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Innovation Management in the Context of Smart Cities Digital Transformation

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Abstract: The paper introduces important aspects of doctoral research concerning innovation management in the context of business management challenges posed by digital transformation. The research was conducted as part of the Research Centre of Business Administration in The Bucharest University of Economic Studies, Romania. The study aims to identify and display key components of innovation management - with a primary focus on topics spurred by the recent wave of digital evolution. Against this background, the issue of smart city solutions makes for an interesting case – firstly, because it affects a large number of people and businesses around the globe and secondly, the complexity of the topic forces companies to pursue different innovation management approaches to successfully manage its associated challenges as well as opportunities. The paper consists of an overview on the existing literature and a concise outline of our research. Both researches from professional associations as well as recognized publishers were considered. Furthermore, market data were gathered and processed. More than 50 publications were analyzed to better understand trends in digital transformation and its impact on innovation management. Our research revealed that in the light of the fundamental challenges posed by digitization, companies are required to take a structured approach towards their innovation management options. In the context of smart city solutions, the adoption of the "4I Solutions Model" enables businesses to choose the strategic option suitable to their individual case. Concisely, this framework includes four different approaches ranging from initiating groundwork innovation internally to establishing partnerships with selected external parties.

Keywords: Innovation Management, Digital Transformation, Business Models, Smart

1. Introduction

Urbanization is a central topic across scientific disciplines against the background of more than 50% of the worldwide population living in urban areas. Until 2050, this number will double putting the existing, stressed city eco systems under additional pressure. The negative results are already visible around the globe with poorly-developed transportation systems, decaying infrastructure, insufficient affordable housing, inadequate energy supplies, poor social services, rising crime, overburdened healthcare systems or exhausted waste management capacities. The mounting challenges in combination with a high level of complexity due to the interconnectivity and interrelation of issues puts municipalities to a real test. On a positive note, companies with innovative solutions are able to benefit from by double bottom line by increasing profits and improving the living conditions of million people worldwide. Understanding the social, economic and technical implications of smart city solutions is the key for companies to unlock opportunities in this field. At the same time, the role of disruptive innovation is critical for companies to improve their competitive positions. Staying ahead of other market participants is closely associated with selecting the right innovation management strategies which are strongly influenced by the lastest wave of digital transformation. In this context, the presented research consists of an overview on the existing literature. Both research from professional associations as well as recognized publishers were considered. In order to provide for a hollistic and balanced picture, more than 30 publications were analyzed to better understand trends in digital transformation and its impact on innovation management. The aim of this paper is to contribute towards the discussion on smart city solutions from a company perspective with a particular focus on innovation management approaches available. (Dirks et al., 2009; 2017; Betis et al., 2018; Ross 2017).

2. Characteristics of Digital Transformation

The issue of digitization is often associated with optimizing business processes. In this context, automation and standardization are key components in the hunt for improved efficiency in any given business. Essentially, it centers on the question of implementing leaner and cost-efficient processes and procedures. By taking these measures, businesses strive towards improving their market position, while firms lacking the skills or motivation to innovate their ways of doing business tend to find themselves at the back of the pack. In fact, digitization efforts are often perceived as cumbersome and require significant resources, but the rewards in the form of better customer centric operations and easier scalability should be taken into account. One of the perceived advantages of digitization is access to business and market data, which can be processed and utilized for improving strategic decision making. In the light of a VUCA business environment, a sophisticated data management system can become an important factor for future success. Therefore, firms tend to focus on holistic software options as a means for underpinning their digitization efforts. All in all, firms have been confronted with those challenges for more than 20 years. Surprisingly though, only a limited number of businesses has been capable of successfully implementing standardized and automated processes. According to research conducted by MIT, roughly 1 in 4 established firms has fully digitized their internal procedures and processes. This is particularly alarming given that digitization efforts are regarded as a first step towards achieving the merits of turning digital transformation into new business opportunities. (Markovitch & Willmott, 2014; Nandram & Bindlish, 2017; Ross, 2017)

