables need to be mapped out on a timeline. In the beginning the ventures have little to rely on other than the team, and the design proposition that is nourished through the team's existing knowledge. Team roles and responsibilities depend on the requirements of the proposition and on the knowledge held by individual team members. The selection of team members may depend on their knowledge and expertise. The triangular interrelationship between team, knowledge and proposition is the driving factor at the outset of a design-led start-up (see figure 7). An understanding of suitable markets and market niches evolves only over time, and assets are often far out of reach. Finances are needed to access assets, and design propositions usually determine which markets or market niches are of interest.



Figure 7 With the team, the knowledge held within and the proposition itself as a given, the interdependencies finance and IP dominate the list of concerns amongst designer-entrepreneurs. According to the interview findings, there is a strong interrelationship between those two variables linked here through the red double arrow.

The financial needs depend not only on the proposition, but also on the complementary assets required to get the proposition market-ready, R&D, production etc. (figure 7). The more access to complementary assets exists, the less financial resources are required. This means that finances and access to complementary asset are interdependent variables (figure 7). Importantly the IP strategy determines the financial needs as indicated through the red double arrow in figure 7. Conversely the availability of financial assets determines what formal IP can be afforded, and in which territories it can be secured. The market, its complexity, and potential uncertainty determines both the sales strategy and possible market positions. In the long run, the sum of these business development factors determines the market power, which also derives from the control over complementary assets. The latter may be increasingly integrated, as shown in the example of the Seaboard, a novel digital music instrument that required software solutions to function. Roli who designed the Seaboard and took it to market, acquired Juce, a software platform, in 2014. This enhanced the market power, and the number of employees increased by about 100%. Business growth also depends on the sales strategy, the control over assets, and it results from the level of market power. The question that emerges is how IP, which is often the only readily available asset for an early-stage design-led start-up, interacts with the other factors mentioned above.

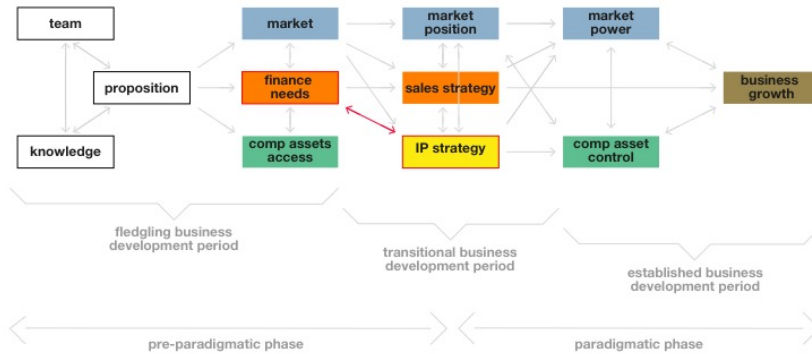


Figure 8 *The significance of variables varies as the venture develops over time. Three business development periods, which connect with the concept of pre-paradigmatic and paradigmatic phases, highlight the dominant variables during the respective periods.*

Murta et al. describe the pre-paradigmatic phase in reference to Abernathy, Utterback, Dosi and Teece as a competitive phase during which companies rely on ‘standardized manufacturing equipment, in order to retain flexibility to adopt an alternative, should their offering fail to establish itself as the dominant design’ (Murta et al., 2004, p.8). Although this framework proposed here is subject to verification, we can already see that the distinction between a pre-paradigmatic phase, and a paradigmatic phase is relevant in conjunction with figure 8. All three variables, market position, sales, and IP strategies are determining the level of market power that a firm can obtain. Where market position connects with market power and control over complementary assets, be it through contractual arrangements or through integration, we may assume that we are looking at an established business. In pursuit of this phase in the business development, the key challenge is to manage the elements within the transitional business development period, market positioning, the sales strategy, the IP strategy. The alignment of these three interdependent variables is critical to the start-ups success prospects.

