
Part I

Imperative and Fundamental Concepts

Change Happens

Change happens. It is just a part of life, if we want it or not. Given that change is natural, we can become better at understanding how to learn from and adapt to disruptive change. Sometimes a story manages to convey central messages so well, that it is not only a pleasure but actually the most effective to just re-tell it. To this end, *Who Moved My Cheese?* is a New York Times business best-seller that has helped millions of people understand and reflect on how to deal with change, both at work and in their private lives. Its central theme is how to overcome fear of the unknown (which often accompanies radical change). The central message that it promotes and illustrates is that constantly learning, adapting and courageously moving on to look for new opportunities can help us to actively shape the future in ways that make us happy. By stepping outside of one's comfort zone when the time is right. This business fable is both a call for optimism and for refusing to give in to the natural tendency of settling in a false sense of comfort and security. It encourages us to find stability in learning how to evolve with, rather than fight against, necessary and potentially growth inducing change.

Storyline Two mice (Sniff and Scurry) and two little people (Hem and Haw) live in a maze and search for cheese. The cheese is a metaphor for whatever makes them happy or they want in life, such as health, a certain job, organizational success, a loving relationship, material things etc. The maze is the place where they look for that cheese. To paint a vivid picture, we accompany these four creatures on how they deal with a drastic, life-changing situation. With their cheese suddenly gone, how will they go about adapting to new circumstances?

In order to find cheese, the mice have developed slightly different tactics than the little people. The mice only have little brains but very good instincts for finding cheese. Sniff has become adept in sniffing out cheese very quickly, whilst scurry is better at always being ready to race about if it leads him to new cheese. On the other

hand, the little people have very complex brains. Rather than trusting their gut instinct, they like to find their way through the maze by using their brain power and make use of guide books or maps. When the cheese is suddenly gone, the little people react with anger, frustration, helplessness and despair: “Who moved my cheese?!” they say. For them, adapting to change with speed and flexibility is not as easy. However, the moment Haw is willing to let go of the illusion of getting his old cheese back, overcomes his initial fear and starts looking for new cheese, he starts to believe in the possibility of a better future and feels free. No longer locked down by his fear, he begins to look for new cheese in the outside of his current world, the maze.

After a turbulent search for new cheese, the story ends with Sniff, Scurry and Haw joyfully finding even more new cheese than they ever had before. Whilst Haw is able to learn and adapt like the mice already did much earlier, Hem is not.

This short business fable contains a plethora of profound, wise insights. It fully acknowledges that leaving one’s comfort zone naturally requires a lot of courage, as in facing one’s own fears and sometimes quite harsh realities. Sometimes we need that nudge from our surroundings to again and again question our own beliefs, remember what we have forgotten, or just find courage to move and take things step by step. Thus this story encourages us to reflect and ask, “what would you do if you weren’t afraid?”, and then to actively create the change you want to see. The way to do this is by taking responsibility for one’s own fate and having the courage to shape it (as in find new delicious cheese), by overcoming own fears and limiting beliefs. As Haw realizes in the story, when you change what you believe, you can change what you do. When you believe in what you do and do what you believe in, you are less scared. When you are less scared to look for new cheese and get going, you are more likely to actually find new cheese and be happy. With good intentions and a warm heart for his friend Hem, in the story Haw also writes down some quintessential insights on the wall, hoping that they will help his friend find his way through the maze. These are as follows:

“Change happens. They keep moving the cheese”. This means that change is a constant in life. A nurturing and energizing ecosystem keeps on changing. Strong leaders see change as an inevitable human experience and get ready for it.

“Anticipate Change – Get ready for the cheese to move”. Realizing and noticing small changes early helps to adapt to large changes that are to come.

“Monitor change—smell the cheese often so you know when its getting old”. Radical change can happen over night, but often there are warning signs which we can spot if we monitor our environments and the systems of which we are part of closely. Of course, we do need to know what to monitor in the first place.

“Adapt to change quickly—the quicker you let go of old cheese, the sooner you can enjoy new cheese”. Let go of the past to adapt to the present and fight for the future. When we live in the past, emotions and limiting beliefs can stop us from moving forward. When we live too far in the future, fear might freeze and inhibit our actions. Thus when we live in the present and choose to see reality as it is, we are open to realizing that new cheese is just waiting for us to be found, but also

that finding it requires actively taking the next steps towards enabling luck and finding new cheese.

“Enjoy change—savor the adventure and enjoy the taste of new cheese”. Change can be an enjoyable adventure of sensing and finding exciting new growth opportunities. By focusing on our values and what gives us meaning rather than our fears, we can use them as our fuel to rise above immediate circumstances and dream of mesmerizing new types of cheese.

“Be ready to quickly change and enjoy it again—they keep moving the cheese”. Living and moving with change is easier than denying it and staying stagnant in the process.

“Change and win! Move with the cheese”. The quintessence is that in order to find new cheese, you need to adapt with the change. If you stick with what you know, fear of failure and settling might hinder from finding that nurturing courage to start into the new and unknown. There is a lot of new cheese, but we can only win if we open our hearts and minds to it! As a consequence, trusting in the process of finding new cheese and actively moving with the change is smarter than passively waiting in a false sense of safety, stability or reality. The longer you wait to adapt, the higher your inertia and the lower your agility and willingness will be to reinvent your current approaches.

Reference

Johnson, S. (1988). *Who moved my cheese*. New York: G. P. Putnam’s Sons.



The reason why it is so difficult for existing firms to capitalize on disruptive innovations is that their processes and their business model that make them good at the existing business actually make them bad at competing for the disruption.

Clayton M. Christensen

2.1 Introduction

Why Do Great Companies Fail?

Imagine the following: your customers love the products, services and performance you deliver, and your competitors are years behind you in terms of performance. You seem invincible, which sales numbers only seem to confirm because your company is breaking one growth record after the other. It truly seems that you are riding on a wave of continuous luck and success, with your teams over-performing and customers valuing your offering. There just truly are no signs anywhere that something could go wrong! Or at least you think so.

This assured mindset of thinking you are the best can have fatal consequences. The problem is that things can change unexpectedly—disruptively, almost overnight. Imagine you are now replaced in your core market and there is nothing you can do but watch the “ship sink”. Hit by gigantic disruptive waves, it is too late to change course or do anything that could restore your business to original heights of glory. Before truly being prepared, you are replaced or “killed” by someone who has never been taken seriously as potential competition, but now they are a true threat because they simply changed the rules of the game within the industry! Although so much weaker and less experienced than your established business, the newcomer managed to make you obsolete by bringing in a game-changing technology or a radically different, more effective way of meeting customer needs. Frustrated, all you can do seems to be to try and catch up with the new competition, re-learn and adapt

to the new circumstances. You begin to ponder and ask yourself, how could all of this happen?

Behaviors and mindsets linked to knowing better or pure hubris manifest in actions and organizational forms that precisely allow for the phenomena of “David conquering Goliath” to occur. In modern usage, this ancient story is used to describe how an underdog (i.e. weaker, smaller opponent) can succeed in the face adversity; against all odds, the newcomer conquers over an “invincible”, old and quite arrogant giant. Unusual and surprising with ingenuity, the new approach taken by the entrant leads the new way forward by taking a route no one even expected to be a smart tactic. In the natural fight for survival, the competition never sleeps nor stops to adapt and evolve. The consequences of the competition coming up with radically different ways to better meet basic customer requirements can be so drastic that they lead to the downfall of your carefully created business “empire”. Thus executives whose companies are currently highly profitable should not think about *whether* the power of their companies earning attractive profits will shift, but *when* (Christensen, Raynor, & Verlinden, 2001).

Example: Siemens Misses a Dramatic Paradigm Shift

A story even used by CEO of Siemens J. Kaeser exemplifies how important it is to constantly adapt to technological innovations (2016). Deriving also from personal experience, the quintessence of “David and Goliath” is shown in this famous incident, which forever changed the face of global telecommunication.

The setting is the mid 1990s to early 2000s and the storyline goes as follows:

Siemens was founded in 1847, and the telecommunication business was one of the most innovative and successful units of Siemens for the last 150 years. In the field of voice telephony, circuit-switched networks had been an established, well-functioning technology. As a quick reminder on how it works, circuit switched networks reserve a dedicated line or channel for the entire communication of a connection between two users. The approach is similar to a string telephone where sound vibrations travel along a fixed pathway in an uncompressed manner, from one end to the other. The incumbents in this highly attractive market were the telecom giants Siemens, Nortel, Lucent, Alcatel, and Ericsson. At that time, Siemens had several ten-thousands employees working in the entire telecom business: the telecommunication business was among the most profitable business segment of the conglomerate. The Siemens switch, called EWSD (Ger: Elektronisches Wählsystem Digital, Eng: Electronic Digital Switching System) became the best-selling switching system in the world. By the late 1990s, the company was delivering EWSD systems for more than 250 million connected units to customers in more than 100 countries. At that time, Siemens communication

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technology was riding the wave of success and everything seemed to be under control.

