



INVOLVING MASS CUSTOMIZATION AND LIVING LABS IN PRODUCT DESIGN AND DEVELOPMENT PROCESSES

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Abstract: *The starting point was the “Democratization of Innovation”. Eric Von Hippel keeping in mind the characteristic of “openness”, highlighted the significance of Open Innovation practices. Acting as a threshold, Open Innovation boosted Mass Customization and due to Frank Piller’s backing, it became the paramount of marketing strategies. Nowadays, a new user-centered strategy, known as “Living Labs” has emerged. Our aim is to reveal the deeper relation between Mass Customized products and those developed under the Living Lab concept. The creation of a product through a Living Lab practice and a Mass Customization process can be considered as a round procedure and not a separate production methodology. Namely, in a Living Lab, a limited number of developers identify the attributes and functions of a product or a service. Then, this product goes across the production line and takes, from a wider amount of end-users, a Mass Customized form.*

Key Words Open Innovation, openness, Mass Customization, Living Labs.

1. INTRODUCTION

During the last few years there is concern regarding the new form of innovation known as Open Innovation. This new direction enables production procedures, to take a more anthropocentric shape. Many researchers consider that new strategies as Mass Customization and Living Labs derive from the openness of innovation. As people getting more and more openminded new needs arise. Owing to this fact, new ideas should be generated.

New technologies stem from the new claims of production line, besides progressive marketing campaigns take place. Technology enables new value-chains to turn into a more network-like existence. Additionally, the user-citizen-consumer is becoming as much producer as consumer [1]. Thus, he exhibits into

the system of innovation where a great mass of ideas and knowledge are accumulated into a “pool”. As argued by Von Hippel and Thomke [2] the users are more often than the, manufacturers of technology, the source of innovations. According to them, users-customers are provided tools so as to design the product that best fits their needs. The basic problem is to overcome design and production limitations and integrate them to user’s requirements. By and large, a user can express himself through Mass Customized products and products developed in a Living Lab environment.

Referring to the first strategy, Mass Customization’s point of view addresses the need of applying new technologies, aiming to bring the user into the innovation process. It is not about handling people as “guinea pigs”, but about getting access to their thoughts and needs. In a Mass Customization process, the prime product is designed and given the basic characteristics by the manufacturer. As a next step, it comes through a mass production-like line and it is ready for use. The only issue that differs between Mass Customized and mass produced products is their final shape. Specifically, a mass produced product is ready for use, without allowing any intervention. On the other hand, a Mass Customized product has a shape of discrete matrices. These matrices are to be assembled by the customer in any way he prefers, shaping his own final product, i.e. Lego.

It is evident that, through all the surveys and projects which have taken place, the most of our interest is focused on Mass Customization. However, Living Labs is agnate to Mass Customization. In this paper, we firmly believe that these two strategies are inextricably linked.

Living Labs represent a user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts. The Living Lab approach strives to break the trial and error process of product development [1]. In other words, the goal is to eliminate the precarity while presenting a new product to the market. For instance,

Living Labs involve the consumer into the development process, ensuring highly reliable evaluation, resulting in a significant reduction of technology and business risks.

Concluding, the objective is to address the alteration between Mass Customization and Living Labs. Firstly, the utmost characteristic of a Living Laboratory is its ability to interact with the end-user in real-time conditions and in his own habitat. In a Living Lab environment, the user-developer is the person that frames the initial product and then the product can be customized and mass produced by the enterprise. Whereas, as been mentioned before, the product in Mass Customization, is already defined before been released to the marketplace.

Even so, all these mentioned are generally known. But the novelty is detected in the deeper relation between Mass Customization and Living Labs aiming to develop a satisfactory product or service.

The remainder paper is structured as follows: In Section 2, we briefly discuss the forms of innovation, with a view to the reader's introduction to the field of innovation theory. Furthermore, the main idea underlying a Mass Customization procedure along with its properties is presented in Section 3. In section 4 we attempt to approximate to the notion of a Living Lab. The correlation between Mass Customization and Living Labs is presented through a theoretical basis in the fifth section. When all is said and done, in the last section we recapitulate the facts and we gravitate to the contribution they have in new life circumstances.

2. THE FORMS OF INNOVATION

Innovation is a new way of accomplishing our visions. It may refer to the enrichment or the evolution of a new product or service.

Luecke & Katz presented one of the plethora of definitions concerning "Innovation": Innovation...is generally understood as the successful introduction of a new thing or method... Innovation is the embodiment, combination, or synthesis of knowledge in original, relevant, valued new products, processes, or services. It typically involves creativity, but is not identical to it: innovation involves acting on the creative ideas to make some specific and tangible difference in the domain in which the innovation occurs. For example, Amabile et al. (1996) propose: "All innovation begins with creative ideas... We define innovation as the successful implementation of creative ideas within an organization. In this view, creativity by individuals and teams is a starting point for innovation; the first is necessary but not sufficient condition for the second".

