

Innovation Supply Chain: A Framework of Innovation Generation

ABSTRACT

There has been a considerable amount of literature that has been written on the subject of innovation, yet a lack in putting the concepts together into the evolution of innovation has yet to be done. This paper first examines the areas of innovation studied and then furthers the area of study into the innovation supply chain area. Much as the writings of the supply chain were a couple decades ago the value of innovation partnership, collaboration, and the supply process of how innovation is gained has yet to be explored. This conceptual piece and literature review first examines innovation literature evolution and then puts it together in the supply sense and thus shows how innovation can be created. It also shows how valuable innovation partnerships and collaboration can be in this chain, as well as the need for further study in this area. It explores the idea that innovation is and has a particular supply chain and if understood as such can dramatically cut the failure rate of new products and failed launches.

Innovation as a concept

Innovation has long been the key to success in an organization (Steencamp 1999 et al). Yet half of the innovations that companies try to produce either fail to even make it into the market or fail to meet their target financial performance (Sivadas and Dywer 2000). For these reasons companies struggle to find ways to create innovation that will be successful and academia tries to explain why they lack success and develop an overall model. In order to understand innovation workings we must first understand the current and past literature in order

to incorporate all ideas into an innovation supply chain. This paper will begin with a literature on innovation ending with an evolution of innovation table. We will then begin to look at a framework of innovation for a supply perspective to show how innovation can be obtained and conclude with the value and importance of an innovation supply chain.

Development/ Sourcing

Innovation can be gained both internally or externally (Gold 1987). External innovation sources can be licensed or purchased from another company with that existing technology, it can be contracted from a separate R & D company, it can be bought through acquiring the entire other company, or it can be partnered into by a revenue sharing contract from both companies (Gold 1987). These alternatives can be pricy and must have great organizational know how to scan for these opportunities (McLaughlin et al 2008). They also require both knowledge of upper level management to not spend the company's money on unimportant innovation, proper application areas that fit the scope of current products, and upper level support to scan for these innovations (McLaughlin et al 2008; Tushman and O'Reilly 2006).

The other way to develop innovation is thorough internal R & D (Gold1987). This requires an extreme amount of diligence to create. There must be a proper recruitment process to generate the necessary staff. This includes risk takers, a "do differently attitude, ability to think outside the box, and the willingness to try something new (McLaughlin et al 2008). Leaders should also possess a certain amount of different skills. These include great knowledge of the subject area, Openness, agreeableness, Conscienceless, emotional stability, and extraversion (Aronson et al 2008; McLaughlin et al 2008). There must also be a culture on innovation throughout the organization (McLaughlin et al 2008). This culture should allow creative

exploration, view risk taking as discovery, willingness to reuse knowledge, and willingness to cannibalize investments (McLaughlin et al 2008; Chandy and Tellis 1998; Adler et al 1999). This culture is detrimental to the survival of the organization's innovative success (McLaughlin et al 2008). The next necessity in creating innovation is integration of departments to facilitate innovation. (Frishammer and Ylinepaa 2007; Dougherty 2007). The most importance types of integration lie between marketing and R & D, manufacturing and R & D, customer and R & D, and the business strategy and R & D (Hong et al 2005; Frishammer and Ylinepaa 2007; Dougherty 2007). This allows a faster process and a relevant product (Frishammer and Ylinepaa 2007). Another important area of management is the upper level support of the new product (Chandy and Tellis 1998; McLaughlin et al 2008).

The third and final method of sourcing that has developed recently but has been gained much attention is called open sourcing (Agerfalk and Fitzgerald 2008). This consists of providing an open platform where the consumer can share, create, and produce their ideas to create the product (Agerfalk and Fitzgerald 2008). It began mainly in the computer software industry but is beginning to branch to other areas as well.