What a fatal illusion!

In no connection to voice transmission came the phenomenal growth of the Internet in the mid-to-late 1990s. The technology behind the internet was originally driven by data transmission and not intended to transmit voice. However, the rapid speed of internet technology development quickly changed also the landscape of telecommunication. Cisco was the company driving this innovation, founded as a start-up in 1984. Imagine that by late 1990, Cisco had a de facto monopoly in this fast growing market segment by connecting the dots between internet and telecommunications in the right way. With this, Siemens and the other large giants could do almost nothing but watch as they were disrupted by Cisco.

How was a radical take-over of market share possible? What Cisco did fundamentally different is that they combined voice with the internet-based technology of data transmission. They helped customers get the same job done yet took a very different approach, by making use of the internet. Thus, Cisco used a fundamentally different technology as its basis for radical innovation. How? The internet is based on packet switching. Packet switching networks transport data in small chunks, meaning packets. First the original message from a sender is decomposed into small packets. Each packet has a destination address that transports the packet to the final receiver. Each packet seeks out the most efficient route through the network, which means that each packet can go a different route. When received, the packets are reassembled in the proper sequence to build up the original message.

For voice transmission, the decomposition of the original voice signal into small packets has a slight disadvantage (no real-time transmission is possible compared to circuit switching), as transporting “voice chunks” through different paths via the internet and finally reassembling those packets at the receiver causes a certain latency/time delay. It also means that the quality of Voice over Internet Protocol (VoIP) is less than in circuit switched networks where voice is transmitted via an established channel. Siemens thought that customers valued voice quality so much that they would never choose VoIP because the connection could never be as good as circuit switched technology. How wrong they turned out to be.

The most tragic reality about this true story is that by the mid 1980s, three young men from California actually came to Siemens in Munich with the cool idea of voice calling via the internet. “Would you be interested to join in?” they asked, but they were met with disbelief, arrogance and rejection. “How should that work? If VoIP was possible, we would have already invented it on our own” Siemens representatives answered (Kaeser, 2016). Siemens could just not believe that this invention was possible and missed an opportunity that

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would later lead to its own downfall in the telecommunication business. So the three young men pursued and accomplished their vision without Siemens and changed our world. These three young men from California were the future co-founders of Cisco.

So what was the problem for the market leading companies such as Siemens? Believing that this new approach would not work, Siemens held on to its ingrained beliefs, just not believing in the crazy, radically new. It continued to follow its set philosophy that for voice calls, there is nothing more important than quality for voice transmission. Very skilled and experienced engineers even thought that VoIP will never really work due to quality and security reasons. So they continued and incrementally made innovations for circuit switched technology. In the meantime, new technologies like ISDN and later ATM (Asynchronous Transfer Mode) had emerged that allowed voice and data transmission at the same time but still were based on circuit switched network (ISDN), or virtual circuit switched networks (ATM). ISDN was very successful for Siemens for some time and there was a coexistence of VoIP and ISDN in the early-to-mid 2000s. ATM was driven by the philosophy to maintain the Quality of Service (QoS) such as voice quality, and it was considered to be the future for the internet by many telecommunication experts.

But the situation changed rapidly as soon as VoIP had a voice quality that was considered to be good enough for most users. VoIP meant higher efficiency, dynamic bandwidth, less complexity, significant cost reduction and tremendous increase in data rate. Most importantly, with the rise of the internet data traffic exploded exponentially and the new performance feature that users were requesting and valued was data rate, not voice quality. The final verdict for “Goliath’s” such as Siemens and the other incumbents in the era of circuit switched voice telephony was finalized. VoIP finally became a fundamental stepping stone in enabling digitalization, displacing circuit switched technology and enabling today’s massive internet “surfing” that seems so normal to us today.

It should be noted that this story is quite exceptional, because Siemens was one of the few companies that was able to recover and reinvent themselves after such a massive disruption. Today this bitter own failure is still deeply ingrained in the corporate memory of the company, and the entire management takes it as a imminent reminder and warning to not let a similar catastrophe happen again. Potentially this is one reason for its current success. Today, one could say that Siemens is one of the leading companies in realizing digitalization in the B2B sphere.

2.2 Defining Relevant Terminology

Disruptive innovation, as introduced by Professor Clayton M. Christensen, has become a powerful way of thinking about innovation-driven growth. Disruptive innovation and technology are now part of almost any business lexicon, experiencing an exponential growth in use since its incarnation in 1997. From the world of multinational conglomerates to small, entrepreneurial companies—disruptive innovations have extreme consequences for any business and its interconnected systems. Linked to the Siemens–Cisco example, disruption means that there are always winners and losers, and usually the large, established companies are the ones that have to give way to newly emerging competition. For the moment we refer to innovation as being about doing the same things but better, and disruption being about making new things that make the old obsolete. We will have a more refined, nuanced view of different types of innovation later in this chapter, including incremental and disruptive types.

But why is disruptive innovation so hard to grasp, and why do we tend to fall into the same traps over time? If we know that maintaining a competitive advantage is important, how can one miss the signals that something dangerous is coming? Why do great companies that seem to do everything right, fail? Questions as the following naturally lead to others such as what are the warning signals that a disruption is on the way? What different types of disruption are there? And finally: in an increasingly complex world, how does one know what is going to become a disruption and what is just a trend? This chapter explores the mechanisms and theoretical models that explain disruptive innovation, and how to recognize and safe-guard oneself against being disrupted.

So what different kinds of disruptive change are there? Businesses face many kinds of threats and risks. Figure 2.1 shows different kinds of “deaths” that can be fatal to a business, from slow to fast. Some types of deaths are similar to smoking.

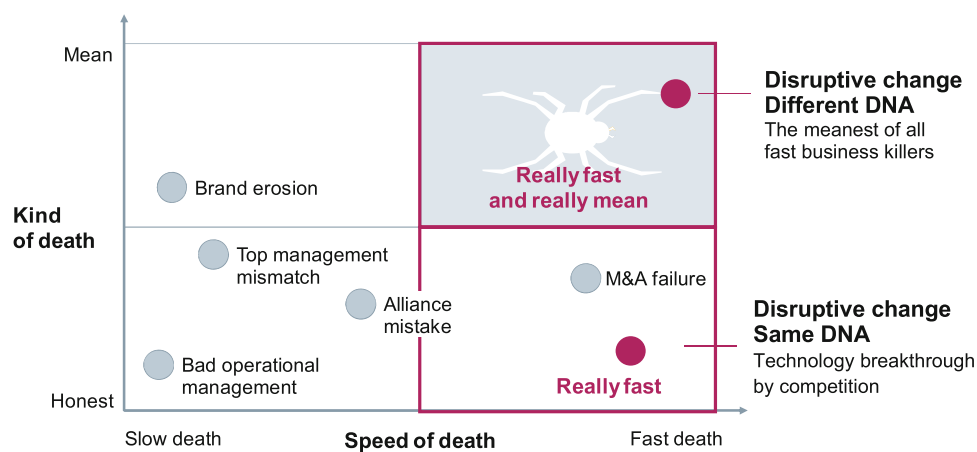


Fig. 2.1 Different types of death for a business (illustrative)

Arguably, they are quite honest yet possibly with fatal consequences that are incurred over a long time period.

On the other hand are those threats which lead to disruptive change. There are two types of disruptive change, of which both can lead to a fast business death. Those with the same DNA refer to problems inferred because the competition has made significant technological breakthroughs, which make your offering obsolete. Comparable to a black widow, disruptive innovations of different DNA are those which are the fastest and “meanest” of all because they can kill you with incredible speed and disastrous consequences. Seemingly being hit out of the blue often means that one is not prepared for drastic changes, such as altered circumstances and market demands. If unaware of new disruptions, these innovations often *seem* to hit businesses from the back, rather than from the front. Or they seem to hit from all sides at once—front, back, left and right. We will focus on exploring these types of business problems that are of disruptive nature. To do so we will start with exploring some of the most influential and foundational ideas that help us understand why great companies can fail to foresee drastic changes in the first place.

2.3 Complementary Thoughts on Christensen’s Theory of Disruptive Innovation

The different types of innovation we define and use in this book hinge on the groundbreaking ideas developed Clayton M. Christensen. In the latest edition of his book the *The Innovator’s Dilemma* (2016), he illustrated how radical technological innovations can lead to the downfall of even the most successful companies. He coined the terms disruptive innovation, and his ideas around sustaining and disruptive technologies serve as a fundament for understanding the re-occurring emergence of this phenomena. The complementary ideas that we develop in the next pages, and have found very useful in explaining disruption in the daily work and field of product innovation and development, hinge on an understanding of Christensen’s insights. Thus, let us shortly look at how he defines two types of innovation—sustaining and disruptive technologies.

