

Explaining Successful Radical Innovations with Effectuation

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Résumé :

Nous suggérons que les innovations disruptives sont une catégorie particulière des innovations qui rencontrent un important succès commercial. La théorie de la disruption s'applique à des situations très particulières. Les entreprises qui construiraient l'intégralité de leur politique d'innovation autour de la théorie de la disruption prendraient un risque considérable. Il serait préférable qu'elles s'attachent à comprendre de quoi est faite une innovation qui connaît un succès commercial important, et comment il est possible d'y arriver. Les innovations qui débouchent sur un succès commercial important résultent d'une combinaison de plusieurs changements majeurs, qui ne sont pas mis en œuvre simultanément. Les entreprises, qu'il s'agisse de start-ups ou d'acteurs établis, doivent progresser selon une logique d'essai-erreur caractéristique d'une logique effectuale, jusqu'à ce qu'elles atteignent, parfois après plusieurs années, la combinaison idéale.

Mots-clés : Disruption, innovation radicale, acteur établi, anomalie

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INTRODUCTION

The management of innovation is one of the most demanding challenges today (Dodgson, Gann, and Salter 2008). The external environment characterized by globalization, convergence, competitive/market uncertainty, time-to-market pressure, shortening product lifecycles is also based on knowledge, information, fast-changing technology and innovative economy. In the recent few years a series of innovations and trends have changed the way people perceive technology. The global availability of the Internet, along with new innovations (innovation comes in a variety of products, services and applications) explain certain aspects of the dynamics of the innovation process and the diffusion of technology across industries or countries. For advanced industrial economies, the information economy is already a leading edge from which national wealth flows and a key to improving competitiveness. The intensification of technological competition between countries forces companies to give priority to innovations.

Since Schumpeter introduced the concept of “creative destruction” in “Capitalism, Socialism and Democracy” (Schumpeter 1942), the academic community has pushed a simple, but very powerful and popular concept, which is mostly referred to nowadays as “radical innovation”, or “disruption”.

More recently, since the end of the 1990s, most of the debate related to innovation has focused on the disruption theory. This theory is the result of years of research and multiple contributions over the last forty years, the most important ones coming from Christensen (Christensen 1997). The study of disruption has then developed as a body of theoretical and empirical work. Several theoretical and empirical contributions have concluded that disruption innovation explains the failure of the established companies. Clayton Christensen has always encouraged researchers to improve theories, including his own disruption theory, by looking for anomalies and trying to find explanations for these anomalies (Christensen 2006). This research started with an intuition; it seemed to us that the disruption theory did

not apply exactly in the same way in the USA and in other developed countries (Europe, Japan and Korea). Looking at a number of cases, would it be possible to spot anomalies, and to use these anomalies to come up with an extended version of the theory?

In order to answer this research question, our objective is to show the temporal dynamics of disruption seen as a process and to describe potential differences between firms located in various countries through several examples thus revealing new connections to be explored. In the first section, our approach is to review the literature on the theory of disruptive innovation. The second section describes the methodology. In the third section we present our results. The fourth section contains a brief discussion. The final section concludes the paper and leads for further research..

1. LITERATURE REVIEW

1.1. THEORETICAL BACKGROUND

Most of the research mentioned above focused on failures, and addressed the question “Why great companies can fail”, which is the title of “The innovator's dilemma” (Christensen 1997). This part reviews the published literature on radical and disruptive innovation to establish a baseline of current understanding of the concept of disruption in various contexts.

1.1.1. The emergence of radical innovation

(Schumpeter 1934) considered as ‘the prophet of Innovation’ (McKraw 2007) argued that economic development is driven by innovation through a dynamic process in which new technologies replace the old, a process he named “creative destruction” considered as consistent with the concept of “disruptive innovation” developed by Christensen in the 1990s. The process of creative destruction can be explained by the capacity of new firms to sell radical technology at the expense of incumbent firms. This idea has been taken up and validated by many scholars (Rosenbloom and Cusumano 1987) (Utterback 1994).

The life cycle of an economy is explained through changes in the level of innovation activities and the key role of the entrepreneur carrying out new activities and contributing to economic growth. In Schumpeter’s view, “radical” innovations create major disruptive changes, whereas “incremental” innovations continuously advance the process of change. Schumpeter proposed a list of five types of innovations: new products, new methods of production, new

sources of supply, the exploitation of new markets and significant changes in workplace organization and management (Schumpeter 1934). Schumpeterian competition drives innovation. Technological innovation often leads to temporary monopolies, allowing excessive profits that would be then competed away by rivals and imitators.

