

Employment of External Resources in Innovation Processes

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Abstract

Enterprises maintain their sustainable competitive positions in dynamic markets by renewing their products and processes in business innovation processes. Small changes are obtained in incremental innovations. These are extensions of current practise and are usually implemented as part of daily operations without special considerations. Radical innovations introduce new business concepts, which require an ability to organize resources and competence in novel patterns. Enterprises extend their ability to develop new business concepts, their dynamic capability, by accessing external resources. This study proposes a model for empiric investigation of how such external resources are used in innovation processes.

Introduction

The purpose of this presentation is to investigate how the use of external resources varies in the course of business innovation processes, and how deployment of external resources is influenced by the nature of the innovation as well as by the context of the innovation process.

Business innovation processes require access to new resources, including competence (Bayer & Gann, 2007; Chell & Baines, 2000), which are frequently tapped from external sources. Many therefore consider better access to such external resources to be a vital policy instrument to support the innovative capacity of the business sector, especially for smaller enterprises. The term innovation system (Cooke, 2001) has often been used to describe the interaction between an individual firm, on the one hand, and firms and institutions that can provide such resources on the other hand. Innovation systems have received attention from researchers as well as policy-makers as possible instruments for improving the innovation capacity of enterprises. It is imperative that innovation systems are developed with a thorough understanding of how enterprises utilize external resources in their innovation processes.

This research is at an early stage. The objective here is to develop a research model through theoretical deliberations supplemented by personal observations from many years of working in and with enterprises in transition. The model will be tested empirically in a follow-up study.

Research Questions

There is a vast field of research concerning the utilization of external resources in business innovation processes with many interesting and important perspectives. This study has selected a small section of the field that we find essential to sustainable development of small enterprises. We will focus our study by posing three research questions:

1. What factors decide the use of external resources in innovation processes?
2. Are the same type and mix of resources used throughout the innovation process?
3. Are external resources managed similarly throughout the innovation process?

Business Innovation Processes

Business innovations enable enterprises to adapt to changes in the markets as well as to exploit new market opportunities (McDermott & O'Connor, 2002; Wolff & Pett, 2006). Business innovation processes are market driven in the sense that their objectives are to create utility to the enterprise through a stronger competitive position. This will be achieved through strengthening current positions or by capturing new positions in the market.

With the current rapid transformation of markets, enterprises would quickly stagnate and loose competitive positions without renewing. Such renewal is most often produced by several small adjustments, commonly referred to as incremental, stepwise or gradual innovations (op. cit.). In many cases, incremental innovations are implemented in the course of ordinary operational activities and hardly noticed from day to day. However, the cumulative effect of incremental innovations is usually sufficient to maintain a competitive position when changes in markets follow predictable patterns.

During times of dramatic changes in the business environment or when an enterprise intends to exploit completely new opportunities, incremental innovations will not provide sufficient leverage for rapid and large transformations. We refer to these large transitions over a short time period as radical innovations. They are also referred to with terms such as discontinuous or really-new innovations (Garcia & Calantone, 2002; McDermott & O'Connor, 2002).

New business concepts

Innovations may represent novelties in one or along several dimensions. They may provide new products or services to a market; they may introduce new technology to existing products; they may introduce new forms of organization of an enterprise or a value creation chain; or most likely a combination of the above since these dimensions generally interact. The fundamental issue is the management of innovation processes, which differs from management in general (Gemünden, Salomo, & Hölzle, 2007) due to the high level of uncertainty and application of novel competence.

The focus here is on innovation processes that are more than minor improvements of existing products or processes. Our interest is the introduction of products or processes that are recognizable novelties to the degree that they represent new business concepts, and will require special attention and provisions outside daily operations.

A new business concept is the spark that triggers the innovation process. It comprises thoughts on how the novel products or processes may be achieved from the platform of current operational concepts, that is, products and processes, combined with thoughts or estimates of the market effect of the

new business concept. The new business concept is conceived from the current state of products and processes in the enterprise, the current markets and a perception of future market opportunities.

The innovation challenge

In real life incremental and radical innovations do not represent a dichotomy. Rather, one will find a continuity of transition rates ranging from incremental at one end to radical at the other end. Innovations at different points of this continuum imposes different requirements on the organisation that hosts the innovation process (McDermott & O'Connor, 2002).

By definition, innovation processes address novel products or processes that require new capabilities or a new application of existing capabilities. Moreover, when the innovation requires interaction between an increasing number of components or subsystems, the complexity of the innovation process will increase rapidly.