Most new technologies foster improved product performance. I call these sustaining technologies. Some sustaining technologies can be discontinuous or radical in character, while others are of an incremental nature. What all sustaining technologies have in common is that they improve the performance of established products along the dimension of performance that mainstream customers in major markets have historically valued. Most technology advances in a given industry are sustaining in character. An important finding revealed in this book is that rarely have even the most radically difficult sustaining technologies precipitated the failure of leading firms.

Occasionally, however, disruptive technologies emerge: innovations that result in worse product performance, at least in the near term. Ironically in each of the instances studied in this book it was disruptive technology that precipitated the leading firms’ failure. Disruptive technologies bring to a market a very different value proposition than had been available previously. Generally, disruptive technologies underperform established products in

mainstream markets. But they have other features that a few fringe (and generally new) customers value. Products based on disruptive technologies are typically cheaper, simpler, smaller and, frequently, more convenient to use.

Disruptive technologies therefore change the rules of the game by creating customer value via new technologies that first target low-end customer segments or completely new footholds. In the long run, they enable unexpected yet highly efficient new ways of meeting customer needs. The story about VoIP and the rise of Cisco poignantly illustrate Christensen's definition of sustaining and disruptive innovation. In this case, Circuit switched technology would be classified as the sustaining technology, whilst Cisco's invention of voice over IP would be classified as the game changing, disruptive technology.

It is not that uncommon to find situations where managers and those involved in the product development process do not fully grasp and face the dramatic situation that they are currently in, namely that they are in the process of being disrupted. It seems that in practice and in our daily business, the nuances of Christensen's definitions and thus their implications are not always well understood. With a missing understanding for how severe and dangerous the current situation is, igniting radical change and successfully leading a business turn-around becomes almost impossible. The unclarity around what disruptive innovation is and what it is not has led to the need to clarify it (Christensen, Raynor, & McDonald, 2015). The issue is that if you miss the urgency and severity of what it means to be disrupted, taking appropriate action to steer against it becomes increasingly difficult! Deriving from own experiences we saw an additional need to refine our vocabulary to better be able to explain different types of disruption to those afflicted by it.

To explore what exactly leads to misunderstanding or misinterpretation in practice, let us consider two examples. These are illustrative examples that are symptomatic for many industries, highlighting the fundamental challenges that we are often faced with.

Example 1 Imagine the following product, a train consisting of six wagons, see Fig. 2.2. The company producing the train has successfully sold it for many consecutive years, yet "all of a sudden" the product has a cost gap of about 30% in comparison to its main competitor.

The need to regain price competitiveness usually invites for standard problem-solving approaches. A typical go-to solution is thinking of initiating radical cost reduction programs. However, thinking that cost reduction alone could sustainably fix the core problem faced here is often an illusion: to accurately depict the depth and severity of the faced challenge, we have to acknowledge the real trouble that this



Fig. 2.2 Six wagon train

company is in. What does a 30% cost gap reduction imply? A 30% cost reduction of the product entails maintaining customer satisfaction by producing and delivering a six wagon train, yet having to save the production costs of two complete wagons, see Fig. 2.3!

Imagine that in this case we are talking about a mature, lean product. This product has already gone through many cost optimization cycles, including multiple cost reduction programs. We can say with highest certainty, that starting a classical Design to Cost effort could not effectively solve this type of problem, because the problem needs to be addressed on the systemic level. Recognizing that the competition has done something fundamentally better requires awareness for the fact that the current product offering will no longer have a future. Taken that actions should translate into core fixes and lasting business impact, partially solving the problem would just not be the best choice. In the struggle to stay market relevant, what other options are there? If incremental is not enough, then the answer is radical innovation. The competition somehow managed to create a starkly better value proposition with their products. In order to stay market relevant, a radical product redesign or even a complete new product design with a focus on cost innovation is therefore the only way forward.

Now the question might arise what does this example have to do with sustaining or disruptive innovation?

There are obviously two facts:

- The product in trouble has been disrupted by competitors' products which have a significantly better cost positioning, and therefore can be offered cheaper yet offer an equivalent value proposition to the market.
- The competitors' products do not introduce any new performance features nor do they create or transform any new market segments; rather, they are disrupting the business within the same industry.

What the competitors' products are doing is that they offer more perceived value to their customer by offering a product with same or even less performance, but at a significantly lower price. The disruption is thus due to a significantly lower price point and not better product performance per se. It is important to point out that performance decrease is only viable until hitting the point of minimum customer requirements. As with the train example here, competitor products do not improve on any performance features. Rather, these products have obviously made cost innovations which often result from better product architectures. By fundamentally



Fig. 2.3 Illustration of what cutting 30% of overall production costs would entail

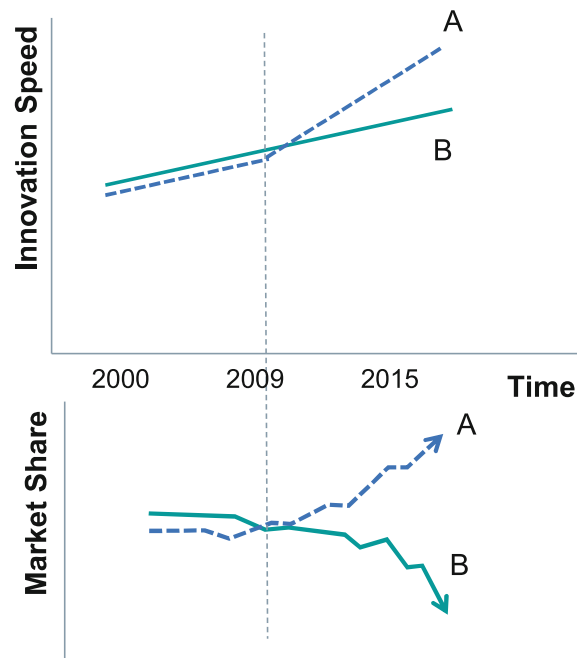
building the product in a radically different way, the competition therefore became more efficient in satisfying customer needs and expectations towards the products to be fulfilled job.

How could we classify this type of product disruption and displacement from the market? Would it be defined and seen as a sustaining, incremental, radical, breakthrough or maybe even disruptive innovation? According to Christensen's definition of sustaining and disruptive technologies given previously, this example would not perfectly fit into any of these categories. Christensen however introduces a new type of disruptive change, calling it "low end disruption" (Christensen & Raynor, 2003). This term would come closest to accurately describing the nature of this kind of business problem. His definition applies to products targeting customers who do not need the full performance valued by the high-end market. However, the difference is that the disruption we describe here is happening within the same industry. We will resolve the mystery a bit later on what name would therefore be even more clarifying.

Example 2 Imagine that two companies are battling for market dominance in terms of product innovation. Until 2009, their speed of innovation was parallel, see Fig. 2.4. Their respective market share was about equal. In 2009, company A suddenly doubled its innovation speed. At that point in time, the market share almost exponentially increased for company A, while the market share of company B dropped dramatically.

Company B was basically disrupted by company A. The competitor literally shot off by doubling its speed of innovation. The upper diagram illustrates the drastic increase in speed of innovation by company A, as measured by the number of new

Fig 2.4 Increasing innovation speed coincides with market share increase



products introduced in the different market segments. The lower diagram shows the respective market share of both company A and B.

What could enable such game-changing speed of innovation? One major enabler for doubling the speed of innovation in this case was that company A introduced modular architectures. This allowed company A to fundamentally re-align its product portfolio to customize yet also drastically reduce the time to market of its products. It also allowed company A to introduce new product variations faster, whilst also delivering orders to customers at a significantly reduced time to market.

The crux is that instead of competing through superior performance, modular products compete through speed, flexibility, customization and price. The customer value in this example varies on the newly introduced products, so it might be better performance, better customization, better price or even a combination of those factors. As seen here, as soon as performance is not the only criteria for creating customer value, modular architectures typically disrupt products that have fixed, integral architectures. (If terms such as modular and integral are new to you, don't worry we will elaborate on them in detail in both the modularization and systems engineering chapters.) The modular approach allowed company A to meet diverse needs more effectively than company B could, and thus fundamentally carve out and take on a competitive market advantage. This effect of modular architectures is also described by Christensen and Verlinde in their paper "Disruption, Disintegration, and the Dissipation of Differentiability" (2002).

The point we aim to make is that modularization is so much more than just a methodology that can be used to manage internal production and external market complexity. As we can see here, it should be associated with innovation and disruption, because it can actually be a way to innovate and disrupt entire markets, especially those that are already quite mature! So the question again arises if the introduction of a modular architecture with its incremental innovations in different independent modules can already be considered an innovation. If so, would it then be considered a sustaining, incremental, radical, breakthrough or disruptive type of innovation?

