

DISRUPTIVE INNOVATIONS, THEIR CHARACTERISTICS AND IMPLICATIONS ON ECONOMY AND PEOPLE

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Abstract

The world is subject to constant changes and innovation cycles decrease in time as technology advances. The last centuries originated a lot from innovations, starting with the 1st industrial revolution in 1780 down to the present 4th industrial revolution or the so called digital transformation. All main evolutionary changes were shaped by visions and innovations and they influenced the economy and the population as well.

The freshest buzzword related to this hotly debated topic is “disruption”. Nowadays the innovations must be disruptive, the business models and strategies are clustered as disruptive or non-disruptive as well as the competition and markets have to have disruptive components. But what does disruption in that context mean, is it good or bad to have disruptive innovations, and is it a new or an old reoccurring phenomenon?

Based on those thoughts and because of the topicality and controversy of this topic the authors have decided to analyze the meaning and significant characteristics of “disruptive innovations” and to have a short historical examination.

The obtained results showed that “disruptive innovation” is: something breathtaking improved or new which disturbs an existing environment or even destroys and reshapes it and is nothing preventable or to fear.

Keywords

Disruptive innovation, creative destruction, industrial revolution, sustainable innovation, technologies, competition.

JEL Classification

D4, F1, M1, O3, Z1

Introduction

While tracking the newscasts and reading the daily headlines, the attentive observer may be inclined to say in style of Karl Marx: “a new specter is haunting the world – the specter of disruption” (Marx and Engels, 1928). In numberless publications and news the word “disruption” seems to be ubiquitous. For this reason it was no wonder that the FAZ (Frankfurter Allgemeine Zeitung) had nominated “disruption” to be the business word of the

year 2015 based on the frequency in printed publications (Meck and Weiguny, 2015). Likewise consulting the Thomson Reuters Web of science shows that the amount of publications with “disruptive innovation” has almost tripled within the past ten years and the citation has even doubled only between 2014 and 2016 towards 830 per year (Thomson Reuters, 2017). All this demonstrates an undoubtedly interest in the topic. What “disruption” really means, whether it is good or bad to have “disruptive innovations”, and whether it is a new or an old reoccurring phenomenon is further analyzed below. It is inevitable to recognize that everyone from politics, education or economy are using the term “disruption” to describe new trends, methodologies and technologies, and that it is controversial and provokes discussions in many publications and news panels (Horx, 2016; Maier et al., 2016; Moazed and Johnson, 2016; Meck and Weiguny, 2015). On the other hand, it is clear to everyone, that the world is subject to constant changes and the innovation cycles decrease in time as scientific and technology advances. Some of the innovations from the last decades had a small impact (e.g. the tea bag) and some of them had the power to change a whole ecosystem (e.g. the microprocessor). Equally it is beyond controversy that all major evolutionary changes were shaped by visions and innovations and they influenced the economy, environment and the population as well. In figure no. 1, the authors have combined, as an example, the main evolutionary steps from the construction of the first typewriter towards the first iPhone to demonstrate the shortening of the development cycles and the different incubation times innovations had before they become mainstream.

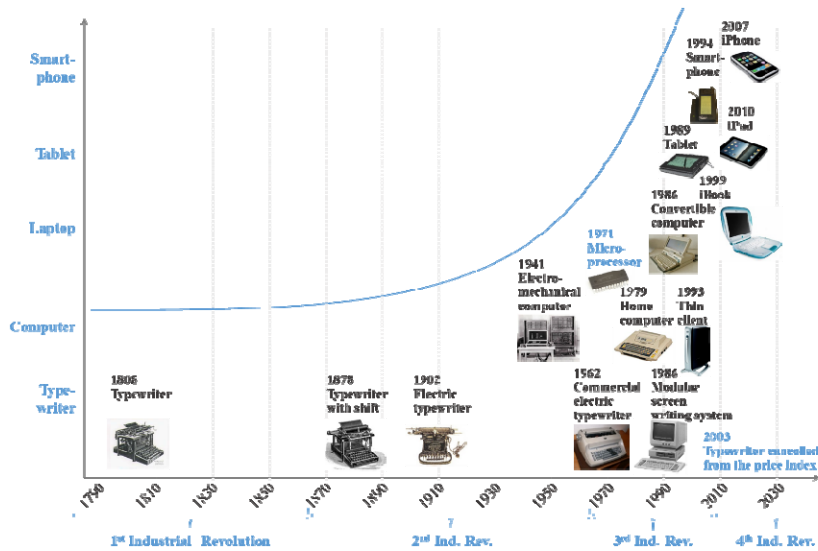


Figure no 1: Historical evolution steps from typewriter to the iPhone
 Source: Authors design

For instance, 70 years passed by from the development of the first typewriter to the next evolutionary step, the invention of the typewriter with the shift function between small and big letters. Today, a life cycle of this length is hardly believable, where every year a new iPhone is presented to the market. Likewise, the incubation time of about 60 years from the

first electric typewriter to the first commercial sold electric typewriter exemplifies how much time an innovation cycle might take from the prototype to mass-production. A further interesting example is the development of the tablet, here the first attempts at the beginning of the nineties were not successful, the mobile internet was at that stage not efficient enough and the operation with the pen was cumbersome.

