

ASPECTS ON COST AND TIME EFFICIENT NEW PRODUCT DEVELOPMENT

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ABSTRACT

Product development can have as intention to improve existing products – which is an aim with Lean product development. Product development intensions can also be to bring new products to the market. In that case new product development is an integrated part of the development of new product based businesses. Sold and implemented new products on the market are here called Innovations.

The fastest and cheapest way to develop new products to become new innovations is to start from lead user solutions, which means products developed by experts in their fields who also develop solutions for their own use but who think their solutions can be of use for others. In general, the longest way and also the most expensive way to develop new products seems to start with a “wish “and to create solutions, to develop the solutions, to test and improve them, to make user test followed by re-designs, etc. Between these two extremes of development starts there are many combinations, which the paper touches on.

1 INTRODUCTION

Product development of existing products is an essential activity for product based companies as it helps to be and stay ahead of the competition. Often that type of product development is rather straight forward.

The aim of new product development normally is to develop new products that can succeed existing products or open up for new user behavior. New product development often is demanding, expensive and time consuming as new solutions have to be found and developed (Björk 2009).

Traditionally, new product development has been based on satisfying a customer needs (e.g. Andreasen & Hein 1987) for which DfMA - Design for Manufacture and Assembly is of prime importance as product price is of great importance for the customers. The last decade a shift in the direction of User Centered Design has been growing meaning to satisfy user needs, wants and wishes (Ottosson 2006). In turn that means that a focus on DfU - Design for use/usability has been a reality for the product developers (Ottosson 2013).

Seen from a commercial point of view, starting the development of a new product from a wish, a want or even a user need, or maybe is not the most efficient way to get a profitable innovation. Therefore, in this paper we will view new product development in a broader perspective than what normally is discussed in product development literature.

2 RESEARCH

The paper is based on observations, experiences, and conclusions made on a large number of PAR - Participation Action Research cases (see e.g. Björk 2003 and Ottosson et al 2006) partly presented in a number of articles and conference papers. Some lately presented reports based on PAR are Ottosson 2013 and Ottosson & Sterten 2014.

2.1 Innovation aspects

We need new product development as an important part of the development of new innovations. In turn "Innovation is as essential to a successful modern economy as water is to life" according to EU Research Commissioner Maire Geoghegan-Quinn (2013). This hard drawn statement is based on the fact that innovation is necessary e.g. to bridge the gap between the present situation and critical new challenges caused by greater international competition, more demanding citizens, a growing elderly population, environmental challenges, etc.

"Innovation and technology drive everything from healthcare to education to election wins" (Hoque 2013)

"Today the public sector and the public services it provides are confronted by increasing demands, like how to manage the complex issues of demographic and climate change, or how to respond to user's diverse demands." (www.oecd.org 2013)

According to conventional understanding innovations (independent of definition of the term) are only done in the private sector (Mulgan 2007). However, in reality they have often been and are developed in the public sector or in the idealistic (non-commercial) sector. From the public sector we e.g. 1989 have got Internet (CERN) followed by the World Wide Web (DARPA). Titanium fixed new teeth and prostheses were developed at Gothenburg University. In the idealistic sector different open-source solutions have been and are frequently developed. When the new solutions in these sectors mature they often "migrate" into the private sector to become commercial products.

Thus innovations are created and developed in all three sectors although the aim of the work differs (Fig. 1). For the private sector the aim mainly is to create a sustainable profit. For the public sector the main aim is to give better service to the people in the society – the users. For the non-commercial sector often a better world – on the local or global scale – is the aim with the innovative activities.

