Analysis of 2017 Gartner's Three Megatrends to Thrive the Disruptive Business, Technology Trends 2008-2016, Dynamic Capabilities of VUCA and Foresight Leadership Tools

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Abstract

Nowadays, digitalization is the key element of business competition. This paper analyzes the concept of dynamic capabilities in the context of technological and business digitalization. We investigate the dynamic competence needed to create and manage a new Digital business, which is emerging from the technological transformation. Firstly, in this paper, we analyze the data of Gartner Hype Cycles 2008-2017. Thus, we present a comparative analysis of the changes in the Gartner hype cycle. Secondly, our aim is to present Gartner´s three distinct megatrends. We will present a summary of these Gartner evaluations and discuss key tendencies and trends of technological changes. Thirdly, the special focus of this article is the challenges of orchestration of dynamic capabilities in the special conditions of VUCA business disruptive business competition. Further, we define the role of competence gap identification inside a firm. Finally, we are presenting some useful tools to manage dynamic capabilities.

1. Introduction

We will present the foresight tools for innovation, knowledge and corporate management. The management tools for corporate innovation, foresight, which help leaders to manage VUCA into consideration, especially in the conditions of hyper-competition and technological digitalization. In this paper, the authors link this discussion to the VUCA approach. The authors note that if corporations create corporate strategies with old-fashioned approaches without the VUCA approach, most "strategic plans" are having low value-added. In many cases, corporate foresight is ineffective and unsatisfactory for leaders. In this paper, the author presents a new corporate foresight framework, which is more relevant for corporations and takes current technology transformation more seriously. They also present some management tools of foresight, which help leaders manage volatility, uncertainty, complexity, and ambiguity into consideration, especially in the conditions of hyper-competition and technological disruption. Key issues in modern VUCA management are agility (a response to volatility), information knowledge management (a response to uncertainty), restructuring (a response to complexity), and experimentation (a response to ambiguity).

2. Theory

2.1. Disruptive technologies

The importance of new technologies for society arises from the discovery that ideas and their implementation generate growth and well-being [1]. How can managers know if the technology will disrupt their organization and firm? The definition

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of disruptive technology relates closely to the disruptive innovation concept of Christensen (1997) [2]. Bower and Christensen, (1995) [3] described a new idea that has long affected the considerations of business sustainability: the notion that new technologies can create new markets, radically change, or disrupt, the status quo in existing markets.

Useful foresight tools are: challenging tools, decision-making tools, aligning tools, learning tools, and the ability to combine these management tools in the practices of corporate management and leadership.

The general conclusion of the paper is that corporate leaders must reinvent strategic planning, framing it to the VUCA conditions and simply-be more strategic. Especially the technological transformation with Artificial Intelligence (AI) and robotics is changing many basic assumptions of business management and strategic planning.

We have known for a while that disruptive technologies [3, 4, 5] fundamentally change the ways people live and work and how businesses operate, and disruptive technological changes ultimately affect the global economy. Existing disruptive innovation theory [2, 6] focuses on key issues like market characteristics, new markets, and low-end innovations.

Disruptive innovations [6] are new services and products that initially gain a market share at the bottom end of the market by making a product or service available to a new group of "low-end" consumers. They are less wealthy or skilled than consumers of such products have been historically.

One definition of a disruptive innovation [4, 6, 7-11] focuses on the functional quality and cost of innovation. This definition defines disruptive innovations as an innovation with a "good enough" functionality that has a low cost [4, 6, 7-11]. Theoretically, the lower quality and lower priced innovation incrementally [3, 6] improve until eventually, the innovation competes with market-leading products, thus strongly disrupting the market status quo [3, 6]. The other definition of disruptive innovations does not focus on an innovation's cost or quality, but on market characteristics.

2.2. Gartner´s hype cycle phases

The Hype Cycle for Emerging Technologies report is the longest-running annual Gartner Hype Cycle [12-21] providing a cross-industry perspective on the technologies and trends that business strategists, chief innovation officers, R&D leaders, entrepreneurs, global market develops, and emerging-technology teams should consider in developing emerging-technology portfolios.

The theories behind the hype-cycle, Fenn and Raskino [22] argue that three human nature phenomena are responsible for the curve's shape: attraction to novelty, social contagion, and heuristic attitude in decision making.

