Changeability

Unfolding a Method for Learning and Designing in a Fast Paced Market

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CHANGEABILITY: UNFOLDING A METHOD FOR LEARNING AND DESIGNING IN A FAST PACED MARKET

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ABSTRACT
This paper addresses the discussion about how designers and design educations should consider the challenges of increasingly faster and unpredictably changing markets. By looking into the domains of software and web development, burdened with similar challenges of changing environments, the procedures of Agile Development are identified as a possible solution to the problem. The paper unfolds procedures of Agile Development in an attempt to utilise them as tools in the Industrial Design education. Furthermore, a set of learning structures from Cooperative Learning are proposed as a feasible way of introducing concepts of Agile Development in the curriculum of the design educations and how to evaluate these activities is discussed.

Keywords: Industrial design, agile development, change, cooperative learning, design education

1 INTRODUCTION

The days of meticulously planned and thoroughly controlled product development are gone! *Now* is a time in flux. Markets for lifestyle and fashion products are seemingly moving faster and faster, dragging other markets with them as they accelerate. The industries involved in this transition are challenged by the needs of faster and more dynamic navigation within their development processes. Even though this statement may seem provocative, it still holds a certain truth in its substance.
The statement could spark a discussion about the difficulties in changing the organisation around product development in order to adapt to the new and dynamic agendas of these markets, but it also raises questions about how designers should handle these accelerated market changes.

1.1 The present situation

An attention towards the first issue seems to have been growing during the later years, and the concept of “Time to Market” has gained footing as one of the main measures of successful product development. This attention indicates the acknowledgement of a gap between the moving markets and the development teams trying to keep up, resulting in products out of sync. Some industries use trendspotters and forecasts in attempts to improve their conditions in the competition of time to market [1], but when addressing “Time to Market”, what really seems to matter is the length of the period from the last point in time where changes in the specific design are implementable to the product ships, that decides the level of sync with market [2]. When considering the claim of increasingly faster moving markets, this understanding of “Time to Market” implies the importance of remaining flexible to changes throughout the development process.

1.2 The Problem: Design students and the fall of “traditional development”

The importance of remaining flexible is leading directly to the second issue raised based on the introductory statement, namely the question about the skills of designers. Industrial Design graduates are often met by the overwhelmingly fast pace in product development without mastering the corresponding tools when they enter the professional world. Hence this, new tools for handling increasingly faster changes around the development team and the product designer seem needed introduced in the industrial design educations [3].
The main question unfolded in this paper is therefore concerning how to accommodate the need of skills in managing within markets in flux through our design educations.

2 A PARALLEL SITUATION: LEARNING FROM RELATED PROFESSIONS

Throughout the years great efforts have been made to clarify and describe the various elements in the process of product development, and design educations all over the world have benefitted from this, preparing students for the real world of fast paced design practises. But even as the needed design and management skills of the next generation of designers are as numerous as never before, the research and optimisation on product development processes still seem to focus within the relatively narrow field of traditional product development practise.

In the considerations about how to strengthen the skills of the design students, the attention is turned towards other professions dealing with processes of creation under similar circumstances in order to learn about their way of working.

2.1 Emerging methods in the field of web and mobile software

During the last decades the software industry and Internet has gradually become more influencing on the way we organise ourselves and communicate with each other. The expectations to this relatively new platform as well as demands for new opportunities have pushed new ways for developers to handle faster development. A wide range of new and fast programming methods were developed during the late nineties [4] to accommodate this need, and in 2001 the Agile Manifesto was authored by these pioneers, thereby making some tendencies in Web- and Software industry explicit.

The Agile Value set

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan

That is, while there is value in the items on the right, we value the items on the left more.

Figure 1. The value set of Agile Development [5]

Agile Development has since the authoring of the manifesto (which also includes twelve principles not shown here) proven to be a highly successful alternative to traditional phased development in the software industry, enabling software- and web-developers to create solutions in sync with the fast moving markets [6].

2.2 Real-life example

With the discovery of an industry dealing with similar issues of product development, a case about professionals working with agile development is introduced. This case, found in the web development industry, is based on interview and outlined in the Figure 2 [7].

