

Sustaining Product Innovation in the New Economy: The Case of Siemens Switzerland

S. Wilson
Institute for
Manufacturing
University of Cambridge
CB2 1RX Cambridge,
United Kingdom

M.C. Dissel
CeTIM at
University Bw Munich
Werner-Heisenberg-Weg
39, 85577 Neubiberg
Germany

D.R. Probert
Institute for
Manufacturing
University of Cambridge
CB2 1RX Cambridge,
United Kingdom

B.R. Katzy
CeTIM at
University Bw Munich
Werner-Heisenberg-Weg
39, 85577 Neubiberg
Germany

Abstract-Today innovation is considered the main driver for growth in the new economy and it therefore follows that to sustain any competitive advantage, *continuous* innovation is a pre-requisite in most industries [1]. However, innovation is by no means straightforward and for large firms, this situation is further exacerbated when small, entrepreneurial firms react to changing market conditions quicker than the often slower incumbent. This paper examines and analyses the steps taken by Siemens Switzerland to meet the threat posed by such firms and the influx of disruptive technologies. In particular, attention is paid to the firm's development of a new dynamic innovation capability. The paper concludes with a model of activities that the firm have assimilated into proven processes for dynamic front-end innovation.

I. INTRODUCTION

Siemens AG, headquartered in Munich, Germany, has a long and successful tradition of operating in the telecommunications, electronics, power generation and more recently the computing and domestic appliances sectors. However, over the past five years the firm has striven to uproot a corporate culture viewed by many as unresponsive and lacking vigour. This has proved to inhibit innovation and has caused major concern as competition on all fronts began to intensify [2]. Consequently, an upheaval of existing practices has emerged as the major challenge to Siemens with its globally diversified operations base, its 450,000 employees and its \$46 billion annual sales.

This challenge has recently been taken up at Siemens Switzerland, a division of Siemens AG. Here, the transformation of the division into a knowledge-based organisation that embraces entrepreneurship as its defining culture is the key objective. This is nowhere more apparent than in the division's Enterprise Networks unit based in Zurich that provides bespoke communication solutions to the international telecoms market. Indeed, when faced with a newly privatised Swiss telecoms market in 1998, the turbulent nature of their local market led the

division to realise a new innovation capability was required. Therefore, in order to deal with the smaller entrepreneurial firms who were behind the disruption that was threatening their market share, they needed to respond quickly. They did so by integrating, building and reconfiguring internal and external competencies and processes.

This paper deconstructs this process and details the methods and techniques that have transformed the firm from being reactive to proactive innovators. By doing so, the key objectives of the research are met. These objectives are twofold. Firstly, the research attempts to draw out a practical approach to sustaining pioneering product innovation within large enterprises. Secondly, within the context of the resource-based view (RBV) of the firm, the research attempts to detect the presence of dynamic capabilities within the firm's innovation process.

The resultant findings tentatively point towards the development of a model for breakthrough innovation within large enterprises. Furthermore, a model is developed that illustrates the adoption of RBV principles in order to develop a dynamic capability for pioneering innovation.

II. THEORETICAL PERSPECTIVES

A. *Notes on Innovation Theory*

The literature on managing innovation spans four decades including the early seminal work by Burns & Stalker [3] with a host of other authors subsequently adding to an increasingly rich tapestry of work. However, as Drazin and Schoonhoven [4] adroitly point out, no significant work has yet emerged that incorporates multiple strands of the innovation research. Indeed in explaining this situation, the authors point out that few changes have occurred in the development of innovation theory throughout the last 40 years. They point to the fact that the theory

still has, at its core, three basic assumptions that allow it to be viewed from an “adaptationist perspective”:

“...1) innovation is universally desirable for organisations, 2) once an organisation increases its size beyond a critical mass it becomes more inert, less capable of meaningful organisational change, and only haltingly proficient at innovation and 3) certain structures and practices can overcome inertia and increase the generation rate of innovation.”

