

Understanding **Market** Agility for New Product Success with Big Data Analytics

Purpose:

The complexity that characterises the dynamic nature of the various environmental factors makes it very compelling for firms to be capable of addressing the changing customers' needs. The current study examines the role of big data in new product success. We develop a qualitative research with case study approach to look at this. Specifically, we look at multiple cases to get in-depth understanding of customer agility for new product success with big data analytics. The findings of the study provide insight into the role of customer agility in new product success. This study unpacks the interconnectedness of the effective use of data aggregation tools, the effectiveness of data analysis tools and customer agility. It also explores the link between all of these factors and new product success. The study is reasonably telling in that it shows that the effective use of data aggregation and data analysis tools results in customer agility which in itself explains how an organisation senses and responds speedily to opportunities for innovation in the competitive marketing environment. The current study provides significant theoretical contributions by providing evidence for the role of big data analytics, big data aggregation tools, customer agility, organizational slack and environmental turbulence in new product success.

Keywords: Big data analytics, customer agility, effective use of data, new product success.

Introduction

The scale of complexity that characterises the dynamic nature of the various environmental factors of current digital age makes it very compelling for firms to be capable of addressing the changing customers' needs (Gbadamosi, 2015; Schriber et al., 2018; You et al., 2019). So, to achieve sustainable competitive advantage, they are expected to achieve agility in combining data across the organisation in order to be able to deploy analytics for addressing this challenge (Kitchens et al., 2018). Incontestably, data come from a variety of sources. For instance, e-commerce sites provides accumulated large number of online customer reviews in relation to various products and services and has strategic customer value for product development (Zhou et al., 2018). Similarly, the data generated through the Internet of Things (IoTs) generate knowledge that is ultimately used by firms to monitor and control business network operations (Akhtar et al., 2017). Closely linked to this is the notion of big data which has been described as a state-of-the-art technology for handling data and can create and uncover the value of business through its unique analytical and predictive capabilities (Chen et al., 2012; Sun et al., 2015). From a different perspective, Orenga-Roglá and Chalmeta (2016) describe it as the current ability to have a large amount of data and draw conclusion about various processes of the company and customer and their interactions. There are huge opportunities for businesses to engage with customers in the form of capturing, analysing, and exchanging vast amount of customer intelligence through big data approaches due to these capabilities (Kunz et al., 2017). Businesses such as Honda, Walmart, Samsung, and several others of varying scales in various sectors have significant activities that are amenable to big data technologies. These explain a new generation of technologies and architectures that are orchestrated to tease out economical value from huge volume of a wide variety of data (Gantz and Reinsel, 2011; Smeda, 2017). This echoes the claim of Khatri (2016) that even though data is undeniably valuable, deriving that value requires broad and deep understanding of the digital universe. Clearly, this topic is greatly valuable in various organisational types including the business-to-business transactions in which there is a plethora of transactions and activities. Evidently, this research domain is now gaining scholarship attention in the extant literature (See for example, Yaqoob *et al.*, 2016; Ghasemaghaei *et al.*, 2017). For example, Megarry et al. (2019), examine big data in relation to pharmaceutical flow properties while Son et al. (2009) emphasise its usefulness for efficiency in product development processes. This corroborates the position of Johnson et al. (2017) to a great extent who link it to new product revenue. In relating big data to retailing, Bradlow et al. (2017) contend that it depicts improved data quality rather than a mere increase in data volume for improved outcomes. Unfortunately, there is limited studies conducted on this topic in terms of shaping customer agility, product innovations, and achieving success in new product development vis-à-vis Big data

analytics. As such, to fill this gap, we conduct a qualitative research to address the following questions. 1) To what extent can effective use of data aggregation tools support a company with a better understanding of customer agility and new product success? 2) How does effective use of data analysis tools support a company with a better understanding of customer agility and new product success? 3) How does a company benefit from a better understanding of customer agility for new product success? 4) To what extent can organisational slack and environmental turbulence influence new product success? Hence, the focus of this paper is to fill the palpable gap in the extant literature through an empirical study of how this is done.

