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On Managing Innovation by Design: Towards SMART Methods

Pieter E. Vermaas
Philosophy Department, Delft University of Technology
p.e.vermaas@tudelft.nl

Abstract
In this paper innovation by design is characterised schematically and methodological with the aim of analysing how projects of innovation by design can be managed. First, I approach innovation by design from an engineering perspective, and show that the incorporation of innovation into design projects has complicated their management by making these projects less SMART (Specific, Measurable, Assignable, Realistic and Time-related). Second, I consider methods for innovation by design and propose that innovation-by-design projects can be made better manageable, not by making the projects themselves SMART, but by formulating the *methodological phases* these projects have to go through in a SMART manner.

Keywords: Innovation by design, management of innovation, design methods for innovation, SMART objectives.

Introduction

In the literature a telling case has been made for taking design as a key activity in innovation. Firms like Philips Design and IDEO have described how they arrived at their innovations through design [3,9], and the successes of Apple and Alessi were analysed as innovation due to design (e.g., [22]). The track-records of these firms and the successes achieved are convincing enough: innovation by design is a reality, and the remaining issue discussed in the literature is how to copy it all. What design methods for innovation can we adopt from Philips Design and IDEO? What lessons can we learn from the way Steve Jobs managed Apple and the manner in which Alberto Alessi led his firm? If these questions are answered, so the idea is, then we have gathered the insights to let emerge a new generation of managers and a new type of firms, and systematic future innovation is imminent.

In this paper I do not discuss how Steve Jobs managed Apple and only give a sketch of Philips Design's design method for innovation; I rather take distance and analyse innovation by design schematically and methodologically, aimed at analysing how its applications can be made manageable.

A first point to make is that in the literature on innovation by design the notion of innovation is taken as a *success term*: the cases described are typically ones in which the resulting products were commercial triumphs, suggesting that innovation by design is synonymous to creating economic success. Yet, when firms innovate, success is not a necessity: innovation can fail commercially, as Concorde proved. Hence, innovation is not a success term; innovation is rather an *attempt* to create commercial success.

If this point is accepted, it follows that mimicking the methods used by Steve Jobs or at Philips Design need not lead with certainty to new successful innovation, and a number of questions emerge. What are the economic success rates of the different innovation-by-design methods? Which of these methods should be adopted by firms? Are there different types of innovation by design, each with its specific methods? How should design for innovation be managed in order to realise success with the given rates, or improve on these rates?
In this paper I explore primarily the last question. I adopt an engineering perspective, and analyse how the gradual incorporation of innovation into design projects has complicated their management by making these projects less and less SMART. Second, I propose that innovation-by-design projects may become better manageable if the *methodological phases* these projects have to go through are formulated in a SMART manner. A project or design phase is SMART if it is Specific, Measurable, Assignable, Realistic and Time-related [6].

An engineering perspective on innovation by design

From an engineering point of view, innovation by design as discussed in the literature involves two shifts: design is extended from incremental improvement of products to creating innovative products, and design is extended from finding new products to ideation and to developing concepts for new families of innovative products. Let us call design of individual innovative products *product innovation by design* (e.g., [3,5,20]) and let *concept innovation by design* refer to design for ideation and product family concepts (e.g., [9,22]). From a design-methodological perspective these two shifts involve departures from the engineering domain in which design is supported by well-defined methods, and this has ramifications for the way in which design projects can be managed.

Incremental product improvement by design

Engineering design for incremental improvement of products is typically an algorithmic procedure for finding a design solution to a given and fixed design problem. A client, be it a customer of an engineering consultancy, or a firm setting an assignment to its engineering department, specifies the design problem. And engineering designers search for solutions by going through a linearly ordered sequence of design phases as defined by engineering design methods, in which they make ample use of existing design solutions to similar design problems (e.g., [4,14,17]). Success, being that a solution to the set design problem is found, is not fully guaranteed. Engineers may generate proposals that do not solve the original problem or may encounter technical difficulties, leading to iteration by returning to earlier phases or to abandoning the project altogether. And engineers may not be able to find a design solution in time or with the (financial) resources allocated.
The management of a design project for incremental improvement is conceptually rather straightforward. The design problem is fixed upfront and can be used throughout the project to check progress, as well as at the end to determine success. Moreover targets for the (financial) resources that may be spent in the project can be set, and be used to stop it when they are not met. Incremental-improvement-design project are therefore to a large degree SMART (see, e.g., [17], §6.4, but formulated with different terminology). By the fixed design problems they are specific and measurable, the designers are assigned the task to solve the design problem, and by setting addition resource targets, they are time-related. Incremental-improvement-design projects are moreover to a large extent realistic, yet there is a chance that projects fail.