Adamuthe, Tomke & Thampi [23] study among the others, the description of hype-cycle phases [24] given by J. Fenn [24]:

1. Technology/Innovation Trigger Phase: A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.

2. Peak of Inflated Expectations Phase: During this phase of over-enthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes but more failures as the technology is pushed to its limits. The only enterprises making money are conference organizers and magazine publishers.

3. Trough of Disillusionment Phase: Because the technology does not live up to its over inflated expectations, it rapidly becomes unfashionable and the press abandons the topic.

4. Slope of Enlightenment Phase: Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks, and benefits. Commercial off-the-shelf methodologies and tools become available to ease the development process.

5. Plateau of Productivity Phase: The real-world benefits of the technology are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generation. The final height of the plateau varies whether the technology is broadly applicable or benefits only a niche market.
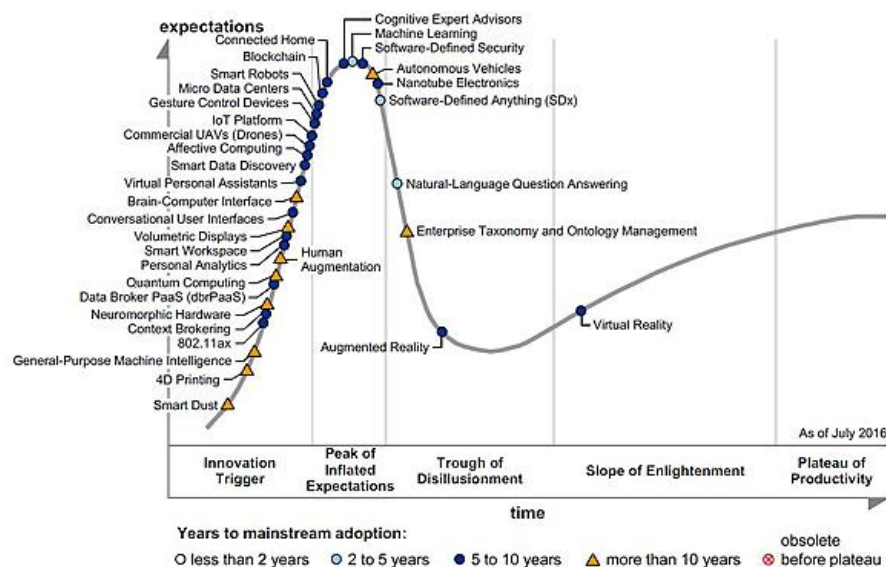
Fig. 1 Hype cycle for emerging technologies 2016 [20]

2.3. The use of life cycle measures

How should organizations and individuals use the hype cycle and deal with the expectations of novel disruptive innovations? [22] First of all, a company can find individual product opportunities. Secondly, through segmentation analysis [22], it can build a deeper understanding of its customers that revealed significant opportunities. A company can know the special "golden" shopper segments. Thirdly, organizations can respond effectively to competition [22, 25]. And finally, a company is able to identify and introduce new businesses.

The hype cycle helps explain why people adopt, abandon or ignore innovations. Too many organizations are tempted to jump into innovation prematurely, at the Phase of Peak of Inflated Expectations [22, 25], while others wait too long. Adopting innovation without understanding the hype cycle [22, 26] can not lead to good decisions and waste of R&D money.

3. Results

3.1. Understanding the dynamics of technological disruption: comparing the gartner´s hype cycle between years 2008 and 2016

In Year 2008, the Hype Cycle Includes: Erasable Paper Printing System, Context Delivery Architecture, Behavioral Economics, Mobile Robotics, Augmented Reality, Surface, computers, Cloud Computing, 3D Printing, Microblogging, Green IT, Social Computing Platforms, Solid-State Drives, Public Virtual World, Web 2.0, Service-oriented Business Applications, Virtual Assistance, RFID, Corporate Blogging, Idea Management, Social Network analysis, Electronic Paper, Tablet PC, SOA, Location-Aware Applications, Basic Web applications.

In the year 2016: The 16 new technologies included in the Hype Cycle for the first time. These technologies include 4D Printing, General-Purpose Machine Intelligence, 802.11ax, Context Brokering, Neuromorphic Hardware, Data Broker PaaS (dbrPaaS), Personal Analytics, Smart Workspace, Smart Data Discovery, Commercial UAVs (Drones), Machine Learning, Nanotube Electronics, Software-Defined Anything (SDx), Enterprise Taxonomy and Ontology Management, Blockchain, Connected Home. In addition, some earlier items stay: The Volumetric Displays, Brain-Computer Interface, Visual Personal Assistants, Affective Computers, IoT Platforms, Gestore Control Devices, Micro Data Centers, Smart Robotics, Machine Learning, Autonomous Vehicles, Natural-Language Question Answering, Augmented Reality, Virtual Reality.

