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Value, Actors and Networks

A Revised Perspective on Disruptive Innovation

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Value, Actors and Networks – a revised perspective on Disruptive Innovation

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Abstract

The concept of disruptive innovation has received increased attention over the last decade. This stream of literature has increased our understanding of incumbent failure in the face of technological change by looking at the control that profitable customers impose on established firms. However, there are several issues which haven't been sufficiently addressed thus far. This article adds to existing theory on the subject by drawing upon literature on networks and utility theory. Literature on the topic has put an emphasis on the different performance characteristics of a disruptive innovation. We shift the focus of attention towards the utility that it creates for customers, and how this is done. Moreover, we adopt a different notion of networks, arguing that an over-simplified view upon customers has been maintained previously. In doing so, we provide an extended and more nuanced conceptualization which reveals a couple of challenges and managerial solutions.

1 Introduction

It is today well documented that established firms may encounter difficulties in the face of discontinuous innovation (e.g. Utterback, 1994). Incumbent companies are usually good at innovation under steady, stable circumstances, but when more fundamental shifts in terms of technologies and markets take place, the incumbents can all of a sudden become vulnerable. Frequently, established firms do not manage these changes in a fruitful manner; they lose market shares and the successful firms are found among the entrants.

Many scholars have sought to explain the phenomena of incumbent failure, sometimes also referred to as "the incumbent's curse" (Foster, 1986). One stream of literature has looked at how discontinuities make new market conditions incompatible with existing capabilities and organizational structures of established firms (Tushman and Anderson, 1986; Henderson and Clark, 1990). More recent work on the topic has focused increasingly on demand side factors and the role of customers (Christensen, 1997). Christensen (1997) coined the by now well-known term disruptive innovation, arguing that those initiatives which are not initially valued by an incumbent's customers will be developed for new markets

by entrant firms, and that these new products eventually may move into the earlier mainstream market, displacing the products of the former established companies. While this literature has contributed to a better understanding of incumbent failure, there are several elements of the theory of disruptive innovations that have been questioned (Markides, 2006; Danneels, 2004), and these need to be addressed in order to provide a more coherent framework that allows us to understand this phenomenon better.

This article aims to add to existing theory on disruptive innovation and does so by drawing upon literature on networks and utility theory. It starts with an exposition of existing literature on disruptive innovation and moves on to a discussion of issues that this far have been insufficiently attended to. The paper then describes network and utility theory, constituting two bodies of literature that can potentially extend and refine the ideas regarding management of disruptive innovation. These bodies of literature are in the subsequent section used in order to address previously identified weaknesses regarding disruptive innovation. Based on the theoretical discussion, some conclusions and managerial implications are given.

2 An exposition of disruptive innovation theory

As mentioned previously, the literature on disruptive innovation has presented new explanations of how and why incumbent firms encounter problems under conditions of discontinuous change. Previous literature had primarily looked at supply-side factors. A prominent example of this literature stream is the work by Tushman and Anderson (1986), who wrote about competence-enhancing and competence-destroying innovations. They argued that innovations which destroy the value of a firm's existing competencies are very difficult to manage, as established firms are bound by traditions, sunk costs and internal political constraints. Henderson and Clark (1990) nuanced those arguments by introducing the concept of architectural and component level innovation. Similar explanations have been provided by Clark (1985), Tripsas (1997) and Cooper and Schendel (1976).

In his seminal work, Christensen (1997) proposed an alternative explanation of incumbent failure. Instead of looking inside the established firms, he focused on the external environment, drawing upon resource dependence theory (Pfeffer and Salancik, 1978) and the concept of value networks (Christensen and Rosenbloom, 1995). Resource dependency essentially posits that organizations are open systems which depend on resources from parties outside the organizational boundaries. Hence, a firm's freedom of action is in fact controlled by actors outside the boundaries of the company, e.g. customers and investors. Since the customers and owners are the key stakeholders that provide the firm with resources, they also impose a great indirect control on what decisions are taken and how resources are allocated. Bower (1970) provided similar arguments when suggesting that the demands of established customers constrain the freedom of action for firms. This perspective is manifested in Christensen's research in the concept of value networks, defined as "the context within which the firm identifies and responds to customer's needs, procures inputs and reacts to competitors" (Christensen and Rosenbloom, 1995, p. 234).

Consequently, a key determinant of the probability of success for an incumbent firm to innovate is the extent to which the new product addresses the needs of actors in the incumbent firm's current value network. Based on this reasoning, Christensen explains the pattern of incumbent failure by making a distinction between sustaining and disrupting technologies. Sustaining technologies have in common

that they improve the performance of established products along the dimensions that existing customers value. Disruptive technologies, on the other hand, initially underperform along these dimensions. They are described as normally being simpler and cheaper than the established technologies. The lower traditional performance and the higher ancillary performance create a large market uncertainty around the new technology. At the same time the established firm finds it irrational to abandon its current, profitable customers in order to aim for a new market and a new technology. As the performance of the disruptive technology increases it begins to attract customers from the sustaining technology and eventually displaces it. In other words, it can be argued that incumbent firms are “held captive” by their investors and largest, most profitable customers. Therefore, resources are not allocated to initiatives that are initially less profitable. Christensen referred to this pattern as the innovator’s dilemma, arguing that disruptive technologies present a particular challenge for incumbents since they require managerial skills and solutions that are different from the ones needed to succeed in sustaining battles.