Most scholars in economics and strategic management who analyze technological innovation refer to Schumpeter seminal work. The concept of radical innovation has been then the subject of numerous publications covering specific and thematic issues such as uncertainty (Rosenberg 1994) (Leifer, O'Connor, and Rice 2001), knowledge and learning (Lundvall 1992), competition and technological race (Reinganum 1989);(F. Scherer 1991); (Tirole 1988); (Fudenberg et al. 1983) and the degree of substitutability (complementarity) between the existing and the new market (Battaglion and Grieco 2009).

1.1.2. Technology changes and innovation issue

Radical innovations are based especially on significant subsequent technological development. Several factors that shape processes of innovation changes interact in many ways. (Christensen and Overdorf 2000) define then two concepts of technological change: “incremental changes”, which are enhancements of the product on the dimensions of performance usually valued by customers, and the “radical changes”, which redefine the trajectories of performance and bring a new proposal of value to the customer and additional features. These radical changes are the only discernible sources of competitive advantage and enable the emergence of new markets.

Technology evolves through phases of incremental change until, at some point in time, a major breakthrough occurs in the industry. These technological discontinuities increase the uncertainty in the industry and have a profound impact on it (Tushman and Anderson 1986). As a result, a new technological paradigm emerges. Within a new paradigm, different technological paths can be developed, resulting in designs that compete with each other for dominance (Utterback and Abernathy 1975).

Sustaining innovations may be either ‘discontinuous’ or ‘continuous’ (i.e. ‘evolutionary’). Innovation can be then considered as a path-dependent process whereby knowledge and technology are developed through interaction between various actors and other factors (Nelson and Winter 1982). Utterback provides the following definition of a discontinuous or radical innovation: “*By discontinuous change or radical innovation, I mean change that*

sweeps away much of a firm's existing investment in technical skills and knowledge, designs, production technique, plant and equipment" (Utterback 1994, p. 200).

1.1.3. The shift towards disruptive innovation?

Radical, drastic, "really new" or disruptive innovation? Radical and disruptive are used mostly in the managerial literature. 'Really new innovation' has been introduced by Garcia and Calantone who define radical innovations as "innovations that cause marketing and technological discontinuities on both a macro and micro level. Incremental innovations occur only at a micro level and cause either a marketing or technological discontinuity but not both. Really new innovations cover the combinations in between these two extremes." (Garcia and Calantone 2002 p. 120).

As Battagion and Grieco (2009), explain it, "although diffused in managerial studies, the terms radical and incremental are not used explicitly in the economic literature. Nonetheless, similar concepts are analyzed in the context of process innovations. Industrial organization works describe as "drastic innovations" (e.g. Reinganum 1983) those changes in technology that determine a decrease in costs such that the new equilibrium price lies below the pre-innovation cost and consequently turn the innovator into a monopolist. On the other hand, "non-drastic" or "gradual" innovations still affect costs, but only introducing an asymmetry that does not transform the market into a monopoly. Recalling previous works in managerial literature, drastic innovations can be interpreted as a particular manifestation of radical innovations that affect costs and market structure in a dramatic way" (Battagion and Grieco, 2009 p. 346).

But what is a disruptive innovation? Before presenting subsequent developments in the theory of disruption developed by Christensen in the next section, it is worth noting that there have had long debates about what constitutes a disruptive innovation, and what doesn't (Table II). In the managerial literature, several attempts have been made to clarify the meaning of disruption. But several authors have been using the same concept of disruptive innovation to describe different attributes of this phenomenon with an emphasis on competition, market, customer expectations or business models.

There have been also persistent questions about how disruptive innovation differs from radical innovation. As regards radical innovation, it can be also defined in a number of different ways. There is once again confusion between the words "radical" and "disruptive". Radical innovations create a competitive advantage through differentiation and disruptive

innovations open new markets and generate changes in consumer preferences. But these two sentences could be reversed. According to Leifer et al. (Leifer, O'Connor, and Rice 2001, p. 102), a radical innovation is a product, process, or service offering “significant improvements in performance or cost that transform existing markets or create new ones”. (Nagy, Schuessler, and Dubinsky 2016) refer to other authors (Utterback and Abernathy 1978); (Anderson and Tushman 1990); (Dahlin and Behrens 2005) to describe radical innovations as innovations that provide a user the ability to undertake a new behavior or accomplish a new task that was impossible before the invention of the innovation.

