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MANAGING INNOVATION TO ADDRESS FINANCIAL CHALLENGES IN THE TEXTILE INDUSTRY*

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ABSTRACT

This paper addresses the idea that innovation is a major key to competitiveness and financial success in the textile industry. It presents a framework—called the technological community—that can increase the probability of successful introduction of innovation, new technologies, new products, and new processes. The technological community can be applied in companies at multiple levels, and includes multiple stakeholders both inside and outside of the company (e.g., managers, employees, customers, suppliers, regulators, lobbyists, etc.). Recommendations for company decision-makers are included.

KEYWORDS: textile innovation, textile competitiveness, textile technology, new textile products, new textile processes, innovation management

Introduction

In both the popular and academic press, competitiveness and innovation have been identified as keys to financial success in the U.S. textile industry (e.g., Ivey, 2002; Abernathy et. al., 1999). The future of the industry lies in high-tech products and processes. Correspondingly, Porter (1990) asserts that competitiveness can be achieved only through innovation, which he broadly defines as new technologies, new ways of doing things, or better ways to do old things. Hence, innovativeness, or innovation, can be seen as one of the major keys to financial success, especially in the U.S. textile industry.

This paper examines a theoretical framework—the technological community perspective-- to effectively manage innovation, including new technologies, new products, and new processes. As illustrated by the cochlear implant, the beta max, and other promising technologies that were market failures, it is not always the best innovation that is financially successful—but rather, the innovation that is best disseminated to and adopted by users and other stakeholders. The technological community addresses innovation and technology management in these terms; hence, the technological community addresses how companies can increase the probability of financially successful innovations, new technologies, new products, and new processes.

This framework, which was developed by Van de Ven (1993) and expanded by Rusinko and Matthews (1997), has been used in both manufacturing and service industries. It can be applied at the company level, but includes internal and external stakeholders—within and outside of the company and industry. According to Van de Ven (1993), a technological community can be defined as the network of private and public sector actors who create and support the infrastructure that develops and commercializes innovations and new technologies. Therefore, the technological community includes the immediate organization, as well as the community of suppliers, customers, distributors, regulators, and other stakeholders. Hence, unlike many other frameworks, the technological community addresses innovation management at multiple levels. Since textile industry experts advocate integrating information channels for competitive success (e.g., Abernathy, et. al., 1999), the technological community is a particularly appropriate framework.

The paper is divided into four sections. The first section explains the technological community, and how it can increase the probability of successful innovation, new technologies, new products, and new processes; research propositions are included in this section. The second section uses the case of a carpet manufacturing organization to illustrate the technological community perspective, and how it can increase the probability of successful innovation, new technologies, new products, and new processes; the research propositions are also illustrated. The third section includes conclusions and recommendations for decision-makers in industry. The fourth and last section provides suggestions for future research.

The Technological Community

Van de Ven (1993) explains the emergence of innovations in terms of a technological community with three major components or events: (1) resource events; (2) proprietary events; and (3) institutional events. (see Figure 1.) Resource events are basic research and education activities that underlie introduction and diffusion of innovations--including basic R&D, and education and training. Especially in the case of education and training, resource events include internal and external stakeholders (e.g., employees, suppliers, customers).

Proprietary events are activities to transform basic knowledge about the innovation to proprietary knowledge and/or opportunities through applications—including applied R&D; prototyping; testing; and manufacturing/distribution. Hence, proprietary events can include both internal and external stakeholders (e.g., employees, suppliers, customers, distributors).

Institutional events are activities that legitimate and govern the innovation and its community members—including legitimation, regulation, and standards. Institutional events can include both internal and external stakeholders (e.g., employees, suppliers, customers, lobbyists, regulators). The above examples are rather general and limited; however, applications to a specific case will be presented in a later section.

While the three events in the technological community tend to occur somewhat chronologically (especially at the beginning), they are also interdependent. That is, they influence one another, or they "co-produce" one another (Van de Ven, 1993). Therefore, the technological community can be configured as a triangle, with each of the three components at a point, and bi-directional arrows between each event (see Figure 1).