Christensen and Raynor (2003) further developed the ideas about disruptive innovation, utilizing the concept of value networks. One important aspect of their framework is the distinction between low-end and new market disruptions. Low-end disruptive innovations evolve in the lower segments of the market, typically by having a business model which enables the firm to offer cheaper products with a performance that initially is inferior. Steel mini-mills and discount retailing are both examples of this. New-market disruptive innovations prosper by approaching customers that have not been addressed previously. The personal computer and the first portable transistor radios can serve as illustrative examples of new market disruptive innovations.

3 Disruptive Innovation – some areas in need of development

While the work by Christensen, and then in particular the ideas about value network lock-ins, has contributed greatly to an increased awareness and understanding of the challenges related to discontinuities, there are still many questions that this far have not been sufficiently dealt with. This section will try to point out some of these outstanding issues, which are primarily related to how such innovations create value and the impact they have on established networks.

3.1 A diffusion approach to innovation

One potential weakness of Christensen’s framework is that the theory seems to be based upon a diffusion perspective on innovation. The graph Christensen (1997) uses to explain the pattern of disruption looks at different customer segments. It essentially suggests that a disruptive technology prospers in low-end segments or in new markets and later on invade the mainstream market. Hence, existing literature has to a large extent maintained a diffusion-oriented perspective on customer attributes such as the one developed by Rogers (1995) and later on used by Moore (2002).

Several contributions to the theory of disruptive innovation indicate that a diffusion approach has prevailed. For instance, Slater and Mohr (2006) identified parallels between the work by Christensen (1997) and Moore’s book *Crossing the chasm* (2002) and underlined the importance of finding a nursing market for disruptive innovation. Linton (2002) built upon diffusion forecasting techniques and

integrated it with theory on disruptive innovation. Adner (2002) pointed out that the structure of demand needs to be addressed in order to clarify the nature and effect of disruptive innovations. Moreover, Adner used the notion of thresholds, defined as critical performance levels that must be met. The functional threshold of a product is the minimum performance that the customer can accept whereas the net utility threshold also takes price into consideration.

While the diffusion approach has contributed to a better understanding of incumbent failure, we would argue that it is overly simplistic in order to explain the specific pattern of adoption. An over-simplified view of the customer may conceal some important challenges, particularly in business-to-business settings. Seligman (2006) argues that the adopter is often treated as a black box and that it needs to be understood in a better way. This criticism seems to be valid in the case of the literature on disruptive innovation. Tripsas (2000) provides an argument similar to the one of Christensen (1997), underlining the importance of looking for new customers since the existing customer base may not value the new technology. Hence, the role of the customer is often mentioned, but not treated much in-depth.

3.2 How do disruptive innovations create value?

The literature on disruptive innovation is also somewhat unclear regarding how the innovations create value for the customer. For instance, Christensen (1997) states that disruptive technologies are typically cheaper and bring new performance attributes to the market, while having lower performance along the dimensions focused on for the established products. But how exactly does a disruptive technology create value and what challenges are related to commercializing such an innovation?

One reason why this question has not been sufficiently understood is that the disruptive innovation theory has a strong focus on performance dimensions, rather than economic value and total utility. An analysis of the market impact of a technology needs to look at the performance of the technology, but should do so in order to identify the value a user obtains from acquiring it. Several scholars have pointed out the importance of both looking at performance attributes and how these are translated into value for the customer (Oskarsson and Sjöberg, 1991; Saviotti and Metcalfe, 1984). Value can be created in several different ways inside the customer's organization. Activities may be changed or removed completely. Moreover, the utility that a disruptive innovation creates can imply a new distribution of value. In a business-to-business setting, these issues would most likely be overlooked when a diffusion-oriented perspective focusing on performance dimensions is maintained. Hence, the notions of value and utility need to be nuanced.

3.3 Where do disruptive innovations emerge?

Lately, the theory of disruptive innovation has been extended, both in terms of its definition and its applications. Govindarajan and Kopalle (2006) argued that Christensen's original definition was too narrow since it only took cheaper, simpler and initially lower performance products into consideration. They proposed a broader definition, which would also include technologies that initially emerge in higher segments. Utterback and Acee (2005) also called for an expanded view of disruptive technologies. They noted that many technologies such as electronic calculators, fuel injectors and wafer boards were not initially cheaper or simpler than the technologies they later on came to replace. Danneels (2004) asked whether disruptive innovations are never valued by mainstream customers. Govindarajan and

Kopalle (2006) provided an extended conceptualization of disruptive innovation when they suggested that a disruptive technology is a novelty that introduces a different set of performance and price attributes relative to existing products. These characteristics tend to make it unattractive for mainstream customers, but as the technology is improved along certain parameters it eventually displaces the former product or technology. This definition is broader and could also include disruptive technologies which initially prosper in the high-end or mainstream segments of the market. The authors argue that there are several reasons why high-end disruptive technologies may create a dilemma for established firms. Mainstream customers may not value the new performance attributes, it may have an insufficient initial traditional performance, the market niche is too small and therefore it may not offer any significant profits.