Both examples show how Christensen's original definitions in regards to disruptive innovation would not really apply to the two different categories and types of business problems explored here. In recent years Christensen however offers new terms and theories to explain and solve this mismatch: his theory of modularization helps us to understand the second example, and the idea of low cost disruption helps to explain the train example and its respective drivers of innovation and disruption.

In order to make the classification of the different types of innovation more intuitive and crisp, we propose a new definition and classification of disruptive change. In recent years there have already been debates on expanding the term disruptive innovation (see Chase, 2016) so there truly seems to also be a need on an international level to rethink what this term actually means to us. Stemming from this need we decided that if people struggle with understanding the difference and unified big picture between sustaining, disruptive technologies, low cost disruption and his

theory on modularization, then there must be a more intuitive way in which we can explain these fundamental concepts. In this process, we then found a way to not only explain and classify different innovation types with more (as we find) intuitive and comprehensive clarity, but also unify Christensen's theory on disruptive innovation and technology s-curves into one overarching model.

2.4 The DNA of Disruptive Change

At this point one might ask, why bother so much with theories, terms and definitions?

Knowing what a disruptive innovation is and what it is not, is important because we cannot effectively manage innovation without understanding its true nature (Christensen et al., 2015). From working more than 20 years in industry projects that were very similar to the two previous examples, it became clear that most people do not realize and understand the dramatic situation that they are facing when they are in the process of being disrupted. Often, such individuals refuse to face the stark reality for their real problems, finally leading to the demise and downfall of their own businesses. With a missing understanding for foundational theoretical frameworks, it is unnecessarily harder to explain what is currently happening to them, and why their businesses are failing.

The bottom line is that Christensen's theory of disruptive innovation and the unambiguous use of terms and definitions is of such fundamental significance because it enables an understanding of what causes what and why. Clarity in terms of relevant concept definitions help managers and all those involved in the product development process to explain, understand, judge and predict different situations in their real business. A theory at its best therefore helps deduce meaning from re-occurring patterns, and helps to recognize both opportunities for growth, and also dangerous circumstances. Understanding of theory thus leads to better and more informed decision-making in practice, providing the stepping stones for your business to prosper.

To come closer to distinguishing between what disruptive change is and what it is not, from what point onward do we consider something a disruptive innovation?

Disruptive innovation is about coming up with something that makes the old obsolete. It is truly game changing and focused on creating the new. At Google, co-founder Larry Page engrained the mindset of "10× better rather than 10% better" into the DNA of the organization, with the aim of spurring radical innovation (Schulz, 2017). As one of the leading tech-companies of the twenty first century, Google's definition is aimed at producing concepts that are 10× better than the original product—anything less is not radical enough. Engrained into the tech giants philosophy, this core belief requires a reason for urgency in order to be lived and implemented by employees; to not only affect company vision and values, it has to be realized in practice. Page argues that urgency derives from the fact that aiming for

anything less (i.e. incremental innovation) is not enough because from the outset, it will not have the potential to solve the large challenges of our time fast enough (ibid). Incremental innovation will also not truly revolutionize the market in the way that Google sets out to do with its products and services. Changing the world radically often requires radical innovation.

In regards to generating business impact, we are intrigued about discovering the nature and severity of an innovation and disruption. So what can we say about the nature of disruptive innovation? Just as there is a difference between the paw of a cat and a tiger cub from the moment they are born, can we spot different disruptive innovation types early on? The answer is yes. For disruptive innovation, we have developed terms to distinguish between two subtypes.

1. **Disruptive innovation with the same DNA:** These are innovations that are radically better than the “original” product (i.e. around $10\times$ better). We consider such innovations worthy of being considered of having a breakthrough nature because they fundamentally re-define our boundaries of what is believed to be possible and what is not, yet with the term “same DNA” wish to acknowledge that such innovations still remain and disrupt within the same product category or market segment as the original concept. For car combustion engines for example (see Fig. 2.5), reducing fuel consumption from 8 l/100 km to 0.5 l/100 km would be a disruptive innovation with same DNA because it would be radically better than the original offering, yet still deals with the same technology (traditional fuel combustion engines implemented in a car concept).

Note that the two previous examples with the train and industry case would also belong to this category. They pull their disruptive nature from being a low cost disruption/innovation or from increased speed of innovation via modular architectures. They are disruptive, yet act in the same product category and market segment.

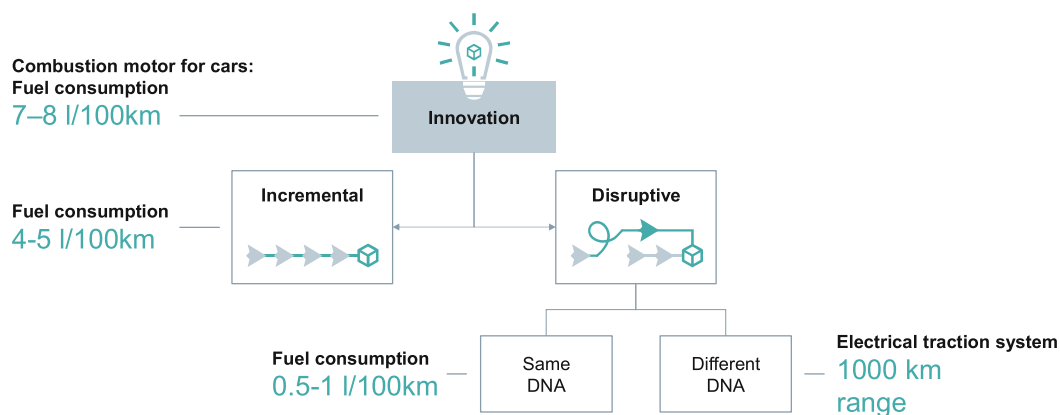


Fig. 2.5 Technological developments enable different types of innovation

2. **Disruptive innovation with different DNA:** Products, services, experiences or concepts with a completely different DNA are radical new innovations that have architectural building blocks which are completely different to those products that are already established in current markets. Their nature is completely different because they build on a different and new technology. Disruptive innovations with different DNA would match to Christensen's definition of disruptive innovation. The story of Cisco's invention of VoIP is a poignant example of this kind of innovation. A new technology that would enable electric car engines to have a 1000 km range, require no maintenance, or address the underlying customers' job to be done of getting from A to B in a fundamentally different way would also belong to this sub-type. As with VoIP, as long as the new technology is not good enough yet, the majority of customers will stick with the established technology. When the range reached with the new type of innovation is good enough, consumers will switch to this new type of technology.

What hinders firms from innovating radically, and rather foster incremental innovation? As we will explore later, disruptive innovations with different DNA are not profitable enough at first for those that look at short-term profit gains. The risk-averse business environment of market leaders usually does not allow them to pursue disruptive innovations with different DNA when they first arise. Incumbents are also faced with the constant dilemma of resource allocation. The development of crazy new concepts can take away scarce resources from incremental or disruptive innovations with same DNA. Especially in large, established firms, most individual decision makers find it very difficult to risk backing a project that might fail because the market for it is not there yet, or well enough understood to put their name on the line for the new idea. In consequence, it is often the most entrepreneurial minds that not only come up with radically new solution approaches, but have the grit and nerves to test them through. Out-of-the-box solutions with different DNA mostly find ground in dynamic environments and innovation hubs that actively foster the development of crazy ideas, test and develop them quickly in order to let them fail fast, and see if they carry any market potential.

Complacency is another problem. Many companies have the knowledge and technologies to lead the way forward yet only radically rethink their approaches when they are already being disrupted, by same or different DNA. Disruptive innovation requires courageous action and leadership, not fear-based decision making. If for example a drastic cost reduction of 30% is the only way to achieve a turn-around, a fundamental re-design of concept might require innovating new products.

2.5 Disruptive Innovation with Different DNA

Why do great firms fail? How can we explain disruptive innovation with different DNA by using the model created by Christensen? As disruptive innovation with different DNA is identical to Christensen's definition of disruptive innovation, we can apply his model to explain this type of innovation.

