
Measurement of Innovation Front End – Foresight Approach

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Abstract: Front-end activities at the operative level can be summarized to include the following activities: opportunity identification, task definition, idea generation, idea screening and selection, concept development, concept testing, customer need assessment, technology verification, business analysis, and project planning. Applied to innovation, foresight provides a structured way to identify and capitalize on new market opportunities for long-term growth, at least two or more product (or service) cycles in the future. First, anticipation helps you to prepare for and take advantage of potential opportunities. Second, foresight lets you shape your own future in smart ways. The framework of the model for measuring the innovation activities front end contains at the first draft five assessment viewpoints as follows; input, process, outcome, social environment and physical environment. A connection with these elements in the measurement of innovation activities as a whole has been weak, but now these will be covered by the new approach, Balanced Innovation Front End Model, BIFEM, in combination with the foresight framework.

Keywords: Measurement; Innovation; Front-End; Future; Foresight

Introduction

A comprehensive measurement system dealing with the front-end phase of innovation process makes it possible for the people responsible for the innovation activities to get a picture of the efficiency of innovation process front-end and effectiveness of outcomes and impacts. This paper describes conceptually the theoretical backgrounds, a tentative idea and first managerial implications of a method, Balanced Innovation Front-End Measurement BIFEM, from the viewpoint of future orientation. We are going to develop and test this approach in 30 Finnish, German and USA companies during next two years.

(1) In this paper the theoretical background of innovation process itself and the role of front-end as part of this process is described first. (2) Second the clarity of foresight is discussed. (3) This is followed by a description of a earlier developed Quality Maturity Method by the writers. (4) Fourth the most crucial points from the viewpoint of measurement in the front-end stage of innovation process in the foresight framework are discussed. (5) Finally the conclusions and first managerial implications of a method in 5 Finnish manufacturing companies are described.

1 Innovation Process Front-End

According to McGrath, an effective core strategic vision steers new product development by giving a common target for the company [13]. In addition, the core strategic vision is a precondition for successful product strategy. In product innovation management, context strategies related to markets, products, technologies and R&D should be considered and integrated. According to Koen et al., activities of the front-end phase should be aligned with the business strategy to ensure an uninterrupted and fluently flowing “pipeline” of new products with value to the corporation [10]. Clark and Fujimoto emphasize that coherent strategic plans that facilitate smooth and quick conception and planning of new innovations, and help in maintaining corporate identity and consistency across innovations are increasingly important elements of product competitiveness. Strategic planning can also impose unnecessary constraints and hinder creativity and imagination in the early phases of the innovation process. Thus it is important to find a balance between overall strategic direction and responsiveness to a changing business environment. [4]

The literature identifies the strategic level front-end elements that form a basis for the operative level front-end activities to succeed, and necessitate company-wide support and top management participation [8]. According to Khurana and Rosenthal, these strategic foundation elements are a clear product strategy, a well-planned portfolio strategy and organizational structure [8]. The product strategy includes the formulation and sharing of the strategic vision, a product-platform strategy and a product-line strategy supporting and facilitating decision-making in the NPD. In addition to the strategic consideration of NPD initiatives, portfolio management considerations of existing products and ongoing development projects also need to be taken into account. In the innovation management context, this means the assessment of existing gaps in the offered product selection, potential risk aspects of development initiatives, and long-term market potential of planned products. Structural issues include the decisions and implementation of the relevant organizational structure, communication channels, as well as roles and responsibilities [8]. Zhang and Doll, in turn, propose internal powerful product champions, the involvement of external parties, and the way of organizing innovation activities as important foundation elements of the front-end [22].

The front-end models presented by Cooper [5], Koen et al. [10], [11], McGrath [14], Cagan and Vogel [3], Khurana and Rosenthal [9], and Nobelius and Trygg [15] include different front-end activities that are considered to be important in successful front-end execution. Based on these models and their discussion by the authors, front-end activities at the operative level can be summarized to include the following activities: opportunity identification, task definition, idea generation, idea screening and selection, concept development, concept testing, customer need assessment, technology verification,

business analysis, and project planning. These are the concrete work activities that upper management tries to influence by implementing control through different control mechanisms.