Conran Associates — a case study

Asked whether or not the entrepreneurship route provides a future for designers, Sebastian Conran, a household name in British design, points out that ‘people like James Dyson have done it, others have done it. It is high risk, and you need to have the capital to begin with.’ (Conran, 2014) Clearly, funding is quintessential for succeeding with design-entrepreneurial initiatives. The previous section uses an inductive approach to identify the variety of criteria (variables) that determine a design start-up success prospects, and leaves no doubt that finance is one of them. The question that remains is how the risk of failure can be mitigated. Strategically increasing the success prospects of a start-up also enhances the designer-entrepreneur’s chances to secure equity investment.

Sebastian Conran is founder-director of Conran Associates in London, UK. Conran Associates is not only a consultancy, but also comprises a small number of start-up initiatives. A few of those have been examined in conjunction with this paper.

Consequential Robotics

In 2016 Conran Associates engaged in a new venture which is being developed under the title ‘Consequential Robotics’. This is a new ‘service-robotics start-up developing solutions for applications in homecare, health, education, and life style’ (consequentialrobotics.com, June 2017). The firm’s flagship product is MiRo (the name stands for biomimetic robot), an assistive robot that looks like a mix of a lapdog and a bunny. For economic reasons, the robot moves on wheels, which according to Conran use thirty times less energy than legs. The eyes on the side reflects the characteristics of prey who need 360 vision and are generally perceived as cuter than predators. However, Miro’s cameras are directed to the front, which provides the robot with stereo vision.



Figure 9 award-winning MiRos gathered in Conran's studio in London

According to Sebastian Conran, the software development is the next big step: 'System control architecture and the prototype demonstration need to be done, and we need commercialization strategy.' (Conran, 2017) The company deploys open innovation methods such as university challenges to allow for other innovators to contribute to the technology development. MiRo currently sells for £2,200 a piece. A software enabled version is due to become available in September 2018, and a simplified version will be made available for £600 in the future. There are currently seven people working on MiRo, two in marketing and administration, and five in design and development.

Inclusiviti

Conran's interest in consumer-facing robotics and digital unaided devices has also led to other initiatives such as Inclusiviti, a firm that focuses on robotic assistive devices. This company, which was set up in September 2016, benefitted from government funding that was secured in pursuit of developing OmniSeat, a smart wheel chair for elderly. The OmniSeat design benefits from Conran's experience with having designed push chairs for Mothercare. Another product under development is IntelliTable, a semi-autonomous table that can be voice activated. It uses sonar and ceiling tracking optics (Consequential Robotics.com, nd). Intellitable is aimed at hospitals, but also at the domestic market. Obtaining proof of market in a rigorously regulated public sector, can much benefit the success prospects in the private sector.



Figure 10 OmniSeat featuring patented wheels



Figure 11 IntelliTable, a semi-autonomous piece of furniture that can be programmed by smartphones and voice activated

Insights: triangulating innovations

Noteworthy with respect to Inclusiviti and Consequential Robotics is the fact that each of the three devices under development can work not only individually but also effectively in combination. They are aimed at very similar markets. Here the sum of design propositions may be greater than its parts. In combination, the products may be deployed as part of a system of autonomous or semi-autonomous assistive devices, which can be connected through a bespoke platform. We can refer to this set of circumstances as a triangulation of inventions or of design propositions.

The hypothesis that emerges is that the triangulation of inventions significantly enhances the success-prospects of a design-led start-up. Not all inventions need protecting through formal IP. In fact, it may be preferable if they are not. Secrecy, formal IP, and open innovation principles can be combined in a strategic manner. Through the triangulation of inventions, designer-entrepreneurs can establish an IP ecosystem that is dynamic and allows the inventor to respond to unexpected changes in circumstances.

This opens room for new business-development- and IP strategies. The most prominent threats which the designer-inventors from InnovationRCA have been experiencing, relate to the fact that most of them focus on one individual isolated product. Although a start-up may not be able to engage in multiple independent companies as does Conran, knowledge related to a variety of inventions that are pursued by one venture, are perfectly conceivable.



Figure 12 The triangulation of innovations within the proposition leads to a system of business development attributes (variables) which provide enhanced flexibility to shift emphasis. Important is the need to have respective design propositions aligned towards one specific market.