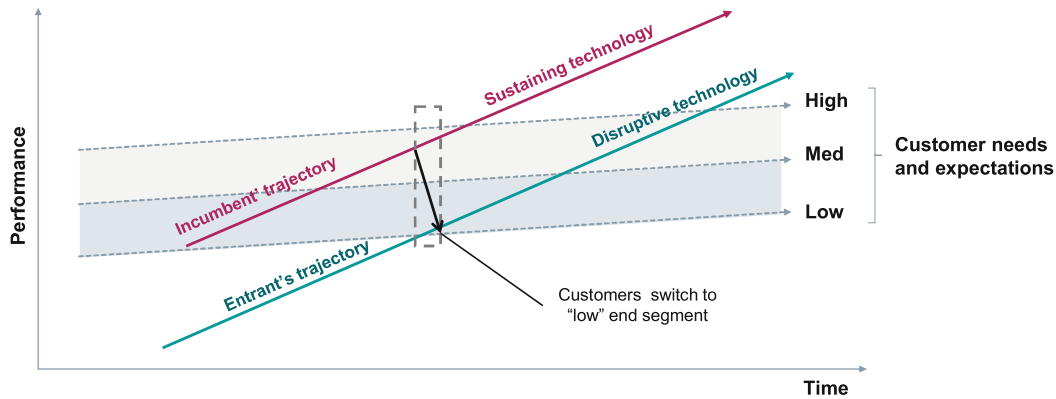


Fig. 2.6 Explaining disruptive innovation. Source: adapted from Christensen (2016)

According to Christensen (2016), disruptive innovations originate in low-end or new-market footholds, and innovations do not catch on with mainstream customers until performance catches up to their standards. Figure 2.6 contrasts incumbents and entrants product performance trajectories (the lines show how products or services improve over time) with customer demand trajectories (the dashed lines showing customers' willingness to pay for performance).

Incumbent companies introduce higher-quality products or services (upper line) to satisfy the high end of the market (where profitability is highest). By doing so, they overshoot the needs of low-end customers and many mainstream customers. This leaves an opening for entrants to find footholds in the less-profitable segments that incumbents are neglecting. Entrants on a disruptive trajectory (lower line) improve the performance of their concepts and move up-market (where profitability is highest for them as well) and challenge the current dominance of incumbents. The tipping point occurs when the performance of the entrant's product is good enough to satisfy minimum customer requirements. At that point, customers are rapidly switching from the incumbents product to the entrant's product, which finally leads to the downfall of the incumbent (see Siemens–Cisco example). Entrants nearly always win (Christensen, 2003). Coming from the low end, the entrants are typically neglected, underestimated or just overlooked because their offering seems too crazy or different to actually become a threat to the incumbents. Since entrants focus on minimum customer requirements, they usually have a cost advantage compared to higher performing incumbents.

2.6 Disruptive Innovation with Same DNA

Through Christensen's theory of disruptive innovation we can understand disruption with different DNA. The question arises of what theory then explains "disruptive innovation with same DNA". To explain this idea of disruptive innovation with same DNA, we can turn to the theory of S-curves.

The concept of S-curves explains the maturity level of technologies or products in a certain business ecosystem. A single S-curve explains the common evolution of a successful technology or product, from early adoption to market saturation. Figure 2.7 shows multiple S-curves, with performance on the vertical axes, and the progression of time along the horizontal axis. So what do successful companies do to maintain a competitive advantage over longer periods of time? High performance is defined by companies that execute repeated jumps and climbs between S-curves (Nunes & Breene, 2010). At the very beginning of each single S-curve, technology or product performance tends to develop slowly, and not at rapid scale. At this stage, there is still a lot of resources spent on development and research on how to improve the new technology. In the next phase, technology development has overcome most major obstacles and hurdles and the first customers—the early adopters—help the technology or product to “take off”. The market in this phase is characterized by rapid growth and together with this growth, the performance of technology or products improves fast. Having reached the last phase of a single S-curve, the products’ performance achieves a mature state. As customer tastes and preferences continue to change over time, customers at some point no longer perceive any significant value increase for the current products’ performance. The current products might also have become over-engineered or too complex, no longer following the lean, agile form follows function mantra. Typically, it is in this last phase that the product is disrupted by another. This is why there are multiple S-curves, where jumping from one S-curve to the next technology/product S-curve starts the life of a new product/technology innovation cycle.

From the companies development point of view, the performance described in this S-curve shows the perspective of a dedicated business that is embedded in a certain market environment. Performance is usually not a single parameter, but a set of criteria that are key buying factors in this business. Imagine now that this business has customers on the one end and suppliers on the other end. Customers of this business can be B2B (business-to-business) or B2C (business-to-customer). Within this customer–supplier chain, the business of course centers and focuses its activities

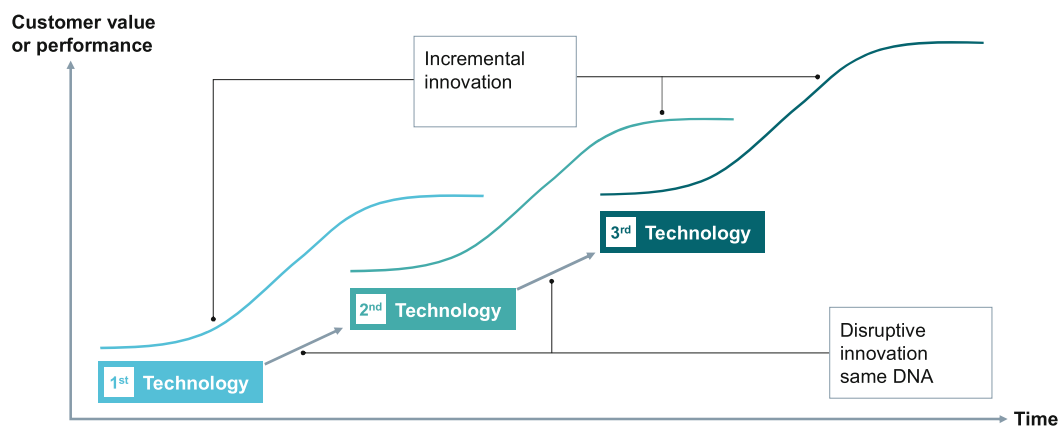


Fig. 2.7 S-curve model to describe innovation trends

on a dedicated business model. From this view it becomes evident that “performance” as described in the S-curve model has to address customers’ buying criteria and their true needs, because the business aims to increase perceived customer value (and thus sales) via their technology applications and products.

Products, experiences and services should exist because they make the lives of their customers better and more enjoyable, as by adding value to them. In order to address the aspect of value more explicitly, we propose—in difference to the original S-curve model to use customer value on the vertical axis, instead of performance. Value here refers to the maximum amount of money a specific person/company is willing to pay for the satisfaction of his/her needs delivered by a product or service. With this slight change it should be evident that the successive S-curves and thus innovations always develop towards increasing customer value. They place the customer at the center of attention. Another aspect that we cherish by using value on the vertical axis is that it acknowledges that performance increase not alone will lead to better customer value, but also cost decreases. Innovations on costs (i.e. low-cost disruptions) can thus be seen equally as disruptive innovations if they significantly increase customer value.

What do people truly care about, and how does it change over time and with situational circumstances? Naturally, functionality is much more than performance or technical functionalities. Functionality is linked to a product’s perceived value in how it meets the customers’ deep needs, also their emotional needs. In comparison, the modern world is marked by increasingly affluent societies that no longer only care about survival and security. Increasingly, there is a shift towards valuing experiences that add meaning to our lives, enrich them by manifesting purpose, and are clearly useful and needed. We will explore value more in the chapter on Design to Value, so this is just to quickly mention why we see it as useful to see the y-axis in terms of external customer value rather than product performance.

So when is something an incremental innovation and from what point onward do we consider it a disruptive innovation with same DNA? Small improvements on customer value, performance or cost take place on single S-curves. These are incremental innovations. Big steps in technology improvements, radical improvements or technology breakthroughs on performance, cost or on how customer value is delivered result in a jump from one S-curve to the next S-curve. We define these jumps on the S-curves as disruptive innovation with same DNA, since the roots of the technology are still based on the very first S-curve within this S-curve chain. In opposition to disruptive innovation with different DNA, disruptive innovation with same DNA can kill or disrupt products, product lines or even single companies but it will not disrupt an entire market segment and kill all business providers (like it was shown in the VoIP story). Regardless if incremental or disruptive with same DNA, the chain of single S-curves takes place in a business ecosystem where the customers, technologies, products, suppliers, competitors etc. interact in a dedicated market environment. Innovations remain in the same product category or market segment.

Using these definitions of disruption with same or different DNA, we can easily categorize the examples given earlier. “Low end”, or “low cost” disruption would fit

in the category of disruption with same DNA. This type of innovation usually does not improve on performance within the DNA of a technology but due to a better cost position, allows companies to offer their customers better price points and with that offer more value to their customers. It goes upwards on the S-curves, either incrementally or disruptively by jumping to the next S-curve. Being in technologies with the same DNA, we consider low cost disruption much more aggressive than disruption based only on performance increase. Incumbents are good at innovating on performance, but for low cost solutions their internal cost structures and complex processes often hinder them to compete with low cost solutions entering their market realm. The most dangerous mindset is that those low cost products often are not considered to be a disruptive change or even a disruptive innovation. But reality shows exactly the opposite—they are very much able to disrupt incumbents.

