Collaboration for Innovation: A Product Management Perspective

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Abstract— When it comes to the development of new products, the product management has to encourage collaboration throughout all shareholders. The higher the number of shareholders, the higher the challenges towards cost, development time, delay, quality, and communication. This task has become even more difficult since social networks and online communities have gained popularity as a customer-driven innovation management (innovation pull). On the one hand social media facilitate a collaborative approach towards new product development, on the other hand they represent an additional artefact in the innovation process. In this paper we analyze the changed requirements towards the product management process and suggest a model that can help product managers to more efficiently assimilate information generated in the collaborative innovation process.

Keywords— new product development, product management, customer driven innovation, social media

I. INTRODUCTION

When it comes to new product development, the product management has to encourage collaboration throughout all shareholders of a company. The higher the number of shareholders, the higher the challenges against cost, development time, delay, quality, and communication. While the innovation process has been studied since the late 1980s [1], there are not many computer based applications that support this process [2]. Product managers usually rely on standard office software for document and spreadsheet editing, and email. Recently those have been extended by social media, cloud-based tools of information exchange. A number of companies have embraced social media in an effort not only to support their marketing activities, but also to enrich the innovation process with customer-driven products [3]. This “participation” culture [4] has changed the top-down product development process towards a bottom-up communication, where customers have the potential to actively contribute to new product development. Social Media however, do not only create advantages, but also an additional communication channel which increases the complexity in the new product development process.

On the one hand social media facilitate a collaborative approach towards product development, on the other hand they represent an additional artefact in the innovation process. Its main limitations continue to derive from failed or insufficient interaction between the parties involved in the process. Product managers need to critically review their innovation management practices and adapt to this development. In fact, today’s product development should be entirely human-centered [5].

This requirement lead to a number of publications on new product development lately, all striving to find „the right“ modelling technology for translating market needs in technical requirements and in commercially successful products eventually.

This paper provides an overview on current research in the field of new product development, and on customer driven innovation in particular. The paper is organized as follows: In section 2 we present related work and common paradigms in the area of collaborative innovation and new product development. In section 3 we describe our goals and requirements for the representation of the new product development process in the condition of user-centered design. In section 4 we present a model for its representation. The paper concludes with a discussion on limitations and future work.

II. BACKGROUND

Translating customer needs in technical requirements, and further on, technical requirements in successful products, has always been an ambitious goal for companies around the world. There is evidence that sustaining growth is a challenging task even for Fortune 500 companies [6]. Therefore companies increasingly focus on receiving and adopting product design impulses from the external environment, mainly the customers themselves. Popular tools involved are extended market analysis of customer needs, customer requirements and current state of technological development, mostly supported by statistical data on consumption and empirical studies. In a company using those methods there are still a number of shareholders and interfaces that influence new product development.
But when it comes to integration crowd sourcing methods in addition into the innovation process, the complexity of product management rises due to the exponential number of shareholders, interactions among them, and possible product features. E.g. in a company with 200 employees the highest possible number of opinions on a new product or feature is 2000. By opening the innovation funnel towards social media however it is potentially unlimited.

Since the implementation of collaborative innovation channels in an organizational new product development process is accompanied with high complexity and costs – a high initial investment for developing a computer based platform facilitating the communication through the shareholders, as well as a high operational budget involving the public in the innovation process, it is necessary to develop a systematic approach to managing its outcome.

III. COLLABORATIVE PRODUCT DEVELOPMENT

If we structure the new product development process in three general phases those would be [see Figure 1]:

- Customer requirements: The process of identifying, gathering, analyzing and prioritizing customer needs and the requirements towards new products such as functionality, price, design, accessibility etc.
- Technical specifications: The process of translating the prioritized requirements in technical specifications, in terms of device, channel, technology to be used, user interface etc.
- Product quality: Designing and implementing the business process that support product management in releasing the new product to market

There are several models in literature focused on the requirements analysis task.