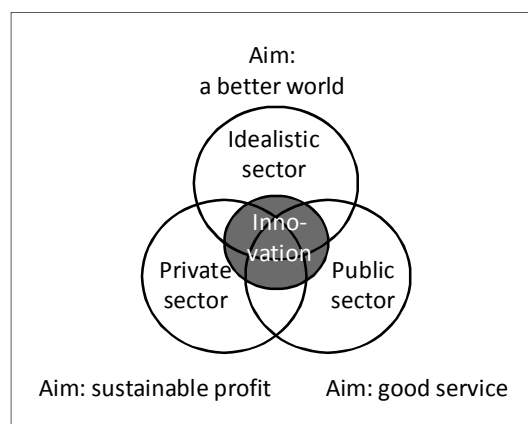


Figure 1: The aims to develop innovations in the three sectors differ (Ottosson 2014)

Within the public and idealistic (non-commercial) domains the "customers" get access to the new solutions often without paying for them in monetary terms. Examples of such innovations are education innovations, administrative innovations, political innovations, nursing innovations, cultural innovations, etc. For service providers in all three sectors one definition of innovation is to find "next practice" and not just "best practice" (Engholm Jensen 2008). Lean Product Development and Lean Production development often has the aim to find best practice.

Independent of if the development of a new product and/or service is to be developed in the private sector, the public sector or in the idealistic factor the provider is facing increasing regulatory pressure by the society and increased international competition. Of that reason, streamlining development processes is becoming a major priority for providers looking for to improve their market share, and to build responsible and sustainable activities.

Based on their development start, innovations can be seen as technological innovations or behavioral innovations (in the private sector often called market innovations). However, in the long run all innovations change our behavior. Figure 2 shows some examples of that.

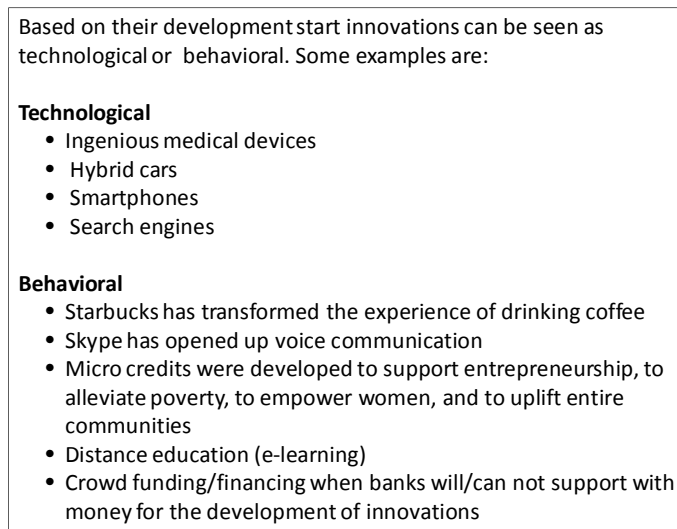


Figure 2: Some examples of technical and behavioral innovations (Ottosson 2014)

The term “innovation” seems to derive from the Latin “novus”, which means new or young or novel. Unfortunately there is no single accepted definition of the term “innovation”. However, in general innovation is defined as the process by which an idea, a research result or an invention is translated into new goods and/or services that have been taken in use. A short definition of innovation covering all sectors and situations might be:

Innovations are ideas for new products and/or services that have been developed and that have been taken in use or been consumed.

The term “innovation” is often combined with some other terms such as (Moore 2004):

- *Radical or basic innovation* – a breakthrough innovation which creates a new platform for following incremental innovations
- *Product innovation* – takes established offers in established markets to the next level (a type of sustaining innovation)
- *Process innovation* – makes processes for established offers in established markets more efficient or effective (also a type of sustaining innovation)
- *Application innovation* – takes existing technologies into new markets to serve new purposes
- *Experiential innovation* – makes cosmetic/surface modifications of established products or processes that improve customers’ experience
- *Marketing innovation* – improves customer touching processes e.g. by marketing communications or consumer transactions
- *Business Model innovation* – reframes an established value proposition to the customer or a company’s established role in the value chain or both
- *Structural innovation* – capitalizes on disruption to restructure industry relationships
- *Public sector innovation* - new or significantly improved ways of doing things, either within the structure of the public sector itself, or in the way in which public services are provided (OECD)

Seen from a user’s point of view a successful product innovation needs to satisfy four product values while only three values need to be satisfied for a service innovation (Fig. 3).