For innovation to happen, we need something more than the generation of a new idea or an insight. There is a high need of tools, rules and discipline. To this way, emphasis is put on a more general process of creation, progressive thought and action.

Innovation may be:

- A totally new product, unknown to the customers, produced from scratch
- A new production method
- A new target group
- A new supplier

- The preserve in the field of commerce

The same mechanism of choosing value, providing value and communicating value – as described by Lanning and Michaels – can be superimposed on the three horizons model of the Innovation Matrix (Fig. 1) [3]. What this matrix illustrates more than anything else is that there is a number of interesting and potentially effective new ways of capitalizing on innovations that arise from the identifying value matrix square in Horizon 3, which can be regarded as the point from which the whole process begins.

	horizon 3	horizon 2	horizon 1
communicate value	aspirational promise	concept car	specific campaigns
develop value	innovation debate (probes)	collaborative innovation	incremental innovation
identify value	social cultural trends & narratives	future focused persona research	people & market research

Fig. 1. The Innovation Matrix

As Werner Sombart said, Innovation and Entrepreneurship are the core of "creative destruction". Once you destroy something, something new is going to emerge.

At the same time, innovation has a dual action. Its first stream is Closed Innovation and the second is Open Innovation, where the latter supersedes the former, due to practical reasons. This diversification has been analyzed below.

2.1. Closed Innovation

Control is the key component for Closed Innovation. To begin with, every single industry has to manage the ideas, the production, the marketing, the distributions, the financing and generally every obligation needed. This type of innovation, domain during the 20th century and it is attributed to the total absence of Universities and governmental interest in the field of exploiting science [4]. This in turn, had a domino effect, while industries were organizing their R&D systems with the absence of any assistance. The lack of time and the imposition, in order to cooperate with external factors, caused to the companies autarky and insociability. Company's boundaries were sealed and impenetrable (Fig. 2) [4].

Gradually, a plethora of factors caused the erosion of Closed Innovation. Some of those factors are mentioned below:

- Workers' mobility
- Market extension
- Unused external ideas
- Capability for external suppliers

Those mentioned were the vital factors which contributed, in order to build a new knowledge market. Knowledge and information, are not any more company's monopoly, they belong to employees, suppliers, customers, competitor and universities. Thus, during these processes Closed Innovation changed into Open Innovation.

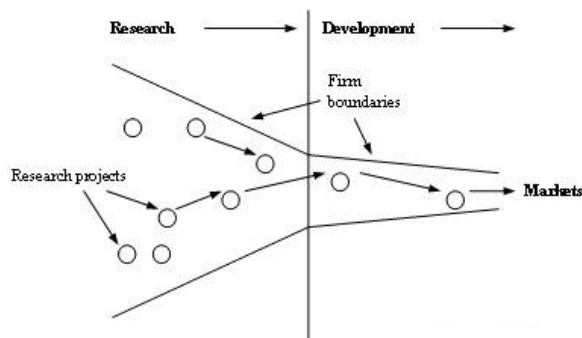


Fig. 2. Closed Innovation

2.2. Open Innovation

MIT professor, Eric Von Hippel introduced the “Democratizing Innovation” concept [5]. In his book, he insists on innovation communities and their significant role towards the openness of innovation. In particular, it is clear that users have no more reservations in revealing their innovative thoughts and actions.

But what’s going on with the informal cooperation between users and the formal cooperation in order to develop a product? In both cases, the answer lies at the leading actor of the procedure, the user-innovator. Users are able to use simple tools and create a product on their own. The utmost result is the change of mentality, Open Innovation in other words.

In a world where free speech and knowledge liberty take place, companies can no longer afford the financial weight of research and this is why they prefer to buy or even rent ideas and innovation from external stakeholders. This happens with the purpose of supplementing their internal innovative functions. Of course, it is apparent that Open Innovation is no longer a linear procedure, while innovation is distributed to more than one stakeholder.

All in all, the conclusion is that, a company acting under the umbrella of Open Innovation has penetrable bounds (Fig. 3) [4], so as to serve external knowledge relations between innovation networks.