As highlighted in the beginning of the paper, knowledge surrounding concepts, ideas, production processes, and market opportunities are the only selling points which independent designer-inventors tend to have at the outset. Securing exclusive knowledge in relation to a range of mutually complementary inventions is not only possible, it is highly recommendable.

The triangulation of mutually complementary inventions multiplies the range of IP-strategic possibilities, because it allows the designer entrepreneur to respond to emerging threats including competition, imitation and value chain bottlenecks. Such flexibility is particularly beneficial in an appropriability regime that is underdeveloped and subject to uncertainties. Rather than using different modes of IP protection in combination to harness one proposition, two or more inventive steps ought to be triangulated in order to secure a market advantage. This triangulation of inventive steps extends Teece's concept of complementary and integrated assets, because inventions here become assets that are complementary to other inventions that are fostered and owned by a single design-led start-up.

Risk mitigation through diversity

To strengthen the appropriability regime sufficiently, different inventions related to the startup need to be mutually complementary, and so do the forms of IP which protect them. Each component of the proposition needs to be of significance to the startup's core selling point, i.e. to the problem which the proposition seeks to resolve. At the same time, the individual element must not be critical to the success of the firm overall, as this would increase the adverse impact in case of IP infringement or competition. In other words: Inventions must be beneficial but not indispensable to the way in which a firm addresses the issue(s) which it seeks to resolve. The desirable position is such that if one of the inventive steps (proposition elements) is challenged by a competitor through imitation or invalidation of the exclusive IP, then the innovator can resort to the other inventive element(s) and shift emphasis. A good IP strategy must leave room for the tactical response to unforeseen circumstances.

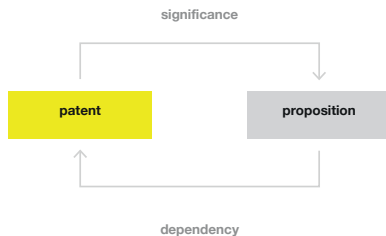


Figure 13 *With the significance of the IP, respectively the function which the IP protects, the ventures dependency on the IP increases too.*

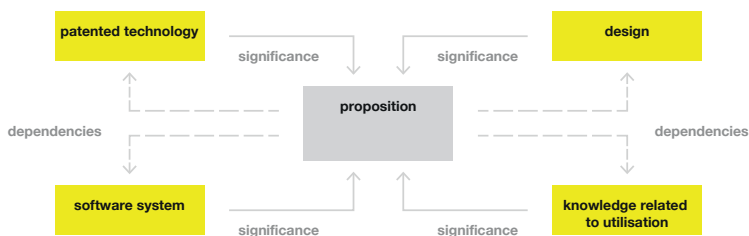


Figure 14 *With multiple innovative elements as part of the proposition, the dependency on the individual components, and consequently on the IP that protects them can be reduced.*

Not all inventive elements need protecting through formal IP. In fact, it may be preferable if they are not. Secrecy, formal IP, and open innovation principles can be combined in a strategic manner. An IP system can be established that is dynamic and allows the inventor to adapt to unexpected changes. IP then becomes a dynamic capability. As highlighted in the beginning, knowledge surrounding concepts and ideas, is the only asset which independent budding designer-inventors have at the outset. To convert these elements of emerging knowledge systematically into a dynamic capability through IP-strategic steps is most important for the designer inventor. Some of the InnovationRCA incubatees have done so, such as Roland Lamb who acquired Juce or KwickScreen who developed Romulus, their own bespoke client management platform. These added assets, be they integrated through acquisition or developed internally from scratch, significantly enhance a venture's success prospects and its value. We can conclude that the triangulation of mutually complementary innovations strengthens a start-up disproportionately because it mitigates

the risk of being edged out of the market through imitators, and it multiplies the possible options of combining different forms of IP.