One consequence of maintaining an insufficiently nuanced view upon customers and the value proposition is that it becomes difficult to understand in what market segments a disruptive innovation may prosper. The question of where disruptive innovations start has up until now not really been adequately answered, and one reason for this may be that a mainstream disruptive innovation could be thought of as a contradiction in terms. Given that resource dependency and the concept of value networks are the main pillars of Christensen's theory, an innovation which prospers in a mainstream market would by definition not be regarded as disruptive. However, given that disruption is a relative phenomenon (Christensen and Raynor, 2003), virtually all disruptive innovations should prosper in a mainstream market for some firm, unless it creates a completely new market. Would those firms which are operating in a segment where the disruptive innovation emerges be better off than others? And if not, what challenges would they encounter when trying to bring a new, potentially beneficial value proposition to an established customer?

3.4 How can incumbents succeed with disruptive innovation?

Christensen's most powerful managerial recommendation regarding disruptive innovation is that such initiatives must be put into an independent organization. By doing so, he argues that these attempts can be protected from the forces of resource dependency, which tend to drain those initiatives since there is no obvious financial logic in pursuing those initiatives.

While this recommendation has turned out to be useful for many companies (Christensen, 2006), more knowledge is needed regarding how incumbent firms can successfully manage disruptive innovations. Christensen (2006) described the innovator's dilemma as a business model problem, but remains vague about exactly what firms should do in order to manage these challenges. Danneels (2004) underlined the importance of developing a "customer competence" in order to succeed with disruptive innovation, but did not specify what constitutes such a competence or how firms can develop it.

One main difference between Christensen's notion of disruptive innovation and previous work on discontinuities is that he drew upon a different theory stream, highlighting the importance of firm-external stakeholders and thereby identifying completely new explanatory factors. Having argued that established firms are "held captive" by their most profitable customers, the managerial solution inevitably became related to how the firm's resource allocation mechanisms should be changed in order to overcome this barrier. Hence, Christensen stresses the impact that customers have on the firm's internal organization, but pay limited attention to how firms can actually manage their networks, to the extent that these actually are possible to influence.

3.5 Can business models be disruptive?

Christensen (1997) also mentioned that services may be subject to the same kind of disruptive pattern as products. Utterback and Abee (2005) argued that such an attempt would possibly stretch the model too far. Nevertheless, some scholars (Christensen and Raynor, 2003; Charitou, 2001). have taken this even further by addressing the topic of disruptive business model innovation, i.e. innovations which are not technological, but instead change the business models used by firms. Even though this concept is still not particularly well defined, it provides a useful perspective on how firms create and appropriate value, thereby complementing the more traditional view on business strategy which focus more unilaterally on only the appropriation part (Chesbrough and Rosenbloom, 2002). Markides (2006) contested this notion and argued that business model innovation was a significantly different phenomena than the one originally described by Christensen (1997). Christensen (2006) however provided a nuanced and extended argument when he framed the fundamental problem of disruptive innovation as primarily a business model problem, and not necessarily a technological problem. This may also be the main reason why Christensen used the term *innovation* instead of *technology* in his more recent work (e.g. Christensen and Raynor, 2003; Christensen, 2006). Hence, a disruptive technology is now considered as a technology that is incompatible with an incumbent firm's existing business model. While such a definition may be broader, it arguably also results in some confusion since it would require a more thorough understanding of business models and the related bodies of literature. Moreover, such an extension would also imply several new challenges that need to be faced by management.

Summarizing the above, we can conclude that the by now substantial work on disruptive innovation has shown the importance of looking at the demand side in order to understand the competitive dynamics related to this specific type of innovation. However, we also see that as long as the theory regarding disruptive innovation draws narrowly upon resource dependency and the concept of value networks, it will most likely not be able to address several of the important shortcomings mentioned above. Consequently, the underlying theoretical framework needs to be modified into a more comprehensive one. It has been argued above that the raised issues can be understood by looking more carefully at the notions of value and networks. Below, a literature review on networks and utility theory is provided, which will be applied later in the article in order to provide a potentially improved understanding of disruptive innovation.

4 The network approach

Since the early 1980s, the interaction approach to understanding business-to-business marketing (Hallén, 1982; Håkansson, 1982) has received increased attention. This perspective materialized from a critique of those neo-classical economic models which assumed individual action and independence. These thoughts were later on developed into what is often referred to as the network approach (Håkansson, 1987; Håkansson and Snehota, 1989). These scholars argued that existing literature on market practices missed out on the interdependence that characterized many relations between customers and suppliers. Instead of looking at markets as homogeneous and without any friction, they argued that a market consists of actors that are interrelated and depend upon each other and that this

aspect was not sufficiently captured by other theories of the firm (Håkansson, 1990). Networks can be thought of as separated from the more traditional notions of markets and hierarchies.