The Gartner [27]. sees leading revolution is the Smart machine technologies, which will revolutionize manufacturing and its related industries include the following: Smart Dust, Machine Learning, Virtual Personal Assistants, Cognitive Expert

Advisors, Smart Data Discovery, Smart Workspace, Conversational User Interfaces, Smart Robots, Commercial UAVs (Drones), Autonomous Vehicles, Natural-Language Question Answering, Personal Analytics, Enterprise Taxonomy and Ontology Management, Data Broker PaaS (dbrPaaS), and Context Brokering. Emerging technologies are enabling entirely new business models, driving a Platform Revolution**.** Platform-enabling technologies making new business models possible, include Neuromorphic Hardware, Quantum Computing, Blockchain, IoT Platform, Software-Defined Security and Software-Defined Anything (SDx).

Summary: Some technologies of the year 2008 Hype Cycle were foresighted very well and they are nowadays very popular: Tablet PCs, Internet of Things, Cloud Services, 3D Printers even in the libraries of Finland, Solid State Drive is well foresight, and also Augmented Reality is coming fast. In the year 2016: Fourteen technologies were taken off the Hype Cycle including Hybrid Cloud Computing, Consumer 3D Printing, Enterprise 3D Printing, and Speech-to-Speech Translation because they are not hyped anymore. Additional technologies removed from the Hype Cycle include 3D Bioprinting Systems for Organ Transplant, Advanced Analytics with Self-Service Delivery, Bioacoustic Sensing, Citizen Data Science, Digital Dexterity, Digital Security, Internet of Things, Neuro business, People-Literate Technology.

3.2. Gartner [27] *identifies three megatrends that will drive digital business into the next decade*
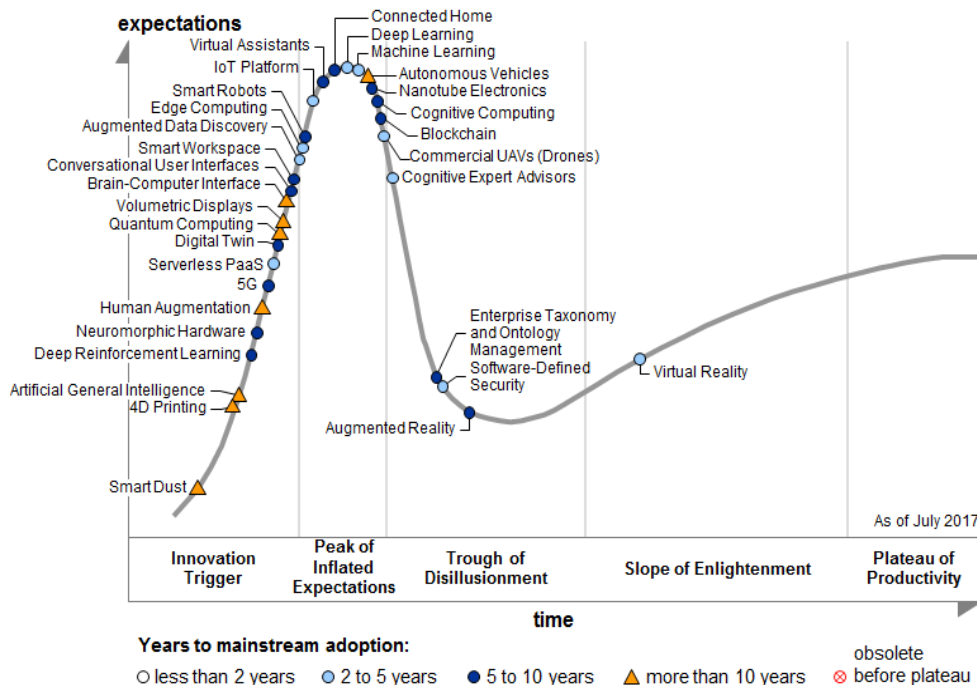
Fig. 2 Hype Cycle for Emerging Technologies, 2017 [21]. Note: PaaS = platform as a service; UAVs = unmanned aerial vehicles

The first megatrend is Artificial Intelligence (AI) everywhere. It means transparently immersive experiences and digital platforms are the trends that will provide unrivaled intelligence, create profoundly new experiences and offer platforms that allow organizations to connect with new digital business environments.