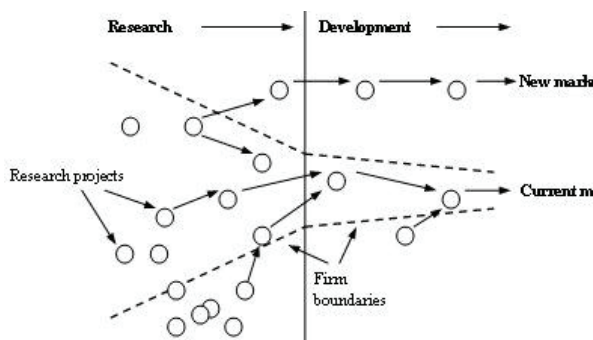


Fig. 3. Open Innovation

Yet, the amount of openness between industries differs. For instance, some companies choose to open up in some fields such as, product development, supplies, marketing. Nokia for example, considered product development as an in-house procedure. At the same time the 3D cell-phone development was an external matter.

In my view, it is highly significant to refer to creation nets, the forerunner of Mass Customization and Living

Labs. According to this concept, there is a number of collaborators who aim to create new knowledge, relying on each other’s information and taste.

Creation nets’ managers focus on three principles:

- Knowledge Acquisition
- Knowledge Integration
- Knowledge Exploitation

Concluding this subsection, a reference to the flows of Open Innovation must be made. Firstly, it is probable for the user to have luck of knowledge. Also, personal aspiration and mentality could cause trouble to the process. Other problems may be restrictions, market distinctiveness, the misunderstanding and the lack of communication between customer and vendor.

3. MASS CUSTOMIZATION

As a consequence, after Open Innovation, new strategies emerged. One of them was Mass Customization. Concisely, Mass Customization meets two converse principles at once. On the one hand there is the price and on the other hand is the personalization of the product. Price, quality, flexibility and velocity must be taken into account.

The notion of Mass Customization was born by Stan Davis in 1987 [6], who supported that, the more you personalize a product, the more competitiveness you gain. Joseph Pine described Mass Customization as the opposite of Mass Production. Hart & Taylor were convinced that Mass Customization is the use of agile processes, which aim to produce a variety of differentiated and personalised products or services.

Although 200 years has gone by the 1st industrial revolution, little progress has happened in industry. Nowadays time is valuable and productive processes seem to be endless. That’s why, to colossal strategies are in contrast. These are Mass Production and Mass Customization. But do they really differ? The secret of their ties is the fact that Mass Customization does not only focuses on production. But it constitutes Mass Production’s evolution.

Trying to integrate consumer in an Open Innovation environment, a new type of consumer, the “procumer” (producer + consumer) [7], emerges. By this I mean that consumers are also able to configure and shape their own products. Due to Kondylis, under this contemporary philosophy, people are independent and equal beings, with separated roles and rights without facing any social discrimination. In fact, the acceptance of uniqueness boosted Mass Customization, from a social point of view. Kondylis referred to “Mass Democracy”, but he was subconsciously referring to Mass Customization [8].

From a technological and industrial point of view, there is a dynamic relation between two competitive streams [7]. The one stream is Mass Production, where less people are needed in production processes and the other stream belongs to Mass Customization, where people’s involvement matters the most. A chart, which shows Mass Customization and Mass Production evolution through the years, follows (Fig. 4) [9].

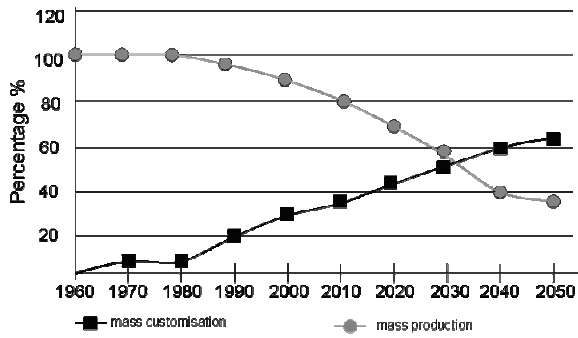


Fig. 4. The balance between Mass Customization and Mass Production.

Lastly, owing to thought and will for cheap but unique houses led to “Mass Housing” [7]. To further explain, any user can easily configure his house, with the assistance of appropriate “configurators”. Benros & Duarte [10] were those who paid the most attention in the field of Mass Customization.

3.1. Is Mass Customization worthwhile?

According to David J. Gardner discrete manufacturers struggling to apply Mass Customization practices so as to gain wider marketplace. The benefits are [11]:

- Reduce engineering effort per order configuration.
- Create a department devoted to innovation.
- Differentiation.
- Connection between customer and vendor-enterprise.
- Increase velocity, while new products enter the market.
- Increase customer satisfaction.
- Reduce product cycle times.
- Enterprises become leaner and waste eliminates.
- Inventory decreases.