In order to study how firms interact, network scholars regard companies as actors which employ resources in order to conduct activities. Actors have different objectives, scale and scope and are embedded in a network where they depend upon other actors. However, they should still have some degree of autonomy in order to be regarded as actors. Activities concern the transformation and transaction of resources into interdependent activity cycles and webs of transactions. Resources are also thought of as heterogeneous and can be comprised of tangible assets like capital and land, but also as intangible assets like knowledge, competence and skills (Håkansson & Johanson, 1992; Håkansson & Snehota, 1995).

Actors possess resources and carry out activities. However, no single actor can control all the required resources or performs all the related activities throughout the chain of transactions. Hence, resources and activities are interrelated with other resources and activities and therefore, actors also become interdependent and are exposed to uncertainty. Actors depend upon their environment but at the same time, the environment is deemed to be unreliable. They are therefore willing to trade off some freedom in order to reduce uncertainty by establishing relationships with other actors (Dubois, 1998; Håkansson, 1987). These networks are held together by mutual interest, however, there is always a mixture of intersecting and diverging interests present in these relationships (Håkansson, 1989). Another consequence of the network perspective and the view that the value of resources, actors and activities are relational is the notion of perfect heterogeneity.

In the network approach, the behavior of an actor is governed by its relationships to other actors. The resources that actors possess and transform have a value in a network and thus, it is context dependent. Therefore, the outcome for an individual firm is not solely based upon its own decisions. Rather, it is the result of all interactions taking place in a network and companies have to modify their ambitions continuously. In this sense, networks are based upon restricted freedom (Ford et al, 2002) and moreover, this interdependence exists on many levels in the network. Ford et al (2002) argue that there are three levels on which a network can be analyzed. First of all, it can be for a *single actor*, i.e. a company, an organization, a team or an individual. The next level is to look at a *relationship* between certain actors and thirdly, the network as a whole can be analyzed. Ford et al (2002) underline the importance of investigating changes on all these levels in order to understand how networks evolve.

4.1 Interdependence in industrial networks

Due to the abovementioned interdependence, network theories of the firm claim that a firm's behavior is largely controlled by other firms and not by internal factors. The main managerial challenge in a network is therefore not the internal allocation of resources, but rather how relationships with other actors can be handled (Håkansson & Snehota, 1989). Ford et al (2003) states: "no company *alone* has the resources, skills or technologies that are necessary to satisfy the requirements or solve the problems of any other". This approach has a lot in common with resource dependency theory (Pfeffer and Salancik, 1978), which suggests that organizations cannot be in control of themselves since they have to acquire resources from their surrounding environment. The network approach, however, is in some ways slightly more developed in that it looks at this interdependency along a couple of established dimensions – actors, resources and activities.

Another implication of the interdependence is that while a firm's relations are the basis of its current work and development, these relations may at the same time hamper further development activities. Actors which are embedded in an industrial network have a limited freedom of action since they depend upon relationships with others. A small change in one relationship may require a considerable change throughout the network (Håkansson and Ford, 2002). Hence, existing networks impose constraints upon agency since the value of any resource is defined by its context. From this observation follows that 1) the network needs to be mapped and analyzed in order to understand the impact an innovation may have 2) industrial networks are conservative to their nature. Johansson and Mattsson (1992) nuanced the notion of interdependency in industrial networks by claiming that those are comprised of two levels – an institutional set and a technological one. Hence, industrial networks can be thought of as an interaction between social and technological structures.

A network approach to innovation would shift the focus of attention from supply-side issues towards addressing the firm's external environment. Thus, the impact an innovation has on relationships to customers, suppliers and other actors become more important from this perspective (Håkansson (1990). One immediate consequence of such a perspective is that innovations are not primarily judged by their absolute performance, but rather in a relational way, i.e. to what extent it generates support from its surrounding network. Succeeding with innovation therefore becomes a process of adaptation to the network rather than just a matter of strong internal development skills.

Networks tend to be path dependent - they create opportunities but also impose constraints upon attempts to innovate which are outside an existing trajectory. Therefore, the success of an innovation ought to be regarded as dependent upon economic, social and political conditions. Given that the value of resources exists in a particular context, innovations which are incompatible with existing resources, processes and activities in the network will be difficult to commercialize. The activities of one firm can be thought of as one element in a chain of activities and its resources are elements of a greater context of resources. An innovation will therefore not be evaluated primarily with respect to its performance, but to what extent it is valued in its particular context. From this perspective, innovation is inherently something that creates conflicts and power struggles. Hence, the innovating firm must develop a thorough understanding of its network and to what extent its intentions are compatible with the resources and activities of other actors. The established links between actors may create a resistance to change since the network has evolved over time in order to fulfill certain purposes. Innovations in an existing network will therefore be evaluated with regard to how it fits existing structures and incentives rather than by pure performance. Moreover, due to the high degree of interdependence in an industrial network it may suffice that one actor rejects the innovation to block it completely, even though others demand it.