Theoretical Background

Customer agility and Environmental turbulence

The dynamic business environment is associated with constant change in customer requirements both at the B2C and B2B levels. So, the firm's capability to not only sense but also to respond in expeditious way to customer-based opportunities for innovation and competitive action is of great importance. This has been known as customer agility (Brusset, 2016; Roy et al., 2017). So, it is not surprising why it is argued that customer agility has two distinct dynamic capabilities which are identified to be sensing and responding promptly to the customers in service-oriented environments (Roberts and Grover, 2012a; Chatfield and Reddick, 2017). With the advent of the internet and the ever-changing nature of the needs of the customers, the need for firms to be agile is closely linked to their competitive edge in the marketplace in that it will increase customer satisfaction (Roy et al., 2017). As indicated by Kitchens et al. (2018), a key challenge to achieving agility is in the identification, collection, and integration of data from the functional silos that permeate both within and outside the business organisation. So, agility is about being able to efficiently and effectively redeploy organisational resources to value creating and value protecting higher-yield activities as warranted by internal and external circumstance (Teece et al., 2016; Corte-Real et al., 2017). In a study on measuring customer agility from online review, Zhou et al. (2018) found that a large volume of online review enhances product developer's motivation to leverage online review and as a consequence increases customer agility. The literature identifies three implicit characteristics of organisation that influence competitive action as: awareness of the context and potential opportunities for innovation, the firm's motivation to take action, and to the ability of the firm to take action (Chen, 1996; Roberts and Grover, 2012). Parts of the benefits of agility as presented by Roy et al. (2017) in a study that revolves around e-retailers agility is that it will result in loyalty vis-à-vis quality of information made available to customers. It also positions

organisation to grow its revenue and have a higher profit margin (Chen *et al.*, 2014; Ghasemaghaei *et al.*, 2017). There is a contention which identifies four dimension of agile supply chain practices to be customer sensitivity, process integration, virtual integration, and network integration (Hoek *et al.*, 2001; Chen and Chiang, 2011). This seems to be closely consistent with an earlier perspective in the work of Li *et al.* (2009) which indicates six dimensions of supply chain agility to be strategic alertness, operational alertness, strategic response capability, operational response capability, episodic alertness, and episodic response capability.

The notion of customer agility has been explored and applied from different contexts and perspectives which demonstrate its wide scope of application. According to Chatfield and Reddick (2017; p.345), customer agility could be linked to public value creation and on-demand service delivery by three institutional mechanisms which are agent empowerment self-organisation, data analytics-enabled business process change, and moving networked and mobile citizens from the physical network to digital and mobile channels. Tersine and Wacker (2000) in their study linking agility to inventory strategies, note the link between inventory requirements to customer requirements for response, quality and benefit-to-cost ratio in relation to reduction in valueless time, valueless activity, and valueless variance in business processes. So, to attain supply chain (SC) agility, a firm will have to tap various synergies between different SC flexibility forms which entails internally focussed capability and how the firm could adapt its various SC functions such as purchasing manufacturing, and distribution with speed at the business level (Aggrawal, *et al.*, 2006; Um, 2017). Citing Cristopher and Towill (2001) and Swafford *et al.*, (2008), Um (2017) cites examples of business level speed as lead time reduction, rapid market responsiveness, reliability in delivery, and pace of product introduction.

By and large, there are two perspectives in relation to how a firm respond to volatile and dynamic environment which are the static viewpoint and the dynamic perspective (Roberts and Gover, 2012). In this line of reasoning, the static perspective is the research stream that explores how an organisation's structure and flexibility influence its capability to adapt to its environment whereas the dynamic perspective revolves around the explication of how firms build, leverage, and reconfigure capabilities that allow them to adapt to changes in the environment (Burns and Stalker, 1961; Eisenhardt and Martin, 2000; Roberts and Gover, 2012a). In their study on measuring customer agility from online review, Zhou *et al.* (2018) found that responding to customers' demands effectively enhances customers' willingness to buy the offering of the organisation. However, they note that overresponding on that issue generate numerous costs to the product developer (Atuahene-Gima, 2005; Roberts and Gover, 2012b). Hence, it requires utmost managerial effectiveness to achieve a beneficial outcome.

New Product Success: A Critical overview

Evidently, there is a plethora of new products introduced into the market this day and age. This is not surprising in that New Product Development (NPD) is linked to customer retention and corporate growth as introducing new products or modifying existing ones could appeal to existing strategic customers that desire change (Flint, 2002). It is one of the key driving forces to attain competitive advantage and sustained growth (Chang and Cho, 2008). With reference to a body of literature, Wong and Tong (2013) highlight that, it is vital to the organisational long term survival and can be a cash cow for the firm tomorrow. Meanwhile, it is noteworthy that while some of these new products fail due to several reasons, some of these inventions succeed even within the volatile marketing environment. Among factors that influence New product success (NPS) have been identified as product quality, innovativeness, functionality, colour, and prestige associated with a brand (Wong and Tong, 2012; Kam-Sing, 2014).