B. Managing Innovation in Large Enterprises – Some Elements of Theory

Focusing on Drazin & Schoonhoven’s [4] three basic assumptions sets the background for the empirical work documented in this paper. The organisation under analysis is part of a very large corporation who had become more inert and unable to sustain pioneering product innovation. A review of the literature specific to this phenomenon reveals that several authors have undertaken research on the subject, most focusing on organisational antecedents. For instance, Kanter [5] describes the effects of the firm culture on product innovation, Quinn [6] looks at leadership issues whilst Van de Ven et al [7] analyse a number of factors including leadership and the organisation infrastructure. Leonard-Barton [8] also examines leadership styles but in the context of creating innovative climates through flows of knowledge that firms can harness into their innovation processes. Several other authors also cite knowledge management issues as crucial to *breakthrough* innovation [9, 10, 11]. Finally, a number of scholars have analysed the importance of entrepreneurship activities within the corporation that aid the process of discovering and developing breakthrough product innovation [12, 13, 14, 15].

However, an added complexity with large firms sustaining innovation lies with those that operate within in hi-tech sectors. Here the need for quick responses to ever-decreasing product life cycles brings its own particular challenges. As Leonard-Barton [16] explains, larger firms have the pitfall of core rigidities¹ to avoid. These rigidities could in turn stymie any attempt to redevelop an effective innovation process. Nevertheless, large firms do have extensive access to competencies and capabilities through their size alone. The challenge then becomes

¹ Core rigidities as defined by Leonard-Barton [8] are the flip side of core capabilities and are grounded within the same aspects: physical systems, managerial systems, skills, knowledge and values. They are thought to emerge when firms become insular due to sustained periods of success or when they fall prey to extremes by overshooting the optimal levels of best practice on either products or services. They can be avoided by the regular evaluation and deconstruction of a firm’s business systems in order to overcome static processes.

trying to reconfigure resources within fast changing environments. Therefore, to meet this challenge it is perhaps appropriate to explore the underlying theory, and integrate the concepts of, dynamic capabilities and the resource based view of the firm.

C. A Dynamic Capabilities Approach

The emerging literature on dynamic capabilities draws on the concepts of the resource-based view of the firm [18, 20, 21, 22, 24] that states that the firm’s resources are an essential basis for innovation.

“*The resource-based view of the firm (RBV) is an influential theoretical framework for understanding how competitive advantage within firms is achieved and how that advantage might be sustained over time...*” [18].

Within this perspective, firms are conceptualised as “bundles of resources, which are heterogeneously distributed across the firm, and where resource differences persist over time” [18, 19]. Indeed, when firms have resources that are valuable, rare, difficult to imitate and non-substitutable they can implement value-strategies that resist duplication by other firms and hence create a competitive advantage [18].

Furthermore, according to Eisenhardt [18], the concept of dynamic capabilities is based on “antecedent organisational and strategic routines by which managers alter their resource base” (acquire and shed resources, integrate, and recombine them) to generate new value-creating strategies [22, 23]. Moreover, in the context of turbulent markets in hi-tech industries, the resource-based view has provided a dynamic concept that focuses on the capabilities a firm should possess to approach uncertainty and maintain competitive advantage [20, 21]. These dynamic markets show rapid and unpredictable change that lead to shifts in the competitive landscape [18]. Firms should therefore have the dynamic capability of anticipating these shifts by “integrating, building and reconfiguring internal and external competencies to address their rapidly changing environments” [21].

In addition, Teece *et al* [21] have proposed that dynamic capabilities are the result of the co-ordination of a firm’s distinctive managerial and organizational processes, shaped by the firm’s specific asset positions (for example its technological or knowledge endowments) and moulded by the evolution path(s) it has adopted or inherited.

Fig. 1., in accordance with the above definitions, illustrates how dynamic capabilities evolve. Paths relate to a firm’s strategic options and the presence or

absence of increasing returns therein². Positions are defined as current specific endowments of technology, intellectual property, complementary assets, and knowledge assets. Processes relate to the managerial and organisational routines that reflect the firm's current practices [21]. These processes and positions collectively encompass the firm's competencies and capabilities. Projects are viewed as mechanisms to establish the processes [24].