While the industrial network approach may be very useful when exploring innovation in a better way, several scholars have pointed out that better frameworks are needed in order to look at the dynamics of a network (e.g. Waluszewski, 2004; Dubois and Araujo, 2004). Many studies which draw upon this perspective are indeed fairly static, describing a network at a certain point in time. Mattsson (2003) states that this approach could be combined with Actor Network Theory (ANT) and thereby create a better understanding of how business networks evolve over time. ANT will be reviewed in the following subsection.

4.2 Actor Network Theory

Actor Network Theory (ANT) is an approach to social theory which resembles the industrial marketing perspective in many ways. ANT has primarily been developed by Latour (1987, 1993, 1996), Callon (1986) and Law (1999). The most notable difference between ANT and other sociological theories is its insistence upon the agency of non-humans, i.e. technologies, products and humans are regarded as the same when performing an analysis. This idea may seem a bit odd, especially from an ethical point of view. However, proponents of ANT often underline that treating people and objects in a similar way is not an ethical position, only an analytical approach. It may be useful to combine this theory with industrial networks since ANT is explicitly concerned with how human and non-human elements interact in a network.

Latour (1993) argued that reality is often thought of and spoken of in a one-dimensional way where nature and culture, human and non-human are considered as opposites which are never really brought together. Hence, reality tends to be thought of either in terms of social constructivism or realism. The essential idea of ANT is to transcend this separation and look at how these different forces interplay in a network. This interaction is the unit of analysis that ANT explores and by doing so, the proponents of it argue that it is possible to analyze the parallel construction of society, culture and nature. Therefore, these networks are not only composed of people, but also of animals, machines, money, culture etc. Law (1994) uses the term 'performativity' to explain that reality is both constructed and real at the same time.

Consequently, ANT scholars argue that sociology's task is to describe these networks in their heterogeneity and analyze how these actors together result in organizations, power structures and how they evolve over time as a consequence of changes among the underlying components. ANT suggests that order a product or an organization is an effect which is generated from heterogeneous means. Put differently, social structure is not a noun, it is a verb, something that creates and is continuously re-created (Law, 1993) and such an approach could therefore complement the industrial network perspective when looking at the dynamics in a network.

ANT is also somewhat different in its more explicit focus on such notions as power and politics in a network. This theory has often focused on understanding how social networks and power structures emerge, prevail and collapse. The process is thought of as highly unstable and uncertain, given that incentives can be changed and that each actor is subject to power from many different actors at the same time. Actors continuously seek to influence others, bring in new ones and remove others and hence, the network is created and re-created over time. Hence, it is a relational and dynamic approach, which underlines that the world is under constant change. Given that everything is relational, actors must negotiate their positions and roles and manage the incentives and expectations that differ depending upon the relevant network. The emergence of networks can therefore be thought of as a process of surmounting resistance and Latour refers to this process as translation. When interests diverge in a network, social and material negotiations emerge, leading to either compromises, one actor being removed or that the network dissolves. The highest degree of stability is obtained when a set of heterogeneous actors emerge as one distinct actor, for instance a machine or an organization. This event is referred to as punctualization where different actors integrate into one actor. The creation of a machine can be thought of in these terms. When the different components are put together into a functioning unity, the machine becomes a new unit of analysis. However, if it breaks down, one needs to

look at the components and their linkages in order to understand why. The global is therefore comprised of several local and interrelated structures.

The ANT perspective can also explain the various challenges that an actor encounters when trying to order reality in new ways. As an actor seeks to remove others or form new networks, others will have incentives to block or hamper such a development. ANT urges scholars to look at controversies and conflicts since they indicate that other actors are influencing something and that the network may change (Latour, 1987). For instance, Law (1992) suggests that building actor networks is primarily an issue of overcoming resistance.

Summing up, ANT has a lot in common with the industrial network approach in maintaining a relational view upon society. Apart from the obvious difference that ANT is a sociological theory and the network approach is more of a management approach, ANT seems to be more concerned with power, politics and the dynamics of a network. However, these two bodies of literature should still be thought of as similar in many ways. Together with the subsequent section on economic value and utility theory they will be drawn upon in order to understand disruptive innovation in a better way later in the article.

5 Economic value and utility theory

The previous section reviewed two bodies of literature that may contribute to an increased understanding of the phenomenon of disruptive innovation. This section describes a third body of literature, namely the notions of utility theory and economic value. Economists have often referred to utility theory and marginal utility when trying to understand value. Total utility refers to the satisfaction that comes from the possession of a good (Bowman and Ambrosini, 2000). A basic assumption is that consumers use their income in a way that optimizes their utility. Marginal utility is usually defined as the utility someone gets from obtaining or losing one unit.

Several scholars (e.g. von Mises, 1963) have pointed out the subjectivity of value, i.e. the notion that a good can be of great value for one individual or firm and be of no use for another one. In line with this, Menger (1950) made a distinction between use value and exchange value. The exchange value is the paid price whereas the use value is the economic value that the buyer obtains from using the product. A positive difference between these two measures is regarded as a consumer surplus. Given that buyers may use a product for different purposes their use values differ and consequently they are willing to pay different prices. Moreover, while the use value is a key variable in any purchasing decision, it does not materialize until after the transaction has taken place. Hence, in any transaction there is always a degree of uncertainty or speculation.