Kam-Sing (2014) concludes that environmental turbulence has a mixed effect on new product success in that it could strongly and negatively affect some firms but may have no negative impact on new product success of others. Ayers et al. (1997) suggest that new product success is a function of many factors namely the integration of marketing and research and development (R&D), relational norms, and managerial controls. It has been argued that, due to the complexity associated with cross-functional integration and new product success, care should be taken to ensure that the firm achieve the most effective form of integration (Troy *et al.*, 2008). Meanwhile, Ma et al, (2012) in their study on the effects of strategic alliance resource accumulation and process characteristic on new product success conclude that resource balance in determining NPD success is important. According to them, this comprises balancing resources between marketing and technology resources, and between resource exploitation and resource exploration. This interconnection is very compelling in that new product success requires considerable information from various stakeholders in relation to issues such as markets, regulation, technology, and competition at higher speed (Xu et al., 2016).

It is noteworthy that Zhang et al. (2017) caution against overemphasising the key effects of either internal or external resources as their study showed a negative moderating effect of network power in the relationship between interactive effect of internal resources and sensing and seizing capability (SSC), whereas they found a positive relationship between SSC and new product success. The literature also stresses that the role of salespeople in new product success cannot be ignored in that they serve as boundary spanners between the external market players and the organisation (Kuester et al., 2017). As indicated by Kuester et al. (2017), the use of sales people's

market knowledge in new product development is beneficial in that new products could be aligned with the needs of the customers and provide superior benefits from the customers' perception.

From the international marketing perspective, Boso *et al.* (2012) found that seeking complementarity between Market-oriented behaviour (MOB) and Entrepreneurial-oriented behaviour (EOB) will be beneficial for export new product success, especially in situations of competitive intensity in the export market environment and when the unit of export has greater access to financial capital. This is useful and resonates the contention of Flint (2002) that it is important to find ways to increase the efficiency with which new products are developed. According to Cui *et al.* (2013), *guanxi* has a positive effect on the speed of new product to the market by reducing the cost of negotiation. The term *Guanxi* is used by Chinese to denote interpersonal connections (Park & Luo, 2001) and it is entrenched in relational behaviours underpinned by morality and social norms (Arias, 1998; Wang, 2007). The study of Wong and Tong (2013) shows the role of customer orientation as a mediator of RMC –NPS link where RMC stands for the Research and Development (R&D) and marketing cooperation (RMC) and NPS is an acronym for new product success. Nevertheless, this study found that competitor orientation does not exert any influence on this link. From a different perspective, Etlie *et al.* (2017) note that promote NPS and enhances integration between IT function and the overall strategy of an organisation.

Big Data: Sources and Opportunities

The scale of data at the disposal of businesses and shared for various purposes is huge in recent times. To make effective use of this, specific courses of action are needed. Accordingly, this brings in the notion of Big data (BD), which, according to Sivarajah *et al.* (2017: 263) could be explained as the artefact of human individuals and collective intelligence developed and shared mainly via the technological environment within which virtually anything and everything could be documented, measured, and shared digitally, and through this transformed into data. The extant literature indicates that the term Big Data Analytics (BDA) was coined by Chen *et al.* (2012) to be a related field of business intelligence and analytics. In a more detailed perspective, it has been explained as the collection of data and technology that does not only accesses but also integrates and reports all available data by filtering, correlating, and reporting insights which could not have been attainable with past data technologies (APICS, 2012; Kude *et al.*, 2017). We compared to traditional data, Big Data is different in terms of the volume, variety, veracity, and velocity and the potential to create significant value (Wedel and Kannan, 2026; Kunz *et al.*, 2017). It has been noted that the world's data volume is anticipated to grow by 40% annually and expected to be

50 times by 2020 (Waal-Montgomery, 2016; Yaqoob et al., 2016). In terms of the sources of Big Data (BD), Yaqoob et al., (2016) identified the key sources to be Internet of Things (IoT) multimedia, social media data, and self-quantified. The IoT covers those devices that have network connectivity and the ability to send and receive data in relation to other connected objects and has emerged as one of the key technologies of the modern era (Akhtar et al., 2017). The literature has provided evidence of opportunities of Big Data (BD) in data analytics as help in the acquisition of knowledge in relation to market trends, detecting fraud, aiding decision-making in relation to understanding customers and various marketing elements (Yaqoob et al., 2016). It offers firms new opportunities to create business value (Sun et al., 2015). This is closely related to the perspective that argues that it allows effective internal and external knowledge management that assist business to create organisational agility (Côte-Real et al., 2017). In the context of Social CRM, Orenge-Roglá and Chalmeta (2016) indicates that Big Data technologies could be used for a number of purposes which include competitive intelligence, commercial recommendation, debt recovery of customers, predictive models of trend, automated categorisation, and routing of customer interactions over any channel, and 360⁰ customer view. According to these authors, Big Data allows knowledge to be teased from customer information and converted effectively, securely and in a scalable way. By and large, it provides unprecedented opportunities for statistical inference on massive analytics (Talon-Ballestro et al, 2018).