2 Clarity of Foresight

What exactly is foresight? Foresight is often widely interpreted as an ability to see into the distant future. Chief executive officer Shumeet Banerji of Booz & Company highlighted this view of foresight in his firm's growth: "Successful execution, in turn, requires foresight; every industry and government faces a rapidly changing world in which it is difficult to distinguish the important long-term trends from the noise." [23]

Other times, foresight is misconstrued as a knack for fortunetelling, and in literature, foresight typically stems from a supernatural aptitude for prophesy. In real life, however, foresight must be more than prognostication or speculation about the future.

Ultimately, foresight is a type of strategy focused on long-term prospects. Foresight begins with a solid understanding of long-range opportunities, leads to a flexible plan that embraces ambiguity and uncertainty, and follows with the ability to take action. In other words, a clear foresight strategy recognizes the complex world we live in, discovers a range of available options, and develops multiple ways to build the future, taking into account that there is no direct path to get there. With foresight, you see the world in terms of rich potential and possibilities. Part of foresight is learning how to look ahead and compare the likelihood of different opportunities. Learning from history, you can wisely apply the lessons of the past toward future activities. Moreover, you can combine different foresight methods to find relevant early solutions faster.

Applied to innovation, foresight provides a structured way to identify and capitalize on new market opportunities for long-term growth, at least two or more product (or service) cycles in the future. First, anticipation helps you to prepare for and take advantage of potential opportunities. Second, foresight lets you shape your own future in smart ways. Consider the popular Apple iPod that launched in 2001. By releasing this product, Apple was then able to deploy additional services, such as iTunes and Apple TV, and related products, such as iPod Nano and iPod Touch, based on the original product, ultimately creating an entire profitable product ecology that has dominated the consumer electronics market for years.

Further, for companies who seek truly sustainable solutions, foresight offers a way to think long-term. Sustainable means addressing the potential longevity of a solution. By using clear foresight techniques, opportunities in the far future can be linked to efforts today, so that current activities become even more valuable and meaningful years down the road. This long-term philosophy is the heart of sustainability, and philosopher Voltaire once wrote, "It is said that the present is pregnant with the future." A foresight-driven approach takes an integrated systems view, which is well suited in dealing with the complexities of the business world. This systems perspective ensures that all solutions are developed in a broad context. Although external changes and disruptions can happen quickly, the actual process of innovation takes time, giving you multiple occasions to plan ahead and adjust strategies.

With foresight, leaders will be more equipped to respond and think ahead of competitors – both in today's and tomorrow's environments. As innovation expert John Kao explained to an eminent audience: "Innovation is the capability of continuously

achieving a desired future state". [24] Knowing what and how to get to this future state is the essence of clear foresight.

3 Quality Maturity Method

Based on the earlier research [6], [7], [18], [17], [1], [2], [16] the structure of the BIFEM model lies on the structure of the Quality Maturity Method QMM and assessment method for national technology programs in Finland. The mentioned methods consist of a three-step procedure for the setting of objectives where the objectives of a technology program are divided into impacts, outputs and activities. In the QMM model the business viewpoint is corresponding with the impacts of the national technology programs assessment model, whereas in the QMM model product viewpoint is corresponding with the outputs of the national technology programs assessment model and, finally, in the QMM model implementation viewpoint is corresponding with the activities of the national technology programs assessment model.

The method for assessing the quality and maturity of R&D (QMM), contains three parts: the assessment model (framework, maturity level definitions), the assessment process and the assessment tools (questionnaire, 'quick assessment' form, scoring guide). The framework of the model for assessing the quality and maturity level of R&D contains six assessment viewpoints. The activities in each of the 6 viewpoints of the model will be assessed and scored by a maturity level, which are as follows: initial, repeatable, defined, predictable and optimising level.

The nature of time varies remarkable in the different phases of the innovation process. Depending on the situation, the status of time is linear or cyclic. This cyclic viewpoint is strongly stressed in the front-end stage of the innovation process and also dealing with the question of the innovation environment. More important than emphasize the process is to concentrate on the environment where the cyclic processes take place.

When measuring product development both the product development process and its results should be measured. As a benchmark, one should have both qualitative and quantitative measures and indicators. Quality approaches (Quality Systems, Quality Awards) it is as a guiding but crucial requirement to model a product development (R&D) process.

4 Measurement of the Innovation Front-End in the Foresight Framework

The framework of the model for measuring the innovation activities front end contains at the first draft five assessment viewpoints as follows; input, process, outcome, social environment and physical environment. A connection with these elements in the measurement of innovation activities as a whole has been weak, but now these will be covered by the new approach, Balanced Innovation Front End Model, BIFEM, in combination with the Foresight Framework. Next we introduce the Foresight Framework and concentrate on all of these five assessment areas of innovation front end.