As mentioned, innovation based on market driven modular architectures often also falls into the category of disruptive change by same DNA. Modular architectures compete through increased speed, flexibility and customization, and have the power to disrupt mature, integral architectures. But modular architectures can even combine both types of disruptive change. Typically, major parts in such modular architectures are driven by innovations based on same DNA (incremental or disruptive) while they can simultaneously integrate modules that are driven by innovations with different DNA. With this in mind it becomes obvious that modular architectures are much more than just an answer to market complexity. Modular architectures become a key success factor in dealing with turbulent markets, increasing speed of innovation cycles and the demands of the modern VUCA world.

2.7 Theory of Disruption Waves or the Modulation of Disruption

Creative destruction is a process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one—Joseph Schumpeter

The S-curve theory can be used to describe incremental innovation and disruptive innovation with same DNA. Christensen's theory of disruptive innovation describes the concept of disruptive innovation with different DNA. As Christensen describes in *The Innovator's Dilemma* (2016), it is not possible to plot disruptive innovation with different DNA in the S-curve figure of an existing business ecosystem (p. 41). The reason for this is that disruptive innovation with different DNA originates in a totally different business ecosystem where other criteria on how to maximize customer value apply. Only when minimum customer value criteria for an established business ecosystem are achieved and reach a tipping point, does the disruptive innovation with different DNA penetrate into this existing system, thereby disrupting it and cutting the existing S-curve chain.

In the following we propose a new view on the different types of innovation which actually allows us to combine the two previously explored theories. This

unified theory might be helpful to understand the overarching phenomena of disruption with more clarity, making it more adaptable to the real business environment. The idea of this model is that we do not plot value or performance in regards to time like it is done in the S-curve and Christensen's theory. Instead, we use sales volume over time. Sales volume typically refers to technical products, systems, or services, and we use this as a reference because it later lets us compare concepts that derive from different business ecosystems, to see how they interact in a unified model over time to (re)shape the future.

Figure 2.8 shows sales volume (in %) for different products over their lifecycle in a certain market. Each single half sine wave is the lifecycle of a dedicated product. The maximum peak is always at 100% for a dedicated product. There are multiple products expressed by $P_1, P_2, P_3 \dots P_n$. Every product starts with a sales volume of 0% and rises up to its maximum sales volume of 100%. The overlap between a declining product P_n and a rising product P_{n+1} is not depicted in Fig. 2.8. As innovation is about improvement and progress, products overall develop towards delivering better customer value. As better innovations appear, products reach their peak in terms of sales volume, and respective sales volumes again decline, until the product is finally completely phased out and replaced by the next innovative product.

What drives product sales? It is important to note that situational circumstances, space and time and respective technological developments in that era considerably determine what products will be highly successful in the market, and which will slowly phase out or be considered as outdated. Think of fundamental shifts as from oil and gas to renewable energy, or the switch from analog to digital. Within these time periods, there are many types of products, yet when for example renewable energy becomes the status quo, products that are built on the old, now out-dated technology wave can no longer truly compete in the market. It is because of this type of disruption that some articles propagate that true disruptive innovation is “surprisingly rare” (Hutt, 2016), because such radical disruptions and technological developments do not happen often.

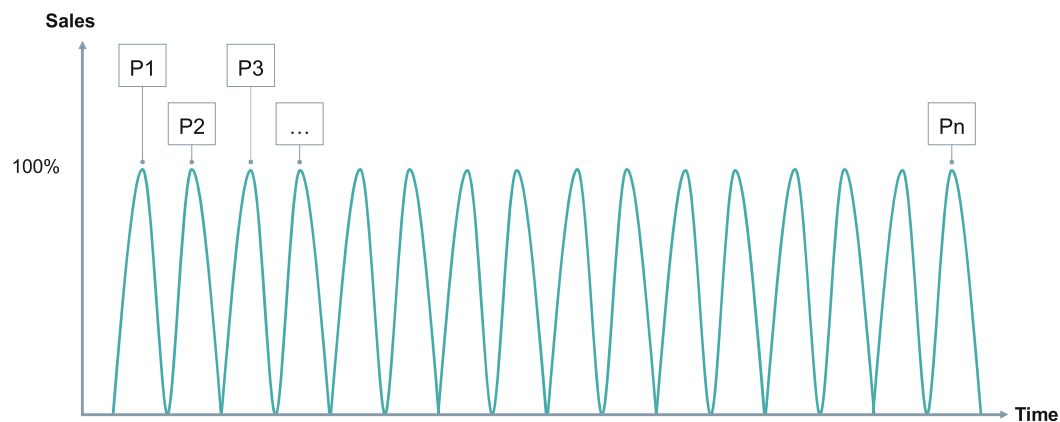


Fig. 2.8 Product lifecycles along a time continuum

All products are based on special technologies or dedicated business models. For the technologies that are the underlying base (DNA) for above mentioned products, the same concept of representing their development over time and in form of waves can be applied, see Fig. 2.9. Technologies and business models also have their own lifecycle, yet their lifecycle is different and longer than the product lifecycle.

If we now overlap product lifecycles with technology lifecycles, we get a modulation for the different innovation waves. We can now also derive at a unified model that shows different eras (waves) of technologies and their respective products in one! For simplicity, let us shortly dissect the issue into smaller understandable chunks. We will describe each set of curves one by one, and then overlap them to produce one comprehensive curve set that includes all information.

In order to simplify the illustration in Fig. 2.10, the period (or frequency) of the waves is kept constant. Of course it is not realistic to say that it always takes the same amount of time for a new disruption to appear; this assumption of a constant period for technology era's is only a rough estimate, especially for the disruption waves by different DNA. With the overall increasing speed of innovation cycles, it seems as if radical technological advancements appear faster over time. Nevertheless, the basic idea and the conclusions behind this visual depiction hold true because although the moment of disruption is still unknown and might vary, it is a given that change and disruptive innovation will occur again and again over the evolution of time.

The first curve-set shows the disruption waves based on different DNA. In the Cisco example given at the beginning of this chapter the first, left wave would illustrate the circuit switched era, the second wave would stand for the IP-based era.

The second curve-set shows disruption waves by same DNA, as explained by the S-curve model. Each smaller wave depicts a jump in the S-curve from one technology to the next. Taking again circuit switched technology as an example, in the circuit switch era there were different evolutions of technology, as from analog switches, digital switches, ISDN to ATM. These would each be represented as

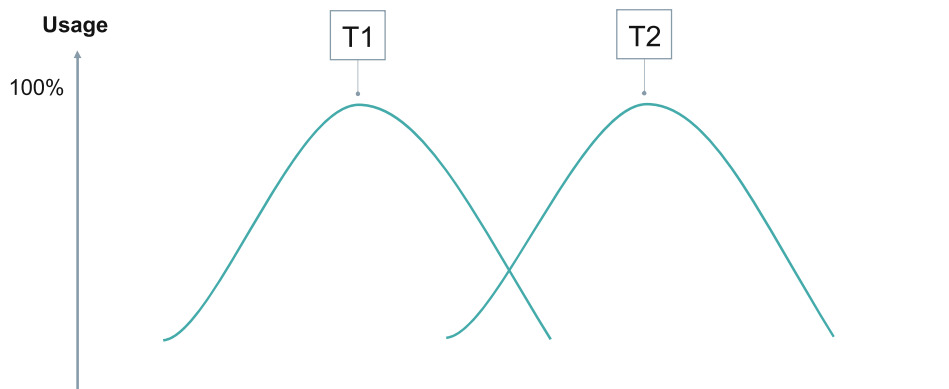


Fig. 2.9 Technology lifecycles along a time continuum

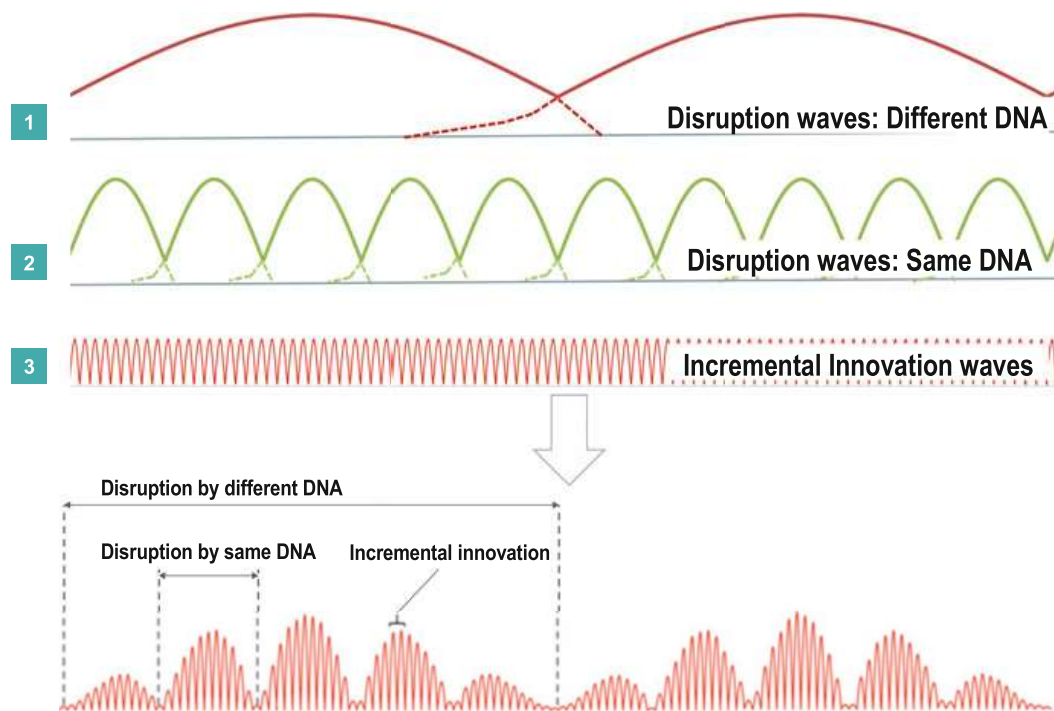


Fig. 2.10 Unified model for all types of disruption waves

disruptions within the overarching DNA group of those based on circuit switch technology.