Meanwhile, Big Data also has challenges. One main challenge of obtaining strategic value from big data is the difficulty of creating an integrated big data infrastructure which supports the agile development of customer analytics in such a way that spending in worthless data or not spending enough is avoidable (Kitchens et al., 2018). No wonder Ghasemaghaei et al. (2017) in their study on increasing agility through the use of data analytics suggest that the effective use of data analytics tools will require possibly fine-tuning of the resources associated with the system, and firm can only get their agility benefits of their investment if these resources work closely together.

Research Propositions

The above mentioned literature review and the gap, we develop a conceptual framework and it has been shown on figure 1.0. In the following section we support our arguments and the relationship between those variables.

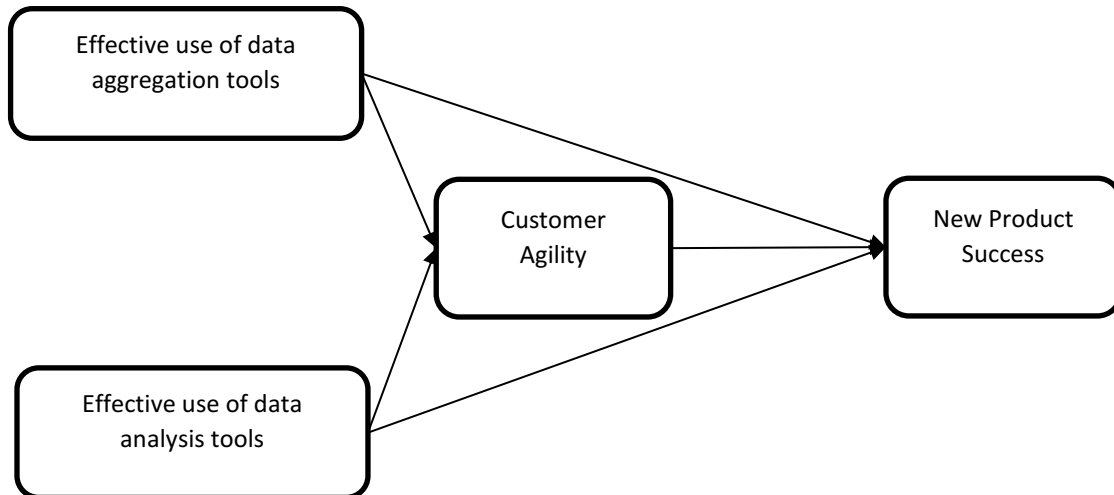


Figure 1. The conceptual framework

It is increasingly clear that huge volume of data is now at the disposal of businesses this day and age. As people and machines are involved in various activities nowadays, they are monitored and measured by sensors in incredible ways involving collection, storage, transmission and analysis of the big data sensor data (Wu et al., 2016). As argued in the literature (Richard, 2011; Wu et al., 2016), the data aggregation technology is often employed to reduce the transmission size and time of sensor data in Wireless Sensor Network (WSN) thereby effectively avoiding the transmission of unnecessary data and accurately extracting the needed data for decision making (Rajagopalan and Varshney, 2006; Wu et al., 2016). Since customer agility revolves around sensing opportunities in the environment and responding to them promptly, it is logical to propose that:

Preposition 1: Effective use of data aggregation tools is directly related to customer agility

As shown by Guan and Si (2017), data aggregation device makes it possible to collect all the data sent by Smarter Meter (SM) and is closely linked to homomorphic encryption and data obfuscation in that it could be used to protect the users' real time data. It allows firms to combine data considered similar from a variety of sources to remove redundancy and the consumption of resources available in a network (Harb et al., 2017; Boubiche et al., 2018). In view of this, data aggregation would help organisation to be successful in their planning for product development and subsequently lead to new product success. Therefore, it could be proposed that:

Preposition 2: Effective use of data aggregation tools has a direct effect on new product success

Undeniably, big data encapsulates information derived from various sources such as customers' preferences and their transactions (Oenga-Rogla and Chalmeta, 2016). The multiplicity and complexity of the sources of this data (Sivarjah et al., 2017) necessitates a need to have an effective means of data analysis approach in place. Hence, how the data is interpreted will be very crucial to decisions around new products development which in turn directly result in new product success. Accordingly, it could be stated that:

Preposition 3: Effective use of data analysis tools directly lead to new product success

Since customer agility involves being able to efficiently and effectively redeploy organisational resources to value creating and value protecting higher-yield activities as allowed by internal and external circumstance (Teece et al., 2016; Corte-Real et al., 2017), businesses would be in a position to be able to tailor their market offerings to suit the specific needs of the customers including the development of new products to meet their contemporary needs. Since understanding and meeting these customers' contemporary needs would be closely related to how successful the new products would be, it could be proposed that:

Proposition 4: Customer agility directly results in new product success

Environmental turbulence necessitates a thorough environmental scanning due to the need to gather various data for effective decision-making activities in business organisations (Selene Xia and Gong, 2014). Expectedly, without a thorough analysis and interpretation, this data collected from a plethora of sources may not be as valuable as expected. Hence, it is considered imperative to have effective big data analysis tools in place in order to be able to make good business decisions (Spiggle, 1994; Xiao, 2017; Nayak et al., 2018). Accordingly, a proposition in this context could be stated as:

Proposition 5: Effective use of data analysis tools has a direct effect on customer agility

Methodology

For the sake of effectively addressing our research propositions, we chose qualitative method of study. To get an in-depth view of a phenomenon, qualitative approach is very suitable to understand the heterogeneous and complex characteristics (Berg-Schlosser and DeMeur, 2009). The aim of the current study is to develop and empirically evaluate a framework of the role of big data analytics in new product success, therefore case study approach was harnessed as empirical evidence in the inquiry strategy. As the objective of the study was to gain a deeper understanding and not testing an existing theoretical model, a case study approach was deemed appropriate (Yin, 2009). Case study is an empirical inquiry that enables one to investigate a contemporary phenomenon in depth and within its real life context, especially in settings where the boundaries between the context and the phenomenon are not clearly stated. In the current study, big data refers to the contemporary phenomenon because besides getting considerable attention by both academicians and practitioners, it still requires more scholarly attention. In addition, case study is an appropriate approach because it can reveal in-depth examination of the phenomenon and context at hand, which in our case is new product success.

After careful consideration, **we have selected three cases in Finland, Canada and the UK. As such, this research looks at multiple cases. The first case is from Finland.** The company has a strong presence at different online platforms such as social media platforms, search engines, Mailchimp, Indiegogo platform pages in order to launch its tech-based products. The company's presence on the online platforms help them to accumulate big data and utilize it further to devise marketing strategies. **The second case is Services/ Digital Marketing Agency in Canada. Finally, the third case is a company in the UK that is from Information Technology industry.**

Furthermore, semi-structured interviews were conducted with the Senior Marketing Managers who directly involved in marketing brands and harnessing big data to devise strategies in these companies. For the sake of ensuring systematic coding that leads to discovery of the themes through text analysis, a content analysis approach was adopted (Hsieh-Fang and Shannon, 2005). The interviews were transcribed and coded. Initially, an open coding phase was relied on where the interviews were coded by paragraph and further classified according to the core concepts (Glaser and Strauss, 1999). In addition, the concepts were summarized in thematic categories in the process of axial coding. This coding process was instrumental in the development of the interconnection between categories and led to the identification of the central concept. This is exemplified in Table 1.

Table 1: Abstraction level and central concept

Quote	Level of Abstraction	2 nd level of Abstraction	Thematic Category	Central Concept
To me big data is like a design process that you test, and then you learn and then you test it again, and then you learn and then you come to a conclusion. It's not like a big pool of data that you make sense of it right away. For instance, if you go to google analytics and immediately choose your customer base and design your strategies, thousands of visits cannot always translate visitors into buyers.	Big data requires careful thinking to be meaningful.	Consumer needs are to be carefully addressed.	Customer sensing and responsiveness.	Customer Agility

Content analysis technique was harnessed in order to identify the underlying themes and proved valuable to identify the intentions, meanings, context and consequences (Cavanagh, 1997). The themes generated during the process are given in Table 2. Findings were further validated by the existing literature.

Table 2: Themes generated

Keywords	Theme Number	Themes

Data Aggregation Tools	1	Data aggregation tools develop customer agility
Data Analysis	2	Data analysis tools develop customer agility
Analytics	3	Data analysis tools lead to new product success
Aggregation tools	4	Data aggregation tools lead to new product success
New product success	5	Customer Agility leads to new product success
Environmental Turbulence	Control	Environmental turbulence affects new product success
Resources	Control	Organizational Slack affects new product success

Results

Data Aggregation Tools

A company can possess huge amounts of data coming from various sources such as multimedia platforms, internet of things (IOT) and social media data. IOT pertains to devices that are able to send and receive data through network connectivity. For the sake of achieving sustainable competitive advantage, a company is expected to combine all the data from different sources. **In our context, the companies rely on their social media channels, crowdfunding campaigns data, Mail chimp data, the data from company's own web shops as well as data from other agencies. Therefore, they possess enriched data coming from various sources.** However, it is always difficult for a company to create an integrated infrastructure of big data. Though data aggregation technology is improving and reducing the transmission size for the companies to get meaningful data, still many companies struggle to keep that data in a more structured way. Even the recent data tools are very limited and insufficient that raise many complications (Yaqoob et al.,2016). **An example of what a manager said about data aggregation tools is here:**