The Emerging Technologies of the Hype Cycle is the longest-running annual Gartner Hype Cycle [21]. It provides an important cross-industry perspective on the digital environment and disruptive technologies [28]. The Hype Cycle also shows the trends for global market developers, chief innovation officers, and R&D leaders. It is important for digital business strategists and digital entrepreneurs to develop digital – and emerging-technology portfolios.

The Emerging Technologies Hype Cycle is unique among most Gartner Hype Cycles [21]. There are insights at least 2,000 technologies and they are seeking emerging technologies and digital trends. The Emerging Technologies Hype Cycle focuses on the technologies, which promise a high degree of competitive advantage over the next 5 to 10 years (Fig. 1).

When we focus on technology innovation, it is significantly important to evaluate these high-level trends and the featured technologies, as well as the potential impact on their businesses. In addition to the potential impact on businesses, these trends provide a significant opportunity for enterprise architecture leaders to help senior business and IT leaders respond to digital business opportunities and threats by creating signature-ready actionable and diagnostic deliverables that guide investment decisions.

3.2.1. AI everywhere

AI everywhere: Artificial intelligence technologies will be the first technology megatrends. AI will be the most disruptive class of technologies because AI will include radical computational power, unprecedented advances, near endless amounts of data in the digital networks. Thus, organizations with AI technologies will have harnessed data in order to adapt new situations and solve digital problems that no one has ever encountered previously.

In this AI theme, the companies that are seeking advance, consider should following the disruption technologies: Deep Learning, Artificial General Intelligence, Autonomous Vehicles, Deep Reinforcement Learning, Commercial UAVs (Drones), Cognitive Computing, Smart Robots, Conversational User Interfaces, Machine Learning, Enterprise Taxonomy, Ontology Management, Smart Dust, and Smart Workspace.

3.2.2. Transparently immersive experiences

Transparently Immersive Experiences: The digital technology is coming more and more human-centric to the point where it will introduce transparency between people, businesses and things. This relationship will become significantly important when the evolution of digital technology becomes more contextual and adaptability in the workplace or at home. The most important thing is interacting with people and new businesses.

The critical technologies of Transparently Immersive Experiences includes: Connected Home, Human Augmentation, 4D Printing, Augmented Reality (AR), Computer-Brain Interface, Nanotube Electronics, Virtual Reality (VR), and Volumetric Displays.

3.2.3. Digital platforms

Digital platforms: the emerging technologies require enabling foundations, which will provide characteristics like: enough data volume, advanced computing power, and ubiquity-enabling ecosystems. The ecosystem-enabling platforms allow entirely new business models between humans and digital technology.

The innovative digital platform technologies include: IoT Platform, Serverless PaaS, Neuromorphic Hardware, Quantum Computing, 5G, Digital Twin, Edge Computing, Blockchain, and Software-Defined Security.

These three digital megatrends include the human-centric enabling technologies within transparently immersive experiences: Most important are smart workspace, augmented reality, virtual reality, connected home, and the growing brain-computer interface. Then, we are becoming the edge of digital technologies that are pulling the other trends along the Hype Cycle.

The emerging technologies of AI everywhere are moving fast through the Hype Cycle. Those technologies are key enablers to create transparent and immersive experiences such as deep learning, autonomous learning, and cognitive computing.

Finally, digital platforms are rapidly moving up the Hype Cycle. The new innovative IT realities provide the underlining platforms that will fuel the future. This future set of technologies includes Quantum Computing and Blockchain, which will create the most transformative and dramatic impacts in the next 5 to 10 years.

These three megatrends show that the more companies are able to make technology an integral part of employees', partners' and customers' experiences, the more they will be able to connect in new and dynamic ways to employees', partners' and customers' ecosystems and platforms.

For digitalization management and technology leadership, it is important to understand the opportunities and threats affecting digital business. Further, it is significant to take the lead in technology-enabled business innovations and help organizations define an effective digital business strategy.

