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Customer Analytics Capabilities in the Big Data Spectrum: A Systematic Approach to Achieve Sustainable Firm Performance

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Customer Analytics Capabilities in the Big Data Spectrum: A Systematic Approach to Achieve Sustainable Firm Performance

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Abstract

Customer analytics plays a vital role in generating insights from big data to improve service innovation, product development, personalization, and managerial decision making; yet, no academic study has investigated customer analytics capability through which it is possible to achieve sustainable business growth. To close this gap, this chapter explores the constructs of the customer analytics capability by drawing on a systematic review of the literature in the big data spectrum. The chapter's interpretive framework portrays a definitional aspect of customer analytics, the importance of customer analytics and customer analytics capability constructs. The study propose a customer analytics capability model, which consists of four principal constructs (i.e., management, technology infrastructure, personnel expertise and 4P mix modeling capability) and fourteen sub-constructs (planning, decision making, coordination, control, connectivity, compatibility, modularity, technical, technological, business, relational, incorporation, allocation and assessment). The chapter concludes by briefly discussing the challenges and future research direction for developing the customer analytics capability model in the specific sector.

1. Introduction

“Big Data” continuously challenges firms, creating an exhilarating leading edge of prospect in the last couple of years. Contemporary firms are taking initiatives to adopt analytics for gaining a superior advantage in the rapidly changing data-rich business environment (Popovič et al., 2016; Nam et al., 2018). The worldwide market in business intelligence and analytics is estimated to be worth \$200 billion by 2020 (IDC, 2016), with many industry experts predicting that the customer analytics capability of a firm would enhance the overall firm's performance in the big data environment (Germann et al., 2014). France and Ghose (2018) refer to customer analytics as to the advanced technology that able to solve the customer-centric challenges by analyzing the massive amount of marketing data. A large stream of research focuses on the benefit of customer analytics (e.g., Verhoef et al., 2010; Erevelles et al., 2015; Braun and Garriga, 2018), with relatively little or no attention been devoted to understanding the firm's capacity building of customer analytics in the data-rich environment. Therefore, this chapter seeks to answer the following question.

RQ: What are the dimensions of customer analytics capability to gain sustainable firm performance?

To answer this research question, firstly, we portray the definitional aspects of customer analytics, including discussing the difference between customer and marketing analytics. Secondly, we highlight the importance of customer analytics, and we articulate the findings of a systematic literature review and propose a set of customer analytics capability constructs.

In addressing the research question, this chapter makes two contributions to customer analytics research. Firstly, it offers a theoretical framework of capability dimensions of

customer analytics. Secondly, managers can get a clear idea of the customer analytics capability that will lead to attaining sustainable firm performance in the competitive business environment. Following an extensive literature review, we propose a model of customer analytics capability that gives direction to achieve sustainable business growth. Finally, we present a brief discussion on the challenges and a path for future research in this particular area.

2 Literature Review

2.1 Customer Analytics in Big Data Environment

Customer analytics is a robust procedure to manage today's ever-changing customers in the data-rich environment (Sun et al., 2014). Magill (2015) argues that customer analytics is no longer just an exility; it is a necessity to create the superior customer experience, triggering firms to perform large-scale customer analytics to gain profound insights into customers and the entire market.

In defining customer analytics, one stream has reflected on value creation and strategy-centric analysis. For example, verhoef et al. (2010) enlightened that the application of customer analytics in the data-rich environment helps managers to implement a cross-selling strategy through analyzing individual customer's purchasing pattern over the various product categories. Indeed, an analytically mature organization is strategically ahead to gain a competitive advantage (Ransbotham & Kiron, 2018). In another study, Germann et al. (2013) mentioned a firm's actual performance, and management's decision-making shape well when managers strategically applied analytics.

Another stream of research defines customer analytics from the viewpoint of discovering new opportunities. For example, Surma (2011) explained the scope of data mining for customer intelligence in four areas. Firstly, customization on portable devices and the convergence of media, secondly analysis of internet user behavior, thirdly correlation between physical location and customer behavior, and finally develop an advanced system can all converse with customers inconvincible ways that provide opportunities for a firm to attain competitive differentiation. In a similar stratum, Wedel & Kannan (2016) explained that the extensive development of media, channels, digital gadgets, and programming applications (analytics) has given firms incredible opportunities to use information to enhance experiences, deliver enormous value to customers, increment their happiness, and pull out the value in return. Braun & Garriga (2018) pointed out that improvements to customer journey experiences and driving product or service design can be achieved through customer journey analytics.

Table1 presents the concepts of customer analytics and how they have been defined in the literature.