"This is one thing we are still struggling right now. We donot have the tool to combine data yet, and so far we collect things based on the resources we have, for instance using excel sheet. We are having some word documents to write down our insight from there. But basically the data, once you collect it, it cannot be lost. It is stored there on the tools such as Google Analytics, FB pixel, Mailchimp, Indeigogo, Dashboard. Actually data come from many sources and it is difficult really to say where we get the most information. So you can really see all the data

on these platforms. But then that is just a broad data. And we still have to figure it out, how to combine the data properly in a small company. We do not have the big tools". (Theme 1&4)

Data Analysis tools

Big data analytics is related to the field of business intelligence and analytics, in which companies try to make sense of huge piles of data. Various technological advances have led to the rise of tools that enable companies to makes sense of data by filtering, correlating and reporting insights. Some of the traditional marketing analytics techniques include regression modelling, mapping/multidimensional scaling, diffusion modelling, stochastic processes, math programming modelling and optimization that turned out to be very useful for the companies (Lilien et al., 2013). An even excel spreadsheets have been a very popular tool for companies in doing primary analysis (Cosentino, 2012). Moreover, data analytics can help the companies to gain knowledgeable insights with regards to the market trends, and assist in decision making and better understanding of customers. **Another example of a statement by a manager about data analysis tools is given below:**

"Google Analytics obviously provides a lot of insights for you, you want to know who visits your site and what are their gender, age, where they come from, what kind of device do they use. These modes of statistics serve the purpose but not really in terms of qualitative understanding. For example, further insight might come from Facebook ad. Based on the insights from Google Analytics, if you can create the right ad for right audience, you can really see the results. For example, when you run a Facebook campaign ad, and target the right audience, and then you can see the results (positive or negative) right away from tools such as Google or Facebook analytics".(Theme 2 and 3)

Effective data analysis tools are very important in order to deal with complex nature of collected data coming from various sources. However, it is not always possible for a small company to fully utilize the data. With all the data in possession, it can be very hard for the company to draw meaningful conclusions out of it. **One of participants made the statement below about data analysis tools:**

"So yeah for now I don't think we have a very good analysis tool for the data yet. But in the future we hope that we can sync on these data into one software and then get some insight from there and put them into the big picture of transitioning into the market. But for a small company you really have to see resources, for how can you develop the next product".

Customer Agility

Customer needs to keep on changing with the passage of time. It is of utmost importance for the company to sense and respond the customer needs accordingly. Data through its unique analytical and predictive capabilities can enable the companies to sense and respond to customer needs in an appropriate manner. Moreover, large amounts of data can enable the company to get insights and deal with the change which happens all the time, not only in the product but also in the service oriented environment. Data can therefore be really helpful in this regards:

“Big data helps a lot, when you have the data of your customer or your prospect customer, you can really know what kind of message could you use for your branding, how can you design the work package to meet with your customer requirements. What kind of branding material you can prepare according to the taste of the customer, so that they can buy more. Therefore, it really helps a lot in terms of branding strategy, in terms of content marketing strategy, even when you prepare some investment proposal, you want to need big data in order to present to the investors . Therefore, it helps in many cases. For example, one million people come to your website and pulse raise is 90%. It means 900,000 people already walked away when they come to your website. They pinpoint here is that people do not stay at the website, then why these people come to your website and why don't they stay? and how can you improve a more organic search with kind of content for their longer stay. We actually after the first campaign made a survey, to target the backers and who ordered the product. We asked them why did they buy this product? Then we really saw the need and after the 1st model, we could really see that 60% of those surveyed said that they had sleep problem. And from that problem we decided to work on a new product. Our CEO said we are obviously having a roadmap for different models in our product development. But then we decided to launch the second one right after the first model. So yeah that was really insightful hint or clue about what's coming in the future”. (Theme 5)

New Product Success

Not all the products that are launched in the market become successful. New product success is determined by so many factors and it can be reflected through profits, sales revenue, fan base, corporate growth and customer retention to mention a few. Traditionally, there have been several factors involved in new product success development, for instance innovativeness, product quality, technology, regulation, higher speed to market entry, functionality and prestige associated with branding. In this age, big data can be crucial for the new product success.

“New product success can reflect in different aspects, it can be in sales obviously. We also raise quiet a lot from the crowdfunding campaigns from the second model. Secondly, it can also be the market reaction, how big it is, how much potential the market has, so when you do crowdfunding, or when you do branding, or a new ad, you

do see how people react to your product. In addition, if you see a huge positive reaction, it means that the market is really big and have potential for the product. Besides that, you also have different exhibitions, and exhibitions with B2B buyers, we can see a lot of potential people who contact us to say that we want to sell your product in this market. So we meet with different partners, clients, customers, through which we can gauge the success of our products”.