The third curve shows incremental innovation curves. Each new half-sinus wave stands for a new product. These are not of disruptive nature yet critical for creating progress by incrementally driving innovation forward. Each new innovation aims to increase customer value. When a product enters the market, sales volume increases (starting from 0 to a 100% sales volume as a maximum). Each curve falls again as the product is phased out, and pushed from the market by a different, more innovative product.

The last curve-set is a superposition (i.e. modulation) of all the previously described curves. It illustrates the real products that are sold to customers (B2B or B2C). Each peak depicts a single product. These products develop incrementally within their own window of technology. For every product, the respective disruption by same DNA and different DNA influences what kind of product is most in demand by the market. All together, this last curve-set therefore combines all the previous knowledge and curves illustrated in Fig. 2.10.

2.8 Benefit of a Unified View on Disruption

The value of this disruption wave theory is that it provides a much better understanding about what type of innovation causes what and why. Its unique value is that it helps us understand, explain and start to make predictions about what is going on

in regards to innovation and disruption within a companies' own business. It allows us to understand how societal mega-trends and technological breakthroughs influence individual product demand, but also helps us to predict when a new disruption would be most likely to be expected and thus encourages us to start looking out for warning signs in the market, as they naturally re-occur over time.

What conclusions can we draw? Disruption by same DNA pushes products in certain market segments towards maximum customer value for a given market model. Each single wave of disruption is like a freak wave (imagine a huge killer Jaws wave) that can kill entire product lines within this market segment of the same DNA. But it will not completely change the rules of the game. This means that the basic business models within this market segments remain and the incumbents compete against each other. The good news is that if part of the disruptive change early enough, harm to your business will be minimal to non-existent because you are actively shaping the change itself. If a company does not actively shape the future nor is not able to jump to the next wave and overcome little bumps in the current wave with incremental innovations and adjustments, this type of wave however does have the power to kill companies.

In order to know what mindset we need to successfully deal with disruption by same DNA, think of what good surfers do: they constantly watch the development of waves, have a deep awareness for their surroundings and know their own strengths and limits. They know what wave to catch when and where to enter the wave. They are determined and courageous in how they catch a wave, and then aim to safely ride on that dangerous wave in a way that does not stretch their capabilities too far. They are able to stay calm and relaxed in face of surprising challenges, adapt and react quickly to ensure survival. If slightly hit they illustrate fearless resilience through their ability to bounce back to normal strength levels quickly. Most importantly, they know when and how to jump off or onto the next wave before being destroyed.

Disruption waves with different DNA can be compared to being like a Tsunami; they are waves that re-define what we believe possible and endanger much more people. They have tremendous energy and power that prolongs over a longer duration than a normal wave. They also span across a broad area, taking with them everything that comes within their reach. Such a wave builds a new era or "species" of products and technologies. Once present, it transforms existing market segments and has the power to kill the players in the former market segment (as it happened with Siemens) if they are not fast enough in riding on this wave of destruction themselves. For those who created the wave, it is a wave of opportunity and possible dominance. For those having to surrender to its natural force, it is a source of mass destruction. Of course this type of disruption is much more rare, so companies cannot just wait around until these gigantic waves of disruption occur; they also need to invest in Christensen's "sustaining innovations" (Hutt, 2016) in order get close enough to the point where such technological breakthroughs can even occur or its technology be invented.

The fitting nature of Christensen's term "The Innovators Dilemma" becomes clear when looking at this wave model. The incumbents have to be able to ride on the waves of same DNA by making incremental innovations. In order to stay in the game

they also however have to be able to jump from one wave to the next wave of the same DNA. In order to ride those waves, they must invest in technologies with same DNA to innovate both incrementally and if possible disruptively. These huge investments (R&D, marketing, manufacturing, service etc.) in technologies of same DNA hinder companies to put scarce resources on technologies with different DNA. Thus, companies are truly placed into a conundrum: rather invest into more secure and same DNA innovations, or invest more into the radically unknown? How to ensure that the radically uncertain and new will not be missed in terms of those ideas that truly take off, and thus disrupt incumbent players?

As discussed, when technologies with a different DNA first emerge, they do not seem lucrative for the incumbents since they serve tiny niche markets. In addition, due to the long wave period those technologies with different DNA are often not taken seriously. The fatal illusion is that the technology breakthrough is far ahead or that the technology with different DNA is not even possible, thus not able to endanger the own business. Connecting this to the story of *Who Moved My Cheese* in the introduction of this book, companies try to stay in their well known environment and are looking for new cheese to come. Their experience based on looking in the past makes them falsely believe that new cheese will reappear soon when the market recovers. Alas, imagine when they really wake up and realize that the cheese has gone—this time, forever! Innovation is about change. Change requires both adaptation and evolution, by constantly learning in order to progress with, and not against the disruptive change.

Table 2.1 summarizes the two types of disruptive innovation we have intensively discussed.

2.9 Relativity of Disruption

Looking at this unified theory of disruption it becomes obvious that disruption is relative, see also Christensen (2016). A technological innovation can be incremental for a certain company in its' own business model, while the same technology can be disruptive (consisting of the same or different DNA) for another company. In the business context, perspectives vary depending on for example different business models that determine your companies' actions and perspectives. As mindsets drive behavior, reality is also subjective for each manager, leader or individual within a firm; how you perceive change truly depends on your point of reference, programmed mindset and guiding past experiences.

Let us take the example of an electric motor in the car industry. The electrical motor and battery can be disruptive for a traditional manufacturer focused only on producing traditional combustion fuel engines. For another company that manufactures electrical motors, the electric engine and battery is an innovation within the same DNA. This is because their own products are very similar or even spurring the new technological innovation forward, so they would not perceive it as fundamentally threatening to their core business. For the car manufacturer who has a modular architecture for his engines and product families, this new product might be

Table 2.1 Different types of DNA for disruptive innovation

Disruptive innovation same DNA	Disruptive innovation different DNA
Innovation jump is based on a common root technology (DNA)	Innovation jump is based on different root technology (DNA)
Takes place in a business ecosystem	Starts in a different market and invades the existing business ecosystem
Builds on existing customer value model	Typically changes customer value model
S-curve theory	Christensen's theory
Shorter lifecycles	Longer lifecycles
Can kill products and single competitors	Can kill all business providers and transforms markets
Fast speed of "death"	Fast speed of "death"
Recovery possible, but needs fast and determined reaction	Recovery usually not possible, re-invent yourself
	
Metaphor: "Jaws wave" (dangerous, huge wave)	Metaphor: "Tsunami"

seen as a mixed type of innovation. The new electrical traction system could be something truly revolutionary for them, meaning it would be disruptive with different DNA in comparison to the former, currently used combustion module. But this module can be integrated into the overall product architecture of their larger product, thus becoming only a sub-element of a grander product. If our product of reference would not only be an electric motor combustion engine but we would consider the entire car as the product and the engine as one of its modules, this type of innovation to the motor or battery alone would be a disruptive innovation with same DNA. Since the car manufacturer still develops and produces cars, it is of the same DNA as his own business model.

Note that interestingly, a surfer or boat that would be far out from a harbor and experience a Tsunami on high and open waters would not see the Tsunami as dangerous; this is similar to the relativity of disruption. Once you are however hit by its full force and forced to fight against it, its immanent power will relentlessly try to destroy everything in its reach. Tsunami's are also so gigantic that "diving through" the wave as a tactic to protect yourself from its destructive nature, or waiting until it has past, is not possible.