Therefore, the technological community can inspire some general propositions, which will be presented below. Applications to a particular case will be presented in the next section.

Because the three events in the technological community—resource, proprietary, and institutional—are interdependent, they can influence or co-produce one another. That is, positive actions with respect to any one event can co-

produce positive actions with respect to the other two events. For example, resource events (e.g., R&D; education and training) can co-produce positive actions with respect to proprietary and institutional events. In other words, basic research, and actions to educate and train employees, managers, customers, and suppliers about the benefits of an innovation or new technology (resource events), can have a positive effect on a company's speed and effectiveness in prototyping, testing, distribution, and dissemination of a new technology or product (proprietary events), and can also help the organization to meet voluntary and non-voluntary standards with respect to that technology or product (institutional events). Likewise, positive actions with respect to proprietary events can have a positive effect on resource and institutional events. Positive actions with respect to institutional actions can have a positive effect with respect to resource and proprietary events. All three of these events can help the organization to more effectively introduce innovations, new technologies, new products, and new processes. In addition, these events or actions can also help the organization to achieve operational or management goals, such as reducing costs, increasing quality or performance, and/or developing niche markets.

It should also be noted that negative actions with respect to any one event can co-produce negative actions with respect to the other two events. For example, inaction, or actions to limit R&D, and education of employees, managers, customers, and suppliers (resource events), can have a negative effect on a company's speed and effectiveness in prototyping, testing, and distribution of new technologies, products, and processes (proprietary events), and can also deter the organization from meeting voluntary and involuntary standards (institutional events). Likewise, negative actions with respect to proprietary events can have a negative effect on resource and institutional events. Negative actions with respect to institutional actions can have a negative effect with respect to resource and proprietary events. All three of these events, if occurring as negative actions, can prevent the organization from effectively introducing innovations, new technologies, new products, and new products. In addition, negative actions can also prevent the organization from achieving operational or management goals such as reducing costs, increasing quality or performance, and/or developing niche markets.

Therefore, because each event in the technological community influences the other two events, organizational decision makers are advised to try to take positive actions (and avoid negative actions) with respect to all three events—resource, proprietary, and institutional. To do this would help to effectively introduce innovation, new technology, new products, and new processes. According to Van de Ven (1993), technological innovations emerge through the inter-relationships of events and have the best chance of successful development when the resource, proprietary, and institutional events within the community are well-established.

Proposition 1: Organizations that take positive actions in one or more events—resource, proprietary, institutional--in their technological community will positively impact their overall ability to introduce innovation, new technologies, new products, and new processes.

Proposition 2: Organizations that take negative actions in one or more events—resource, proprietary, institutional--in their technological community will negatively impact their overall ability to introduce innovation, new technologies, new products, and new processes.

Proposition 3: The greater the number of positive or negative actions in one or more events-- resource, proprietary, institutional— in the technological community, the greater the impact (positive or negative) on the overall ability to introduce innovation, new technologies, new products, and new processes.

Van de Ven (1993) also proposes that the time, cost, and risk incurred in developing an innovation is inversely related to the developmental progress of building the technological community--in terms of resource, proprietary, and institutional events. In addition, he proposes that the more novel the innovation, the greater the time necessary for development, and the greater the chances for failure. Therefore, organizational decision-makers are advised to make management of innovation, new technology, new products, and new processes part of their long-run strategic plan—particularly in the case of more novel technologies. In many cases, organizations undertake innovation and new product development in a fragmented and somewhat piecemeal manner; this tends to reduce the probability of financial success.

Proposition 4: Organizations that make introduction of innovation, new technologies, new products, and new processes part of the long-run strategic decision-making process will increase their probability of success, including long-run financial success.