With regard to our initial question on disruptive innovation and semantic issues it raises we propose in the next section to come back to the original thought of Christensen.

1.2. THE EVOLUTION OF THE FRAMEWORK OF THE INNOVATOR’S DILEMMA

The disruptive innovation concept was originally developed by Christensen (Christensen 1997) who used for the first time in 1997 in his book, “The Innovator's Dilemma” to describe a new technology that unexpectedly overturns the dominant technology in the market sector. When new entrants introduce this new technology, incumbents face a dilemma called the innovator’s dilemma. Should established firms cannibalize their existing products to invest in an innovation that does not ensure short term survival? Incumbents could be also resistant to change and consequently unable to achieve the benefit of the innovation.

But since the publication of his first book, Christensen has constantly updated his work integrating some significant changes in response to several criticisms in order to improve his traditional model. It is possible to identify different steps in this pathway summarized as follows.

1.2.1. Back to basics: the 1990s

Christensen (Christensen 1997) adapted Schumpeter’s ideas and separates new technology into two categories: sustaining and disruptive. Sustaining technology relies on incremental improvements to an already established technology. The author distinguished between sustaining and disruptive technologies. The former are technologies that respond to an improvement, radical or incremental, of “established products, along the dimensions of performance that mainstream customers in major markets have historically valued” (Christensen 1997, p. xv).

Disruptive technologies are those that force changes in industry frontiers, business processes and business models. Christensen affirms his position as being situated within the study of theories of industrial innovation (Christensen and Bower 1996); (Foster 1986); (Teece 1986); (Utterback 1996); (Von Hippel 2005).

Disruptive technology is defined then by Christensen (Christensen 1997, p. xviii) as a “typically cheaper, simpler, smaller and frequently more convenient to use” version of an existing technology proposed by the incumbent(s). This definition has been challenged by Daneels (Daneels 2004); (Daneels 2006) and others. Yu and Hang have quoted Barney (Barney 1997): ‘it may simply be the case that some firms are lucky in their technology choices’ (Yu and Hang 2010, p.6). This issue of luck will be discussed in more detail in subsequent sections.

1.2.2. From disruptive technology to disruptive innovation and business models in the 2000s

If the term disruptive technology was first analyzed in depth by Christensen, the term was later changed to disruptive innovation. Disruptive innovations can be found in various industries (personal computer, low-cost airlines, copiers, education etc.) and change entire markets.

Christensen and Raynor identified two different types of disruptive innovations: new market innovations and low-end innovations (Christensen and Raynor 2003). There is a distinction between low-end disruption which targets customers who do not need the full performance valued by customers at the high end of the market and “new-market disruption” that targets customers that could previously not be served profitably by the existing firm. Low-end innovations provide similar characteristics to existing technologies but cost substantially less. New innovations lead to new demand for a new technology on the market. The effects of these two types of disruptive innovations on markets are different. Christensen and Bower “*contest the conclusions of scholars such as Tushman and Anderson (Tushman and Anderson 1986), who have argued that incumbent firms are most threatened by attacking entrants when the innovation in question destroys, or does not build upon, the competence of the firm. We observe that established firms, though often at great cost, have led their industries in developing critical competence-destroying technologies, when the new technology was needed to meet existing customers’ demands*” (Christensen and Bower 1996, p.199).

Daneels summarized the general thought of Christensen by highlighting that “disruptive technologies tend to be associated with the replacement of incumbents by entrants.” (Daneels

2004, p.247). This vision must be refined once internal factors (organizational structure, resources, competences, processes, and values framework) are taken into account as mentioned by Christensen and Raynor who suggested that established companies could exploit a disruption only by creating a separate unit (Christensen and Raynor 2003). “As Burgelman and I used this theory to explain the success and failure of various companies in the semiconductor and computer industries, we encountered anomalies: incumbent leaders in their industries that had succeeded at disruption. We observed, however, that in each of these anomalous instances, the leader had maintained its industry-leading position by setting up an autonomous business unit and by giving it unfettered freedom to forge a very different business model appropriate to the situation. In other words, it was not a technology problem; it was a business model problem. I made a mistake when I labelled the phenomenon as a disruptive technology; the disruptive business model in which the technology is deployed paralyzes the incumbent leader.” (Christensen 2006, p. 43). Christensen widened then the application of the term of disruptive to include not only technologies but also products and business models.