Current research focuses on optimizing the product development platforms and the products themselves. There are several ways of increasing the fit between the second and third category from Figure 1. Most common approaches are standardisation of components, or modular design [7]. The importance of modular design for the industry is growing [7].

Modular design is commonly used to reduce costs in complex products, while increasing their quality and raising variety. To manage modular design higher abstraction modules have been developed, especially in software engineering [7]. Research on modular design focuses on the definition of commonality, components and measurement techniques [8], as well as on the interfaces between the modules [7].

In extreme cases, the process of open innovation can be extended to „telemanufacturing“ [9], meaning „an internet-based infrastructure which gives the general public access to layered-manufacturing/rapid-prototyping machinery“ [10]. Such systems provide end users, mostly consumers, with a service allowing them usually to send a file directly to the manufacturing facility and produce an object.

Lean management seems to be an appropriate alternative to tackling the complexity of the indicated problem. There is academic evidence that lean techniques can indeed enhance site management, achieve better communication through all involved parties, and improve product quality through an improved construction planning [11].

Another suitable approach would be „Living Labs“. It is a user-centered open innovation approach for fostering innovation in the real life context of customers [12]. Living Labs is a project launched as a regional innovation policy instrument during the Finish EU Presidency in 2006. The Living Lab methods advocate the introduction of „coordination agents“ to the design management [13]. The main disadvantage of this method is that its success depends to a prevailing extent on organizers skills and political willingness [14]. Lately, this approach has received much attention.

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<th>Method</th>
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<th>Technical specifications</th>
<th>Product quality</th>
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Systems engineering is another methodological approach towards the development of complex systems [15]. Lately companies have gained renewed interest in this method due to rising complexity of open innovation systems. The main area of application is in collaborative engineering environment.

There also are product management frameworks for the second step, e.g. agile development, system engineering etc. For the third step there are even highly popular and detailed implemented frameworks such as ITIL for service management. All those focus however on a “standard” innovation processes, i.e. without considering the “social consumer”. Furthermore, most frameworks are centered on the translation of customer requirements to technical specifications, or controlling the quality of the outcome products as opposed to the initial market needs, i.e. on transitioning from one phase into another. We could not identify any framework that approaches the innovation process in the context of collaboration with the consumer as a holistic process.

In this paper we propose an alternative model, which can be used throughout the complete new product development process and therefore more efficiently assimilate the information generated in the collaborative innovation process (a.k.a. open innovation). Our goal is to determine the main requirements towards such holistic model that maximizes its outcome while reducing complexity, i.e. the ratio of lost information, and the ration of wrong information, as well as the ration of not assimilated on entire information volume created.

IV. DEVELOPMENT OF A MODEL FOR COLLABORATIVE INNOVATION

A. Requirements

Our goal was to come out with an alternative model capable of mapping the complete innovation process of new product development throughout all shareholders group.

Throughout the literature review, and in expert interviews we identified four major requirements towards a product development model in the context of collaborative innovation. The main requirements towards the model are:

- **Completeness**: The model should map the information flow throughout all three steps of the new product development process [see Figure 1]
- **Actuality**: The model should be usable as an operative tool, and thus should always contain real and actual information, especial from social media sources
- **Customisation**: As an operative instrument it should be adaptable to changing conditions, working systems and growing or shrinking shareholders or shareholders groups, as well as evolving technologies.
- **Visualizability**: The model should be presentable in a workable way, meaning that it can be visualized in an user-friendly manner.

B. Shareholders

In a midsize organization there usually are a number of shareholders in the new product development process: governance, product management, project management, product design, product development, operations, support, marketing, financial management and sales. All those have their different agendas and their interest in introducing new products may differ substantially from each other.

In the context of collaborative innovation we add the to those the social customer, contributing to new product development by concisely or subconsciously providing information in his requirements, needs and problems.

