

USE OF TECHNICAL DEBT AS COMPANY INNOVATIVENESS VALUE MEASURE

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Abstract

Innovation management process implies the strong relation between innovativeness and organization performance but generalization of those interdependences stays limited by the lack of valuable predictors. Realized studies emphasize particularly in the context of emerging market the growing impact of organization learning on the company performance realized through the innovativeness triggering a research for new management tools. Their use becomes still delimited by the lack of incontestable predictors, thus the impossible generalization of realized implementations. Also, the notion of product innovativeness requires to be clearly defined and its dimensions have to be characterized. The expected relationship between the innovativeness and performance and its managerial attractiveness, remains than the organization strategic preoccupation and starts to be used as value creation process foundation particularly in the case of innovation based enterprises, where the business efficiency measure establishment is a must. Instead of conventional financial analysis, the new concept is proposed. Firstly, the term of innovativeness is analyzed and redefined with the application of technical debt notion, introduced by Agile Management concept. Then, basing on the use function definition and with the use of value chain model, the appropriate product definition is proposed. Hence the interesting opportunity to determine the innovativeness measure as concept integrated to the customer value creation process. Here presented with the regard to new technologies commercialization. Suggested construct can also serve to conceive the new management tools focused on cohesion of innovativeness and strategic planning process.

Keywords: Innovativeness measure, technical debt, product use function, customer value

1. INTRODUCTION

The notion of innovativeness within organizations gains considerable role in company strategy formulation process. However, the sources or stimulus of innovativeness stay still completely ambiguous, their impact on company market advantage becomes considerable and seems to be the driver of innovation based company development. Hence the question of innovativeness performance resulting in its measure system conceptualization applied to the concrete product. Actually, the importance of innovativeness in company performance enhancement becomes often attributed to the resource based view of organization [1]. This approach emphasizes organizational innovativeness drivers and their specifics coming from the company management process configuration, where the entrepreneurial and technical capabilities facilitate this establishment. Also, the use of value creation perspective seems to highlight not only the way that the innovativeness drivers stimulate the performance, but also the lack of its universal assessment mode. Globalization challenges enhance the strong impact on the introduction of innovation based market advantage and differentiation strategy. Alas, the utilization of classical financial analysis becomes too narrow to evaluate the company innovation closely associated with development and application of new ideas or new organizational construct often with no relation to antecedent solutions. This dimension of innovativeness concept begs the question about the possible determination of explicit and practical measure with possible use as new innovation management tools concept keystone. Thus, the formulation of such requirement entails the innovativeness notion detailing and then, connecting it to the customer oriented value creation frameworks. It is understandable, that the consequences of interacting the company innovativeness and the value creation

shall result in conceptualization of new - more reliable instrumentation for innovation management process, particularly in a case of new technology based companies.

2. PRODUCT NEWNESS AND INNOVATIVENESS - PROBLEMATIC MESUREABILITY

The managerial applications arise from the use of customer orientation in the case of innovative companies concern the operationalization of the innovativeness concept. From actual strategy perspective, stays important to remind the potential role of learning process in organization innovativeness [2]. The concretization of strategic management process complemented with the tenets of innovativeness theory shows the positive consequences confirmed by company financial performance. Also the architecture of pro-innovative strategic management process should consider the actual market nature shaped by the use of companies' diversification or differentiation strategies to optimize their offer portfolio. This last notion would be reviewed in context of company innovativeness effort, when the innovations commercialization becomes the used growth stimulation strategy [3].

Product innovativeness becomes the fundamental parameter for its future successful commercialization. Therefore, the growing impact of customer in new product development implies that this process should still be analyzed as the transponder of organization innovativeness into the customer value, reflected by successful market launch of innovative products [4]. New product development process viewed as innovation measure appear very complicated and ambiguous, involving lots of interactions thus entailing the use of complex adaptive systems as its descriptors [5]. Such complex perspective on company innovativeness notion concretization establish an interesting research area but at same time stays too circuitous for managerial uses.

The consequence of such statement is to reinforce management process with the strong customer orientation. In fact, the innovation based companies commit more costs associated with new product unexpected failures and those costs impact the company financial results. Also the new product remediating activity can be also analyzed as the important factor of company innovation success [6]. Company innovativeness perceived as its product newness assumes that consumers who desire new and different experiences are homogeneous with respect to their motivations and to the mental and physical activities initiated by these motivations [7].