Commonly designer-entrepreneurs focus on a single-minded proposition (SMP) that is carried through a single inventive step (figure 13). Although various forms of IP can be combined to protect one individual inventive step, certain forms of formal, informal and loose IP, cannot be combined. The triangulation of mutually complementary innovations strengthens a start-up disproportionately because it multiplies the possible options of combining different forms of IP (figure 14). This paper argues that a design-led startup is best developed around a combination of two or more inventive steps which need to function individually, but also in combination with each other and in support of a SMP.

Conclusions — the new business model canvas

A critique on the business model canvas

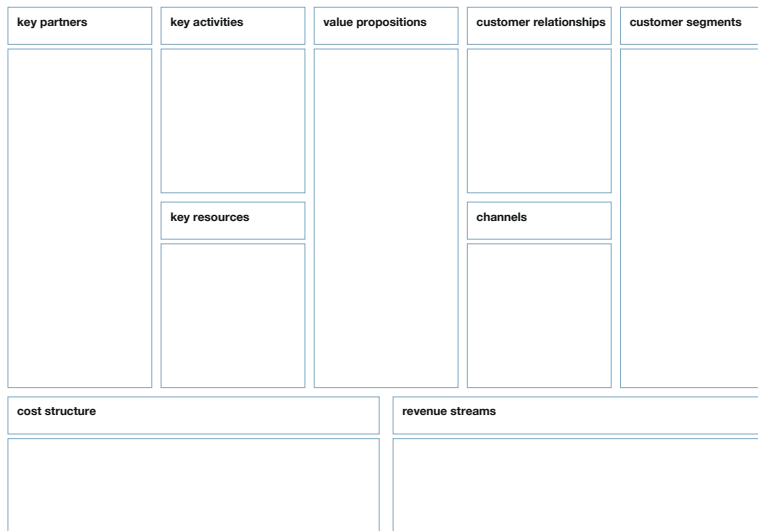


Figure 15 Structure of a typical business model canvas

The conventional business model canvas reflects the traditional approach to start-up business management. It provides a situational snapshot of a company's assets. Fledgling start-ups are not aimed at stability but at growth. What is required here is a dynamic system that allows monitoring the most significant business development aspects (variables) over time, i.e. the inter-relations between the critical business development factors, team, proposition, finance, assets, market. IP can become a flexible 'fabric' that supports the development of all these business development aspects. However, the startup team needs to manage the respective developments in a context of unforeseen circumstances. Market knowledge, for instance, is generated over time. Radical innovations are often situated in market niches, or in emerging markets. Negotiating these dynamic interdependencies needs a fundamentally different model compared to those that have been deducted from the investigation of the management of established corporations. This is why the conventional business model canvas would be best replaced with a multidimensional flow chart for the management proprietary early-stage design-led startups. This will permit to continuously negotiate the relationship between the critical development elements throughout the fledgling period, which is particularly useful if multiple mutually complementary inventions are at play.

Towards an alternative model

The conventional business model canvas is suitable for illustrating a momentary snapshot of a business case. To provide an oversight of how the different business development attributes (variables) relate to each other, and what ought to be the driving factor behind certain decisions, a flowchart is required. The qualitative inquiry highlighted in addition to the team, knowledge and the proposition itself, finance, IP, market-related matters, and complimentary / integrated assets as key components. These four meta variables are aligned in four horizontal parallel streams (figure 16). Depending on the business development stage (fledgling period, transition period, established business) the criteria (variables) take on slightly different characteristics. In the beginning markets need identifying and analyzing. Later market power can be developed through the defense and the expansion of IP, for example (figure 16). The degree to which market power can be acquired, also depends on the way in which the business is

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positioned in the market. Market positioning, in turn, may depend on the way in which IP is implemented (open innovation, secrecy, formal IP etc.).