How does foresight lead to the type of game-changing, heart-stopping, creation of an unfair competitive advantage that disrupts industries, creates new ones, and keeps competitors up at night? First, foresight is the acknowledgement that the future isn't sneaking up on us. We are creating it, planning for it, envisioning it. Gary Hamel and C.K. Prahalad note this lesson in their book *Competing for the Future*: "Foresight is not

enough to guarantee a profitable journey to the future. Yet without foresight, the journey cannot even begin.” [25]

When we look to the future with open eyes, we can begin to see the opportunities that are coming. Foresight is about understanding the situation today, seeking future opportunities, and intelligently creating innovations. It echoes what Peter Drucker described as the one trait he found in successful entrepreneurs, namely a commitment to approach innovation as a “systematic practice.”[26]

Based on our experience in industry and at different universities, including Stanford University, we have developed the Foresight Framework as a systematic practice. While we will briefly outline lightweight theory that build on the ideas of eminent thinkers like Hamel, Prahalad, and Drucker, this research is primarily focused on describing a set of foresight tools that let you get from here to there. With the combination of these methods, we believe you will be able to prepare successfully for the future and answer three fundamental questions: How do I begin looking for future opportunities? How can I create a path that anticipates the changes that will occur along the way? What can I start doing today that will help me get there first?

The tools are presented in three phases, which tend to overlap in real life. The first phase is focused on developing perspective, the second phase is focused on creating opportunities, and the final phase is all about discovering solutions earlier. Taken as a whole, each tool supports an integrated process.

In the selection of the measurement criteria two most crucial questions are:

- What are the objectives of measurement? and
- How can objectives be made measurable?

After we have linked objectives with attributes we have got the entity of measurable criteria.

In the selection of objectives we have several challenging issues to take into account. What is the reliability of potential objectives? Are there any reference data related to the objectives collected in an earlier measurements of the same company or in other partner companies? What other things than the product development have an effect on achieving the impacts? Also, it is important to see the entity of measurement criteria and interrelationships between the different factors [8].

Our idea is the framework of the model for measuring the innovation activities front end contains at the first draft five assessment viewpoints as follows; input, process, outcome (including impacts), social environment and physical environment. A connection with these elements in the measurement of innovation activities as a whole has been weak. The sub-objectives of these three assessment areas are presented in the Table 1., which contains a collection of objectives mentioned in this paper before.

Table 1. Main Innovation Process Front End Objectives, Balanced Innovation Front End Model, BIFEModel.

<i>Main objective</i>	<i>Sub objective</i>
Social Environment	Innovativeness Creativity Ability to implement
Input	Market growth Market orientation Customer understanding
Innovation Process	Determination of developing perspective Creating opportunities Discovering solutions Pattern recognition Concept idea/ Formal project plan
Hoped for Outcome	Goods Services Customer interaction
Hoped for Impacts	Market share Profitability Customer satisfaction
Physical (Artefact) Environment	Spatials ICT-systems Other artefacts (process descriptions, templates,...)

Criteria to be assessed become concrete measurable ones when the party responsible for the assessment makes decisions on the assessment criteria, corresponding attributes of measurement and the emphasis of qualitative and quantitative data. Attributes can be subjective or objective. We can have a notional scale with purely subjective measures at one end or measures based on absolute standards at the other [21]. Our ideas for objective and subjective attributes are presented in the tables 2 and 3.

Table 2. Objective attributes

<i>Attribute category</i>	<i>Attribute</i>
1. Currency unit	Turnover Increase in turnover Adherence to budget Economic performance in relation to competitors Production costs Net profit/ROI Development of quality costs by products
2. Pieces	Patents, publications
3. Persons	Number of personnel
4. Time (year, month)	Adherence to timetable Repayment time Throughput time of products
5. %	Changes in market share Product renewal rate Share of demanding products
6. Technical attributes	Technical performance in relation to competitors

Table 3. Scaling list for subjective attributes

<i>Importance</i>		<i>Input</i>	
very important	4	too large input	4
important	3	proper input	3
rather important	2	too small input	2
little of importance	1	insufficient input	1
<i>Goal setting</i>		<i>Attainment of set goals</i>	
		You can use here % too	
Very successful	4	Very successful	4
Successful	3	Successful	3
Some success	2	Some success	2
Poor	1	Poor	1
<i>Changing of set goals</i>		<i>Benefits</i>	
Very big changes	4	Very big benefits	4
Big changes	3	Marked benefits	3
Some changes	2	Some benefits	2
Little changes	1	Little benefits	1
<i>Difficulty</i>		<i>Successfulness</i>	
lot of problems	4	extremely successful	4
fair amount problems	3	very successful	3
a few problems	2	moderate successful	2
no problems	1	unsuccessful	1