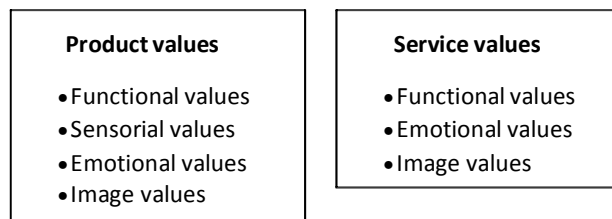


Figure 3: Product and service innovations have many similarities (Ottosson 2014)

At a deeper level the four product values are recognized as (Ottosson 2013):

- *Functional product values* are dependent on the technical solutions mostly hidden inside the product. The function can be simple as just filling out the space (e.g. a gas in a balloon or concrete in walls). It can also be advanced with all degrees between simple and advanced – e.g. an engine in a car has simple as well as advanced parts and systems.
- *Functional service values* are dependent on the effect the use of the service will have.
- *Sensorial (perceptory) values* are based on what we experience with our five classic senses (see/hear/taste/touch/smell) from outside and/or in contact with a product. The product semantics is an important part of these values.
- *Emotional values* are the passion/feelings we have for a product or a service. Product semantics can influence these values.
- *Image values* are based on the image we get of the product/service and what we think of it e.g. when closing our eyes. Brand names, patents, the image given on web pages, stories and the expressed experiences of the product by other users, etc., will influence and develop the image we have of the product. The product semantics can influence these values.

A metaphor for the product values is what we experience as a human being. Most of the functional values are hidden inside of us like the heart, the liver, the kidneys, etc. The sensorial values we experience from or through the “surfaces” as smell, sound, shape, etc.

The emotional values we feel can be anywhere between hate and love and is time dependent.

Image values are values at a higher level than, and outside, the product or service itself. Image values therefore can be said to be environmentally specific and are “ego-reinforcing”. The image values are based e.g. on what is known about the person’s education, occupation, rumors, etc.

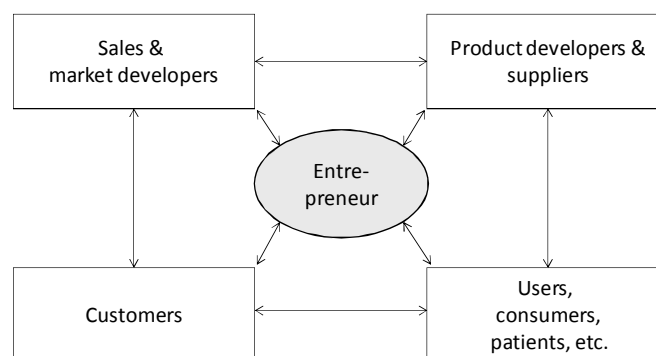


Figure 4: The entrepreneur is like the spider in a web

The process – the work - of transforming an idea, a research result or an invention into a new product or service is done as an *innovation project*. The innovation project leaders are often called *entrepreneurs*.

Entrepreneurial leadership differs radically from the conventional leadership used e.g. for the development of customer needs and for Lean Product Development. For an innovation project to be successful, it needs to contain sub-projects taking care of development, sales development, and market

development. The sales & market developers must be closely related to the potential customers while the product developers and suppliers must be closely related to the users and consumers of the products being developed (Fig 4).

2.2 Lean development and innovation

Existing products and processes can be improved by continuous improvement – which is the aim of so called *Lean development*. Continuous development in incremental steps of existing solutions means to fine tune solutions and ways to do things and does not have as aim to produce radical innovations. Thus Lean and Innovation are in general two different things although Lean development can lead to incremental innovations. However, both are needed in the short and long run for any organization, which figure 5 indicates.