However, new product success is a continuous process and cannot be seen once at a time, but over the period of years and often companies have set different targets for achieving their goals.

“We aim higher. We can do a much better job, based on what we see from the market response. Obviously, the market we are in, we are very well aware with that, but we really need the resources to bring the products earlier. We also plan to open to the retail operations more but we have the scarcity of resources, so it is difficult. Therefore, I would not say that we have really met our target. As our target is higher”.

Environmental Turbulence

The road to success is not linear always. For instance technology develops very fast, the number of competitors come into the market to replace your products. For some companies the turbulence can be devastating and for others, the turbulence does not have a strong impact. For example, two different perspectives, static and dynamic perspectives with regards to turbulence have been discussed before in the literature. Therefore, companies’ ability to deal with environmental changes is based on various factors. For instance, the situation in our cases is indicated as follows::

“We have our product patented, so that is one thing that is very great. Meaning that if any product meets with our products dimensions, the design, the technology of our product; it violates with our terms in a very big market, for instance US or UK market. We already have our patent that is good. but then obviously, the pros and cons of being a pioneer are there. We think we had made a revolution in our product category. However, other products might be introduced with the same size and then there are many other big players who have more resources, coming into the market. I think in this kind of competition, the richer you are the easier you can become the winner”. (Control)

Organizational Slack

The resources that company has are very important. In order to be competitive and relevant in the market, a significant amount of resources are needed by every company.

“So resources are very important, not so much of the technology development, because you know now a days, we have patents and copyrights and laws and intellectual laws. So I do not think that we have a big problem with that, it is more about the resources. Let’s say people can look and copy your technology. However, they cannot copy your intellect and they do not really know where you want to head to, so that’s something we can be proud of. But resources is something a big hindrance for a small company to thrive. The final true resource is human resources. I do not think we are very resourceful right now. We have the core member in every team but that core member cannot do everything”. (Control)

Evaluation of the study

Scientific research is evaluated on the basis of its philosophical underpinnings, methodology and objectives (Eriksson and Kovalainen, 2000). The main objective of the current study was to develop and empirically validate a framework for the role of big data analytics in new product success by adapting qualitative research methods and constructive approach. Trustworthiness tends to be one of the main key criteria of evaluating constructionist qualitative work (Lincoln and Guba, 1985, 2000). Using Guba’s (1981) approach, the trustworthiness of the study is addressed by four criteria 1) credibility (referring to the internal validity), 2) transferability (referring to the generalizability and external validity) 3) dependability (referring to the reliability of the study) and 4) confirmability (referring to the objectivity) (Miles and Huberman, 1994). According to Polkinghorne (2007), credibility refers to the extent to which the results are believable to others and are an acceptable representation of the data, and broadly address how congruent are the findings with the reality (Merriam, 1998). Once credibility is ensured in a qualitative study, it establishes trustworthiness as well. To increase credibility of the study, several approaches can be adapted including rigorous selection of criteria for data collection and data analysis methods, through peer debriefing more reflexivity can be obtained and detailed description of the research process through member checking and transparency (Lincoln and Guba, 2000; Shenton, 2004). With regards to the rigorous research approach, the data collection and analysis procedures have to be in line with the philosophy and purpose of the research project. **Therefore, case study with narrative approach and interviews as a qualitative method of inquiry was applied to conduct the current study for the sake of gathering deep insights.** Moreover, interview approach gives an opportunity to obtain thick and detailed descriptions of a complex phenomenon such as the role of big data in new product success, which is concurrent with the constructionist approach (Guba and Lincoln, 1994). **Furthermore, special attentions has been paid to select the cases to ensure the reliability of the empirical evidence of an informative case example** (Patton, 2002).

The conceptual understanding of the topic has led us to develop the interview guide that enabled us to ask all the relevant and important questions and cover all the topics under investigation. Constructionist approach refers to the phenomenon where the interviewer and participant are both actively involved (Polkinghorne, 2007). This co-construction enables the researchers to apply strategies where participant's meaning are prioritised than that of researchers' own ideas (Polkinghorne, 2007). Hence the researchers were primarily interested in the participant's experiences and ideas and therefore took an active listening stance. Further details were requested from the participants if any detail was left unclear so that meaningful interpretations could be drawn.