Against the background of digital transformation, businesses face substantial challenges with technological development such as cloud computing, internet of things and artificial intelligence resetting the rules of the game in business. Given the multitude of topics raining down on companies, they sometimes have difficulties in seeing through this complexity. Additionally, adjusting ways of doing business under these circumstances can be challenging for individual market players who have been settling on a rent-seeking modus for an extended period of time. Digital transformation turns markets and their players upside down with the rules of supply and demand being redefined. As a consequence the power dynamics between firms and customers is shifted, leaving businesses with open issues in the field of creating new value propositions for their clients, attracting digital savvy talent, building and maintaining a culture of sharing and caring among others. Concisely, digital transformation goes far beyond building a new app. It comes down to implementing a new way of doing business. (Schallmo et al., 2016; Ross, 2017; Newman, 2018; Richards, 2018)

In order to facilitate the digital transformation journey, Futurum Research (2018) publishes an annual digital transformation index to outline the most essential impact factors for internally driving developments and changes to embrace the dawning digital era. In this context, figure 1 underlines the importance of technological partnerships; in combination with a supportive company culture including management assistance as well a group of skilled employees. This essentially summarizes the backbone of digital savvy company embracing change and innovation.

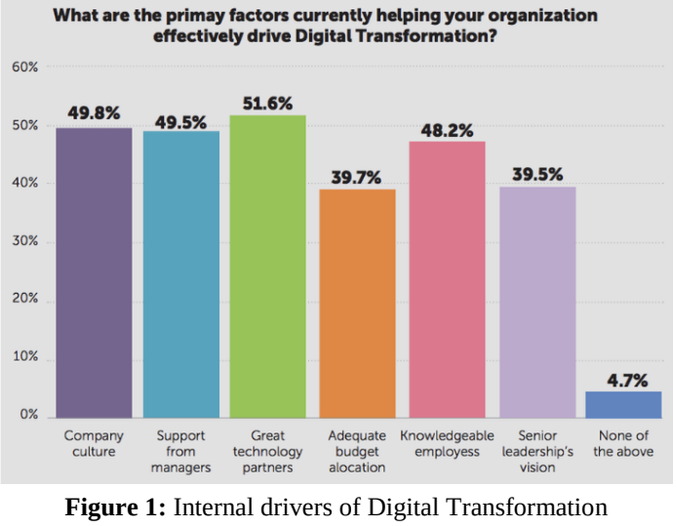

Figure 1: Internal drivers of Digital Transformation

Source: (Newman, D., 2018. 2018 Digital Transformation Trends: Where Are We Now?, Forbes: 20 August 2018, Retrieved 3 January 2019 from: https://www.forbes.com/sites/danielnewman/2018/08/20/2018-digital-transformation-trends-where-are-we-now/#5ce36efbc647)

3. Impact of Digital Transformation on Business Operations and Management

Digital transformation changes the fundamentals of doing business by disrupting business models across the globe. While this is not evenly distributed across the planet, Hirt and Willmott (2014) have identified a set of distinct driving forces. Those seven elements impact on traditional business operations and allow firms to reconsider their strategic options going forward:

1. New competitors enter the stage:
Companies have been taking rent-seeking position often protected through insurmountable entry barriers. Given the rapid development of internet services, digital market participants have been enabled to break into formerly impenetrable territory. At the back of refined management approaches, technical skills and talented employees, those firms put pressure on the current champions. AirBnb has successfully disrupted the hospitality industry without owning a single accommodation, while direct bank ING Germany has made the case of attracting millions of clients without a single branch. The next step of this digital trend is that successful firms use their brand value to venture into other fields of business as showcased by Apple launching its payment service in a growing number of countries. (Handelsblatt, 2018)

2. Prices and margins come under pressure:
Customers are no longer caught in a weaker position against companies thanks to a drive towards greater transparency triggered by the internet. Firstly, the number of products and services has increased substantially, giving customers additional choice. Secondly, an abundance of testing and review websites allows buyers to see through flashy marketing and advertisements straight through the actual value of available goods. This helps bringing prices for end-customers down, while at the same time firms face pressure on prices and margins. Given regional differences in digital sophistication, this however might not be case in all countries.