Based on the first findings and because of the topicality and the controversy discussion, the authors decided to analyze the meaning and significant characteristics of “disruptive innovations” by having a short historical examination. The objective is, to gain a common understanding about the acceptance of the terms “disruption” and “disruptive innovations”. Secondly their implications on economy and people based on selected historical examples shall be elaborated. Thirdly, the authors prove the periodical appearance of the terms and thereby define a basis for future researches.

Literature Review

For this study a systematic literature review was conducted between December 2016 and March 2017. The focus was set on publications from the recent years with the subjects: “disruption”, “disruptive innovations and relations to economy, people and industrial evolutions and revolutions. The area of research was therefore clustered in three main parts, the derivation of definition and characteristics, evaluation of the history and analysis of the presence.

1. Definition and Characteristics of “Disruption” and “Disruptive Innovations”

Due to the exhaustless amount of newer publications and articles about “disruption” and “disruptive innovations” which aimed presenting the suitable and latest definition of disruption and the historical derivation, the authors decided to summarize the main cogent findings.

In a couple of publications, the history of disruption is seen in the analogy of the phoenix, the faith of reincarnation and in the god Shiva (the creator and destroyer) (Weis, 2014). Again, in other publications famed names are listed from philosophical, sociological and economical field, like Karl Marx with his book “The Communist Manifesto”, Josef Alois Schumpeter with his theory of the "creative destruction", Friedrich Nietzsche with his book “Thus Spoke Zarathustra” up to the “disruption messiahs” of the 20th century, Clayton M. Christensen with his book “The Innovator's Dilemma” (Denning, 2016; Kiehne et al.,2016; Meck and Weiguny, 2015; Weis, 2014). To approach the meaning of “disruptive innovation” the authors firstly elected a linguistic leveling based on synonyms for each single word in a first step (cf. table no. 1).

Table no 1: Synonyms for disruption and innovation

<i>Disruption</i>	<i>Innovation</i>
<u>Related to continuity or regularity:</u> <i>discontinuity, interruption, stoppage</i>	<i>Improvement, modernization, relaunch, novelty,</i>
<u>Related to upsetting and break:</u> <i>disordering, disorganization, obstruction, confusion</i>	<i>unconventionality, variation, change and development</i>

Source: Authors compilation based on Harper, 2016; LoveToKnow,2016 and Oxford, 2016.

Based on this compilation “disruption” is associated with an destroying or crushing attribute and commonly used and envisioned by examples where companies lost their market dominance and ceased to exist. On the other hand, “innovation” is associated with something breathtaking, improved or new. Bringing those theories together, “disruptive innovation” is: **something breathtaking improved or new which disturbs an existing environment or even destroys and reshapes it.**

To sum up, disruptive innovations can be seen as the trigger of an evolutionary process eliminating the weak, pricy and obsolete solutions and replace them with modern, favorable and more convenient solutions. From the customer perspective, disruptive innovations are almost always positive and value adding and from company perspective they are sometimes existential, when the companies do not discern the signals and bask in their yesterday’s success.

2. Short historical Examination of Disruptive Innovations

In the analyzed publications, a lot of examples for disruptive innovations are listed and their disruptive impact is explained: Kodak and the digital photography, Amazon and eBooks, Apple and iTunes, Netflix and movie streaming, Airbnb and hotel business and Uber and taxi market (Christensen et al., 2015; Diamandis, 2015; Horton, 2014). The questions arise, if all the many times named innovations truly were disruptive innovations, if the identified characteristics apply to them and what were their implications on economy and people?

The authors decided, not to simply recap the often quoted examples and instead used a selected list of main historical innovations to verify if they meet the conditions to be a disruptive innovation or not.