3.3. Corporate foresight, management and leadership tools

Since the late 1980s, the term "foresight" has been used to describe activities which inform decision-makers by improving the inputs about the long-term future of an organization [29-31]. The term foresight and strategic or corporate foresight need to be briefly discussed. The term foresight has been used since the late 1980s to describe an inherently human activity [32]. The term strategic, organizational or corporate foresight has been used to describe future research activities in corporations [32] or organizations. Martin [33] and Coates [34] emphasize that foresight deals with the long-term future and Vecchiato [35] use strategic foresight deliberately to emphasize the tight relationship between foresight and strategy formulation (Rohrback and Gemüden) [36].

Academic studies have generated knowledge on the need for corporate foresight systems (Rohrback and Gemüden, Ruff) [36, 37] and the value contribution of strategic foresight [38] (e.g. Vecchiato and Roveda, Burt and Van der Heiden).
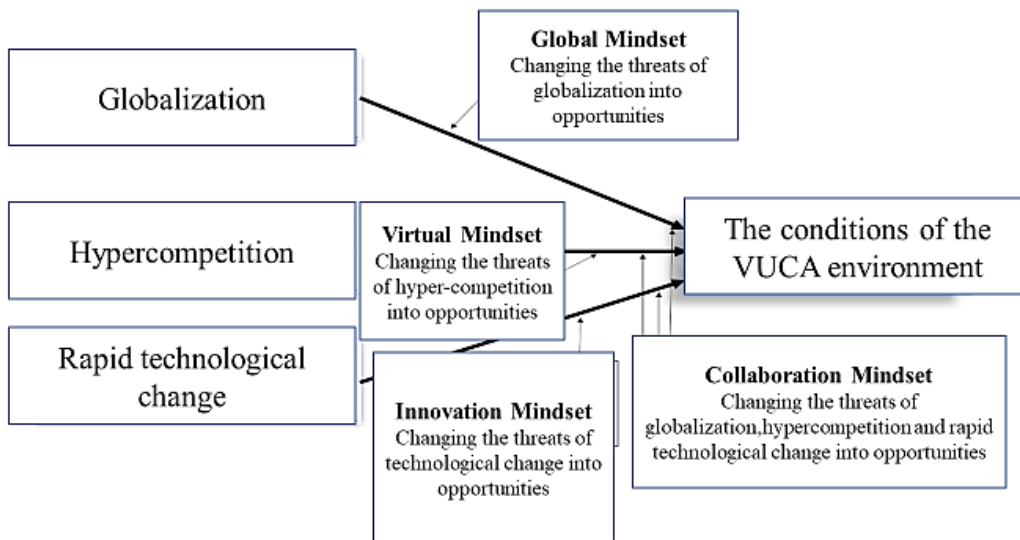

Fig. 3 Framework showing relationships in the VUCA environment. Modification of [40]

In Fig. 3, we have figured out key elements of the competitive landscape which are relevant to the VUCA environment. Globalization, hyper-competition and rapid technological change create key pre-conditions in the VUCA environment. The key challenge for leaders is to change, the threats of the competitive landscape to opportunities. The role of mindsets is very important in this respect. A global mindset or the ability to view the world using a broad perspective converts globalization threats into growth opportunities by thinking beyond geographic boundaries, valuing integration beyond across borders and

appreciating regional and cultural diversity. An innovation mindset is a mental framework that fosters the development and implementation of new ideas. A virtual mindset or the ability of managers to hand over their companies´ activities to hyper competition [39] and external providers, turns hyper-competition into prospects for growth by facilitating flexibility and responsiveness. Finally, a collaborative mindset means willingness allowing companies or corporations to engage in business partnerships. Collaboration mindset integrates all the other mindsets, which can lead to synergy by business complementarities [40]. We can conclude that these four critical mindsets help corporations to manage disruptive technological innovations. The ability to change threats into opportunities is a critical asset in the VUCA conditions.

3.4. The novel VUCA challenges for corporate leadership and management

In Fig. 4, we present a novel synthesis about the VUCA challenges and key solutions. The volatility of the environment requires agility on organizational culture. The uncertainty of the environment requires updated information and knowledge management. The complexity of the environment requires active restructuring of corporate organization. The ambiguity of the environment requires experimentation of management activities in the corporations.