The combination of novelty and complexity will define the conceptual distance, often termed the *leap* (L) between the initial and terminal status for the innovation process:

$$\mathbf{L} = \Lambda(\mathbf{novelty}; \mathbf{complexity})$$

As stated above, incremental changes are implemented over time as part of ongoing activities without special attention. The cumulative effect measured by the leap may, however, be just as large as for a radical innovation. Due to the time factor and the subdivision into many small steps of change, there is a significant reduction in the novelty and the complexity of each step. Thus the experienced *radicality* of the innovation will increase when the time for completion of the innovation process is reduced. The incubation period can be written as:

$$\mathbf{I} = \mathbf{T}(\mathbf{time})$$

We denote the measure of novelty by v , the measure of complexity by ζ and of time by τ and can then symbolically define a conceptual radicality index as:

$$\rho = \Lambda(v; \xi) / \mathbf{T}(\tau)$$

This radicality index is a symbolic representation of how an innovation is perceived. A high value for the radicality index will indicate that the persons that are exposed to the innovation will perceive that it will require substantial and rapid adaptation. A low value of the radicality index will indicate that that innovation will require minor adaptations with ample time.

The larger the leap from old to new products the higher value of the radicality index. The perceived magnitude of the leap is subjective and we propose that it is a function of the nature of the changes, the novelty as well as the complexity. But the experience of the leap will also be a function of the context, including the enterprise's capability and experience in handling innovation processes. The radicality index also proposes that the perceived experience of the leap will be more dramatic with decreasing time period for implementation of the leap.

We are here looking at the innovation process from a management perspective. How can the innovation process be structured and supported in order to maximise the probability for success, that is, to achieve the initial objectives? We posit that the more radical innovation, the more challenging the management of the innovation process will be.

Incremental innovations are usually handled as part of daily operations without extensive planning or attention. Radical innovations, on the other hand, require the firm to cope with novel challenges that need special attention and with decisions and control procedures (Gemünden et al., 2007). As the innovation process proceeds, new knowledge will be developed and old knowledge will be recombined in order to tackle the challenges posed by novel products and processes. The decomposition and structuring as part of the innovation process will also reduce complexity. Hence, the radicality index will be higher in the initial phases than the terminal phases of the innovation process.

This line of reasoning suggests that the quality and quantity of external resources will vary throughout the innovation process.

Stages of the innovation process

We propose that three phases or stages may be discerned in the innovation process with no distinct delineation between the stages: inception, development and implementation. Progress will normally not be linear within or between the stages. Due to the trial and error nature of development projects, iterations are frequently required to redefine intermediate solutions in the innovation process. The stages will therefore neither define the logical nor the temporal progression of the innovation process. Rather, the stages describe the progression from an idea to a completed and implemented innovation.

Inception We postulate that the innovation process in an ongoing enterprise has two starting points. The first is the combination of products, processes, resources and competence that constitute the existing operational concept. The second is a new market opportunity that arises through changes in technology, in policies or in competitive forces in the markets. The opportunity is most often subjective and needs to be identified and interpreted in relation to the objectives and capabilities of the enterprise. The outcome of the inception phase is the identification of a new business concept that will allow the enterprise to exploit the new opportunity in the market¹. This stage focuses on development of concepts and relies on creative abilities in addition to an ability to see practical implications without being unduly deterred by risk and unsolved problems.

Development The new business concept will be made concrete during the ensuing development stage. As this stage progresses, problems will be better defined and the quest for solutions will start. This will require a gradual transition from creative towards effective management methods during the development stage. The definition of problems and break-down into tasks represent a division and structuring that allow for the use of discipline specialists, such as engineers, to direct their attention to solving specific problems within the scope of defined design criteria. In this phase, existing knowledge and resources will be recombined; and new knowledge and resources will be accessed or developed. The development stage focuses on giving the new business concept a concrete form that can be subjected to pilot tests in the value creation process of the firm and in the markets.

¹ The new business venture will increase competitive positions through improved characteristics of existing products, introduction of new products or accessing new customers. Developments may be in processes (including marketing and sales) or in products.

Implementation Once the value and practicability of a new process or new product have been proven through testing, implementation of new processes may start internally and marketing and sales efforts can commence externally. This phase is often overlooked in the innovation process, but is essential for ensuring that the accrued costs in the two previous phases are compensated for by future income. External constraints as well as a strong discipline-orientation in this phase combined with well-defined milestones will push the process further in the direction of efficient and effective work methods.