4. LIVING LABS

Living Labs are Open Innovation environments where real life conditions do exist. User driven innovation is totally adapted to co-creation processes and Open Innovation Functional Region consists of SMEs Collaborative Networks and Virtual Professional Communities in a Public, Private, People Partnership.

In Europe, Living Labs are a very forceful tool in R&D processes. Thus, there is the European Network of Living Labs (ENoLL) [12] which is a European User Driven Movement. At the moment there are 129 websites correlated with Living Labs, with different scopes of interest. The 129 Living Labs network represent an impressive partnership of:

- Public bodies
- Companies
- Final users

In section 3, we discussed about Mass Customization phenomenon and this because it is the tie binding Open Innovation and Living Labs. As we have already mentioned, their common characteristic is “openness” [13]. Another reason why we correlate these marketing

strategies is the attention paid on the subjective and individual user needs.

With the purpose of covering new needs in a meta-capitalist society, new practices are indispensable. In Living Labs’ approach, users act as co-creators and constitute the core of the laboratory. Enterprises focus on user’s deeper thoughts and needs. Furthermore, this is the biggest gain for an enterprise, while all the previous years, companies were struggling so as to have access to this fount of knowledge.

For one thing, historically the Living Labs idea appeared during the 90s aiming to grasp new technologies in people’s own habitat [14]. The sheer fact is that, Living Labs were established in order to empower coordination in the European area and build a more anthropocentric profile. During the years, Living Labs have been characterized as environments, methodologies or systems. Undoubtedly, they can be used as an anthropocentric research and development area, where everything is co-designed, controlled and evaluated under open and co-operative real world’s circumstances.

4.1. The matter of Living Labs

What’s a living Lab? There is a great amount of definition about Living Labs and that’s because it is a really new field of experimentation. Folstad presented three classes for Living Labs [13]:

- Those for experience and experimentation in software, bears resemblance to open source practices.
- Those which function as Open Innovation platforms.
- Those where users interact with products and services in order to better develop and shape them.

Indeed, all three classes consider human to be the only source of innovation.

In addition, Living Labs have been defined as “*experimentation environments in which technology is given shape in real life contexts and in which (end) users are considered ‘co-producers’*” [15]. This definition differs slightly from the previous, but emphasizes on experimentation and not on research.

Needless to say, users are not “guinea pigs” but innovators. They aren’t also employees, but an interesting and interested group which contributes to productive processes. A Living Lab environment, with its stakeholders is presented in Fig. 5 [16].

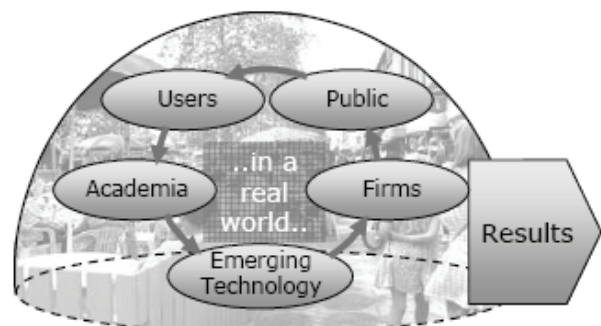


Fig. 5. The basic Living Lab idea.

4.2. Living Labs against conventional laboratories.

Due to Anna Stahlbrost, the basic principles, which far highlights the vast differences between Living Labs and Conventional Labs, are addressed below [17]:

- **Continuity:** This principle is important since good cross-border collaboration, which strengthens creativity and innovation, builds on trust, which takes time to develop.
- **Openness:** The innovation process should be as open as possible since gathering of many perspectives and bringing enough power to achieve rapid progress is important. The open process also makes it possible to support the process of user-driven innovation, including users wherever and whoever they are.
- **Realism:** To generate results that are valid for real markets, it is necessary to facilitate as realistic use situations and behavior as possible. This principle is also relevant, since focusing on real users, in real life situations, is what distinguishes Living Labs from other kinds of open creation environments and Conventional Labs.
- **Empowerment of users:** The engagement of users is fundamental, in order to bring the innovation process in a desired direction based on human needs and desires. Living Labs efficiency is based on the creative power of user communities; hence, it becomes important, to motivate and empower the users to engage in these processes.
- **Spontaneity:** In order to succeed with new innovations, it is important to inspire usage, meet personal desires, and both fit and contribute to societal and social needs. Here, it becomes important to have the ability to detect, aggregate and analyze spontaneous users' reactions and ideas over time.

Fig. 6 [18] also illustrates the differences between the two types of laboratories. In the first half of the figure, the new product is designed and produced with the contribution of a little amount of people. Then, it is released to the market, without having any opportunity to be altered due to users' desires. In contrast, in the second case, the product is examined by a big amount of users and given to the enterprise, so as to be produced with mass production practices.