Product innovation by design

The first shift from design for incremental improvement to product innovation by design complicates this straightforward management. Design for innovative products is part and parcel of engineering design, not only because of the technological and commercial appeal, but also because it was acknowledged in design research that not all engineering design can be incremental improvement. Design problems can be ill-structured, wicked or paradoxical [7,16,19], meaning that if engineers are to solve them, they should be able to reformulate the problems. Such reformulation of the initial design problem of clients became under the heading of *reframing* [5,18] seen as a step in engineering design to arrive at innovative products; it amounts to rejecting the initial design problem, and produces a creative phase in design in which engineers generate solutions for the reformulated design problems [8]. Success is now that a design project finds a *matching pair* consisting of a reformulated design problem and a design solution that satisfactorily solves the reformulated design problem. This success is again not guaranteed: in addition to the causes of failure in design for incremental improvement, product innovation by design may not lead (in time) to a matching design-problem/design-solution pair.

The consequence of reframing for managing design projects is that the initial design problem cannot be used anymore to check progress of the design project or to check the outcome: the initial design problem is by definition not the one that is to be solved. A product-innovation-design project is therefore less SMART. The initial design problem makes it specific, the project is still assigned to designers, and targets for resources that may be spent, may make it time-related. Yet, a product-innovation-by-design project is less realistic than one for incremental improvement, since it need not lead (in time) to a matching design-problem/design-solution pair. A product-innovation-by-design project is, moreover, not measurable, since for arguing that the solved reformulated design problem in that pair can count as capturing the initial design problem of the client, some sort of rule is needed that equates the initial design problem with the solved reformulated design problem. Currently such a rule is not available, and can designers merely hope that the client just accepts the reformulated and solved design problem as his or her problem.

A common position in the literature on innovation by design suggests that the managerial complication due to the reformulation of the original problem of the client is actually to be welcomed. In this literature user-driven innovation is seen as risky; users are presented as conservative by blocking innovation when they, as clients, formulate what products have to be designed. Designers should take the lead in innovation, and propose what problems clients have and what solutions design can offer. For justifying this reversal in who determines best the design problems in innovation, the experts in innovation are cited, such as Steve Jobs: “A lot of times, people don’t know what they want until you show it to them.” (in [22], p. 51). And the means designers have for determining the design problems in innovation include ethnographic studies, which is taken as a tool to explore what problems users are really concerned with despite what users may say themselves about this [3,20].

Concept innovation by design

The second shift to concept innovation by design complicates the management of design projects even further. When innovation by design concerns not individual products but rather longer term trajectories in which firms search for concepts for new families of innovative products, even the designers may initially not know what it is about. A project at Philips Design aimed at exploring whether projections of images on bedroom ceilings could define innovative wake-up devices, evolved into innovation of medical CT and MR scanning: the projections of images were eventually used in examination rooms to calm patients, and to let them lay still for getting better resolution with the scanning devices [9,10].

The management of concept innovation by design through predefined goals is for this reason rejected; “often the real application of a technology is not in the area in which it was initially envisaged” ([9], p. 5); hence, so the argument goes, predefined goals block a search for concepts for new families of products before it can reach innovative results. For the same reason distance it taken from project management and from defining upfront financial and business models for projects [22], because that deny how such concept innovation by design evolves. Designers should get a free hand, and firms should engage into concept innovation by design in a manner that avoids pigeonholing projects too early [9]. Concept-innovation-by-design projects are therefore hardly SMART since most SMART objectives are assumed to be disadvantageous. Initial goals that would make such projects specific and measurable are bound to be abandoned in concept innovation by design, and targets for resources that may be spent, which would make projects time-related, are rejected. Realism is claimed by referring to all the existing success stories of concept innovation by design, suggesting that successful concept-innovation-by-design projects are ones that capture large shares of existing markets or create entirely new ones. But when it is accepted that innovation is not a success term, also these aims are not always realised.

Methods for innovation by design

Innovation by design is a reality. Hence a claim that it cannot be managed is bound to contradict existing management practices, for instance, those in the firms that are analysed for understanding innovation by design. Moreover, in the literature proposals on this management are becoming available (e.g., [2,13]). In this paper I aim to add to this literature the possibility to make projects of innovation by design manageable by formulating the methods for innovation by design in a SMART manner; innovation-by-design projects may themselves not be SMART, yet the phases such projects have to go through according to the used methods may be formulated SMART. For this argument I consider two methods, one for product innovation by design and one for concept innovation by design.