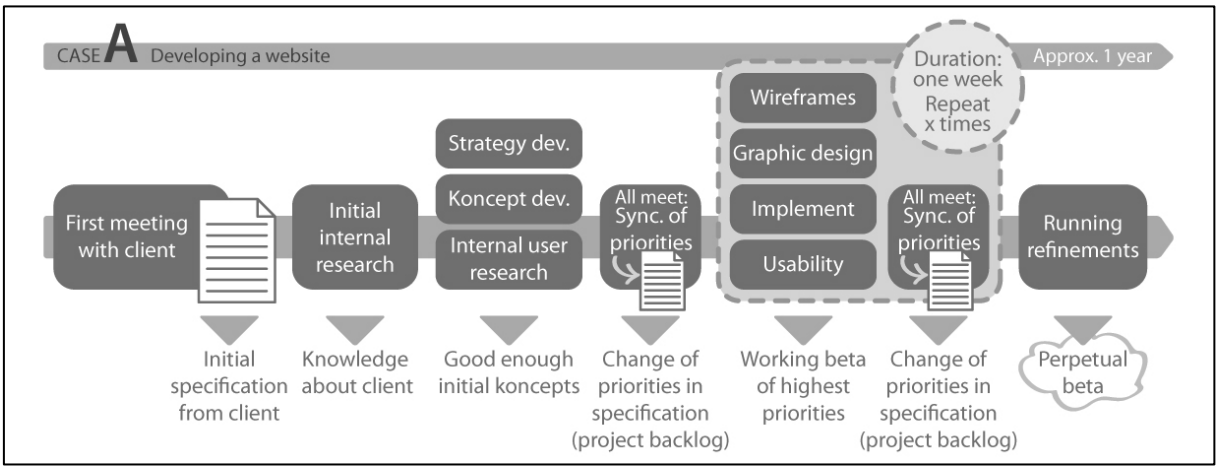

Figure 2. Case A: A development process in the web design company

Figure shows the development process of typical projects within the company claiming to use agile methods. The motivation for choosing this way of working is based on experiences of faster development and better targeting of the users.
What differentiate these projects from the traditionally top-down planned and phased projects is significant in regards to at least three aspects, which can be directly transferred to design educational activities:

A) Continuous reconfiguration of a dynamic design specification
Projects are initiated with a traditional project specification in cooperation with the respective clients. But after the initial meeting, the specification is treated as a highly dynamic "backlog", allowing for critical reviewing and rejection of the initially included sub parts as well as welcoming new ideas and initiatives to include and give priority. In opposition to traditional development, meaning following a pre-defined and fixed plan, the dynamic backlog embrace the emerging possibilities that shows up during the project period and that were impossible to predict in the beginning of the project.

B) Development process structured in short sprints
The task and product requirements in the backlog are periodically reconfigured and their priorities reordered according to the present situation. In-between these reconfigurations, the development team focus on the one or two product requirements in the backlog with highest priority. For the company in the case above, these periods, or "sprints", run for one to four weeks. By focusing the development team's effort on a small part of the project in these short sprints, the team is able to handle the otherwise rapid changes in the overall project settings, including the user needs and other market changes.

C) Simultaneous evaluation and development with "Working Prototypes"
Build into each sprint is the ambition of a "working prototype" as well as testing with the involvement of users. The working prototypes should meet the specific product requirements in focus in the respective sprints. The web development company found this close user contact and much more frequent testing highly effective as it resulted in faster feedback and a better understanding of the actual user needs. This was radically different from what they exercised in the traditional development process used earlier [8].

Altogether, these emphasized aspects of Agile Development improve the company's positions as being in tune with market needs. Acknowledging the usefulness of these procedures within the domains of web- and software-development, a transfer of some qualities from Agile Development to the domain of Industrial Design is unfolded in the following chapter.

3 BRINGING AGILE INTO THE DESIGN EDUCATION

Clearly there are differences between developing software and developing physical products. It is not only in the obvious difference between the production systems, where physical products, in contrast to software products with their non-physical nature, most often are significantly slower to manufacture. It is also the high level of "post-production flexibility" – the possibilities of launching software and web applications in beta stage – that makes non-physical products easier to adjust in correspondence to market change. Despite these obstacles, it may be fruitful to pursue an exploration of the benefits from Agile Software Development to the Industrial Design education, but before looking too much into how the introduction of Agile Development in design educations could be done, let us assume that agile procedures are learned most effectively by simulating close-to-real-life situations.

3.1 Creating a team based learning environment for teaching Agile Development

As outlined above, three key aspects characterise agile activities, and it seems natural to focus on bringing these specific aspects into play in the educational environment when teaching knowledge and skills on Agile Development to the design students. To recapitulate, the aspects are A) Continuous reconfiguration of a dynamic design specification; B) Development process structured in short sprints and C) Simultaneous evaluation and development with "Working Prototypes."
The next question surfacing concerns how to facilitate the teaching and learning supporting these aspects, but the answer to the question may be found in the origins of Agile Development: As the agile

procedures emphasise team based and multidisciplinary activities, it seems obvious to build the corresponding learning activities on this as well. Nevertheless, without being tightly facilitated to mimic real-life situations of changing environments, the team based activities will not alone be sufficient. The chosen teaching methods therefore need to allow for this, and Cooperative Learning could be a viable solution.