Innovation Literature Review (Evolution of Innovation)

From the vast literature on innovation there are several main concepts as to the success of innovation. Schumpeter 1942 the father of innovation theory began his career by stating that small firms had an advantage in creating innovation due to their flexibility and small size. He later recanted and changed his opinion to state that large firms are better at creating innovation due to their monopolistic powers. He is best known for the idea of "Creative destruction" stating that new technologies and innovation create waves of destruction in the market that will create a

new market infrastructure (Schumpeter 1942). There is no denying that the literature on innovation has been hazy over the past seventy years. Yet we notice that there is a lack of talking about this system as a whole. Therefore the goal of this paper is to first put the literature together and then provide a framework for further study on innovation supply. This framework could later be studied to show the linkages and workings of the innovation processes well as the collaboration and partnership benefits that can be gained much as the supply chain

There have recently been many articles on the subject of innovation and by putting these articles together we can add a valuable framework for the innovation supply chain. This supply chain will allow us to properly identify ways to create innovation and see how, just as in the supply chain, partnerships and collaboration are imperative to innovation success and creation. This literature includes two major factors include the internal and external components, whereas innovation can either be created in-house through research and development or outside through another firm or consumer.

The process of innovation creation first begins with the management side of the creation from R &D or the generation of an innovative product. Before that concept an organization must be aware of the consumer side creating necessary and useful products for the consumer. There is an innovation supply framework attached to the end of this paper however each necessary component is described in detail in the following paragraphs. Francis and Bessant 2005 created the four p's, product, process, position and paradigm to describe innovation. This First two Ps deal with the product itself and second p, position deals with commercialization and the four P, paradigm deal with the management.

Product innovation was coined by Cooper in 1979 and is the most studied aspect of innovation. It is the redesign of the product due to technological change (Cooper 1979). This

innovation can be in a variety of ways including Radical, modular, incremental, and architectural (Henderson and Clark 1990). A radical innovation consists of a breakthrough technology that creates a new market infrastructure (Garcia and Calantone 2001). This is what Schumpeter 1942 explained as a “creative destroyer”. An example of this is the transition of disk memory to flash memory. Architectural innovation shifts the components around to function differently (Henderson and Clark 1990). An example of this is the miniaturizing of the computer disk while at the same time increasing the capacity. Modular innovation changes one component technology (Henderson and Clark 1990). An example of this is the change of a fan’s blades to make them faster, more effective, quieter, and cooler. Incremental innovations are changes to product and process that do not incorporate a breakthrough technology and thus do not create a new market infrastructure (Christensen 1995; Dosi 1982). The overall product is the same however the technological component of the fan blades has changed. No matter which type of product innovation it remain detrimental to the success of the organization’s success (Steenkamp et al 1999; Tushman and O’Reilly 1997)

The second p is process. Process innovation is the changes in process and procedures that change a product by making it faster/more durable/ect.... (Francis and Bessant 2004). These two Ps, product and process innovation are examined very in-depth in the literature. March 1989, referred to these innovations as exploration and exploitation (March 1989, 1991). The importance of exploration and exploitation is shown to be necessary for the firm’s survival in a rapidly changing environment (He and Wong 2004; Tushman and O’Reilly 1997). Too much exploration drives out efficiencies and prevents learning by doing (He and Wong 2004). At the same time too much exploitation creates inertia and prevents a firm from acquiring new knowledge (Sull 1999). For these reason it has been stated that a company must remain

ambidextrous and create a balance between exploration and exploitation (Tushman and O' Reilly 1997; He and Wong 2004). In the case of the four Ps a firm must create both innovative product and process to remain effective and efficient. It has been show the necessity for senior leadership teams to command both of these processes (Tushman and O'Reilly 1997; He and Word 2004).

Positioning is the third P (Francis and Bessant 2005). Positioning consists of the right market for the innovation and the consumer (Francis and Bessant 2004). Paradigm is the most fuzzy of the four p's and includes the invisible part of the innovation which is the management (Rickards 1999). Paradigm is very important to innovation creation because it allows the R &D process to acquire innovation.