Van de Ven (1993) also proposed that ties between and among firms (e.g., producers, customers, suppliers, distributors) are conducive to successful development of innovations. Therefore, organizations should seek out supply chain relationships with like-minded organizations, or with organizations that are supportive of innovation, new technology, new products, and new processes.

Proposition 5: Organizations that develop supply chain relationships with other like-minded organizations with respect to innovation (e.g., suppliers, customers, distributors) will positively influence their overall ability to introduce innovation, new technologies, new products, and new processes; this can increase the probability of financial success.

The Case of Collins & Aikman

One way to try to illustrate the effectiveness of the technological community perspective with respect to successful innovation and development of new products and processes is to examine the case of Collins & Aikman Floorcoverings (C&A). C&A has been working on innovations (including new technologies, new products, and new processes) to make carpet manufacturing more environmentally friendly for about 10 years. But at the same time, C&A also needed to remain competitive in the carpet industry. They were motivated to examine the environmental impact of their management and operations by their customers, who are among their stakeholders—architects, designers, facilities managers. These customers asked questions like, "Did they recycle?" and, "Did they reuse recycled material in new carpeting?"

This resulted in C&A taking positive actions in terms of their technological community--resource, proprietary, and institutional events--which allowed them to successfully introduce a technology and a product that was new to the industry—sustainable carpet backing. This sustainable carpet backing is now the standard backing for C&A's modular tile line of carpet. The backing is completely recycled and recylable, and production of virgin backing for modular tile products has been discontinued. In addition, C&A reclaims and recycles their (and other recyclable) carpeting, and recycles it into new carpet products, rather than sending it to landfills. They also focused on developing a set of measures to evaluate their environmental results, which were significant. Between 1990 and 1997, C&A's waste to landfills decreased by 78 percent, while their production increased by almost 50 percent. Between 1993 and 1997, energy per square yard of carpet produced decreased by 43 percent (Bridger, 1998). C&A not only succeeded in reaching their environmental goals, but also succeeded in their operational and management goals of

profitably producing a high quality, competitively-priced product. C&A's actions also reflect the five propositions above. C&A's actions are translated more directly into the language of the technological community perspective below.

In particular, resource events at C&A included basic R&D in the form of creation of a sustainability lab. C&A sponsored basic research starting in the early 1990's. They focused on how to manufacture carpet backing from completely recycled carpet materials. When they started, other technical experts said that their goal was not technologically possible. In addition, they provided education and training throughout the company with respect to the importance of reducing their environmental footprint in all parts of the organization.

The positive steps in terms of resource events (e.g., basic R&D and education) facilitated positive steps taken by C&A in terms of proprietary events (applications with respect to prototyping, testing, manufacturing, distribution). Basic R&D and organization-wide education and training facilitated the eventual prototyping, testing, manufacturing, and patenting of C&A's sustainable carpet backing.

The positive steps in terms of resource events (e.g., basic R&D and education) also facilitated positive steps in terms of institutional events (legitimation and standards). The basic R&D and education that facilitated production of sustainable carpet backing also had a positive role with respect to the carpet backing eventually meeting Environmental Protection Agency (EPA) and other federal standards (e.g., recognized by the EPA as meeting the intent and guidelines of the President's Executive Order 12873-Federal Acquisition Recycling and Waste Prevention, and also meeting the spirit of section 6002 of the Resource Conservation and Recovery Act). Meeting these standards legitimates C&A as an organization that uses environmentally appropriate practices. In addition, in 1999, the EPA recognized C&A as one of a few Private Sector Pioneers in environmentally preferable practices. Over the last few years, C&A has won a number of environmental awards from government and private organizations, which further legitimates their environmental commitment.

However, C&A's goal to manufacture carpet in a more environmentally friendly way is, and has been (since the early 1990's), part of a long-run strategic plan. They see innovative technology as the key to their competitive and environmental initiatives, and view protecting the environment as a business opportunity, not just a means of compliance. They view environmental development as an ongoing, organization-wide process. According to Bridger (1998), C&A sets goals; achieves them; reassesses; and sets new goals.