Consistency between two major elements is decisive for a successful completion of the innovation process. The first element is the character of the innovation – what challenges does the innovation present. The second element is the capability of the enterprise to address these inherent challenges, that is, the capacity of the enterprise to muster resources and to act in a sufficiently dynamic way.

Innovation capacity – dynamic capability

Our observations over many years indicate that one frequent reason for the inability to complete innovation projects is the failure to dedicate adequate resources to the project. Especially in small organisations where each person has several tasks, innovation projects compete with daily operative requirements. A minimum requirement for success is therefore that there is redundancy or slack that will allow an organisation to absorb the workload and to provide the necessary competence. Another minimum requirement for success is that the enterprise has sufficient capital to finance the innovation process until the income from the new business venture starts to flow in. In the long run, the enterprise must also have capacity to carry the costs of risk.

The innovation capacity of an enterprise thus rests on the foundation of its resources, which have been accumulated as a result of previous activities. These resources have been shaped by the needs of the past and are subsequently applied in the current innovation process to respond to the needs of the future. The ability to come up with novel solutions will therefore depend on an ability to adapt the resources in response to the new requirements of the innovation process (Eisenhardt & Martin, 2000; Pek-Hooi, Mahmood, & Mitchell, 2004; Teece, Pisano, & Shuen, 1997).

Eisenhardt and Martin (2000, 1107) define dynamic capability as “...the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die.” The dynamic capability is thus the process at the strategic level that enables the enterprise to change the content, structure and organisation of the resources that are available to the innovation process. Correspondence between the dynamic capability and the dynamic change patterns of the business environment is essential for the long-term survival of the firm. Therefore, adequate flexibility in its dynamic capability constitutes a significant part of the core competence for a firm’s innovative sustainability.

The internal resources that are available to the innovation process will often need to be supplemented by external resources. The dynamic capability must therefore include practices to access alternative external resources in order to serve the important bridging function between the enterprise and its business environment. The dynamic capability has three main components in our research model. (1) The *resources* that are accessed and have a specific work capacity and capabilities that are related to the tasks at hand. (2) The *structure* or organization of the resources that are accessed. The structure may be closed and directed or open and searching, it may focus on control through acquisition and employment or on flexibility through partnering and hiring, and so on. (3) The actual *knowl-*

edge that is made available including general technological know-how as well as market information and the functional requirements of the customers.

Dynamic capability is multi-dimensional. Nevertheless, it may be illustrated by a linear continuum. The enterprise may choose a position on this continuum as part of the strategic development of its core competence. At one end, the enterprise may choose low dynamic capability in combination with high repetitive efficiency. This configuration typifies standardized products with low per-unit costs found in mass production linked to stable markets. At the opposite end of the continuum, the enterprise may choose high dynamic capability in combination with high flexibility. This may be very efficient for providers of one-off or small-series products produced to the purchasers' specifications. It is also appropriate in turbulent markets (Eisenhardt & Martin, 2000). This highlights that there must be correspondence between the characteristics of the firm's (chosen) market and its (chosen) dynamic capability. The match between the temporal characteristics of a firm's market and its dynamic capability is one of the central strategic choices of an enterprise and has been somewhat neglected in theory.

The dynamic capabilities are a consequence of how the enterprise configures its total resources including how it accesses, interacts, and relates with external resources. The dynamic capability defines the possible expression of its innovation activities and the innovation process will influence how the dynamic capabilities develop. There is a two-way interaction between the dynamic capabilities and the innovation process.

Research Model

The reason for using external resources in innovation processes is to improve the probability for success. We maintain that the methods for accessing external resources will also influence the dynamic capability of the enterprise – and in effect partly constitute the dynamic capability. For this reason, the methods for deployment of external resources in innovation processes will therefore have short-term as well as long-term effects.