Table no 2: Selected historical innovations and their disruptive characteristics

<i>Time</i>	<i>Innovation</i>	<i>Disruptive characteristics at market start compared to the disrupted solution</i>
1788	<i>Power weaving loom</i>	+ <i>New technology, faster & cheaper production, higher flexibility & diversity</i> - <i>More expensive compared to the Hand loom (2nd cent. AD)</i>
1913	<i>Belt production of the Ford Model T</i>	+ <i>New production process, faster & cheaper production, wider reach, higher standardization, mass market</i> + <i>Less expensive compared to the old fashioned Electric car (1839) & manual produced Automobile (1886)</i>
1941	<i>Computer</i>	+ <i>New technology & functionalities, new way of working, higher reusability & duplication</i> - <i>More expensive compared to the Typewriter (1808)</i>
1969	<i>Internet</i>	+ <i>New technology & functionalities, new way of collaboration</i> - <i>More expensive compared to the Telephone (1860) & Media</i>
1971	<i>Email</i>	+ <i>New technology, faster delivery, higher parallelism</i> + <i>Less expensive compared to private Post (1520) & Telegram(1844)</i>
1973	<i>Mobile</i>	+ <i>New technology & functionalities, mobility, new market</i> - <i>More expensive compared to Telephone (1860)</i>

	<i>phone</i>	
1995	<i>MP3 player</i>	+ <i>New technology, higher capacity, smaller size, new platform</i> - <i>More expensive compared to Walkman (1979) & Discman (1984)</i>
2007	<i>Apple iPhone</i>	+ <i>New technology & functionalities, higher mobility, smaller size</i> - <i>More expensive compared to the Laptop (1996) & iPod classic (2001)</i>

Source: Authors compilation based on Diamandis, 2015; Horton, 2014; Allis, 2013

As it is distinguishable from the examples in the table, disruptive innovations appear almost alongside with technical innovations and new or different functionalities. Likewise in the beginning of their lifecycle the new solutions show sometimes higher expenditure or have a different quality compared to similar established solutions. Therefore the added value of those new solutions need to be overwhelming, it must fulfill the basic needs and they are required to touch the spirit of the age. Besides, a great many times, disrupted solutions continue to exist in parallel for a certain period but sooner or later they will disappear if they have no unique power and remaining demands. Sometimes, such products survive in the underground and through lovers they can later experience a kind of renaissance when they become modern or the environment has changed as for example the vinyl and the electric car.

Around 1910 the manufacturing of electric cars was stopped after the mass production came up and the automobile with combustion engine conquered the market. Since the end of the 1990s, the automobiles with electric motors experienced an increasing attention due to the dwindling natural resources, zero-emission mobility and the quest for the drive of the future. If one believes the prediction, there will be a reversed repression within the upcoming years if the problems with the charging rate, the power stations, the cell density of the batteries and with that the recoverable distance will be improved. The Apple iPhone instead, is a good sample to show that disruptive innovation can come from one and the same company based on parallel development of solutions with a high rate of similarity in their functionalities they offer. The classic iPod functionality was reused and extended within the iPhone and therefore after some years Apple decided in 2010 to stop the production because the market had changed towards a demand for iPhones combining more functionalities within one device. Further attributes identified based on those examples are the emergence of new markets, platforms and processes, as for example the innovations of internet, mobile phone and mass production and the importance of smaller size and higher mobility like with MP3 player and mobile phone. In a nutshell, the carved-out characteristics of disruptive innovations can be proved by those innovation examples and they can be classified as disruptive innovations because they pushed the previous used solution either out of the market or in a niche market after their teething troubles were eliminated, they performed certain sustaining innovation steps and got mainstream and their prices got fair.

3. Disruptive Innovations and their Implications on the Economy and People

As mentioned in the beginning of this paper, real disruptive innovations will always have an impact on the economy and the people and with their penetration of the market they have the power to initiate a restructuring process. In the following chapter, the authors

analyzed those implications from disruptive innovations on the economy and people. Therefore, the examples from the previous chapter were reused and the changes, they forced in the economy and for the people at that time, were summarized (cf. table no. 3). The aim was to identify a pattern and to demonstrate that disruptive innovations are strongly linked to reiterating industrial and technological evolutions and revolutions.

Table no 3: Selected historical innovations and their implications on economy and people

Time	Innovation	Implications on	
		Economy	People
1788	Power weaving loom	<ul style="list-style-type: none"> → 1784 beginning of the 1st industrial revolution → Mechanization & rationalization of work → Change from home to factory work → Labor wage → Increased productivity → New logistics & transportation 	<ul style="list-style-type: none"> → Unemployment & immiseration → Changed profile of qualification & job types → Emergence of technical schools & restructured society → Exploitation of labor & child labor → Organized labor & union
1913	Belt production of the Ford Model T	<ul style="list-style-type: none"> → 1870 beginning of the 2nd industrial revolution → Assembly line production → Standardization & automation → Supplier industry → Mass production → Productivity improvements → Forced to economic growth → Globalization 	<ul style="list-style-type: none"> → Changed profile of qualification & job types → Mass consumer society → Lower-priced goods → Growing prosperity → Motorization & mobility → Growing standard of living based on electricity → Social legislation
1941	Computer	<ul style="list-style-type: none"> → Automation of production → New industries → Electronic data processing → Restructuring workflows → Increasing complexity of work 	<ul style="list-style-type: none"> → Changed profile of qualification & job types & way of working → Specialization & monotony → Increase material wealth
1969	Internet	<ul style="list-style-type: none"> → 1970 beginning of the 3rd industrial revolution → New industries & markets & platforms → New ways of communication & collaboration → Reduced direct customer contact → Beginnings of digitalization → Higher accessibility 	<ul style="list-style-type: none"> → Changed profile of qualification & job types → Easier access & exchange from information & messages → Alienation & Social networking → New consumption pattern → Different ways of collaboration → Higher mobility & speed
1971	Email		
1973	Mobile phone		
1995	MP3 player		
2007	Apple iPhone	<ul style="list-style-type: none"> → 2010 beginning of the 4th industrial revolution → Growing interconnectedness 	<ul style="list-style-type: none"> → Social platforms → Change of consumption behavior