Table 1 Definitional views of customer analytics

Study	Definitions
Davenport and Harris (2007a)	Customer analytics refers to the use of quantitative data analysis statistically through various models to make managerial decisions and actions.
Kayande et al. (2009)	Customer analytics refers to customers' data interpretation mechanism to make a superior decision.
Verhoef et al. (2010)	Customer analytics is used to manage and understand a significant amount of customers' data by applying a descriptive and predictive model.
Agarwal and Weill (2012)	Customer analytics helps to understand customer needs, make an emotional connection, and improve business process.
Germann et al. (2014)	Customer analytics is the technique used to seek endless opportunities to generate discovery and to support repetitive decisions.
Erevelles et al. (2015)	Customer analytics is the technological advancement that helps to capture customer's observable fact in the real-time from the data-rich environment.
Dhaoui et al. (2017)	Customer analytics focuses on technological advancement to get customer's best insight, such as Lexicon text mining software to analyze the consumer's sentiment.
France and Ghose (2018)	Customer-centric analytics in marketing is the technological advancement that able to solve the customer-centric challenges by analyzing the massive amount of marketing data.
Braun and Garriga (2018)	Customer analytics in big data refers to the quantitative fact-based analysis throughout the consumer's life cycle.

2.2 Positioning of Customer Analytics

Customer analytics is a sub-dimension of marketing analytics. Customer is the king in marketing, and a company's sustainable long-term existence depends on customers lifetime value. Marketing analytics is the technological advancement that focuses on the collection, coordination, management, and analysis of every marketing touchpoint data to confirm higher marketing return on investment (Wedel & Kannan 2016). Prior research in the big data spectrum has uncovered the critical relationship between the investigation of technology-based analytics and their considerable advantages (Braun & Garriga 2018; Dhaoui et al. 2017;

Erevelles et al. 2015). However, McAfee et al. (2012) and Ross et al. (2013) suggested business firm should focus on more exclusive assets in addition to technology, and that will help to develop firm's analytics capability infrastructure in the data-rich environment. Marketers always manage customers. A firm needs a few assets to reap benefits from the massive volume of customer data and information; although, a number of firms rarely determine how they could build and embed customer analytics inside their firms. The adequacy and ability of the customer's value creation can be enhanced through the mix of analytics models and algorithm development (Erevelles et al., 2015). A strategic fit model that analyze voluminous data helps to identify demographic and other vital factors of the customers, allowing firms product innovation, favorable pricing, meaningful promotion, and to set up the right place or online space for distributing products for the ultimate target customers (Verhoef et al. 2016). More precisely, customer analytics refers to the processes and technologies that give organizations insightful customers information which is necessary to deliver relevant and timely offers; further, as the resolution for all marketing activities, customer analytics comprises techniques such as predictive modeling, data visualization, information management, and segmentation (Germann et al., 2014).

3. The Importance of Customer Analytics

It has been observed that now there is a higher pressure than before on attaining an enterprise view of the customer systematically with the accessibility of enormous amount of data (structured and unstructured) from both the internal and external sources of the firm (Sun et al. 2014; Wedel & Kannan 2016). Such pressure triggers firms to perform large-scale customer analytics to gain more profound customers insights. Kayande et al. (2009) and Germann et al. (2014) advocate that a firm benefits from customer analytics if they possess three main characteristics. Firstly, the customer's data available are voluminous within the firm. Secondly, the existence of an analytics-based method and finally, analytics-based techniques are used to support the repetitive decision. Fieldler et al. (2013) considered a Wal-mart example to show the relationship between voluminous data and customer analytics effectiveness. Wal-mart successfully discovered through scanner data that hurricane warnings significantly increase sales of particular products such as Pop-Tarts. Kumar & Petersen et al., (2012) also refer to the analytic based method such as customer relationship management (CRM) and Customer lifetime value (CLV) metrics to maximize the firm's profitability. Analytics also helps to take the repetitive decisions on customer's product or service. For example, Kannan et al. (2009) found that the National Academies Press (NAP) of the USA that made many of the same decisions repeatedly, built a pricing model through analytics-based customer understanding. In another example, a German mail-order company made profits after introducing a dynamic multilevel response modeling system that answered when, how often and to whom should the company mail its catalogs (Elsner et al., 2004). Similarly, Erevelles et al., (2015) focussed on customer analytics and the strategic transformation of firms, where researchers bring up an example of Southwest airlines which introduced speech analytic software to gain superior competitive advantage through extracting customer insights.

Despite the potential benefits of analytics in data-rich environments, some firms are yet to introduce such mechanisms properly (Mithas et al., 2013). To be competitive in the marketplace, firms require the right process of generating and storing customer activities' records as big data, ensure the technical capability of extracting insights from big data, and adequately manage ideas to enhance dynamic capability (Erevelles et al., 2015). Hence, to embed customer analytics as an integral part of a firm's culture and its business routine, the firm's top management team must adequately support it. (Germann et al., 2013). The techniques of customer analytics have rapidly transformed over the past ten years, from text

analytics to audio Analytics, then video analytics, web analytics, social media analytics, behavior analytics, predictive analytics, journey analytics, and to most recently, cognitive analytics (Magill, 2016).