Commercialization

From the end customer side there has been much literature devoted to creating a product that has a fast adoption rate (Rogers 1995; Bass 1969). Rogers created a bell curve stating that people adapt to new products differently depending on several factors. Innovators consist of 2.5% of the population, early adopters consist of 13.5% of the population early majority consist of 34% of the population, late majority consist of 34% of the population, and laggards consist of 16% of the population. This was then used to create the S curve of adoption where 50% the line between early majority and late majority is the inflection point (Rogers 1995). Rogers said several factors create the rate of adoption which he called perceived attributes of innovation. These include relative advantage, compatibility, complexity, triability, and observability. He also pointed to communication channels, the social system, and a change agent effect on adoption rate (Rogers 1995). There has been literature to expand this to include price (Thomson and Sinha

2008), and four categories of risk Functional, economic, social, and physical (Ram and Sheth 1989).

Evolution of innovation

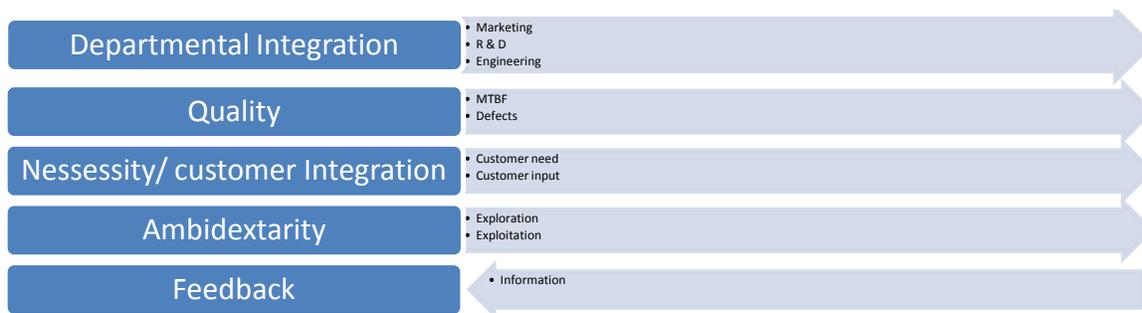
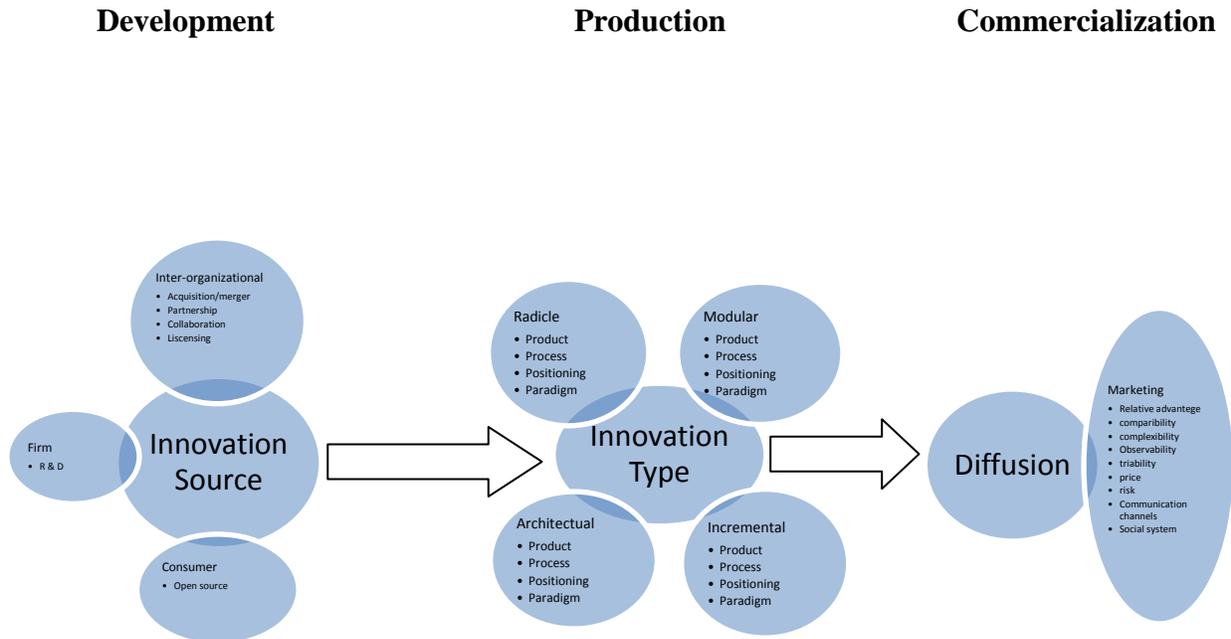
Author and date	Topic	Focus	Findings	Extensions
Schumpeter 1942	Innovation disruption	Market	Innovations form creative destroyers that create new markets.	Disruptive innovations, discontinuous/continuous innovations, radical/incremental innovation
Gold 1987	Source	Inter-organizational	Innovation can be gained both internally or externally. External innovation sources can be licensed or purchased, contracted, acquired or partnered	Open sourcing, network relationship, licensing, acquisitions, partnerships, collaboration
March 1989	Exploration Exploitation	Firm	Firms can either use exploration, search for a new product, or exploitation, enhancement of an existing product.	Ambidextrous organizations, inertial forces, management personalities, employee personalities, integration
Henderson and Clark 1990	Innovation categories	Product	Innovation can be set into four unique categories, Incremental, radical, modular, and architectural	Four Ps product, process, positioning, paradigm;
Rogers 1995	Diffusion of innovation	Consumer	Bell curve of innovation. Five attribute of innovation: relative	Consumer innovation scale, brand, price, risk, integration, quality