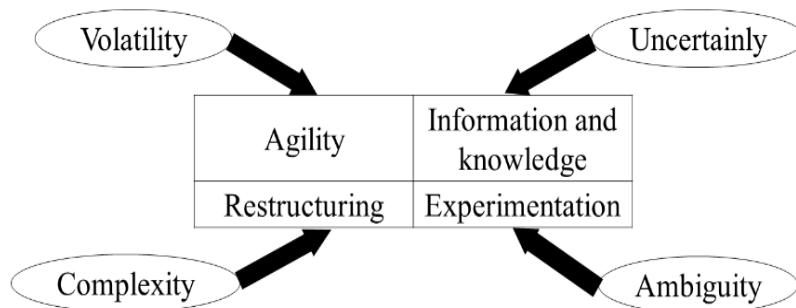### 3.5. Foresight tools important for the VUCA environment

Fig. 4 The VUCA challenges and key solution concepts

The term VUCA has gained currency in the military during the late 1990s to describe an environment of volatility, uncertainty, complexity, and ambiguity. It reflects a shift from traditional Cold War military conflicts to asymmetric warfare with agile dispersed opponents fighting under different rules for causes we do not fully understand. Business condition is increasingly encountering VUCA conditions as well and this poses deep new challenges. After short-run pressures are in conflict with long-run challenges. Peter Drucker [41] was one of the first to emphasize that management is doing things right and that leadership is about doing the right things [41]. However, in the VUCA conditions, it is not easy to define, what are the right things and how to do things in the right ways.

In recent manage and leadership literature, Krupp and Schoemaker [42] have presented a comprehensive answer, the Sig Discipline model to meet the VUCA challenge. In Fig. 5 the model is presented.
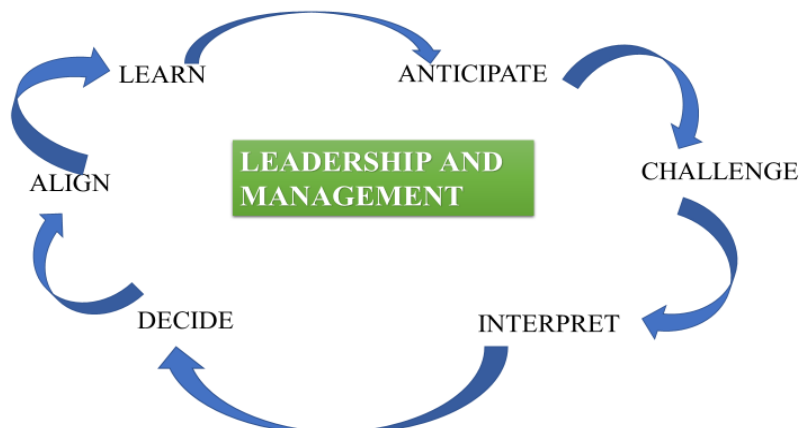

Fig. 5 The Six Disciplines [42]

Table 1 The tools relevant to the VUCA environment, relevant foresight tools
and the key functions of foresight tools inside corporations

Tools relevant to the VUCA environment	Relevant foresight tools	The key functions inside corporations
Anticipating tools	Statistical forecasting tools, especially based on probability analysis	Identify risks and emerging new mark-markets
Interpreting tools	Statistical forecasting tools, risk analysis, especially based on probability analysis Expert and crowdsourcing methods (Delphi methodology and crowdsourcing techniques)	Analytical reflection of the results of anticipating tools Creation of "big picture" of markets and corporate stakeholders
Challenging tools	Weak signal and Wild Card analyses, creativity tools, the analyses of desirability and feasibility, mirroring and benchmarking tools, technology roadmaps, trend and scenario analyses, competitor analyses	Identify alternatives and uncertainties in the environments Eliminate the conceptional problems of group thinking Amplify weak and strong signals
Decision-making tools	Priority setting tools, multi-objective decision-making tools, and models Dr. Z Methodology and analysis: 1. Don´t Rock the Boat, 2. Joining Forces, 3. Go IT Alone, 4. Look for a Friend and 5. Fight the Good Fight.	Help decision-makers to be future-oriented decision-makers Enable decision making with identifying options and comparing alternative options relevant for corporations Pre-condition to the use of decision-making tools is to link challenging tools to decision-making tools
Aligning tools	Stakeholder Analysis Tools Action planning Deep dialogue tools	Bridging differences and understanding stakeholders
Learning tools	Organization of simultaneous experiments Experimental fast learning tools ("valid experiments" and "robust experimental designs") Fast learning organization tools ("easy and quick experiment set-up" and "experimental data available quickly and automatically") Deep learning tools based on AI.	Create strong passions for experimentation and learning inside a corporation
Combination tools	Transcendent leadership tools	Transcendent leadership combines (1) leadership of self, (2) leadership of others and (3) leadership of the organization

In this paper, we are not discussing all the elements of the Six Disciplines. We focus on the foresight aspects of corporate leadership. However, from Fig. 5 we can learn the following messages. Leaders and managers can develop their ability and capabilities [42].