Transactions become even more complex and uncertain in a business-to-business setting. Firstly, it is more difficult to establish the use value under these conditions since the acquired good may be used as an input in the customer's production process along with several other inputs. Secondly, an organization is comprised of many individuals, and these maintain their own subjective opinion about the use value. These individuals may also have diverging incentives which complicate matters even further. Thirdly, the use value can be realized for another actor inside the customer's organization. The purchasing organization has an aggregated utility from buying a good, but it is much more difficult to measure it and it may be distributed over many different functions or individuals. Hence, there may be a discrepancy between the purchaser's perception of the use value and the actual use value.

Given the agency of humans, the situation described above can result in 'the principal-agent problem' (Sappington, 1991). In economics, this notion stands for the dilemma of motivating one actor to act on behalf of another one. It occurs when a principal assigns an agent to perform certain tasks on behalf of the agent and it is difficult to monitor the agent. Under conditions of risk and information asymmetry, the agent is sometimes able to act on its own behalf instead of the principal's. The solution to this problem is to make sure that the incentives of the agent are aligned with those of the principal.

In a business-to-business setting, this and other dilemmas may arise when a purchaser is assigned to buy goods on behalf of an organization. It is more difficult to establish the use value, the distribution of it is hard to assess and there may be diverging interests inside an organization. Therefore, several inefficiencies, uncertainties and power struggles are likely to influence the transaction at stake in a way that makes it much more unpredictable and difficult to accomplish than when a consumer buys something. It would be difficult to predict the success or failure of a potential transaction if the interacting organizations are regarded as rational, utility maximizing individuals.

6 Value, actors and networks – towards a revised perspective

This section contains a discussion of disruptive innovation informed by the theoretical exposition above regarding networks and utility, in order to address the identified shortcomings of the existing theory on disruptive innovation. We suggest that the existing theory needs to be complemented along two dimensions, namely the ones of *value* and *networks*.

6.1 Towards a more comprehensive view on networks

Hernes (2007) provided a summary of how ANT can be applied to the study of innovation processes. He suggests that networks are created and re-created over time. Moreover, actors can be thought of as outcomes of their relations, which means that this perspective would underline the importance of looking at the dynamic changes an innovation creates in its network. Such an approach would first of all imply that the technology, or the innovation, is regarded as an actor (Callon, 1987). This means that it exerts force, and consequently influences its surrounding network in various ways. Therefore, the successful commercialization of an innovation would be thought of as a relational process, i.e. an interplay between social and physical actors. A critical amount of actors must be mobilized in order to succeed in this continuous process of negotiation, and aspects like power and incentives consequently become important. Value is created in social and economic structures through translation and framing. Hence, the introduction of an innovation can be thought of as something that often creates a rivalry between different actor networks who try to expand and invade the other network.

One direct consequence of applying an ANT perspective on disruptive innovation is that focus is shifted from objective performance dimensions towards looking at the political effects it has in an established network. An ANT approach would suggest that the perception of a technology may actually matter more than its performance characteristics. Whether customers adopt an innovation or not would rather depend on the extent to which different actors inside the customer's organization benefit from doing so. Adoption often involves several different actors and interests inside organizations. A large firm can be considered a political economy where units and individuals differ in terms of power and interest

(Benson, 1971). Disruptive innovations may thus create value on various levels and in different places. Consequently, the adoption process is often much more complex than a straightforward diffusion approach would suggest and several challenges related to changes inside the customer's organization need to be better understood.

While the theory of disruptive innovation certainly looks at power and the role of customers, it essentially maintains a financial view upon power. Drawing upon resource dependency theory, it is argued that those customers which provide a firm with profitable revenues also impose a great indirect control over the incumbent firm. In this sense, ANT differs from Christensen's (1997) notion of value networks since it does not only look at power as a financial issue and hence, the unit of analysis becomes different from the one used by Christensen. As has been argued previously, the disruptive innovation theory has maintained a somewhat simplified view of customers, primarily since it is concerned with flows of money rather than power in a sociological sense. An ANT perspective would suggest that there are several actors inside the customer's organization which may be powerful and control the incumbent firm. Thus, it would imply that the demand-side is conceptualized as something more complicated and multi-dimensional than just one distinct end-user, with one specific utility function.

One potentially fruitful way of looking at customers would be to think of them as comprised of *actors*, *resources* and *activities*. Actors in an organization control resources and perform activities. Such an approach would explain why existing structures tend to favor minor innovations, rather than those of a more significant character (Hernes, 2007). An actor network can only prevail by repeated activities over time and a major innovation would by necessity have implications for the network, new actors will obtain more power, others are removed completely and some linkages would change. In line with this reasoning, Håkansson and Waluszewski (2001) claim that innovations must be adapted to existing networks and activities in order to be accepted. Therefore, an innovation that calls for a major change in these structures will be met by resistance. Disruptive innovations which distort existing power structures in terms of resources, actors and activities may thus be blocked from adoption even though established customers would benefit from adopting it.