In addition, Christensen and Raynor (Christensen and Raynor 2003, p.69) have stressed that “disruption is a process and not an event [...] it might take decades for the forces to work their way through an industry but [they] are always at work”.

1.2.3. The emergence of anomalies: towards a successful resolution in the 2010s?

Since Christensen’ seminal work, many criticisms have been made. The theory has its critics, many of whom call for more work on demand-side factors (Danneels 2004). Additional contributions also stressed the need for more work on demand-side factors, managerial solutions and business model innovation (Christensen 2006) (Danneels 2006).

Sandström, Berglund and Magnusson contributed to this debate as follows: “As will be elaborated below, we see that the TDI (Theory of disruptive innovation) is asymmetrical in two ways. First, it treats the focal firm as an internally complex and heterogeneous entity, but does not assume equal heterogeneity in the surrounding environment. Second, it assumes that incumbents are influenced by firms in their environment but it regards incumbents as incapable of influencing the firms that comprise their environments. By analyzing these asymmetries in greater depth, we hope to reveal ways forward for productive future development of the TDI” (Sandström, Berglund, and Magnusson 2014, pp. 474-475). Others have been more critical, such as Lepore (Lepore 2014) with an article in which she dismissed

the initial findings of Christensen regarding the disk-drive industry, the very ones on which the disruption theory was built.

Consequently, since his first book was issued in 1997, Christensen has continued to amend particular aspects and clarify some questions raised on this matter of disruption. One of them is linked precisely to the development of anomalies in his words. Christensen believes that the best way to improve a theory is to study anomalies. As represented in the figure 1, anomalies are the elements which enable researchers to go up the pyramid. Christensen values anomalies so much that he is reported to have hanged a handwritten message “Anomalies wanted” on the door of its office at Harvard Business School¹.

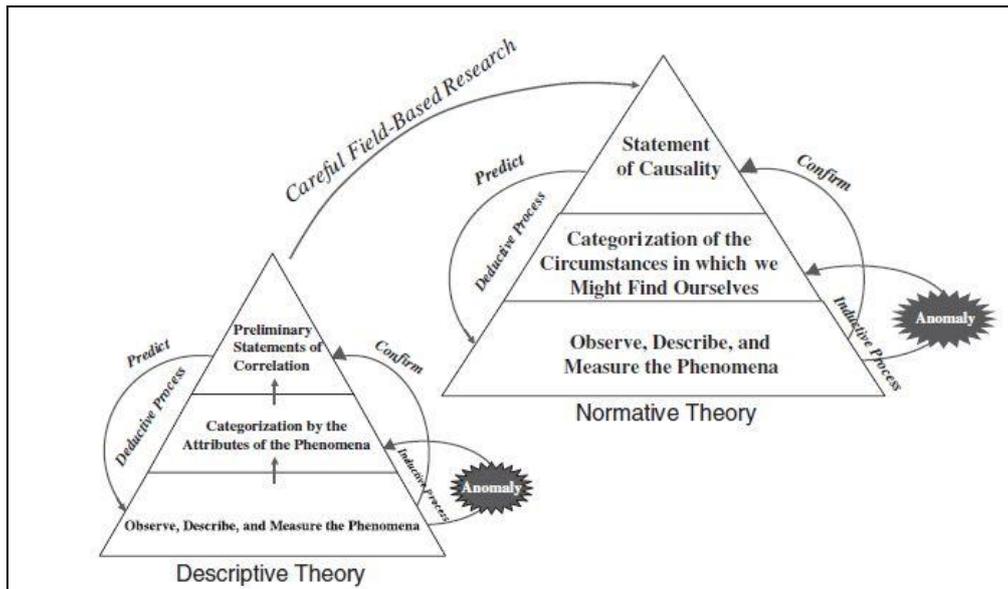
“We would be foolish to claim that it is impossible to create new-growth companies with a sustaining, leap beyond-the-competition strategy. It is more accurate to say that the odds of success are very, very low. But some sustaining entrants have succeeded. For example, EMC Corporation took the high-end data storage business away from IBM in the 1990s with a different product architecture than IBM’s. But as best we can tell, EMC’s products were better than IBM’s in the very applications that IBM served. Hewlett-Packard’s laser jet printer business was a sustaining technology relative to the dot-matrix printer, a market dominated by Epson. Yet Epson missed it. The jet engine was a radical but sustaining innovation relative to the piston aircraft engine. Two of the piston engine manufacturers, Rolls-Royce and Pratt & Whitney navigated the transition to jets successfully. Others, such as Ford, did not. General Electric was an entrant in the jet revolution, and became very successful. These are anomalies that the theory of disruption cannot explain” (Christensen and Raynor 2003, p.69).