The innovativeness also affects the customer behavior, hence the concept of innovator customer new product oriented. This idea of product innovativeness predisposes the customer role in its valuation - the product is innovative when it is new and when it possesses specific attributes to be evaluated by the buyer. Those product specific attributes are connected to the term of product use functions and often are the source of customer perceived value. Also the level of product novelty varies in function of different functional-hedonic values sourced in the use of new product. In consequence, the level of product innovativeness is proportional to range of offered use function, thus possible adaptation of M.E.Porter value chain as the model of innovative product composed of different use functions.

The described approach to the innovativeness is similar in certain points with its formulation proposed in the agile management conception [8]. Innovativeness is defined than as the ability to create change through the innovation and to respond effectively to the customer existing new attitude although expected or unexpected. Consequently the innovation can be understood as crating new appliance without the precedent. Agile management concept determines also innovation as non-deterministic process, different from optimalization, associated with the creativity and resulting in new utensil. Besides, the innovation is linked to the technology and to its excellence as the customer value driver. The Agile techniques are concentrated in case of development innovation project on technical debt reduction. Agile management uses firstly the notion of technical debt, in the context of innovativeness, to measure the ability of adopting the new solutions offered. Likewise, the innovative solutions value offer and its technical debt are closely interrelated and the intensity of this relationship affects the innovativeness. Technical debt can be also perceived as the difference between

actual condition of offered product and it's theoretically condition responding intimately to the needs of customers.

Hence the remark concerning the technical debt appearing moment, which is the result of time pressure arising from fast new product market introduction. If its accumulation is not controlled then diminishes future customer value because of a growing lack of customer responsiveness. In the case of a new technology based product, the technical debt value is zero. The main reason for this is the fact that new technology based innovations have no competition in the first stage of market introduction and, in this situation buyers aren't familiar with it. Those are also two main aspects characterizing the market innovation. Its consequences for technology innovations are; a nonexistent initial technical debt and the desire to satisfy future customer needs as the source of growth. In case of innovative product, the technical debt creation process is similar, but it intensification and interpretation differ. Firstly, commercialization of innovation offer imposes that its uniqueness makes value for customer, and at the beginning, this value is associated with hedonistic approach. In this period the technical debt doesn't appear, just like in case of new companies. Offered innovation proliferation results in augmentation of used product quantity and in growing time of its use. The technical debt dynamics is correlated with the time of customer use and also depending on customer attitude - hedonistic of utilitarian - manifested toward the product consumption. Those last are also the attributes of innovativeness. Wherefrom the possibility of observing the changes in technical debt accumulation depending on the consumer evaluating attitude of product. Admitting the correlation between the innovativeness and the amount of technical debt, it can serve as the base of use the technical debt as the measure of innovativeness.

Innovative product technical debt formation has its own logics, which differs from new introduced market product, by introducing subtle approach to its innovativeness basing on product novelty degree. This schematization can be seen as the simplification of innovation concepts, but at same time makes equivalent company and consumer perception of innovation. Introducing the innovative product means for customer the possibility of consuming something new - with any reference, incomparably, without antecedent. The purchase of innovative product gives to the customer the possibility of unique consumption, which make him incomparable to the others. In this period the hedonistic approach dominates and the client just learns how to apply the innovation familiarizing himself with its use functions. With longer use experience, the consumers acquire the knowledge about new product functioning and the conscience about its defaults appearing. Proliferation of innovation among the clients implies the domination of the utilitarian approach. This change of customer comportment is also associated the appearing possibility of innovative product comparative analysis. The client under the utilitarian perspective starts to compare possessed product with existing substitutes and to analyze the failures which results in standardizing its functioning - the quality of commercialized innovation is imposed.

Agile Management concept assumes that is that increasing technical debt directly reduces responsiveness to customers, which is can be extrapolated to product innovativeness level. More the product is innovative in the sense of novelty, the more customers will retard with the proposition of innovation improvement, the technical debt rise slowly, and with company available resources can be controlled. In case of innovation it's also possible to analyze the technical debt accumulation process as the measure of new product innovativeness interpreted as temporal lack of customer reaction. More the technical debt is reduced by the company the less innovative is its customer perception.

The gap between the offered product state and those attended by the customer becomes the source of technical debt. The company effort to satisfy these customer requirements stay more and more important - company is improving the product but only if the adequate resources are available also concerning the time. Otherwise the technical debt increases very fast and if company has no resources or no time to diminish it - the commercialization of innovation becomes ineffective and the value creation process is endangered. In this situation, despite possessed innovation, company cannot deliver it to the market because company cannot diminish the technical debt. Special situation can appear if the company proposed offer is rejected by the



customers being misunderstood by the market - the technical debt doesn't appear but also the proposed innovations physically don't diffuse.