3. Customer behavior triggers a winner takes it all dynamic:
The development associated with digitization fuels a customer login dynamic that allows web-based champions to profit from superior management skills in combination with state of the art organizational set-ups. This generates additional business and works as a vital tool in the fight for talent. Customers perceive these firms as desirable and choose them as go-to places, creating a virtuous circle of success breeding new success. (Grab et al., 2018a)

4. The invention of plug-and-play business models:
Against the background of individual champions being able to take it all, there is a question to what extend smaller competitors are capable of securing their share of the digital pie. The answer is fairly simple since smaller niche players are able to use the existing platform structure of market heavyweights to reach out to clients. In this way, both sides benefit from this business relationship. While bigger businesses expand the product or service range to be offered to their clients, smaller players serve customers in a familiar and secure platform environment. (Schallmo et al., 2016)

5. Fierce fight for the right talent:
In the light of dramatic changes expected in the labor market of the future, mainly because of phenomena such as the use of robotics and artificial intelligence, companies need to revisit their HR and recruiting strategies to come up with winning staffing plans. Given that Frey & Osborne (2013) underline that 1 in 2 professions could be replaced by machines affecting both blue and white collar jobs, companies will have to decide on jobs to be made redundant. On the other hand, specialized profiles might be even more difficult to come by given the expected fight for talent. (Manyika et al., 2017; Nedelkosa & Quintini, 2018)

6. Convergence of global supply and demand:
Online retailers have conquered the globe. While this might differ from region to region of the world, the growth of e-commerce is significant. Against the background of this rise in online retailing, customers expect a harmonized experience across borders. This includes the entire value chain from product selection over delivery to payment options and customer support services.

7. Constantly evolving business models:
Digital transformation has no finishing line that companies can reach with the aim of securing their position in the market. It is rather a gradual process which sees different waves of digital evolution. Therefore, successful companies build adaptable and resistant organizations capable of evolving swiftly based on a customer-centric approach. Business models are continuously changed, adapted and developed to stay on top of their competition. The hospitality and tourism industry provides for an interesting case in this context with market players such as TripAdvisor and booking.com being at the forefront of broadening their client and revenue base through new products and services. (Schallmo et al., 2016)

4. Innovation Management in the Digital Era

With relentlessly involving business models becoming an imperative of the digital era, the demand for innovation management can be regarded as a factor of strategic importance. (Maier et al., 2013; Maier et al., 2014; Kiehne & Olaru, 2017). In this context, firms need to find a middle way between incremental development and disruptive change or as March (1991) pointed out – between exploration and exploitation. Both strategic options require employees with different skills, different tools and overall a different team or company culture. Further, they offer a deviant risk and return profile with exploratory ventures often being eyed as overly bold and risky. Figure 2 showcases that misbalance between the number of exploitation projects perceived in companies and the actual rewards generated by exploratory projects. The latter allows firms to turn their disruptive ideas into real profits. (Kahn, 2012).

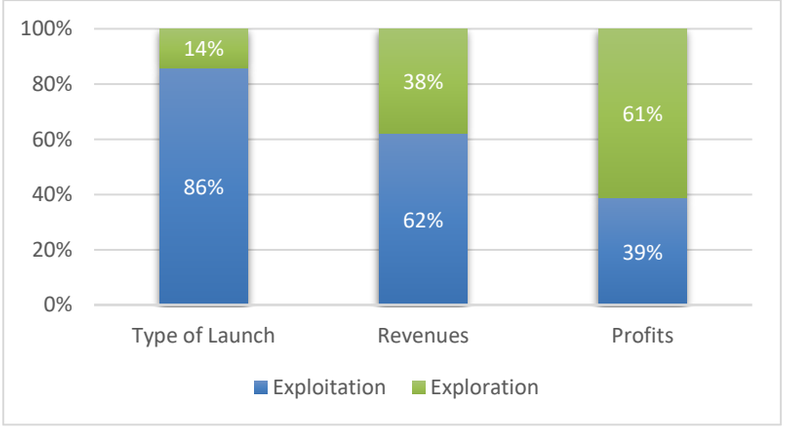

Figure 2: Spread and benefit of innovation types
Source: (Kahn, K., 2012. The PDMA Handbook of New Product Development, Chichester: Wiley)