2.10 Typical Warning Signals for Disruptive Threats

An explicit model as presented in the previous section is a very powerful way to help leaders and managers make better choices and decisions in regards to managing product portfolio's. Knowing that such waves of innovation exist and overlap, companies can search for patterns of disruption waves. By doing so, they can answer the question of whether a certain technology trend is within a wave determined by disruption of same DNA, or if the trend is determined by the overarching disruption by different DNA. Having identified the underlying wave, the next question is to analyze at which point the own company and the other competitors are currently in. If currently successful, on what part of the wave are you currently riding it? Just as we aim to plan and adapt our own lives according to when we have the most energy and in older age are usually better off with managing incremental rather than fundamentally disruptive changes, portfolio decisions depend on where we are on a certain wave.

If riding a wave of same DNA, do you need to focus more on innovating incrementally, or prepare and adapt for a disruptive trend? Answering this question well will determine if you stay market competitive or not. In case of riding at the end of a large wave of the disruption by different DNA nature, it is important to face reality. We consider it not possible to withstand such a disruption, similar to it being impossible to stand on a beach and believe that a Tsunami will pass without hurting you. If in a situation where such disruptive waves unexpectedly hit your business without giving enough time to get out of the danger zone, the only thing is to develop a phase out strategy for the old technology, and invest in the technologies and business models of the new DNA.

From this you might be asking yourself, how can we see the warning signals of potential disruptive threats that could affect my own business? Figure 2.11 shows the warning signals and the danger area for potential disruptive threats. There are three important points to consider.

First, disruptors think of completely new ways to delight customers. This means that a predominant success factor (e.g. performance) might be completely replaced by another (e.g. mobility, portability, price). As the factors that are important in terms of performance and experienced customer value change over time, new innovations can all of a sudden radically re-define what form best meets a customer's need and minimum product expectation.

Second, minimum customer requirements are unclear or even misunderstood. As seen in the Siemens and Cisco example in the beginning of this chapter, Siemens did not realize that voice quality could actually become so unimportant. The importance of the previous minimum customer requirement (quality) decreased so significantly that it gave way to a newly defined minimum customer requirement; to surf in and call via the internet, because customers began to care more about data transmission volume and lower overall price than perfect voice quality.

Third, a competitor focused on a secondary success factor, but is trailing significantly concerning the primary success factor. In the Siemens–Cisco example, the secondary success factor was data rate, and voice transmission was the disruptive factor which reached the minimum customer requirement.

Disruptors of different DNA often build business models that are very different from those of incumbents. This implies that their flow of value is significantly different than to the company serving a more high-end market and is in the process of being disrupted. A switch in what constitutes a success factor can rapidly change as technology advances. Imagine for example replacing a linear value stream by a platform ecosystem, which is lately one of the most successful approaches for disruption (Parker, Alstyne, & Choudary, 2017; Moazed & Johnson, 2016). This trend has been widely facilitated by new digital means, which are able to replace solutions formerly realized by hardware.

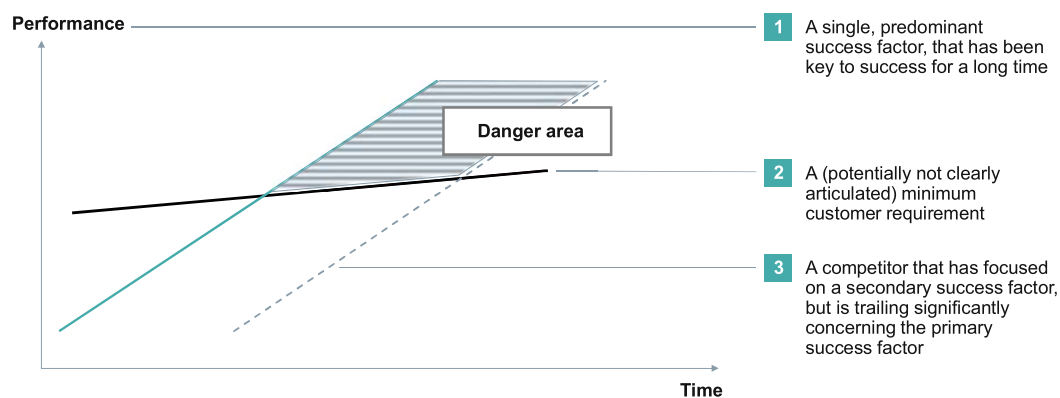


Fig. 2.11 Three warning signals for potentially disruptive threats

Disruption can actually take time and does not happen over night. The problem rather is that incumbents frequently overlook early warning signs and future disruptors. Sometimes disruptors start out serving a seemingly unimportant or “not dangerous” niche customer segment, thus leading incumbents to falsely believe that a vigorous counterattack is not necessary. It is not a single event but often the lack of responding to the process, the trajectory a company is on, that leads another to its collapse. As minimum customer requirements change, tipping points are reached and rapid changes can occur. Thus, the missed identification of minimum customer requirements drives the most rapid changes.

2.11 Summary

Products need to meet basic customer requirements in order to be attractive. Focus on what customers truly need and value. Let the product be the answer to these needs, adding not more and not less than needed. A common mistake is to put too much effort and resources (such as money) into standard features where additional investments do not lead to higher perceived customer value, but rather unnecessarily add product complexity and costs. There is a danger in overshooting minimum customer requirements and only serving high-end customers, because it enables a market gap where new entrants can enter and target mainstream and low-end customers. Constant innovation, as by riding the waves and S-curves of innovation are necessary as features which were once new and exciting, as for example the touchscreen of a phone, are at some point normal expectations for any phone; they become minimum customer requirements themselves. When minimum customer requirements are understood, it becomes easier to design solutions to meet them, decide which features are less important, and discover which market segments are possibly still underserved and unaddressed.

In this chapter we introduced a more nuanced way to think about innovation. We explored different types of innovation, namely those with same and different DNA. These different types allow us to not only understand with more clarity different classical models such as the S-curve and Christensen’s theory of disruptive innovation, but also combine them into one unified concept. The unique aspect we explored in regards to Disruption Waves helps us understand the superposition of long-term and short-term disruptive trends, and might be used to predict innovative trends in the future.

Overall we can say that products should be designed to create value for customers. In the attempt to design such products, meeting minimum customer requirements and delighting them in the most effective and efficient way possible is key. What does this mean in practice? The following fundamental principle of “form follows function” that we will now explore guides us on how to successfully design such products that are of this nature: simplifying complexity to create no more and no less than customer value.

References

- Chase, R. (2016). *We need to expand the definition of disruptive innovation*. Boston: Harvard Business Review Publishing Retrieved from <https://hbr.org/2016/01/we-need-to-expand-the-definition-of-disruptive-innovation>.
- Christensen, C.M. (2003). *Disruptive innovation and creating new market growth: Capturing the upside while avoiding the downside*. [PDF Slides]. Retrieved from <https://sdm.mit.edu/conf04/Presentations/cchristensen.pdf>
- Christensen, C. M. (2016). *The innovators dilemma: When new technologies cause great firms to fail*. Boston, MA: Harvard Business Review Press.
- Christensen, C. M., & Raynor, M. E. (2003). *The innovators solution: Creating and sustaining successful growth*. Boston: Harvard Business Review Press.
- Christensen, C. M., Raynor, M. E., & McDonald, R. (2015). *What is disruptive innovation?* Boston: Harvard Business School Publishing Retrieved from <https://hbr.org/2015/12/what-is-disruptive-innovation>.
- Christensen, C. M., Raynor, M., & Verlinden, M. (2001). *Skate to where the money will be*. Boston: Harvard Business Review Publishing.
- Christensen, C. M., Verlinden, M., & Westerman, G. (2002). Disruption, disintegration and the dissipation of differentiability. *Industrial and Corporate Change*, 11(5), 955–993.
- Hutt, R. (2016). *What is disruptive innovation?* World Economic Forum. Retrieved from <https://www.weforum.org/agenda/2016/06/what-is-disruptive-innovation/>
- Kaeser J. in Handelsblatt. (2016). *Siemens hat in 80er Jahren Idee für VoIP abgelehnt*. Retrieved from <https://www.golem.de/news/startups-siemens-hat-in-80er-jahren-idee-fuer-voip-abgelehnt-1605-120754.html>
- Moazed, A., & Johnson, N. L. (2016). *Modern monopolies*. Spokane, WA: Griffin Publishing.
- Nunes, P., & Breene, T. (2010). *Jumping the S-Curve: How to beat the growth cycle, get on top, and stay there*. Accenture. Retrieved from https://www.accenture.com/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Dualpub_23/Accenture-Jumping-S-Curve-POV.pdf
- Parker, G., Alstyn, M. V., & Choudary, S. P. (2017). *Platform revolution: How networked markets are transforming the economy and how to make them work for you*. New York: W. W. Norton & Company.
- Schulz, T. (2017). *Was Google wirklich will Wie der einflussreichste Konzern der Welt unsere Zukunft verändert – Ein SPIEGEL-Buch*. München: Penguin.