This debate on anomalies is actually closely related with the emergence of the prescriptive and normative theory debate in the 2000s. Since mid-2000s, another issue was the focus of Christensen around the notions of prescriptive, normative and predictive. *“Disruption theory began the transition from descriptive to normative theory in my own mind in about 1996, as I interacted with Stanford professor Robert Burgelman in a project at Intel Corporation. It became clear that the causal mechanism of the outcomes we observed—the incumbent leaders excelled at sustaining innovation but rarely succeeded at disruption— was resource*

¹ “Clayton Christensen Moves on from the Dissing of Disruption.” *The Financial Times*, Andrew Hill, October 3rd 2016.

dependence as manifested in the resource-allocation process. We observed that managers must prioritize investments that help them garner resources from customers and investors in the way their firms are structured to generate profit, or they cannot survive” (Christensen 2006, p.43).

Figure 1: The transition from descriptive theory to normative theory (Christensen 2006)



The debate on Christensen theory is not over, as was apparent with the article "How useful is the theory of disruptive innovation?" (King and Baartartogtokh 2015). The authors identified four key elements of the theory of disruption: (1) that incumbents in a market are improving along a trajectory of sustaining innovation, (2) that they overshoot customer needs, (3) that they possess the capability to respond to disruptive threats, and (4) that incumbents end up floundering as a result of the disruption. After they examined 77 cases of disruptive innovations characterized as such by Christensen himself, they found that only seven of the cases (9%) contained all four elements of the theory.

2. METHODOLOGY AND SAMPLE

2.1. METHODOLOGY

This study investigates recognized historical cases of successful innovations, coming from companies operating in various sectors and various countries.

The nature of this qualitative research is exploratory and descriptive, using the case study method (Yin 1984). Yin defined the case study as “*an empirical study that investigates a contemporary phenomenon within its real life context, when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used*” (Yin 1989, p. 23).

Case studies can be exploratory, explanatory or descriptive. Yin also differentiates between single, holistic case studies and multiple-case studies. Case studies can be used to provide description, test theory or generate theory (Eisenhardt 1989). The case study method allows for analytical generalizations based on the research findings.

Case-study research is especially appropriate for an exploratory research, with a focus on documenting this phenomenon of innovation within its technological context, exploring the boundaries of this phenomenon (organizational, business models), understanding the conditions through the main players’ perspective and integrating information from multiple sources. Our tools for collecting data include archival records, surveys, documentation review and interviews. As Stewart and Kamins have underlined, we need to “*question information collected and reported by others*” (Stewart and Kamins 1993, p. 18) and try to assess the trustworthiness of these qualitative data. Therefore, information on markets, competitors, and technologies is derived from a large variety of sources such as company press releases and presentations, materials from conferences, company annual reports and press releases. Triangulation (information and data) was used during this research.

2.2. SAMPLE: CASES

This article considers 46 historical cases of successful innovations. A fraction of them have been analyzed by Christensen, either because he considered these cases as disruption, or because he disregarded them as disruptions. Each case is associated with two characteristics: it is time dependent, and it is industry dependent. Therefore specific years must be mentioned

for each case, as well as a specific industry. For instance, the case of Nokia is interesting to consider because the company was able to grow a very successful line of new mobile phones in the 1990s and early 2000s. In terms of innovation, the same Nokia company is not that interesting if we look at its performance in another industry (the wood industry for instance), or at another time (the 1980s for instance). A more detailed list of the cases is attached in appendix 1.

3. RESULTS

The first result which appeared after examining the 46 cases of the sample is that not all of them are consistent with the disruption theory: 26 of them are not (detail is available in Appendix 1). Although these 26 successful innovations do not qualify as disruptive innovation, all of them were so successful that they changed their industry forever. Therefore disruptive innovations are a category of successful innovations.