In order to consider the additional shareholder in the innovation process we believe that these shareholders’ group, the one of the customers, should attain a substantial priority in the organization so that we could leave out some of the classic shareholders like marketing, project management, support and sales.

This model is suggested as a tool for product management so that we understand his role in the innovation process as an interface to all other roles. The product manager has the goal to apply the model, iterate and develop it, as well as to communicate its outcomes with the rest of the shareholders within the organization.

Therefore we focused on the three main shareholders groups:

- **Customers**: Social consumers, individuals actually buying the companies products, individuals that had bought the products in the past, but do not buy them anymore, individuals actively engaging in the open innovation platform through social media in their role as consumers.
Next to the shareholders, the three main elements of the model are the three general steps of the design management process:

- **Business Modell Customer needs**: Those represent the opinion of the shareholders group „customers“, as well as external influences like current or upcoming market trend
- **Technology map**: Those represent the information flow from the shareholders group „developers“, as well as internal characteristics of the company
- **Business process**: This is the point of view of the shareholders group product managers. Since business process directly influence the profitability of a business model and customer satisfaction and renewals.

The holistic model of the new product development process should therefore focus on enabling „information artefacts“ to „travel“ in all directions, as well as repeatedly be sent. At arrival redundant „information artefacts“ should however be recognized and handled.

### D. Model and Test

In Figure 2 we visualize the elements of the resulting model. The main goal of product quality (i.e. business process, see IV.c.) is at the top of the hierarchy being its final goal, and the single one that can secure sustainable commercial success. This element directly branches out to the customer needs as Phase 1 and Technical specifications as Phase 2 of the new product development process as discussed in Figure 1. We also connected the main shareholder groups directly to the business process head of the hierarchy.

After drafting the down the main components of the model and its characteristics we asked 12 companies to apply it in a real-life environment in the process of new product development for collaborative innovation. The companies were chosen on evidence of actually having user crowd sourcing since not less than one year. For this purpose they were instructed to perform a one day workshop and work themselves through the model – from left to right, and from top to bottom.

87.5% of the interviewees rated all three model categories: market needs, technical specifications and business processes, in Top 5 of the crowd sourcing leverages in their company. Through the interviews we could elaborate the sub-categories, e.g. explicit and non-explicit user requirements etc.
The main finding of the interviews was that assuring a transparent and sustainable information flow throughout the diagram is a key success factor to business processes and therefore to product quality. For this reason we introduced the term “information artefact” in order to handle or levels and weights of information in a standardized manner.

V. ANALYSIS AND CONCLUSION

We examined the design management process in the context of open innovation. We investigated current research in this field and identified a number of issues:

- Collaborative innovation is more complex than the “classic” new product development process
- Modeling techniques do not consider the specific process of collaborative innovation
- Current innovation process models do not follow a holistic approach towards mapping the information flow.
- „Information artefacts“ often do not flow transparently and efficiently between the different elements of the models.
- The new product development process in the context of open innovation requires a new model
- A model for mapping the new product development process needs a holistic view on all three phases of the process: customer requirements, technical specifications, product quality

Despite of the broad acceptance of modular design in the software engineering, it is still a new technique in most other technical
- We developed a draft of a holistic model for new product development in the context of open innovation and tested it among 12 companies that do apply open innovation
- We introduced the term “information artefact” and identified the importance of its flow throughout all shareholders of the process.

Though not confirmed in this research it is anticipated that the proposed model for holistic representation of the new product development process as described in this paper would enable a significant beneficial change in the information flow of „information artefacts“, leading to higher efficiency in the assimilation of information.
Specifically, the proper handling of the „information artefacts“ turned out to be a key success factor when using crowd sourcing tools. This was tested and advocated by twelve companies currently using crowd sourcing for more than one year. Thus the change towards a holistic approach enabling the flow of „information artefacts“ throughout the complete model would be very beneficial to achieving the overall goals of the companies adopting crowd sourcing to design new products and thus sustain growth.

REFERENCES