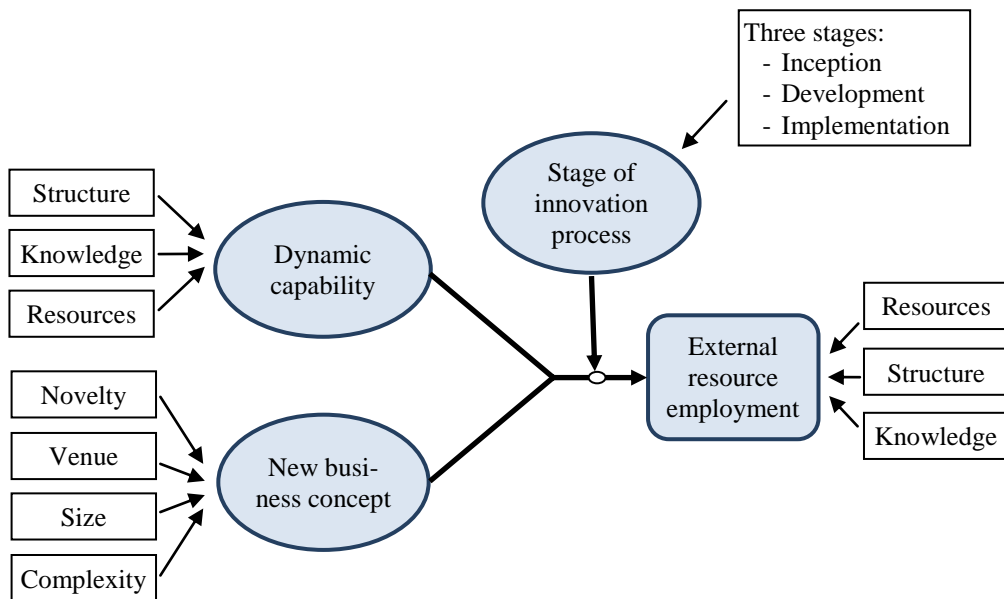
One sub-problem we wish to address here is related to managing the innovation processes, as outlined by the three research questions posed above. We intend to improve the understanding of how enterprises find and integrate external resources efficiently for varying requirements throughout innovation processes.

Each innovation process will be associated with developing one specific new business venture starting with an idea, which is the *new business concept*. Most often this will be organised as a project with a prospective utility. There is of course great variety in the character of innovation projects, and this variety will, together with the available internal resources of the enterprise, necessitate different employment of external resources. In our research model, the new business concept will be characterised by measures of *novelty* (new to world, enterprise, or market), *venue* (such as technology, process, product, market, or organization²), *size* (absolute and relative to the enterprise), and *complexity* (process and outcome).

The *dynamic capability* bridges the gap between the enterprise and its environment. As developed above, the dynamic capability may be measured by the variables *resources*, *structure*, and

² The vast majority of innovations cannot be univocally identified as belonging to one category (Simonetti, Archibugi, & Evangelista, 1995). Innovations will often combine new product with new process and new market.

Figure 1 Research Model - Use of external resources in innovation processes



knowledge. The resources and knowledge are partly intrinsic and partly extrinsic. The structure is, similarly, internal as well as external – but also bridging external and internal elements.

The use of external resources may be measured by the same variables as dynamic capability: *resources*, *structure* and *knowledge*. We postulate that the new business concept and the dynamic capabilities, moderated by the stage of the innovation process, will decide which and how external resources will be deployed. Therefore, the deployment of external resources can be interpreted as one manifestation of dynamic capability.

The research model is set out in Figure 1.

Testing of the model

Following presentation, discussions and possible modifications of this model we intend to test the model in two rounds. The first round will be case studies of five to ten enterprises in order to verify empirically the concepts, the measures and the relationships in the model. The second round will be a postal survey of a larger number of enterprises in order to test the validity of the model in different contexts of the innovation processes.

Discussion

The purpose of this paper has been to develop a model for employment of external resources in innovation processes that can be tested empirically. It still remains to develop the set of variables that may be used to attach measures to these concepts. Additionally, the discussion above illustrates that the concepts are clearly subjective as well as abstract. It will therefore not be possible to find a set of variables that are objective and may be measured by means of absolute and unambiguous scales. Testing of the model must therefore include characteristics of the context, the persons involved and the enterprise, as well as the concepts and causal relationships set out in Figure 1.

We have proposed that the dynamic capability is a significant independent variable and that employment of external resources is the dependent variable. At the same time we have argued that the mode of engaging external resources constitutes a significant part of the dynamic capability of the enterprise. This might appear to be a circle argument, but is not so for two reasons. First of all, we are measuring phenomena at different points in time, and therefore the measurements are different variables. Secondly, the dynamic capability of the firm includes but is not restricted to the employment of external resources.

Conclusion

Our purpose has been to develop a model that can be used to test empirically how external resources are used to facilitate business innovation processes. Based on the work of other researchers, our theoretical deliberations as well as our practical experiences we propose that the use of external resources constitutes an important part of the dynamic capability of the enterprises. The dynamic capability is therefore an explanatory factor as well as being further developed as a consequence of the innovation process.

Our intention is to test the model as a follow-up of this work.

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