Another result is that successful innovations make a difference on a variety of dimensions. The Oslo Manual for measuring innovation defines four types of innovation: product innovation, process innovation, marketing innovation and organisational innovation (OECD and Eurostat 2005). Others have suggested slightly different dimensions to characterise successful innovations, such as Buisson and Silberzahn who chose to stress technological breakthroughs, business model breakthroughs, design breakthroughs and process breakthroughs (Buisson and Silberzahn 2010). They made it clear that in many cases of successful innovations, these dimensions had been combined. The iPod for instance can be considered as the combination of a breakthrough in terms of design (a significant improvement compared with all previous attempts of portable music devices), followed shortly after by a business model breakthrough (iTunes Store). If we accept that successful innovations do not rely on two types of disruptions which can be combined (or not), but four types of breakthroughs which can also be combined (or not), then companies face fifteen different options, as illustrated with Table I.

**Table I: Examples of successful innovations according to
the breakthroughs involved**

Technology Break.	Business Model Break.	Design Break.	Process Break.	Examples
x				Michelin (Radial tires), JVC VCR, Intel microprocessors
		x		IBM PC
x	x			Google, Nespresso
x		x		Dyson, Sony (Walkman), Nokia (mobiles phones), Toyota (hybrid cars), Piaggio (MP3)
	x	x		Apple (iPod), Apple (iPhone), Apple (iPad)
	x		x	Dell, Amazon
		x	x	Swatch
x	x	x		Dassault Systemes (Catia), Tesla Motors
	x	x	x	Southwest Airlines

The final result comes from a close examination of the Nespresso case, which provides additional insight regarding what it takes to achieve a successful innovation. Nestle started exploring the concept of portion coffee in 1974 when it bought a licence from the Geneva office of the Battelle Institute. Between 1974 and 1982, beyond the R&D explorations needed to make both the coffee machine and the capsules reliable, Nestle explored the restaurant market, which proved to be a dead end. From 1982 to 1988, Nestle switched its focus from

restaurants to offices, only to fail again. After 1988, thanks to Jean-Paul Gaillard who previously marketed Marlboro clothes lines and decided to create the Nespresso Club (in 1989), Nestle addresses the top of the household market. But it will take the company several additional years to see the number of Nespresso customers take off, from 2.700 customers in 1990 to 220.000 in 1997. Overall, it took Nestle more than 20 years to turn Nespresso into a successful innovation, as illustrated in Figure 2. The details of the successive stages of the Nespresso story are presented in Appendix 3.

Figure 2: The Nespresso journey



4. DISCUSSION: A COMMON PATTERN BEHIND SUCCESSFUL INNOVATIONS?

Many years have passed since the milestone contribution of Christensen (Christensen 1997), and the disruption theory has helped the academic and the corporate community to make sense of a number of cases. But using Christensen own recommendations, we have also shown in the previous part that this theory, despite several adjustments over the last two decades, fails to explain a number of really important and really successful innovations. By considering successful innovations, we see a common pattern emerge.

4.1. THE “WHAT” AND THE “HOW” IN THE DISRUPTION THEORY: THREE POSSIBILITIES

When Christensen built the initial version of the disruption theory around technology, he logically followed a literature stream which had considered technology as the central

component of a successful innovation, starting with Ansoff and Stewart (Ansoff and Stewart 1967), followed by Utterback (Utterback 1971) and Foster (Foster 1986). Replacing "technology" by "business model" did not enable the theory to explain all cases: characterizing a successful innovation by a single type of change is unfortunately not possible.

Disruptive innovations are either a "new-market disruption", or a "low-end disruption", or a combination of both, therefore there are only three options (Table II). Christensen did explain how each of these options can be achieved; in the case of low-end disruptions for instance, these are achieved by addressing customers which are overlooked by established companies.

Table II: The three options for Christensen disruption

Option	New-Market Disruption	Low-End Disruption	Best historical example
Option 1	x		Apple II
Option 2		x	Wal-Mart
Option 3	x	x	Southwest Airlines

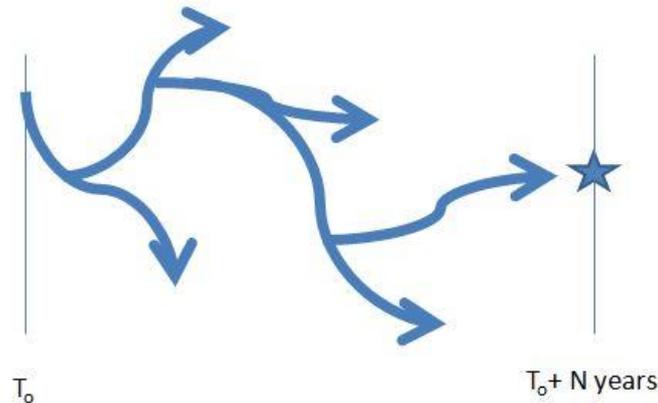
How do successful innovations emerge? Christensen talked about disruption as a process, but he referred to the initial event which changes the industry; for the PC industry for instance, the invention of the microprocessor had consequences for the following decades. Disruptive innovation, on the other hand, is a corporate initiative which happens in a matter of a few month or a few years.