3.2 Cooperative Learning – A possible supporting learning method

Cooperative Learning has become widely used during the last 15 years and consists of a series of learning structures. The structures do not concern the educational content, but merely have the purpose of organising the interaction between the students which are divided into teams. The content of the exercises performed within the teams are tightly controlled by the teacher, and this Cooperative Learning setup therefore seems suitable for being one way of developing the design students' competences in Agile Development.

Content + Learning Structure = Activity [9]

Some structures of Cooperative Learning support discussion in teams, while others aim at assisting in sharing knowledge, gaining knowledge, evaluating and rating concepts, or simply delegating specific tasks. "Meeting in the middle", "Roundabout feedback", "Role brainstorming" and "Value lines" are just some of the approximately 50 structures of Cooperative Learning [9] that could be activated in the course. In addition to imposing the learning structures onto the students, the composition of the teams should also be carefully carried out. Heterogeneous or multidisciplinary teams are emphasised in order to spawn better and richer discussions. This fits well into the agile processes, as software development teams working with agile methods are often multidisciplinary and stresses the importance of diversity in the team.

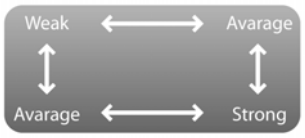

Figure 3. The team composition should avoid only consisting of students on same level

If utilised in a design education, the team composition will most probably not be of multidisciplinary character, as all students have the same educational profile. Nevertheless it is important to assemble the teams in a way that spawns as much discussion as possible. Equally strong students have a tendency to find discussion superfluous and too much will often remain tacit and unsaid.

3.3 Creating a scenario of an ever-changing environment

As just shown above, the learning structures need coupling with content in order to transform into the competence building activities and that is where the role of the teacher is important. In order to simulate a development project exposed to changes in its environment, the teacher should facilitate a scenario as close to a real-life project as possible, but compact in regards to surrounding changes.
The scenario could set out in an actual project in cooperation with a company, kick-starting the teams with a presentation of the project and a design brief from a company representative.
After this introduction, the teams are each required to come up with a "product metaphor" that brings forward the essence of the project [10]. This serves as a common leading star to the team and de-emphasises the initially presented design brief. This is important in order to accommodate *aspect A* from Agile Development outlined earlier: *Continuous reconfiguration of the dynamic design specification*. After these initial manoeuvres an iterative process of product development, that takes *aspect B* and *C* into account, starts. It is the responsibility of the teacher to keep this process running by varying the structures and impose changes to the environment surrounding the teams and their projects. Some possible changes are found in Table 1 below.

Table 1. Examples of simulated changes

Domains of Change		Examples of simulated changes
Customer requirements	→	New high priority requirement (maybe inspired from a 5-year forecast)
Markets	→	A "competitor" introduces an unanticipated and competing product
Technology	→	New emerging and disruptive technology
Zeitgeist	→	Major change in the Zeitgeist from a epoch-making event or disaster
Internal organisation	→	Changing team members or shortening the initial project plan

4 OUTLINING A PROJECT FLOW

As it has now been outlined, the Cooperative Learning structures serve as a team based framework for the activities, and the content is a simulated and compact project development process exposed to several changes during its progress. In Figure 4 below, the proposed project structure is shown.