5 Conclusions

Our first managerial implications in 5 Finnish companies illustrate that the future oriented innovation should be measured differently than in the more conventional context, since forcing people to follow rules designed for measuring incremental change will suffocate innovation. If the measuring system is designed for evaluating actions aiming to produce profit in short-term period, it is not valid for evaluating future oriented activities. Usually future oriented innovation projects change direction several times from idea conception to implementation. In the very early phase of the project the focus should be on learning, focusing and redirecting instead of reaching the milestones. Strict financial analysis or justification too early in the project can be misleading, because of the problems with market analysis. However, in spite of the uncertainty, there should be processes which create a sense of urgency. As such could be specified milestones which will determinate whether the funding will continue. Reward systems should take account of the

differences in radical and incremental innovation projects so that the system allows equal rewarding inside the organization. See also [19].

There are suggestions based on research how to overcome some of the challenges dealing with the nature of companies future oriented innovation environment. The following themes should be considered in order to create success of the measurement in future oriented innovations.

The organization should be challenged to do more than it currently does. Unconventional thinking and the need for new products should be made explicit and it should be made a strategic imperative. The goals should be set so that they prompt extraordinary results. However, the goals should be close enough to avoid paralyzing the organization and in line with and enable the current business objectives and strategies. Yet many future oriented innovation projects will not be successful, and therefore the financial expectations should be based on upon portfolio instead of individual projects. See also [19].

The needs to have an active process which spins the knowledge and ideas from the all parts of the organization as if everyone in the organization are participating the innovation process. It is essential to do this within the context of organization's capabilities with an understanding of appropriate markets and how the products are used. Furthermore, there should be awareness of the progress in a technology platform to enable the usage of it in new product applications. In any case the reduction of information cycle time is crucial for future oriented innovation. Therefore information networking both within the organization and outside of it allows more rapid identification of problems, solution sand opportunities.

Successful recruiting focuses on curious, especially entrepreneurial individuals. Rather than problem solvers they ought to be solution finders. Before one is able to create a future oriented innovation understanding the issue fundamentally is important. Therefore recruited ones should be especially skillful in this area. Rather than experts only in one area a more robust mix of other skills is preferable. A combination of business and technical insight, experience in external partnering and acquisition are found to be successful mix.

The senior management has an important role as a provider of support. They should be involved in the activity, committed to it and passionate to keep the project alive and champion the people all the way till the end of the project. Instead of using control-to-task approach managing future oriented innovation favors mentality of monitor-and-redirect thinking. Monitoring can be done through checking off assumptions as they are tested. The learning from these experiences could be then documented along with the decisions made of based on these results. It has been suggested that future oriented innovation evaluation could be based on the amount that was learned compared to amount of money invested in the project, rather than tracking task completion against budget and schedule. These learning results ought to be distributed within the whole organization so that the benefit of the learning could reach more than few people. See also [12] and [20].

The teams could be protected so that the concepts have a chance to incubate and develop. It could be done by providing isolated environment from the organization to minimize the distractions and pressures. It has been even recommended to spin the teams out from conventional internal organization. However, the problem might be that these projects are not regarded as part and parcel of the organization. Having a crisp and clear

vision for the total business and efficiently explicating it through out the organization is a tool to overcome some of these difficulties. See also [19] and [20].

The spirit of persistence and patience is imperative in the future oriented innovation. It is mediated by the senior management by their actions, such as staffing the teams appropriately and sustaining the support even in tough financial phases. The role of the senior management is cheerleading, since the future oriented innovation projects can be frustrating for the people involved. The proceeding of the project is characterized with series of starts and stops along with ups and downs.

The above mentioned viewpoints should be taken into account when we continue our journey to develop the framework for measuring the future oriented innovation activities in the front end innovation. The framework contains at the first draft five assessment viewpoints as follows; input, process, outcome (including impacts), social environment and physical environment. A connection with these elements in the measurement of innovation activities as a whole has been weak, but will be covered in the future with the Balanced Innovation Front End Method, BIFEMethod.

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