Imposition of correlation between technical debt and innovativeness implies also its impact on consequent value creation process. Value creation in case of innovative product involves high degree of collaboration, which is often mentioned in mass customization perspective of company management process. Within this framework, the technical debt reduction can be perceived as the means of maximizing the future delivered value according the principle on which, the customer need satisfaction is the source of market advantage. The impact of technical debt dynamics will also influence the value prioritization of innovative products. The value prioritization in such situation will depend on the technical debt nature and dynamics. The concept described above, namely bases on a company's future product portfolio established with by means of the use function composition, enables a configurative innovation process. Which is particularly important in new technology based products where exists a very significant problem with assessing the degree of innovativeness. Low innovative products have a reduced potential customer value perception and contrarily - high innovative products are often undervalued because of technological complexity and insufficient customer recognition [9].

Hence appears the need for combining technology with the customer perception to form the base for new technology product development and to enforce the impact on the prototyping stage to enable market success. The proposed attempt to define technology use function is similar to its product connotation but its practical definition and valuation will become the source of product functions [10]. If the purpose of a product function can be described as providing value for the customer because of its usability for need satisfaction, the technology use function must be understood as the future source of market success of the new technology based product. This premise enables a basic parameterization in terms of cost, technical debt, technology life cycle stage and customer value.

The customer value of a technology use function will be expressed with the formula for customer perceived value = (utility + quality) / price [11]. This notion links the value perceived by customer with the utility of the product and, what is important in the case of innovative products, it doesn't relate to the competition. In this formula, value is the subjective appreciation of offered utility compared to the price, what means that product value can be determined by the customer's sense of offered utility. Often defined as the satisfaction experienced from use of the product. In this way the notion of utility consistently expands use function relevance and the customer perceived value increases in connection with the use functions development or with diminishing price.

When considering the customer perceived value ratio dynamics, it is possible to assume that in first periods of commercialization, company activities are concentrated on the utility as the decisive value factor and when product innovativeness softens the impact on the quality factor is amplified [12]. This is also implied in the technology life cycle model interpretation with the product concept based on the sum of use functions:

$$P = \sum_i^n Fu_i (dt_i, cpv_i) \quad (1)$$

where:

P - product,

n - number of use function included,

Fu_i - "i" use function,

dt_i - technical debt assigned to the "i" use function,

cpv_j - customer perceived value assigned to the "i" use function.

The importance of the last model can be also extended to use function value analysis where its assumptions are based on the technology diffusion performance stage distinction [13], hence the next tenet, which is the association between the new use function and new technology.



The first stage of this diffusion is an introduction, during which a new technological platform makes slow progress in performance during the early phase of its life cycle. Wherefore the technology is not well known and may not attract the attention. The second reason for this slow progress is the need for new technology translation into a new use function possible to practical and meaningful improvements in product performance. Then comes the growth stage with the rapid propagation of the new technology and of the derived use function. This stage usually begins with the emergence of a dominant standard which determines the characteristics of most products as well as consumer preferences. Furthermore, the renown of the standardization draws a large number of companies to study the new technological platform. Their cumulative and interactive efforts lead to rapid increases in performance and in quality. This rapid progress leads to increases in sales of products incorporating the new use function based on the new technology. The third stage is maturity. This is the period of slow technology propagation and market saturation. This maturation is due to less innovation activities because of the large competitive offer including the direct imitation and the loss of attractiveness for customers. The use of this perspective on technology based product evolution and the presupposition that the product is the aggregation of its use functions which derive from new technology application makes possible the conceptualization of a use function evolution model (**Figure 1**).