			advantage, compatibility, complexity, triability, and observability	
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Innovation supply chain framework

From this literature review an overall framework of innovation can be seen. The model consists of an internal and external component. In those components the type of innovation is important and how to get that type of innovation is shown.

Innovation Supply chain



Continuous Processes

Innovation Supply chain

The above process model shows that there are three main areas of innovation: development, production and commercialization. A firm first locates a source that the

innovation will come from. That source can be internal or external in nature. Once that source is noted the firm can figure out what type of innovation they will be producing either Radical, incremental, architectural, or modular. Once this is decided the firm will need to break down further say if the firm chooses licensing of a radical innovation they will then have to decide if it will be radical to the product, process, positioning, or paradigm. Finally the firm will need to market the product to the attribute of innovation acceptance in order to create a more successful new product outcome. This innovation supply diagram shows the ways innovation has been created from literature sources and a method for innovation success through a proper supply chain.

Conclusion

In putting everything together we have seen the importance of innovation, the different types of innovation, the different sources of innovation, and different reason that consumers look for innovation. We have seen that this literature does fit together it just has not been put together up to this point. Yet we notice that there is a lack of talking about this system as a whole. Therefore the goal of this paper is to first put everything together and then provide a framework for further study. This framework could later show the linkages and workings of the innovation processes well as the collaboration and partnership benefits that can be gained much as the supply chain

Future research

This paper provides a basic setup and understanding on how innovation should be viewed as a supply chain and from the literature a process model for successful supply of innovation. The innovation creation process can be put together and function as the supply chain functions. This will speed up the process of innovation creation and allow for more value on all sides. However these partnerships and collaborations will need to be examined as well as the types of innovation gained and the best processes for them in the chain based on type of innovation and outcome. Once innovation is viewed as a chain of supply where that be internal or external a firm can find based off of their current situation which method is the best to produce the best innovation outcome and thus vastly improve new product failure rates. Because of this much study will be needed to explore this process and create these outcomes.

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