5. A Possible Solution to Overcome Innovation Obstacles in the Context of Smart Cities Digital Transformation

5.1 What is Smart Cities?

Cities around the globe have a strong attraction to a growing number of people. At this point roughly 50 percent of the World's population lives in urban settings. With this trend not expected to lose momentum in the years to come, the number of people living in cities is projected to double by the year 2050. Such substantial congregations of people come at a price which is showcased by some of negative phenomena associated with urbanization: Under or poorly-developed transportation systems, decaying infrastructure, insufficient affordable housing, inadequate energy supplies, poor social services, rising crime, overburdened healthcare systems or exhausted waste management capacities. (Johnson, 2008; Marceau, 2008; Dirks et al., 2009; Betis et al., 2018)

In the light of these overwhelming challenges, there is a broad consensus that incremental innovation and improvements of urban living will not be sufficient to reach crucial overarching targets such as quality of life or sustainability. With this in mind, more drastic and holistic changes are required spanning across numerous sciences and disciplines. Essentially, smart city is a disruptive innovation approach that focuses on a forward-looking city, as defined by Giffinger et al. (2008). Harrison et al. (2010) complements this forward-looking nature of smart cities by a strong IT dimension using an intelligent flow of collected and processed data with the aim of a smart and interconnected urban area. In general terms, this urban area connects the existing physical infrastructure in the form of buildings, roads and energy lines, the IT infrastructure both tangible and intangible, the social infrastructure, and lastly the diverse business infrastructure to

reap the benefits of the joint smart thinking in a given city. A view shared by various other scholars, including Washburn et al. (2010) as well as Kanter and Lintow (2009). The use of numerous new technologies is at the core of smart city solutions. Given the multitude of technological advancements, it includes such diverse disciplines as computer science, architecture, electrical engineering, business management, social science or medicine. The effective deployment and integration of these disciplines shall lead to creating more safe, secure, sustainable and inclusive urban areas, which could then be labelled smart. (Betis et al., 2018)

5.2 What are the Main Challenges from a Company Perspective?

A smart city is a field of business that allows companies to benefit from a rising demand across various disciplines. At the same, the degree of interconnectivity and complexity is what makes superior management skills essential in the context of this topic. In their integrated study, Chourabi et al. (2012) defined eight individual factors of influence to be considered for designing and implementing smart city solutions:

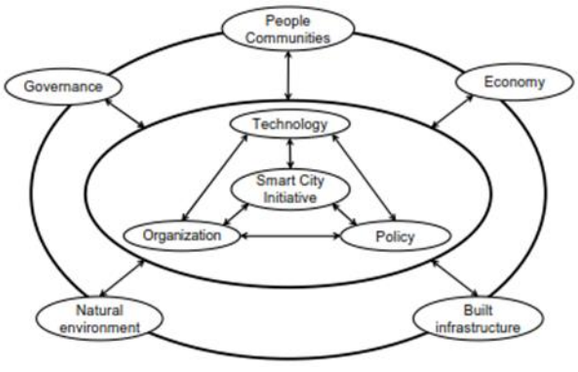

Figure 3: Smart City Initiatives Framework
Source: (Chourabi, H. et al. (2012). Understanding Smart Cities: An Integrative Framework. 45th Hawaii International Conference on System Sciences. 2289-2297. 10.1109/HICSS.2012.615.)

As part of this framework, a holistic approach towards smart cities is taken, providing a profound understanding of the individual elements to be considered. Essentially, it highlights that various challenges are indeed more of an organizational or social dimension rather than being strictly of a technical nature, which could be addressed by either digital innovation or ramping up investments in people, gadgets or infrastructure. This translates into the requirements for managing stakeholders, understanding interfaces, potentially competing interests and values as well as the full scale of social and political complexity. In this light, smart city solutions may require companies aiming to secure their share of the business pie to opt for the right strategic options when it comes to market their disruptive products within a challenging context. (Grab et al., 2018b)

5.3 A Possible Framework for Innovation Management in the Context of Smart Cities Digital Transformation

In the background of the innovation challenge faced by companies interested in benefiting from rising demand for smart city solutions, the issue of drafting, selecting and pursuing the right strategic option is essential. In this context, current research in combination with expert opinions and market observations point towards four widely used approaches allowing firms to innovate in the field of smart cities in accordance with their individual capabilities and need. In this context, the adoption of the »4I Solutions Model« enables businesses to choose the strategic option suitable to their individual case. In a nutshell, this framework includes four different approaches ranging from initiating groundwork innovation internally to establishing partnerships with selected external parties:

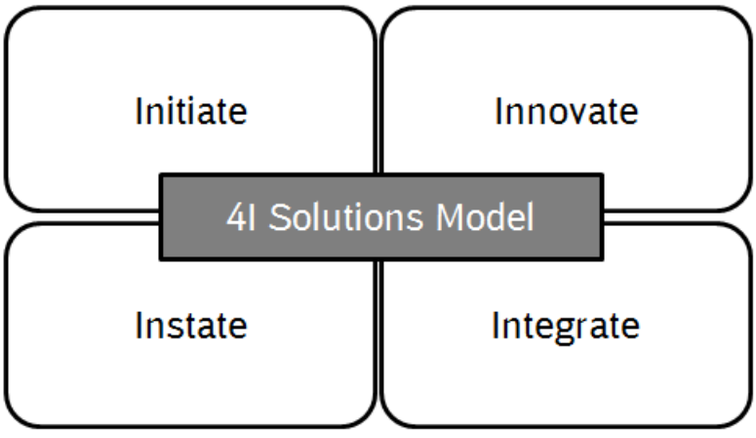

Figure 4:"4I Solutions Model" for Innovation Management in the context of Smart Cities Digital Transformation
Source: Own illustration

1. Initiate:
Firms have the option to start new innovation efforts in the field of smart city internally. This may require significant ramp-up costs given the scope of the solution targeted by the firm - the larger the foreseen investment, the higher the probability that only large corporations are capable of initiating such investments. In this context, those types of companies have the opportunity to cover a wider range of smart city topics with additional capacities and skills in integrating products. Not surprisingly, companies with strong capabilities across various industries such as General Electric rank very highly in smart city indexes such as the Compass Intelligence A-List Index. In contrast to globally active corporations, start-up companies also play an important role in triggering innovation with regards to individual solutions within the wider smart city framework. Given their customer-centric approaches, combined with lean structures and adaptive business models, those firms are in the position to swiftly initiate new smart city: flying car pioneer Lilium or waste management firm NordSense are just two examples of the vast and diverse start-up scene contributing to innovation for future urbanization.

2. Innovate:
Another option concerning innovation management in the field of smart city solutions is the pooling, integration and extension of internal capacities with the aim of creating market-ready products and services. In this regard, firms focus on building on top of existing resources and capabilities. Experience and knowledge can be leveraged, in order to lower costs associated with starting from scratch. At the same time, the structured process of integrating and developing existing batches may form new disruptive ideas.

3. Instate:
Given the complexity of the smart city universe, firms can choose to utilize their existing network to complement products and services with new value propositions developed in other parts of the group or partner network. Thus, reducing costs associated with innovation management while covering a much broader scope of the smart city landscape. Transport providers such as German railway company Deutsche Bahn are therefore able – through a network of subsidiaries - to combine different innovation approaches in autonomous driving, intelligent transport and traffic management with last mile solutions to give customers a more integrated and holistic product and service experience. (Meyer, 2017)

4. Integrate:
While tapping on internal resources and skills is often perceived as the favorite while most cost-effective option regarding innovation management, firms may find themselves in a situation where integrating external resources and skills are considered to be a superior alternative. Depending on the strategic plans of a firm, acquiring ideas and resources may fast track the road towards becoming a significant player in the field of smart city solutions. Verizon's take-over of IoT specialist Sensity is just one example of a major corporation acquiring technical expertise in growth field to catapult themselves towards the front of technological advancements associated with smart city solutions. (Maddox, 2016; Grab et al., 2018c).

6. Conclusion

As outlined throughout the paper, companies are faced with substantial challenges in the context of digital transformation. In order to stay ahead of the competition, they are forced to innovate continuously with a strong focus on disruptive solutions creating real customer value. In this context, an increase in revenues may offset the tendency towards tighter profit margin. For companies addressing challenges in the field of smart city solutions, the awareness of the level of complexity and the multitude of facets is important. Thus, it will determine the strategic options and shape the innovation management suitable to any given organization. Going forward, additional research will be required to put the desk study results of this paper to a practical test. In addition to that, smart city solutions are expected to evolve in the years to come providing ample opportunities for further scientific groundwork both on a macro as well on a company level.

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