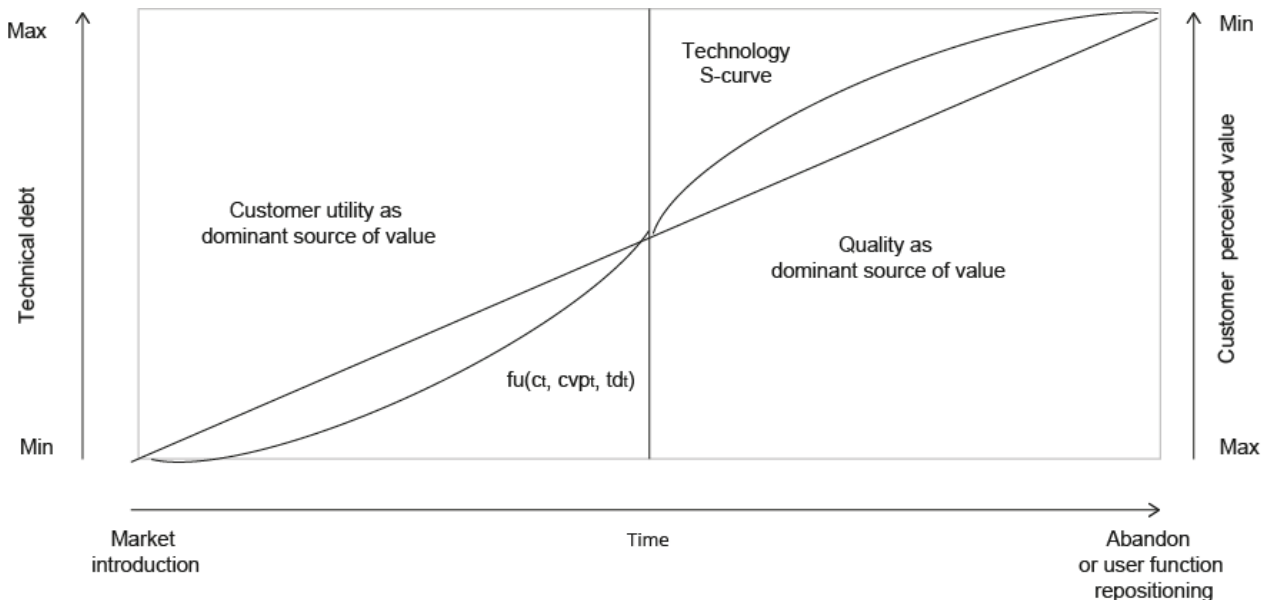


Figure 1 Conceptualization of product use function evolution model. Source: Own

The proposed product use function parameterization underlines its similarity to services offered to the customer [14]. This perspective on use function evolution enriches the conventional product models and can serve as the base for user centric design of the new product. Also the suggested measurement can be used for the mapping of customer value perception evolution of the offered innovation. The mentioned new technology base for product development can be seen as a leading idea for reaching a balanced competition advantage through the technical debt optimization of every use function proposed by the company. In effect, the assignment of technical debt to the use function can be an interesting manner either of new product or of whole company product portfolio configuration where the monitoring of use function technical debt dynamics results in financial potential for the new technology based innovation funding strategy seen especially in product portfolio development possibilities.

Hence, the innovation is the company new proposition of value offer, elaborated and produced with its consumer. This effect appears as the result of interactions between the company consumer and value offer through the adequate communication and production system. The main reason for this is the fact that new technology based innovations have no competition in the first stage of market introduction and in this situation

buyers aren't familiar with it. Those are also two main aspects characterizing the market innovation. Its consequences for technology innovations are; a nonexistent initial technical debt and the desire to satisfy future customer needs as the source of growth. Also the goal of creating a learning process based on the customer interaction with the company's technological innovations concretes later as a new use function. This insures the commercialization process and will be the base for a new product concept developed with the customer and by the customer. Observation of conceptualized use functions and monitoring of their evolution, seen as customer accommodation to new product features, becomes also the first step in new product design, specifically in the evaluation of its technological complexity.

The proposed repositioning of the use function is another aspect of analysis, which makes possible the visualization of the mix of future product use functions, or the redesign of the actual proposed product optimizing customer needs satisfaction. This doesn't base only on the customer interaction but also considers the actual and future costs of the introduced technologies. For this reason, the investment in design of new technology innovation can be easily controlled and its financial consequences can be determined even at the stage of market introduction. The integration of technical debt to the new product development process makes more predictable actual and future funding risks even when the proposed products have no market competition which is often the case of new technology commercialization.

3. CONCLUSION

The proposed optics on innovation management effectiveness based on product use function structure enlarges the possible area of its parameterization and implicates more generalist perspective toward the innovativeness perceived now more as the relationship between new product and its consumer. Potential adaptation of this approach enables the understanding of innovativeness as new interrelationship between company, its business offer (product or / and service) and consumer. This attempt at the innovativeness appears only if this relationship is stimulated by the communication process. This relationship can also be initiated, developed and terminated, when the information process get stopped and stays measurable. Thus, technical debt in the context of technology innovation will be used as an innovativeness measure. High innovativeness means a low technical debt - there is no reference for a new technology based product introduced to the market and the customers are only adopting the producer use function proposition as the unique source of offered value. Low innovativeness is characterized by technical debt growth as the effect of competition imitation and high customer responsiveness resulting from the use experience as the source of new needs identification. In fact, the trend of adaptation of the new product to changing customer needs undermines the innovativeness effect. The adaptation on the technical debt allows the parameterization of product innovativeness, establishing its value in accordance with the principle that bigger the technical debt the smaller the innovativeness of the product. The ideal product innovativeness based on technical debt use level shall equal zero in all period of market proliferation.

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