In addition to pursuing positive resource, proprietary, and institutional events, and viewing environmental goals as part of their strategic plan, C&A is pursuing partnerships with like-minded suppliers who use environmentally preferable practices, and has severed relationships with suppliers who have not been in environmental compliance (Bridger, 1998). Correspondingly, C&A has managed to achieve their environmental goals and also achieve their operational and management goals of producing a competitively-priced, quality product at a profit.

Conclusion and Recommendations

This paper adapts the technological community perspective, as a multi-level, multi-stakeholder organizational framework, to explore ways to effectively manage innovation, new technologies, new products, and new processes—in order to increase the probability of financial success. The technological community was originally used to explain development and commercialization of manufacturing innovations such as cochlear implants (Van de Ven, and Garud, 1992) and was then adapted to explain development and commercialization of innovations in the services sector such as financial derivatives

(Rusinko and Matthews, 1997). Therefore, the technological community framework is appropriate for application to product and process innovations in the textile industry.

According to the technological community, innovations are introduced and diffused through three events—resource, proprietary, and institutional--which influence or co-produce one another. That is, positive actions or steps in any one of the events can positively influence the other two events—and hence, positively influence innovative success. Correspondingly, negative actions or steps in any one of the events can negatively influence the other two events—and hence, negatively influence innovative success.

Therefore, it is proposed that organizations that take positive actions in one or more events—resource, proprietary, institutional--in their technological community will positively impact their overall ability to integrate the natural environment. Likewise, organizations that take negative actions in one or more events—resource, proprietary, institutional--in their technological community will negatively impact their overall ability to introduce innovation, new technologies, new products, and new processes.

Similarly, it is proposed that the greater the number of positive or negative actions in one or more events-- resource, proprietary, institutional— in the technological community, the greater the impact (positive or negative) on the overall ability to introduce innovation, new technologies, new products, and new processes. Hence organizational decision makers are advised to take positive actions—and as many as possible-- in resource, proprietary, and institutional events, in order to maximize the probability of successfully introducing innovation, new technologies, new products, and new processes

Correspondingly, it is proposed that organizations that make introduction of innovation, new technologies, new products, and new processes part of the long-run strategic decision-making process will increase their probability of success, including long-run financial success. Therefore, organizational decision makers are advised to make introduction of innovation, new technologies, new products, and new processes part of the long-run strategic decision-making process, rather than apply a fragmented or isolated program, or set of programs.

In addition, it is proposed that organizations that pursue supply chain relationships with like-minded organizations (e.g., suppliers, distributors, customers, etc.) in terms of innovation, product, and process development will positively influence their overall ability to introduce innovation, new technologies, new products, and new processes. Therefore, organizational decision makers are advised to seek out supply chain relationships with like-minded organizations.

These recommendations are reinforced through the experiences of C&A since the early 1990's. However, C&A is just one company, and C&A helped to illustrate only the propositions about positive actions with respect to the three events of the technological community. Future research must include organizations that take negative actions, and must empirically test all propositions; these issues will be discussed further in the next section.

Future Research

This paper represents a starting point in terms of using a multi-level, multi-stakeholder organizational framework to explore how to effectively manage innovation, new technologies, new products, and new processes. Future studies will empirically test the five research propositions presented in this article.

The propositions and recommendations in this paper raise many questions. For example, one recommendation is that organizations pursue positive actions in all three technological community events—resource, proprietary, and institutional. While this may be the best advice for the ideal scenario, managers with less than ideal resources may wonder whether one of the events has a more

significant effect than the others. For example, are proprietary events (e.g., prototyping, testing, manufacturing) most important to success in terms of innovation, new product development, and new process development? Or, how strong an effect do resource events (e.g., R&D) provide? These questions can be addressed in future empirical research.