4.2. THE "WHAT" AND THE "HOW" OF SUCCESSFUL INNOVATIONS: TOWARD AN INFINITE NUMBER OF OPTIONS

If we accept that successful innovations rely on a combination of breakthroughs, companies would face 15 options. Because the timing of the breakthroughs is completely open, companies face an infinite number of options. Therefore, the probability that a company finds immediately the right combination is close to zero. So how can companies reach the perfect combination of changes which will create a successful innovation? Through a trial and error

process. Sarasvathy (Sarasvathy 2001) described and explained why start-ups follow such a logic, which she called the effectual logic, as illustrated in figure 3 below:

Figure 3: Effectual logic

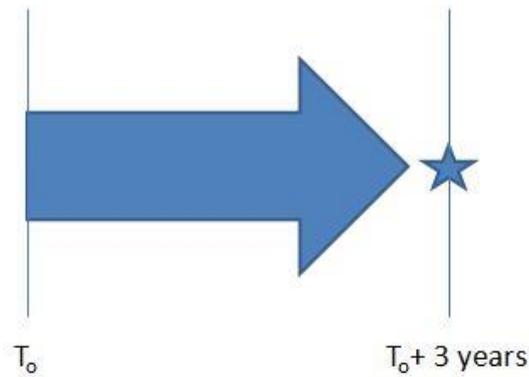


One of the difficulties associated with such logic is that nobody knows how much time it will take to reach the perfect fit, not to mention that most of the time new ventures never reach this stage. Established companies have to go through the same process when it comes to innovation projects, and they hate to admit it because it goes in the way of clean planning and predictable Return on Investment. From this perspective, this work is another attempt to bridge the disruption theory and the effectuation theory, following Dew and al. first attempt in 2008 (Dew et al. 2008).

4.3. WHY DO COMPANIES STILL STRUGGLE WITH INNOVATION?

Almost twenty years after Christensen first book (Christensen 1997) why do companies still struggle with innovation? The first reason relates to the "what": the nature of successful innovation. As detailed above, they are not only disruption cases, and can be much more complex. The second reason relates to the "how": the dominant logic of business is still causal. A project manager is supposed to set up a goal, a deadline, and then try to define the straightest way to achieve this goal. This approach has survived in large companies under the form of innovation projects which are asked to reach a positive Return-On-Investment (ROI) within three years, as illustrated in figure 4 below.

Figure 4: Causal logic



The obvious flaw of this approach is that it implies that companies are able to identify correctly at T_0 what the right breakthroughs are. Such extraordinary capacities do not exist, except in a very limited number of cases. It is often assumed that was the case when Apple, under the direction of Steve Jobs, launched three incredibly successful innovations in just six years (2001 to 2007): the iPod, the iPad and the iPhone. This has created the “Apple illusion”. A number of executives and CEOs have wrongly concluded that great innovations could be achieved with the right, a strong will and a linear process. People make wrong assumptions about the success, and don't really try to see what's behind. Even in the case of the iPod, there was not such a linear journey: Apple launched the iPod in January 2001, and it was certainly a significant design breakthrough at the time compared with all the previous portable music devices. But the iTunes Store did not exist in 2001, and Steve Jobs had no idea at the time whether he would be able to close the required deals with the music industry and artists. The iTunes Store was eventually first launched in the US in April 2003.

What are the consequences of misunderstanding the pattern we observe behind successful innovations? The first consequence is that companies stick to their linear way of approaching innovation. They rationalize, claiming that organizational and financial disciplines must apply to all corporate activities. The general short-term focus context which prevails in most companies does not help. This is a subject in itself which has been documented by books such as “Fixing the game” (Martin 2011) and articles such as “Equity vesting and managerial myopia” (Edmans, Fang, and Lewellen 2013) or “On the timing of CEA Stock Option

Awards” (Lie 2005). This context has an influence on all the aspects of management, including the management of innovation. No company is ready to engage in complex and non-linear multi-year innovation projects. They choose to ignore that most of the linear projects seldom deliver any significant innovation, or at least never deliver what they were meant to deliver when they were initiated. Another way to compensate for the poor results delivered in such an environment is to create more of the same: launching more innovation projects. This creates the illusion of activity; everyone involved in an innovation project is quite busy. But it makes the situation only worse, because the innovation resources of the firm are spread over more projects, reducing the probability that some of them reach significant results.