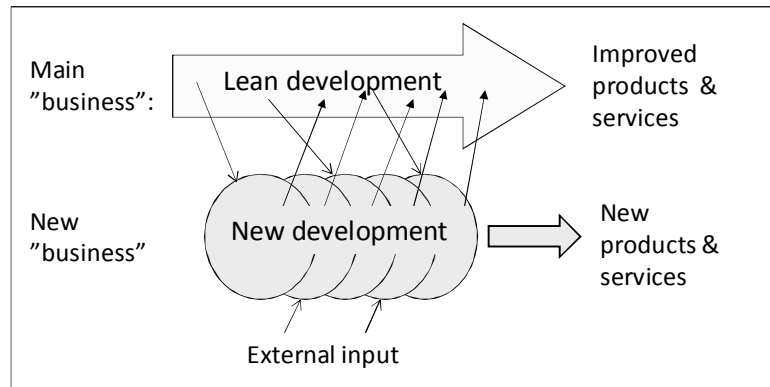


Figure 5: Lean development and innovation development have different origins

If a company, a municipality, a hospital, or a club uses knowledge and experiences outside the own organization that is often called Open innovation. The term is not well defined, but three possibilities exist to actively accelerate the flow of knowledge in and out of the own organization with the aim to develop new innovations (Fig. 6). By using external resources the knowledge base will be larger than only using internal resources, which can lead to a shorter and cheaper development of a commercial solution. A problem with Open innovation is how to handle immaterial rights when unique solutions are created as a result of the joint project. For public supported joint projects – such as EU-projects – that problem must be solved before the projects start.

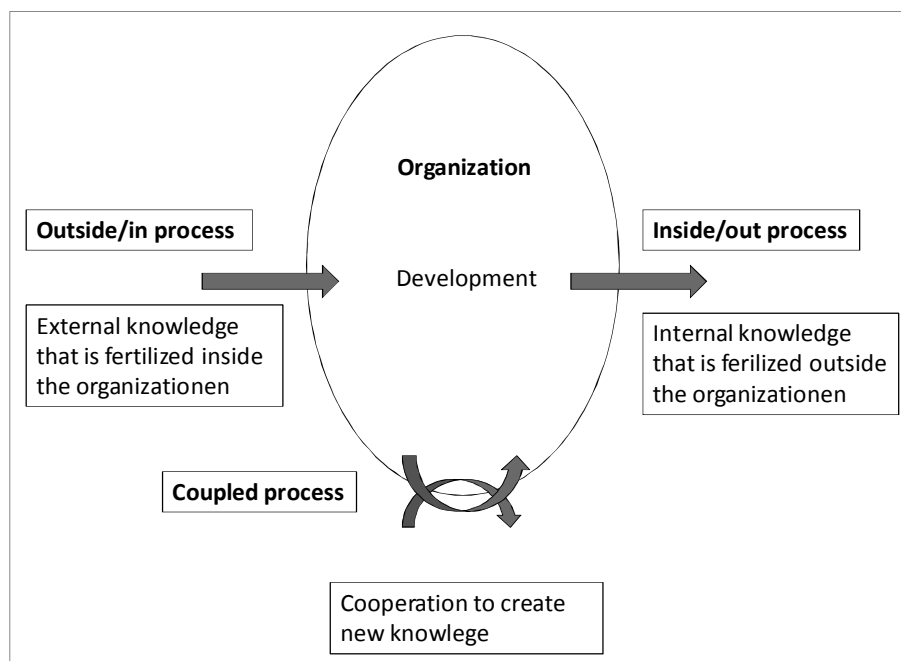


Figure 6: Open innovation means to widen the development base outside the own organization (Ottosson 2014)

2.3 Three different drivers of New Product Development

There are principally different drivers of new product development. They are based on the desire to take care of new insights, new knowledge. (called technology push in the private sector) or challenges (called market pull in the private sector) (Fig. 7).

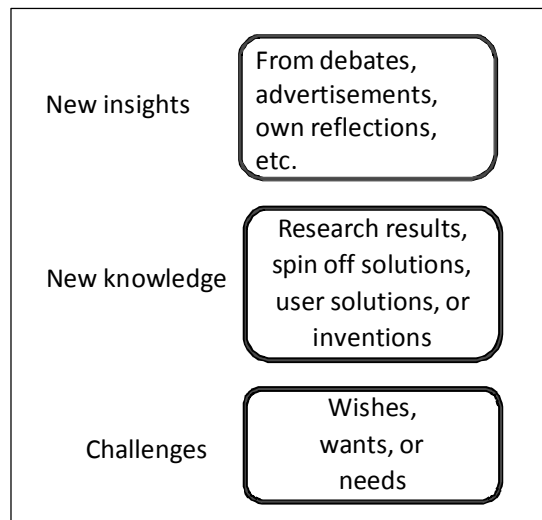


Figure 7: Three type of drivers for new product development (Ottosson 2014)

2.3.1 New insights

New insights are gained from following debates, judging advertisements, networking, by own reflections, etc. Based on the new insights ideas for product development can be formed. The new insights are used for creating own needs, wants or wishes for which existing solutions or own unique solutions are created.