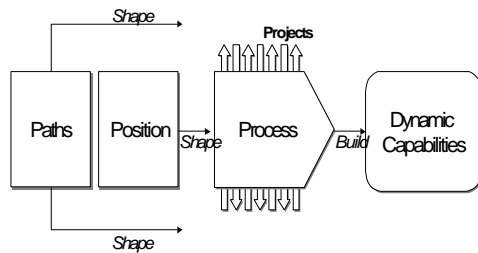


Fig. 1. Evolution of Dynamic Capabilities. [24]

Within the focus of this research, the competences inherent to the firm's development of a new dynamic innovation capability are identified and explained. They are subsequently illustrated as the firm's positions and processes within an evolutionary model of the Siemens's dynamic innovation capability.

III. METHOD

The research methodology for the empirical work followed the case study approach referred to by many authors as a reliable and valid method for carrying out qualitative research [25, 26]. Semi-structured interviews, an accepted method for gathering case evidence [27, 26], were used as the main data gathering technique. Senior management from a variety of departments were interviewed. Questions focused on the firm's approach to innovation and the activities and processes used to facilitate it. The technique used to analyse this data was a cross comparison matrix [28]. This allowed for patterns and consistencies to be identified across the data set.

IV. EMPIRICAL FINDINGS

The research took place within the enterprise networks unit of Siemens Switzerland, a division of Siemens AG headquartered in Munich, Germany.

A. Background to Siemens Enterprise Networks

Siemens Switzerland's head office is located in Zurich and employs 3900 people. The annual turnover of Siemens Switzerland is 1.1 Billion Euros, with the

Enterprise Networks department accounting for an annual turnover, in 1999, of 160 Million Euros. The department employs approximately 350 people and provides tailor made information and communication solutions in five major areas: voice networks, data networks, application services (hardware and software), and recently, converged networks (voice over data networks).

B. Triggers for a New Approach to Innovation

Analysis of the firm's historical approach to innovation revealed a reliance on incremental innovation with their range of profitable "cash-cow" products. Radical product innovation was rarely carried out. As previously discussed this changed when the Swiss telecoms market was deregulated in 1998 and competition intensified in the market (the scale of this intensity can be measured by the significant reduction in wireless products' life cycle - from 3 years in 1995 to 9 months in 2000). To reconfigure their ability to compete with and develop their own novel technologies and products, the firm re-evaluated their innovation process. This signalled the start of a concerted effort to remove what they considered were *core rigidities* from the innovation process.

C. The Sources of the New Innovation Strategy

The firm had two sources of inspiration for their reconfigured innovation capability: the unexpected success of a radical product development project and the past example of a successful working culture change programme carried out within another firm division.

With the former, the Zurich division drew heavily on the activities carried out in a previously successful "Product X" process. This was a project began after the privatisation of the Swiss telecoms industry and the subsequent initial flurry of activity on the market. During a period of market consolidation, two researchers within the product research and development unit had more time to concentrate on new concept work and subsequently developed "Product X" as a pet project. This in turn proved to be very successful and caught the firm unawares. They soon realised that similar opportunities were being left "untapped". New methods were required to seek out new opportunities that could prove to be the "spark" for new product ideas.

With the latter, the Zurich division group had previously merged with the Siemens Nixdorf division. An opportunity then arose to take on new ideas in developing a new working culture conducive to creativity. This stemmed directly from the Siemens Nixdorf "knowledge culture" strategy that Nixdorf had piloted when faced with declining profit margins in 1996. The scheme had been successful and proved

² Teece *et al* [21] in defining "paths" state, "Where a firm can go is a function of its current position and the paths ahead. It's current position is often shaped by the path it has travelled."

to be an influence in shaping the changes that were to occur at Zurich after the merger.

D. The Core Components of the New Innovation Strategy

The core principles of the new innovation capability were built directly from the main activities and processes from the Product X process and the Siemens Nixdorf knowledge culture programme. Analysis of these principles led to a number of findings. To begin with, the experience of the Siemens Nixdorf culture change programme had taught the firm the benefits of leveraging tacitly held knowledge from its staff to help improve the flow of ideas. This led Zurich to implement an idea generation programme to help collect as wide a variety of ideas from different departments and groups as possible. They believed that the use of an “idea competition” would serve as a means of bringing people together from different departments. By a process of osmosis, a network of competencies would then be formed that would serve as the bridge across the innovation “void” between the future customer requirement and the technology requirement.