	<ul style="list-style-type: none"> → <i>Virtualization</i> → <i>New markets & platforms</i> → <i>Highly flexible production</i> 	<ul style="list-style-type: none"> → <i>Decreasing privacy & increasing public sharing</i> → <i>Instant contact & action</i>
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Source: Authors compilation based on Marquardt, 2017; Paeger, 2016; Wolter et al., 2015 and Rammert, 2002

First of all, it can be stated that the selected disruptive innovations always occurred within the era of an industrial revolution. Each of those revolutions came along with a massive modernization or substitution of existing industries and technologies, changed their mode of operation and the related processes and caused thereby a circulating effect on economy, environment and society (Perez, 2009). It can be concluded that disruptive attributes of innovations are undoubtedly provoked and influenced by the industrial evolution of the past and will presumably follow these patterns in the future as well. The most common implications on the economy and the people can be summarized with the depicted general points in figure no. 2. Additionally, the authors related them to each other to show up some mutual interactions as for example an improvement of productivity, standardization and automation have a direct influence on unemployment.

Going back to the presence and the “disruptive innovations hype” it should be much easier to identify what truly is a disruptive innovation by applying the characteristics and the implications they should have on the economy and the people. From the authors’ point of view, some of the modern so-called “disruptive innovations” do not reveal the identified characteristics of being revolutionary and will force enormous economic and social upheavals.

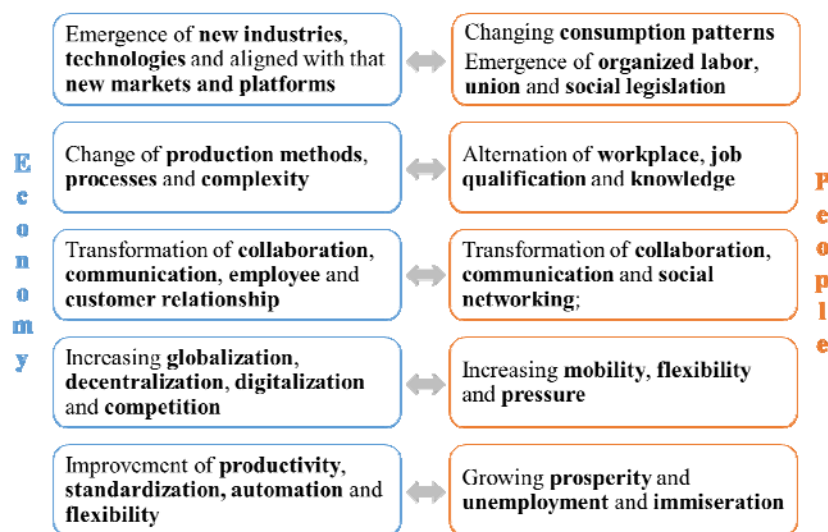


Figure no 2: The common implications of disruptive innovations on economy and people

Source: Authors design

Conclusions

Based on the analysis of the referenced data sources, the following definition of a “disruptive innovation” is elucidated: a disruptive innovation is something revolutionary improved or new disturbing an existing environment or even destroys and reshapes it, it can emerge from outside by entrants or inside of an incumbent and it will always have a powerful effect on economy, environment and society. The term “disruptive innovation” is according to the authors’ findings solely an inflationary used word for innovations that describe activators of a natural revolutionary process. The fact is, it cannot be stopped as much as the three industrial revolutions before and it is nothing to worry about, it is just a question of early detection, active management and utilization. For straightforward, flexible and visionary companies that are willing to take risks and uncertainty, disruptive innovations offer a lot of possibilities and the vanguards and leaders on the market have already shown what can be achieved when disruptive innovations were active.

The authors emanate that this study will increase the understanding about the often misused term “disruptive innovation”, the history behind it and to demystify the actual hype about it. As it was apropos formulated by the Greek philosopher Heraclitus of Ephesus more than 2.500 years ago: “Nothing is permanent except change” (Hainsch, 2014).

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