A design method for product innovation

The design method for product innovation by design I consider is the one taught at the Hasso Plattner Institutes of Design at Stanford and Potsdam [15,20]. It gives a linearly ordered sequence of six design phases [15] as depicted in Figure 1. Yet, this linearity allows for changes in the initial design problem by which a project starts. In the 'understand' phase it can be decided by the designers that this initial problem is formulated in a too general or too specific way, leading to reformulation. And after the 'observe' phase in which ethnographic studies of and interviews with prospective users are done, it can be concluded that the problem is still not well understood, leading to an iteration back to the 'understand' phase. That same iteration can occur after the 'point-of-view' phase, in which designers take a perspective on the design problem by deciding how to frame the prospective users and how to frame the problem. "Personal music player as jewelry" is an example of a point of view in which the design of a headset is framed in a non-utilitarian way [20].

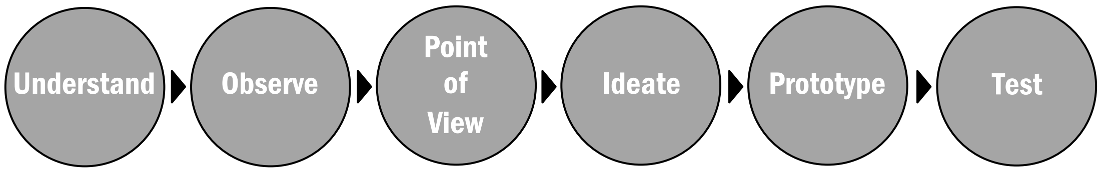

Figure 1 The Hasso Plattner Institute method for product innovation by design

In the 'ideate' phase ideas for design solutions are generated by various creativity tools such as brainstorming. Of the generated ideas a few are selected to be visualised for the prospective users in the ‘prototype’ phase. And in the ‘test’ phase it is observed how these users respond to the prototypes, for identifying the strengths and the weaknesses of the chosen design solutions, which again may lead to iteration.

It may be said that with the Hasso Plattner Institute method product-innovation-by-design projects become to some extent SMART *during* the projects. The ‘point-of-view’ phase makes projects specific. And in the ‘understand’ phase standards have to be defined for assessing the success of the final design solution, introducing the SMART objective of measurability. Yet, specificity and measurability are not defined upfront; they emerge.

A design method for concept innovation

Methods for concept innovation by design are the ones that Roberti Verganti has abstracted from his analyses of the innovative successes of Alessi, Apple and other firms [22], and that Paul Gardien has described on the basis of experiences at Philips Design [9]. I focus on the latter.

The method for concept innovation by design that Gardien proposes superimposes two models of innovation, arriving in this way at a methodological innovation *matrix* containing nine design phases, see Figure 2. And since these phases are ordered by a matrix, explicit distance is taken from a single linear ordering of design phases for concept innovation by design: concepts of new families of innovative products can be arrived at by taking any path of (adjacent) phases as defined by the matrix.

By the first of the two superimposed innovation models firms are operating with three innovation horizons simultaneously [1]: firms are extending and defending their core business (a short perspective *horizon 1*); firms are developing new business (a longer perspective *horizon 2*); and firms are creating viable options for new business (the longest perspective *horizon 3*). By the second model innovation is broken up in three steps: firms are identifying values for customers; firms are developing these values; and firms are communicating the developed values to customers [12]. Each innovation horizon and each value-process step now defines pair-wise a cell in the matrix, and each of those cells corresponds to a phase in concept innovation by design in the Philips Design method. For instance, the matrix cell on row 1 and column 2 corresponds to a phase of building an emerging business and communicating the associated values to clients, which is often done in the car industry when they create concept cars.

	horizon 3 (create viable options)	horizon 2 (build emerging business)	horizon 1 (extend & defend core business)
communicate value	aspirational promise	concept car	specific campaigns
develop value	innovative debate (probes)	Collaborative Innovation	Incremental Innovation
identify value	social cultural trends & narratives	future focussed persona research	people & market research

Figure 2 The Philips Design methodological matrix for concept innovation by design

A concept-innovation-by-design project can now take different trajectories through the methodological matrix. It can, for instance, start by identifying new values through analysing cultural trends (row 3, column 1), then test these values by design probes (row 2, column 1) and finally move to designing products in collaboration with partners (row 2, column 2) and to incremental improvement of the designed products (row 2, column 3). Or concept innovation by design can start by identifying values by ethnographic studies of social avant-garde communities (row 3, column 2), and then move to designing products (row 2, column 2).