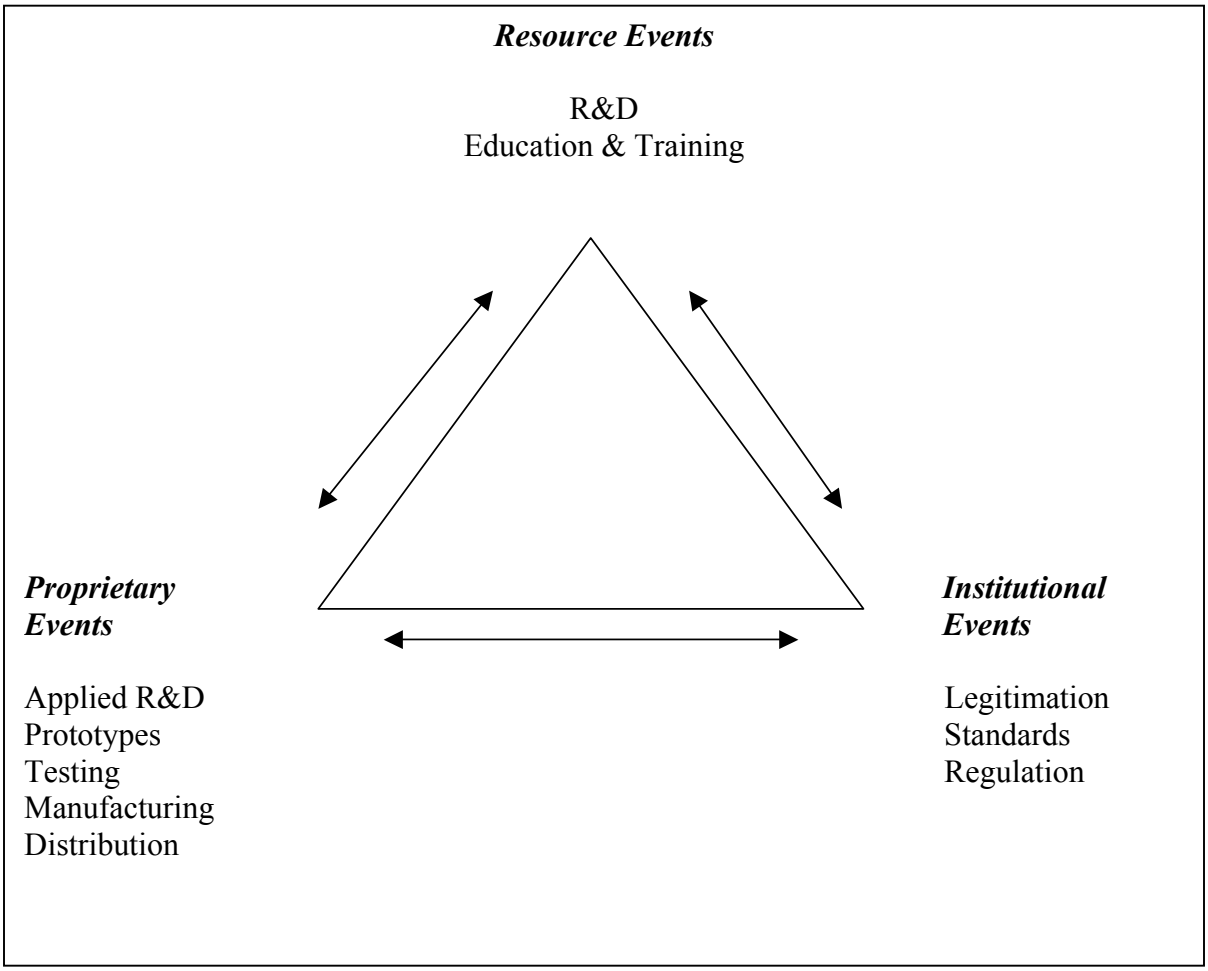

Figure 1: The Technological Community Framework

Adapted from: Rusinko, C.A. and J.O. Matthews. 1997. Evolution of a technological community: A case study of financial derivatives. ***Journal of Engineering and Technology Management*** 14(3): 315-36.

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