E. A Mechanism for Idea Generation

The process to enable this pseudo-network was called “impulse” the format of which was a single innovation “event” held at semi-regular intervals throughout the entire Zurich division. During an “impulse” event around 250 ideas are put forward to an evaluation board from all over the division and from that figure around 2% are taken seriously enough to warrant further evaluation. This may seem a low level of return compared to the effort put in, but as the firm points out the very fact that people are using the process is what counts at this stage. As the process grows, they envisage a scenario where the creativity will continue to grow as the employees become encouraged by what has succeeded before.

The event subsequently led to a venture board being organised to fund the more radical ideas that emerged from “impulse”. Ideas are collated within the division by a small group that includes the senior management of the board with involvement from the provider of the idea. It is here that the process begins to take on an entrepreneurial feel with a switch in emphasis towards nurturing a business case as opposed to an isolated idea. The ideas then pass through a number of stages that test and evaluate their financial, manufacturing and marketing viability before proceeding to a “venture arm” phase. Dedicated teams - called Innovation Task Forces – (ITF’s) are responsible for the progress of the new business case. The subsequent incubation of the ideas then leads to decisions on whether to spin-out or spin-in the ideas.

To complement the “impulse” programme the firm also restructured their technical departments into dedicated centres of competences. These centres operate in the division’s product development unit and are responsible for specific technical expertise relating to the current product portfolio. The objectives of these centres are twofold: to form a network with other Siemens competence centres outside of the Switzerland, and to promote a continuous process of learning by suggesting new ideas to a competence centre steering group. This restructuring allowed the firm to create a solid business process based on the initial experiment with “impulse”. Together the impulse, venture arm and competence centres process provided the division with a robust idea generation mechanism.

F. Networking for New Opportunities

In parallel with its idea generation development, the firm then enhanced its opportunity recognition competences. Several networking initiatives were carried out with the goal of identifying and disseminating useful knowledge back into the idea generation schemes where it would be used as stimuli for new ideas.

The sales division, in particular, became the focus of the firm’s external networking activities. The development of a new sales team process enabled collection of future customer requirements from which potential solutions could be worked out, rather than primarily making direct sales. User communities (known early adaptors of the firm’s products) were accessed and used as focus groups for potential new developments - not just for improvements to, or solving problems with, existing products. Allied to this were scouting activities where staff would report from conferences, forums etc. on new developments in the field. These developments when combined led to the first level of knowledge channels being formed with a team of knowledge “brokers” initiating the knowledge transfer from both the external and internal networks.

G. Developing a Dynamic Innovation Capability

An analysis of the Siemens Switzerland case study reveals the development of a dynamic innovation capability using the key enabling criteria of the product X development process, combined with the assimilation of the Siemens Nixdorf culture strategy.

Subsequently, deconstructing these sources uncovers the elements that provide the firm with a new innovation platform. These elements consist of opportunity recognition and idea generation (internal and external networking) competences. These are combined with the switch to a knowledge-based entrepreneurial culture using venturing activities and incubation techniques to evaluate and progress new

business opportunities. These elements are outlined in fig. 2.

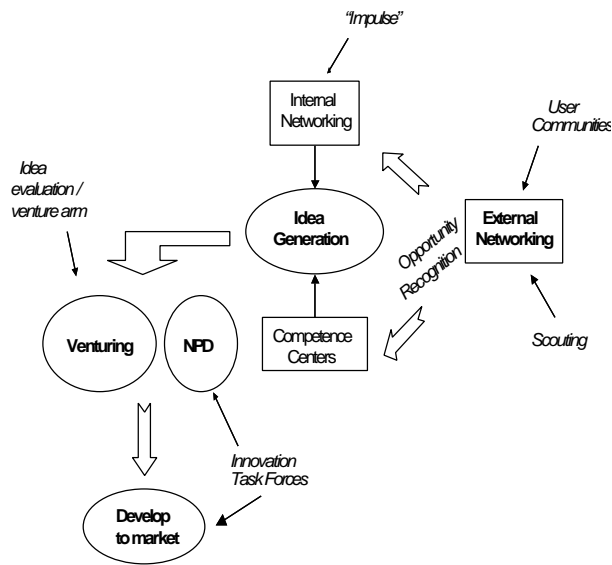


Fig. 2. Core elements of the Siemens Switzerland enabling platform for breakthrough innovation