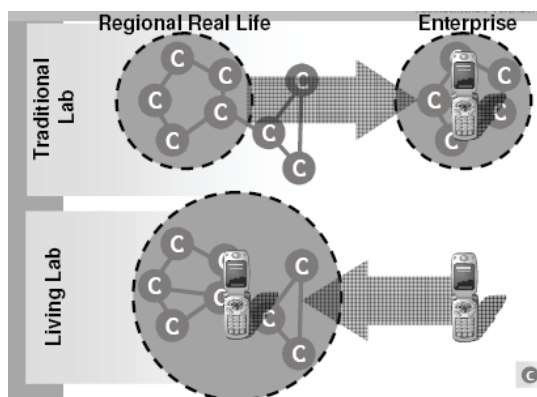


Fig. 6. Differentiation between the two types of laboratories.

5. RELATING MASS CUSTOMIZATION AND LIVING LABS

The creation of a product, or even a service, through a Living Lab practice and a Mass Customization process, can be considered as a round procedure and not as a separate production methodology. Namely, in a Living Lab, a limited number of developers identify the attributes and functions of a product or a service. Then, this product goes across the production line and takes, from a wider amount of end-users, a Mass Customized form. As a result, the enterprise takes into account the feedback provided by the end-users, so as to an ultimate product be produced with a mass production viewpoint. For a product to reach this point, this means that it has acquired its complete form that contains its purpose or goal of existence. This is what Aristotle calls "entelechia" [19].

The following figure (Fig. 7) portrays the whole procedure of developing a product. On the right half there is the Living Lab process, where the product is produced from scratch. Afterwards, information enters the enterprise and on the left half the Mass Customization process happens. Obviously, the process takes the shape of a French "8", which can last forever, if the product doesn't meet users' needs.

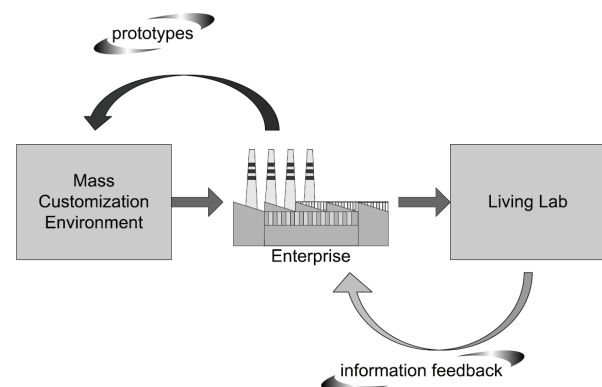


Fig. 7. Circular rout in product development.

As it has already been mentioned, there are some differences between the two strategies. For instance, a product, through a Mass Customization process, is shaped by the enterprise. What is more, the alternatives which are given by the "configurator", are also developed by the company. On the other hand, users have great agility and freedom to shape a product in a Living Lab. In particular, companies just give the idea of a product and then users give whatever characteristic they prefer to. The opposite value streams are given below (Fig. 8).

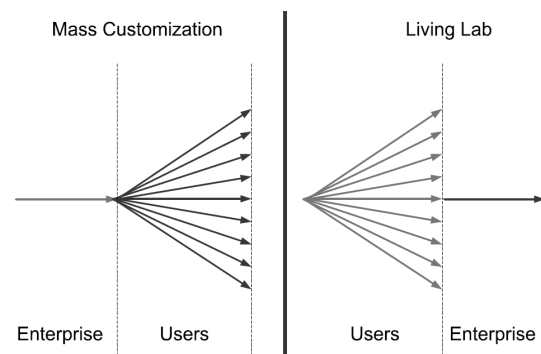


Fig. 8. The opposite value streams.

The aim of this paper is to illustrate the inextricable bind between Mass Customization and Living Labs. Customer becomes the producer of his own product and with his original ideas he also contributes to a “pool of ideas”.

6. CONCLUSION

Concluding the description of the circular process, we recapitulate the facts. From the one side, the vital characteristic of a Living Lab is the ability of a direct contact with the user, in his own environment and life conditions. Firstly, in a Living Lab, a number of users give to the product some basic characteristics and functionalities. Hereupon, the product crosses the product line, where its sub-products are produced, prototyped and reshaped by the end-users, through Mass Customization.

The outcome of our novel idea is that, Mass Customization and Living Labs are not linear and self-contained procedures, but they should be taken into account as a conjoint course. And this is because people in modern communities are disposed, to spend their money, where their needs are totally covered.

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