The practical recommendations:

(1) Anticipate changes in the market environment by staying closely connected with customers, partners and competitors, rather than becoming disconnected and reactive.

(2) Interpret a wide array of data and viewpoints rather than looking only for evidence that confirms their prior beliefs.

(3) Challenge assumptions and the status quo by surrounding themselves with people who think outside the box and open to new ideas.

(4) Decide what to do after examining their options and then the courage to get it done than waffling or belaboring the decision-making process.

(5) Align the interests and incentives of stakeholders based on understanding different views, rather than relying on their power or position.

(6) Learn from success and failure by experimenting, making small bets, and mining the lessons from both the good and the bad outcomes to create quick learning cycles.

In Table 1, we have reported the tools relevant to the VUCA environment, relevant foresight tools and the key functions of tools inside corporations. This Table 1 summarizes the insights of Krupp and Schoemaker [41], but includes some additional remarks of the authors. Especially we have clarified and defined the issue of key foresight tool and key functions of foresight tools inside corporations in this table.

These methodologies are discussed widely in the fields of futures studies and foresight [29, 31-32, 41-45]. The table above refers to the use of these futures oriented methodologies.

4. Conclusions

This paper contributes academically and practically to the discussion of digitalization and disruptive technologies. Digital and disruptive technologies drive most economic growth and productivity.

Further, we practically analyzed and dis-empirical demonstration of the difference between Gartner´s hype curve years 2008 and 2016. Some technologies of the year 2008 Hype Cycle were foresighted very well, and they are nowadays very popular: Tablet PCs, Internet of Things, Cloud services, 3D Printers, Solid State Drive is well foresight, and the Augmented Reality is coming fast.

Compared to the year 2016: Fourteen technologies were taken off the Hype Cycle, and the 16 new technologies included in the Hype Cycle for the first time in the year 2016. Gartner´s Hype Curve helps the leaders to understand the dynamics of technological disruption, which is extremely important for corporate leaders to be able to foresight the future.

The Three Megatrends of digital business are ***AI Everywhere***, ***Transparently Immersive Experiences, and Digital platforms.*** The digital platforms are rapidly moving up on the Hype Cycle. The new innovative IT realities provide the underlining platforms that will fuel the future. This future set of technologies includes Quantum Computing and Blockchain, which will create the most transformative and dramatic impacts in the next 5 to 10 years.

These three megatrends show that the more companies are able to make technology an integral part of employees', partners', and customers' experiences, the more they will be able to connect in new and dynamic ways to employees', partners', customers' ecosystems, and platforms.

This paper combines the discussions of technological disruption, Gartner´s hype curve, and the VUCA environment and leadership. In the VUCA conditions, leaders and managers need a new arsenal of foresight and management tools and methods. This paper elaborates some key theoretical approaches and practical solutions to the corporations facing turbulent VUCA conditions. These tools can be classified to anticipation tools, interpreting tools, challenging tools, decision-making tools, aligning tools, learning tools, and combination tools.

In this paper, we focus on the foresight aspects of corporate leadership. The practical recommendations for leaders: a) Stay closely connected with customers, partners and competitors, b) Interpret a wide array of data and viewpoints, c) Challenge assumptions, d) Decide what to do and then encourage personal, e) Align the interests and incentives of stakeholders, f) Learn from success and failure to create quick learning cycles.

With the systematic application of these tools, corporate leaders and managers can face the VUCA tests of surviving in the markets, where globalization, hyper-competition, fast turbulent technological changes test corporations and create increasing volatility, uncertainty, complexity, and ambiguity. Already awareness of these VUCA conditions and possible tools are important issues. Many corporate leaders and managers need an updated understanding of these issues. Global mindset, virtual mindset, innovation mindset, and collaboration mindset are key issues in the VUCA environment. This paper helps corporate leaders and managers to understand key issues relevant to these mindsets, especially for an innovation mindset.

Conflicts of Interest

The authors declare no conflict of interest.

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