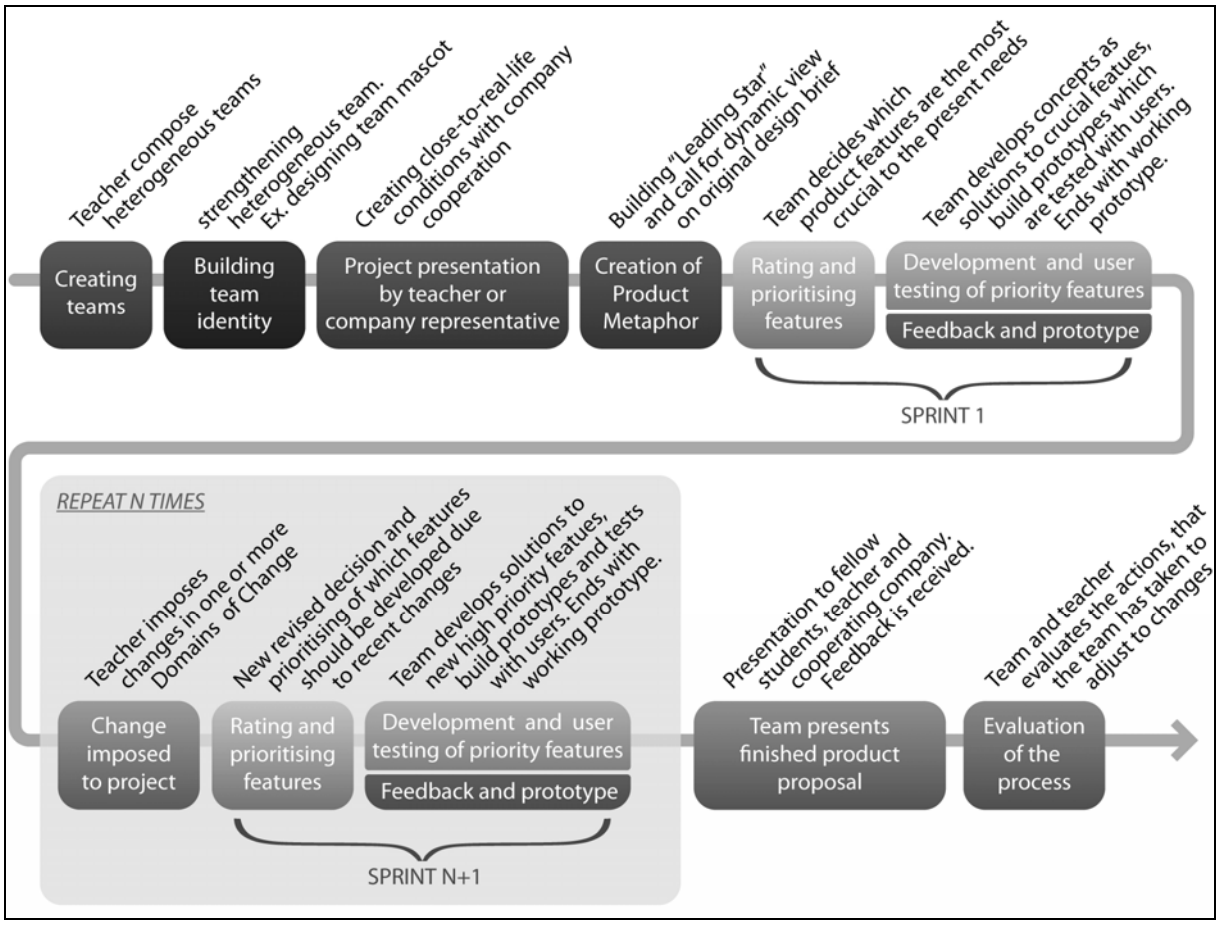

Figure 4. Flow diagram of a proposed project structure.

The project teams run through a series of iterations organised as the agile development process: Continuous reordering of the features according to the present state of the ever-changing surroundings followed by development of the features of highest priority. Each of these sprints involves user testing and prototyping.

5 DISCUSSION

Returning to the alleged weak spots of the way designers organise their development process, one could argue that Agile Development doesn't offer much new to designers or design educations, where solution focused and iterative loops are well-known phenomena [11]. Despite this, it is the believe in

this paper that Agile Development offers very structured and explicit ways of handling the sometimes untamed creative and iterative process of designers, while also maintaining a close connection to the state of the market all the way through the development process. Adding to this, structuring work with a dynamic design specification, such as the project backlog of agile software development, will encourage exploration and enable designers to unfold their creativity in contrast to top-down managed development. Agile Development also encourages early and continuously testing of prototypes with users, and thereby securing user-centred products and solutions.

5.1 Agility, Design students and evaluation of projects

Clearly, a project of the type proposed here could seem somewhat synthetic as it is a simulating a real-life development project in a compact way, but this may be the trade-off when trying to bring market dynamics into the educational situation. Still, design students should know how to deal with unstable situations, when entering the professional world after finishing their education. What has been proposed here is just one contribution to the discussion of how to achieve this, and whether or not it is an effective and successful way of for design students to gain competence in "Changeability" has not yet been tested nor evaluated.

The next step from here is to introduce this workflow in a course to test the applicability of it and also design a way to evaluate the process. One interesting way to do this could be to involve two parallel groups of project teams – five teams working by the principles of Agile Development and five teams working as traditionally phased development based on the initial design brief. The evaluation would then focus on the quality of the students' work. However, this may not be the best way to measure the effect of the teaching method. To do this, more in-depth going evaluation should be done, also including evaluation from the students, possibly through ongoing interviews about their learning experiences throughout the process.

Not included in this paper is the discussion about how the feature-focussed procedures of Agile Development apply to the design profession traditionally characterised by more holistic approaches to problem solving, and whether it is wanted or not. This paper merely attempts to unfold the potential of learning from a parallel domain with a successful solution to a common problem. Further investigation of the coupling of Agile Development and Cooperative Learning and their applicability in the design educations still needs to be uncovered. Hopefully, these initial manoeuvres outlined in this paper will spark further discussion and investigation of this field.

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