Whilst fig. 2. points towards a management organisation perspective of a new innovation platform, a more theoretical resource-based perspective is also apparent. In this instance, the perspective focuses on the evolution of a dynamic innovation capability.

Specifically, the evolution of a dynamic capability outlined in fig.1. illustrated the relationship between the paths, positions and processes that once established are shown to develop into what can be termed a “dynamic capability”. When placed within this context the triggers and sources of the new Siemens innovation platform are clearly visible. The path inherited by the firm (its strategic option) relates specifically to the market deregulation environment faced by the firm. Once in place, this deregulation initiated a subsequent onslaught of disruptive technologies. This in turn led to a decrease in the market’s average product life cycle. Both these “triggers” for a new innovation capability are therefore placed within the context of shaping the firm’s current strategic position, i.e. the path it has inherited.

The competences and capabilities that encompass the positions and processes of the evolution model are then revealed. The spontaneous development of product X and the knowledge culture embedded into the firm’s working environment were the sources for the idea generation and opportunity recognition mechanisms that were to follow. These mechanisms led directly to the development of a learning platform through the dissemination of new ideas. A number of projects helped establish these mechanisms such as

the “impulse” programme and the development of a venture board.

These projects enabled the company to enhance its internal and external resource utilisation and co-ordination, through direct access to the competence centres, the user communities networks, the scouting networks and the ITF’s. The transformation of the firm into one capable of sustaining innovation had begun.

Fig.3. illustrates the paths, positions and processes that evolved to build the Siemens dynamic innovation capability. Within this theoretical model, the path is the market deregulation environment. The positions are shown as the “knowledge culture” and the development of Product X. Consequently, the process is idea generation mechanisms combined with opportunity recognition mechanisms. The projects are the impulse programme and the venture board development. What has clearly evolved is a dynamic innovation capability that allows Siemens Switzerland to sustain product innovation in uncertain environments.

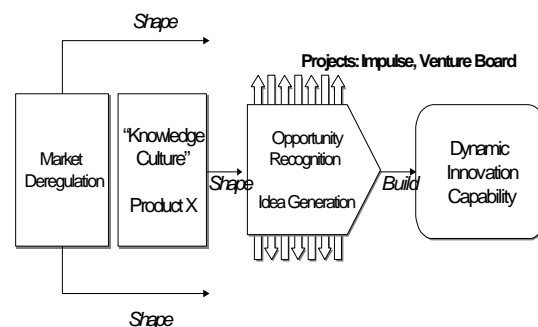


Fig. 3. Illustration of Evolution of Siemens Dynamic Innovation Capability

V. CONCLUSIONS

In conclusion, the case study has shown how a large enterprise was able to overcome the core rigidities that were contributing to an inability to sustain innovation. This failure to continuously develop pioneering products had ultimately resulted in a loss of market share. However, by building and reconfiguring internal and external competencies for breakthrough innovation, the firm was able to develop a new dynamic innovation capability to overcome this situation.

There are obvious limitations to what can be inferred from this single case analysis. Using a single, in-depth, exploratory case study, the research objectives were to draw out a management approach for sustaining innovation in large firms and subsequently to detect the presence of dynamic capabilities within a particular innovation context. Although the results tentatively point towards the

development of such a dynamic innovation capability the generalization of these findings is not possible.

However, the evidence provided by this exploratory case study could be a useful starting point for further research. Similar future studies should test the degree of generalizability of the concept developed in this case. In particular, the front-end of the innovation process, detailed herein, has over the years suffered a paucity of analysis by scholars. Potential additional dynamic capabilities for this stage of the innovation process could be explored further. This would further strengthen the findings on pioneering innovation, providing a framework for large firms competing in turbulent environments.

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