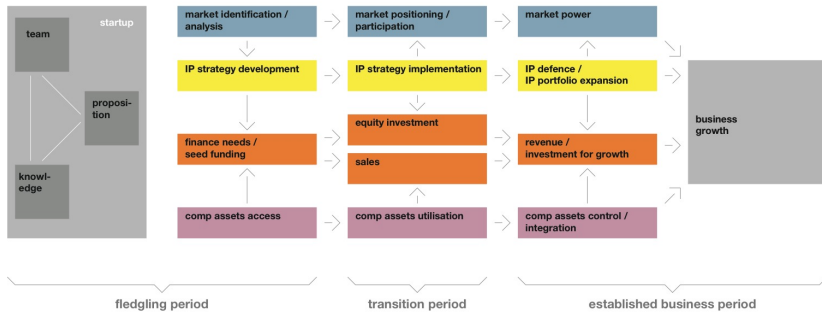


Figure 16 *Four of the meta variables (market, IP, finance, complementary assets) are addressed through a range of sub-variables arranged horizontally and colour-coded in line with figure 8.*

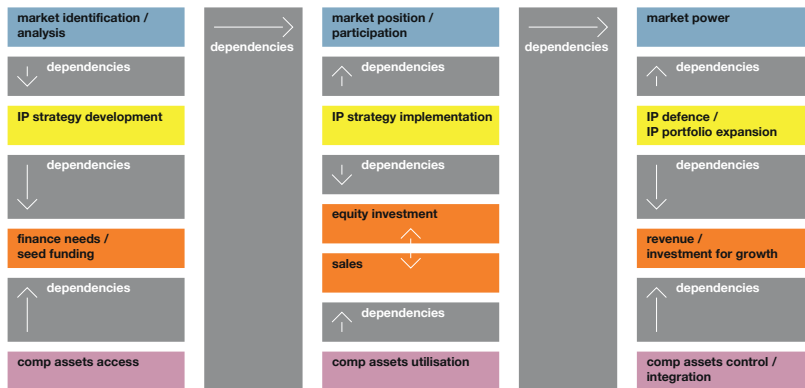


Figure 17 *Instead of only defining the variables that relate to the business development, a business model canvas should also allow for articulating their interdependence..*

The way in which the arrows are pointed in figure 16 and 17 does not necessarily reflect the way in which the variables depend on one another. There is no universally applicable set of circumstances. Instead the dependencies vary from case to case. To facilitate decision making, double

arrows need avoiding, as these represent unanalyzed relationships (Creswell, 2014, p.56). At the same time, dependencies require continuous monitoring. Where priorities change, arrows may need reversing. These dependencies are decided at the discretion of the designer-entrepreneur. It is highly likely that these dependencies change over time, and their direction and description may need periodically adjusting.

The inventors involved in Design London / InnovationRCA frequently reported that they needed a patent to attract angel investment. Conversely, the angel investment was required to invest in a patent portfolio. The question to what extent the access to complimentary assets would require funding, seldom came to mention. The flow chart in figure 17 allows for the definition (directional) and the articulation (qualitative description) of the interdependencies between two or more neighbouring variables. This helps the designer-entrepreneur establish clarity about what are or ought to be the independent variables (driving factors) and which are the dependent / intervening variables. Creswell refers to the former also as 'predictors' (Creswell, 2014, p.52). The model can be used in three different stages, after segmenting it into the three different business development periods highlighted in figure 16.

The sub-variables listed in figure 4 can be examined to establish a more detailed understanding about the complex nature of the meta variables in figure 16 and 17 and their different development-based characteristics. If the qualitative inquiry outlined in first section could be conducted across a greater range of case studies, it is likely that additional sub-variables can be established.

Conclusions

This study used a qualitative inductive approach to identifying key business development attributes (variables) in relation to invention-led design start-up businesses. It examined and categorized these variables before mapping the dominant development characteristics (meta variables) across a flow chart. Developing a start-up into an established design business requires change management, and this change is characterized through the way in which business attributes depend on one another. These dependencies, and the way in which they may change over time, cannot be articulated using a conventional business model canvas. The dynamic relationship between business development variables is even harder to

understand, if multiple inventions are involved. Consequently, this paper suggests the use a time-based business development model in place of, or in addition to the conventional business model canvas. The model proposed here emphasizes the relationships and dependencies between various business development attributes (meta variables). At this present moment the proposed business development model remains hypothetical. Although it has been derived from primary qualitative data obtained systematically through series of case studies, it remains to be tested in a real-life business scenario.

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