This methodological matrix vividly illustrates the freedom claimed for concept innovation by design. Projects may start on row 3 in which no value is yet identified, rejecting pigeonholing the projects and rejecting the SMART objectives of specificity and measurability. Projects may be still made time-related, yet are in principle not so since they may follow a longer or shorter trajectory through the matrix. And realism is not more than a promise.

Towards SMART design methods for innovation

When considering the two methods as described in the previous section, it can be observed that both prescribe relatively well-defined phases for innovation-by-design projects. And although these projects themselves are not SMART, it may be possible to specify the phases they have to go through in a SMART manner, allowing that innovation-by-design projects are managed via the methods followed in these projects. This specification would mean that for each phase it is defined what its specific methodological aims are, how it is determined whether these aims is obtained, how realistic the aims are, and what resources – time, money, and so on – it may take.

Consider, for instance, the Hasso Plattner Institute method for product innovation by design with its six phases. The mere fact that iterations are part of this method means that criteria ought to be available for determining whether each phase has been concluded successfully. These criteria may at this point of the development of the method still not all be explicitly available – at the Potsdam Hasso Plattner Institute teachers still decide on the basis of their experience if a phase has ended properly[1] – yet starting points for such criteria can be found. For instance, it is instructed that tests with prototypes are meant as means for designers to decide between different options to further develop a design solution; prototypes should therefore be built for getting feedback from prospective users that is instrumental to only that decision [20]. The 'prototype' and 'test' phases become with this instruction SMART by being specific, measurable, assignable and realistic.

For the Philips Design methodological matrix for conceptual innovation by design similar SMART specifications seem possible. The design phase aimed at a concept car-style product (row 1, column 2) has a generic objective: the product to be developed should communicate predefined values to customers, which makes it a specific and measurable phase. The task is assigned to the designers involved, and a firm can set standards what recourses the development of a concept car-style product may take, making it a time-bound phase. Realism is more problematic: for this phase success means that the predefined set of values is indeed communicated to the customers concerned, and it may be expected that not each concept car-style product will be doing so; the methodological phases of innovation by design may, however, be made realistic by defining the *rates* of success by which these phases create the results aimed at.

SMART specifications are most probably not available for all nine phases defined by the Philips Design methodological matrix. Yet, in design research efforts are undertaken towards

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[1] Private communication.

these specifications; the phase of designing probes (row 2, column 1), for instance, has been analysed in detail [11].
When SMART specifications would be available for all the phases part of the methods for innovation by design, firms obtain again the means to manage it. For projects following the Hasso Plattner Institute method, designers and their managers have the means to check whether projects progress successfully through the six phases, and when projects follow a trajectory through the methodological matrix of Philips Design, designers and their managers have the means to determine if the individual phases are concluded successfully.

Towards a realistic perspective on innovation by design

SMART formulations of the phases in the methods for innovation by design will not only be beneficial to the management of innovation-by-design projects, it will also give a more realistic and constructive perspective on the prospects these methods may bring.
The prevalent view in the literature is that design will make innovation imminent; it is assumed that by copying Steve Jobs, Roberto Alessi or Philips Design, firms do obtain the means for arriving at systematic commercial successes through innovation by design. The literature on the Hasso Plattner Institute method echoes these high expectations by claiming that each of its six phases has a success rate close to 1 to creating useful results.[2] Yet, it is hardly to be expected that future managers who copy Steve Jobs, will all with certainty create products that are equally innovative and equally commercially successful as those that Apple has produced. More grim predictions compete with the prevalent view. For instance, Victor van der Chijs at OMA, the partnership for architecture, urbanism, and cultural analysis, maintains that in the creative sector 98 out of hundred ideas may fail, meaning that some phases in innovation-by-design methods have much lower success rates.[3] And even of the Hasso Plattner Institute method it is observed that it need not always lead to results that are technically, socially or economically feasible ([15], p. 115).
By now accepting that the phases in innovation by design have only a certain chance to yield the results aimed at, it is acknowledged that innovation is not a success term. Innovation by design can work, yet with a success rate lower than 1 (and hopefully higher than 0.02). This will make the expectations about innovation by design more realistic, and avoids disappointment when it does not always lead to commercial success. Knowing the success rates of methods for innovation by design also opens the way to improve on innovation by design: firms can choose for methods that give the most favourable rates for their projects, and design researchers can start working on developing methods that give higher success rates.
In short, by acknowledging that innovation is not a success term, and formulating methods for innovation by design in SMART manners, a more realistic view of innovation by design can be obtained that makes their management and development possible.

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