2.3.2 New knowledge

Starting with new knowledge means to make use of research findings, existing solutions from commercial solutions (so called spin off solutions), user solutions, inventions, etc.

Research findings are from basic research in physics, chemistry and medicine as well as from applied research.

A *spin off solution* is a new solution derived from an existing solution.

User innovations are done by so called *end users* (Henkel & von Hippel 2012) and *lead users* (von Hippel 2005). *End users* develop solutions to their own needs without having in mind to sell them. Often the solutions can - after refinements e.g. by a producer or service provider - be innovations. *Lead users* are experts in their fields who also develop solutions for their own use but who think their solutions can be of use for others. One example is when a sportsman develops new equipment which results in her/his better performance. Another is when a surgeon develops a new instrument to be better able to do her/his work. A third is programmers making new software when they feel existing commercial products are not good enough. Generally, if lead users develop new solutions, the solutions reached are often of high quality and usability compared to when the solutions are developed in a traditional industrial way.

Inventions are solutions that can be patented done by inventors.

2.3.3 Challenges

Challenges are expressed by someone else and can be seen as user needs, wants, or wishes (Fig. 8). A *need* is normally concrete and existent while a *wish* is distant and at a high dream level. A *want* is something between these two extremes.

Circumstance	Type	Target	Planning	Stable condition	Unstable condition
Important knowledge and solutions are missing	Wish	Vision	Create, make and test	–	✓
Knowledge and solutions are incomplete	Want	Moving	Adopt to the situation	(✓)	✓
Knowledge and solutions exist to use in the development	Need	Fixed	Fulfill plan	✓	–

Figure 8: Differences between a need, a want and a wish (Ottosson 2006)

Starting with a need, a want or a wish can be likened with playing chess, poker, and a dice game (Fig. 9).


Chess (need)	Poker (want)	Dice (wish)
		
You plan way ahead	You plan short term but think long term	No planning possible
You have most of the information	You pay for new information	You get no new information
You know what you have got and what	You discover along the road what you	No cause effect relationship
Slow games	Fast games	Very fast games
Low risk taking ability	Larger risk taking ability	Very big risk taking
Often duce	Several winners possible	Stochastic outcome

Figure 9: Differences between playing dice, poker and chess (after Järrehult, 2006)

3 DISCUSSION

Which way is then the fastest, safest and cheapest to get a new successful innovation based on the different possibilities listed in the paper?

The fastest, safest and cheapest way to develop new products to become new innovations seems to be to start from lead user based solutions as they are tested what regards Design for Usability / User Centered Design and functionality. What remains of product development tasks for the solution to become a market ready product is to take care of other applicable DfX'es as well as the sensorial, image and emotional values. To make it to be an innovation also means many other tasks (see e.g. Ottosson 2013) as was indicated in figure 4.

One long, risky and expensive way is to start the development with a user wish as it means to create and test different solutions before probable solutions are found. Another long, risky and expensive way to start the development is to start from radical research results, and so especially from basic research as expensive equipment often is needed in that case. Sharing costs and knowledge, which is the aim of Open Innovation, means a way to go around that problem.

Between these extremes there are many combinations.

4 CONCLUSIONS

New product development is an important part of the development of new product based businesses. New product development is also an essential activity for product based companies to be and stay ahead of the competition.

The fastest and cheapest way to develop new products to become new innovations is to start from lead user based solutions. The longest, most risky, and most expensive way is to start with a user wish. Between these two extremes there are many combinations, which the paper has touched on.

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