6.2 From performance to value and utility

The disruptive innovation theory has put a lot of emphasis on the different performance dimensions of a technology. Christensen (1997) made a most significant contribution when looking at performance trajectories and ancillary attributes of a technology. Other scholars, however, have underlined the importance of translating performance attributes into economic value and utility for customers (e.g. Granstrand, 1994; Granstrand, 1999). As mentioned previously, total utility can be thought of as the satisfaction that someone obtains from acquiring a good or service (Bowman and Ambrosini, 2000). Such a view would differ from Christensen's in the sense that disruptive and sustaining innovations are not compared in terms of technological parameters, but rather in terms of the utility they create and how this is done. A disruptive innovation, i.e. an innovation which has a lower traditional performance while at the same time bringing new performance attributes to the market may therefore create a higher total utility for some customers, despite its lower traditional performance. Moreover, the total utility perspective would also suggest that disruptive innovations do not necessarily have to prosper in low-end segments or in new markets as suggested by Christensen and Raynor (2003). Rather, they should emerge in those segments where it creates an increased total utility for customers and such

segments might very well be in the high-end or mainstream of the market. In his review and critique of the disruptive innovation theory, Danneels (2004) asked whether disruptive innovations are never appreciated by mainstream customers. Drawing upon actor network theory and utility theory, we suggest that this might very well be the case, however, given the inertia in existing networks outlined above, there may be good reasons why this is often not the case.

If disruptive innovations prosper in a customer segment where an established firm is present, the challenges are also likely to be significantly different from the ones described by Christensen (1997). Given that the most profitable customers request the innovation, the incumbent is in this case not subject to the forces of resource dependency. However, it would still be dependent upon decisions made by actors beyond its own boundaries, albeit in a different way.

While an adopting organization may be considered to have one single aggregated utility function, decisions are still made by individual actors, who perform activities and control resources. Given the lower traditional performance and ancillary attributes of a disruptive innovation, it may have a considerable impact upon the adopting organization's actors, resources and activities and these effects can result in considerable resistance. Existing networks impose constraints since the value of any resource is defined by its context (Håkansson and Ford, 2002). It can be competence-destroying for some actors, utility can be created by removing activities or by changing the value of resources for actors in the customer's organization and thereby shifting the distribution of value and power inside the customer's organization. Given the subjectivity of value and the potential divergence of incentives, political barriers to adoption are not unlikely to occur. Bearing in mind the interdependence in industrial networks (Håkansson, 1990), incumbent firms may indeed be "held captive" by their most profitable customers, even though these customers would actually benefit from adopting the disruptive innovation. The reason for this paradox is that adoption is not merely a rational decision based upon strict performance criteria, it is also a political decision where actors maximize their own utility and power rather than the utility of their organization, a dilemma similar to the principal-agent problem described above (Sappington, 1991).

Summarizing the two sections above, we have argued that disruptive innovations can be understood in terms of changes along two dimensions - actors and value. A disruptive innovation creates utility in new ways and may result in a new distribution of value inside the customer's organization. Here, we have shifted the focus from looking at different performance characteristics towards total utility. Secondly, we have argued that this utility must be analyzed in terms of its impact upon the customer's power structures, the actors, resources and activities. In that sense, our approach differs from Christensen's in not only looking at new and old customers, but also at the effects inside the existing customer's organization.

Conceptualizing disruptive innovation along these two dimensions also makes it possible to address some of the previously posed questions regarding whether business models can be disruptive or not. In the same way as a technological shift may induce a change in value or in the network, a business model change may also do so, thereby causing problems for incumbent firms. However, the business model can on the other hand be seen as a design parameter that can make it possible for firms to manage disruptive innovation in a fruitful manner.

6.3 Managing disruptive innovation

In the previous section, we outlined a couple of challenges related to introducing disruptive innovations. It was argued that barriers to adoption may occur even in situations in which such an innovation offers an increased utility for customers. When actors, resources or activities inside the customer's organization are changed or even removed by an innovation, it may in fact be rational for certain individuals to oppose the adoption of a disruptive innovation. How then, can these challenges be managed?

Many authors have pointed out the importance of a customer competence in order to succeed with a disruptive innovation (e.g. Danneels, 2004), but little is known regarding what such a competence looks like. Managing disruptive innovations that distort existing customer structures may be particularly difficult since an innovating firm can only impose a limited, indirect control over matters that take place inside the customer's organization.

Veryzer (1998) argued that the evaluation criteria needed for discontinuous innovation should be less customer driven and more experimental rather than analytical. Callahan and Lasry (2004) found that regarding market newness, customer input was important for new products up to a point and then drops off for very new products, whereas customer input was becoming increasingly important without any drop for products of technological newness. These managerial prescriptions have in common that they essentially underline the importance of not regarding the established actor network as constant but rather try to modify it in different ways, in that sense contrasting the view of Håkansson and Waluszewski (2001). We therefore argue that a customer competence related to disruptive innovation is based upon an ability to identify critical actors and their incentives, as well as finding new ways to align them in favor of the disruptive innovation.