Initially, a retrospective method (Miller et al., 1997) was applied in order to become familiar with the case company in three months course, where the company was studied in the capacity of expanding its market operations overseas. Hence, data triangulation was established as the information was collected from various sources (Denzin and Lincoln, 2011). As per the constructionist approach, exploring multiple sources of data is appropriate in order to acquire diverse constructions of reality that are valid and reliable (Polkinghorne, 2007). In the current research, a six months course was conducted harnessing problem based learning to witness the company very closely and this was followed by an interview which was conducted with the key directors. The supporting data comes from public information available about company's crowdfunding campaign, webpage, and social media. Hence, triangulating data from various sources gives us an enriched picture of the reality. The company's public data available also helped in verifying the details provided by the participant. In terms of reflexivity, it is important to expose the research project under peer scrutiny through critical discussions with other researchers. Therefore, the current study harnessed the critical view given by other researchers and their reflections were carefully selected based on their perceived relevance for further improving quality. In order to ensure the actual representativeness of the data, it was sent to the interview participant to understand whether selected quotations are represented in her views and findings are thoroughly presented. Thus fulfilling the criteria of member checking (Lincoln & Guba, 1985). Further, transparency has been ensured by clearly spelling out the research process (Polkinghorne, 2007) therefore enhancing credibility of the current study. The findings have been thoroughly discussed in the frame of existing theories eventually enhancing analytical generalizability. Finally, confirmability of the study can be achieved when the results could be confirmed or corroborated by others (Lincoln and Guba, 1985). For this sake, one indication is that instead of researchers' point of view, the participant's point of view stands supreme which results in the findings reported. In this regards, direct quotations have been included in the research paper to solidify the confirmability of conclusions and interpretations (Polkinghorne, 2007).

Aforementioned are some strategies that were employed to ensure the credibility and trustworthiness of the current study.

Discussion and Implications of the study

The current study provides significant **theoretical contributions** by providing evidence for the role of big data analytics, big data aggregation tools, customer agility, organizational slack and environmental turbulence in new product success. Yaqoob et al. (2016) have urged to do more research in the domain of big data; therefore, the current study closes this gap. More specifically, the current study advances the extant research in three ways. Firstly, the study is first to empirically test a framework that **helps explain the role of big data and big data analytics in new products success in the context of small companies**. In addition, it also ascertains the role of big data in developing customer agility that in turn predicts new product success. New product success involves a great deal of information coming from various sources and stakeholders (Xu et al., 2016). Moreover, big data also enables firms to identify the previously unrecognized needs of the customers. **The current study empirically tests the positive role of big data sources on new products success which is in line with the findings from Zhan et al,(2018). By the integrating the concepts from big data analytics, customer agility and new product success (Chen et al., 2012; Xu et al., 2016), the current study expands this embryonic domain of research.**

Secondly, the current study ascertains the relationship between big data (analysis and aggregation tools) and new products success. Several authors have recognized the importance of big data in new products success (Chen et al., 2012; Zhan et al., 2018). Thus providing a workable model of big data as a predictor of new products success advances the literature in this area especially in the context of small companies' usage of big data.

Thirdly, the current study also incorporated the role of environmental turbulence and organizational slack in determining new product success. **Our empirical evidence shows their effect on NPS and these findings are in line with the study of Kam-Sing (2014). Earlier research has emphasized the predictors of new product success (see e.g Ayers, 1991; Kam-Sing, 2014; Wong and Tong, 2012), however the current study provides evidence for predictors such as environmental turbulence and organizational slack in the model which hardly any research before has addressed. Therefore, the current study closes this significant gap.**

In terms of practical implications, the findings of this research provide insights to managers by explaining how effective use of data aggregation and data analysis tools are directly linked to new product success. Our findings also shows the effective use of data aggregation and data analysis tools results in customer agility which in itself

explains how organisations and managers senses and responds speedily to opportunities for innovation in current digital age.

Conclusion

Big data analytics has been widely acknowledged as sine qua non of coping with huge scale of challenges associated with the prevailing turbulence in the marketing environment. Part of the issues underpinned by this phenomenon is the data connected to new product development. As businesses make frantic efforts to develop new products to satisfy the ever dynamic needs of their target customers, the question of whether such strategic efforts will be successful or not lingers which necessitates the need for appropriate tools to tackle the issue. Accordingly, this study unpacks the interconnectedness of the effective use of data aggregation tools, the effectiveness of data analysis tools and customer agility. It also explores the link between all of these factors and new product success. The study is reasonably telling in that it shows that the effective use of data aggregation and data analysis tools results in customer agility which in itself explains how an organisation senses and responds speedily to opportunities for innovation in the competitive marketing environment. Therefore, the study shows customer agility as a strategic and valuable part of the organisation success factor in that it is directly linked to new product success. Besides, it also shows that effective use of data aggregation and data analysis tools are directly linked to new product success. Hence, none of these could be considered inconsequential in organisation big analytic system.

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