The last sin of corporations when it comes to innovation is quick fixes, or what they believe might be quick fixes. This is consistent with the fact that corporations value action more than reflection (there might other deeper cultural reasons such as action is associated with movement, and reflection is associated with immobility). Because of this context, companies are ready to test anything which looks like a quick fix. It can be a "theory" promoted by a management book whose effectiveness remains to be demonstrated or anything which looks “interesting”; Fab labs, Jugaad Innovation, Crowdsourcing. In the end, the life of managers and executives dealing with innovation issues look like the Sisyphus of the Greek mythology; they roll an immense boulder up a hill, only to watch it roll back down, repeating this action for eternity.

Because companies misunderstand the "what" and the "how" of successful innovations, they remain stuck in a wrong paradigm: linear projects.

5. CONCLUSION AND FURTHER RESEARCH

To conclude, the difficulty for large companies is not just ambidexterity, as suggested many times since the contributions of Duncan (Duncan 1976) and March (March 1991). This remains true. But the disruption theory has twisted the debate in such a way that companies, at least the ones who stick to the latest version of Christensen's disruption, try to develop an innovation which instantly fits into one of the three standard cases; new-market disruption, low-end disruption, or a combination of both.

This article started with the exploration of the successive definitions of a disruptive innovation. Looking at 46 cases of successful innovations over the last 50 years, it identified differences which pointed to a possible expansion of the disruption theory: a possible common pattern behind successful innovations. Companies have many more options when it comes to delivering successful innovations. They cannot get it right from the beginning, but rather have to build it as they make progress, following a logic which is much more effectual than causal.

If the conclusion of this article were right, this would have important implications for corporations. It would also push the debate on innovation beyond ambidexterity; companies do not just have to be able to manage their historical business while at the same time developing a new business. The real difficulty is to accept the true nature of innovation, and to approach it accordingly; it might not find immediately the perfect combination, and will need to keep on working on it until it does.

There are therefore two alternatives a company can use to take advantage of the process described above.

The first one is the top-down approach: it requires strategic vision and disciplined and flexibility. That's what Steve Jobs applied when he developed the iPod and the iTunes store.

IBM in the early 1980s, when it created and launched the IBM PC, is another example of a top-down innovation approach. Swatch is another example of a combination between the right strategic vision (re-investing the low-end segment of the market), discipline and flexibility (as described in the book "la fabrique de l'innovation" (Garel and Mock 2012), when Hayek took responsibility of the Swiss watch industry in 1983, the technical aspects of the Swatch had already been explored by a group of three gifted engineers). But not all CEOs are like Steve Jobs or Nicolas Hayek, and such examples do not abound, most probably because this approach is incredibly difficult.

The second one is the bottom-up approach: it requires tolerance and patience. When there is no clear strategic vision when it comes to innovation, *laissez-faire* might work. This is how the Nespresso case could be summarized (Miller and Kashani 2000) as explained previously.

Another famous example is Kevlar, accidentally discovered in 1965 by the DuPont de Nemours research engineers Stephanie Kwolek and Herbert Blades. The first market targeted by DuPont de Nemours was tire manufacturers, because the exceptional characteristics of Kevlar made it a good candidate to reinforce tire structure. Commercialization attempts in the

1960s and 1970s were a failure, so DuPont de Nemours had to find other markets for its new products, among them: helmets and bulletproof vests, sport equipments, music devices.

In these bottom-up situations, the initial trajectory of the innovation within its parent company is very similar to the one taken by start-ups. They have an initial idea regarding what the fit between their new concept and the market might be, but the fit is not there and so they adjust the concept (“pivot” in the language of start-ups) until it finds a market. As explained above, this kind of trajectory does not happen very often in large companies, because they would like any project (including new products) to be fully linear; the finance department will ask right from the beginning for positive ROI within three year. We do support that recent entrepreneurship literature streams, notably the one on effectuation (Sarasvathy 2001) or the one on Lean Start-Up (Ries 2011), are relevant when it comes to corporate innovation.

Future research should seek to extend and deepen the understanding of the underlying model presented in this article.

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