Any existing network constellation contains skeptical actors, which need to be mapped and understood in terms of their incentives. Therefore, the ANT approach would suggest that all affected actors need to be identified, as well as how they are affected by the innovation and which ones that could be brought into the network. Hence, the innovation must have stabilized slightly before involving users and other downstream actors, otherwise, those actors would resist. Since ANT suggests that a network has to be re-created continuously, actors need to be connected and kept loyal to an innovation over time.

The emergence of an actor network around a new idea therefore becomes a matter of connecting actors and aligning incentives. A disruptive innovation would then sometimes require the mobilization of other actor networks and the design of a new business model which fits this specific network. Firstly, the innovator needs to assess the different incentives that govern the different actors. Secondly, the customer utilities should be investigated, both on an aggregated level and for each of the affected actors. This can for instance be done with existing techniques such as customer utility mapping (Kim and Mauborgne, 2000) and looking at the job to be done, rather than the performance attributes (Wunker, 2005). Thirdly, based upon this knowledge, firms need to find a business model which aligns the different actors' incentives so that they are in favor of the innovation. This once again underscores the necessity to have an adequate understanding of the value created for different actors in the network with the existing solution as well as how it will be influenced by the innovation. With this insight, changes to different business model parameters, such as e.g. revenue model, value chain and value network can be explored. In many ways, the proposed view of incentive alignment is similar to ideas recently proposed within the field of demand- and supply chain management. For instance, Lee (2004) suggests that firms can manage their supply chains by exchanging information more freely, defining

roles and responsibilities as well as sharing risks, costs and gains. However, one complicating factor when it comes to innovations is that these have a higher degree of uncertainty and that the value of the innovation for the different actors may be more difficult to estimate than in repeated operations.

If the management of disruptive innovation is a matter of identifying value for different actors and aligning incentives throughout a network, then the survival and eventual dominance of entrant firms must also be related to having a better capability to do so. The lack of an established network may in this sense actually be an advantage for entrants, since they would not be subject to the same rigidities as established firms (Leonard-Barton, 1992; Dougherty, 1996). Hence, there seems to be a paradox here in that well established relationships with customers create a competitive advantage in the established operations, while they at the same time hamper experimentation with new value propositions. Given that entrant firms are not to the same extent locked into an established actor network, they should be more able to allow the kind of trial and error approach and technology drift (Burgelman, 1983; Ciborra, 1997) that are needed for succeeding with disruptive innovation.

7 Conclusion

This paper has attempted to add to the existing theory on disruptive innovation, and in particular propose a few developments of key concepts in order to address some present shortcomings and thereby render the theory more comprehensive and useful. Drawing upon literature on value and utility theory as well as two different literature streams focusing on networks, we have sought to address these issues by arguing that a disruptive innovation is an innovation that creates utility in new ways and distorts existing networks.

Our conceptualization of disruptive innovation differs from Christensen's in two important ways. Instead of looking at different performance dimensions we have argued that innovations should rather be assessed in terms of the utility that they bring to the customer. By doing so, we have been able to explain how innovations with disruptive characteristics may prosper in mainstream or high-end segments, despite their lower traditional performance.

Secondly, this utility needs to be analyzed in terms of its impact upon the customer's power structures, the actors, resources and activities. In that sense, our approach differs from Christensen's in not only looking at new and old customers, but also at systemic changes inside the customer's organization. Drawing upon literature on industrial networks and ANT, it has been argued that customers just as suggested by Christensen (1997) impose a great indirect control over incumbent firms. We would however suggest that they do so not only in a financial sense, but that this control can include other types of power as well. Furthermore, while there is such a thing as a total utility for an adopting organization, the interpretation of it differs among individuals who are in turn governed by different incentives. Based on this, we see that adoption is not merely a financial decision, but also a result of political arguments and power.

Even though established customers benefit from adopting a disruptive innovation, they may not request it due to the changes that it may imply along the value- and network dimensions. Our final contribution is that we have pointed out some ways forward for how incumbents firm can attempt to handle disruptive innovations. We claim that the management of disruptive innovation concerns how actor networks change over time and how companies can find ways of introducing something that is

significantly new for several actors. Hence, such notions as incentive alignment, power and uncertainty become crucial for the innovating entity. Firms that aim to succeed at disruptive innovation need to 1) identify all actors in the network 2) map their interests and power and 3) find ways to analyze changes in utility and in the network induced by the innovation, and change business models so that all actors' incentives are aligned. How this can be performed on an operative level has until now only been partially investigated, and this area consequently calls for further research. There is also a need to extend the focus of research on disruptive innovations from a mainly descriptive and problem-oriented stance to also include more proactive and constructive work. A first logical step in such a development would be to pay more attention to how firms actually can manage to introduce disruptive innovations successfully, possibly also studying more new entrant firms.

8 References

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