4 Research Approach

The study embraced a rigorous systematic literature review applying the guidelines of Ngai and Wat (2002), Benedettini and Neely (2012), and Akter and Fosso Wamba (2016) to answer the research question: What are the dimensions of customer analytics capability to gain sustainable firm performance? Relevant studies of big data analytics capability, marketing analytics, and IT capability are also considered along with customer analytics literature; because customer analytics is emerging in the big data spectrum and information technologies are involved with the process. We considered the time frame of searching for academic papers from 2006 (January) to 2018 (November). We have selected the year 2006 as the lowest boundary because the first seminal paper “competing on analytics” by Davenport was published in Harvard Business Review in 2006 (cited >1000 times). We considered five well-recognized databases (Scopus, Web of Knowledge, ABI/Inform Complete, Business Source Complete, and Science Direct). The searches were limited to the abstract, title, and keywords field. A total of 107 papers were critically reviewed. As we aimed to identify the primary and secondary customer analytics capability dimensions, we considered the 25 most relevant articles (see table 2).

5 Customer Analytics Capability Dimensions

We propose the following customer analytics capability dimensions based on the above mentioned systematic literature review process and its findings.

5.1 Customer Analytics Management Capability

The concept of customer analytics management capability in the data-rich environment refers to a technological unit's ability to process and manage customer-centric routine works (such as CRM, with methods that help acquisition, retention, satisfaction, and improvement of customer's lifetime value) in a structured manner, based on the firm's requirements and priorities. According to Kim et al. (2012), planning, coordination, controlling, and investment decision making for technology are the elemental building blocks of analytics management capability. Thus, firstly customer analytics management capability should start with the appropriate planning process, which helps to improve a firm's performance through big data-based models, and identifies new business opportunities (Barton & Court, 2012). Secondly, a firm's unique strategic position depends on the proper investment decision on analytics, and which helps to build up the funding model of the enterprise to balance costs of investment (Makadok, 2001; McKeen & Smith, 2015). Thirdly, the concept of coordination in the context of information technology represents a type of routine that forms the cross-functional harmonization of analytics initiatives through instruments such as task forces, direct contacts, and gatherings of interdepartmental teams (Karimi et al., 2001). Finally, managers must make sure that the analytics controlling tasks are prearranged, and information technology related procedures are executed efficiently following other tools (Kim et al., 2012).

5.2 Customer Analytics Technology/Infrastructure Capability

Resource-based theory (RBT) views that resources are rare, valuable, non-replaceable, and static. Firms with the proper technology capabilities are arguably ahead of the competitors in

terms of providing superior value to the customers (Morris 2006). Firms need to attain IT capability urgently to deal with the changing business surroundings (Johnson & Lederer 2005; Fink & Neumann 2009). A customer-centric technological ability such as Relational Database Management System (RDBMS) is capable of storing and handling structured data (e.g., customer's orders, customer's inventory management data, and financial transactions) (Storey & Song, 2017). However, eighty percent (80%) of a firm's data exists in an unstructured format (Gupta & George, 2016). To benefit from customer analytics capability, a firm has to urgently change the traditional RDMS into new-fangled technological tools such as a Java-based software Hadoop that process parallel to massive unstructured data (Bagheri & Shaltoolki, 2015). Firms require some other technological tools apart from Hadoop to process, store, visualize, and analyze the large volume of data (Kaisler et al., 2013). Moreover, to gain the competitive advantage in the data-rich environment, firms must ensure the technological advancement to connect the cross-functional data, maintain compatibility in multiple platforms and assure modularity to build the advanced model (Akter et al., 2016). The concept of customer analytics infrastructure in big data environment refers to the technological capability to connect various data points from remote places, generate well-matched (Compatible) data sharing through channels, and develop multiple models to engage in the changing environment (Cosic et al., 2012). Thus, the first infrastructure capability is to ensure the connectivity among the different customer-centric data, which consequently helps to build more critical management of customer relationship. For instance, banks often improve customer services by analyzing ATM transaction data, social media comments, and online queries in the data-rich environment (Barton & Court, 2012). The second component is compatibility that helps to synchronize overlapping data and to fix missing information for real-time decision making. For example, Amazon uses cloud technologies for rapid data analysis, collaboration, and trial suggested that connectivity and compatibility make it possible to embed information system within organizations, and such capability facilitates and develops the firm's overall technological skills. Besides, Akter et al., (2016) refer modularity as another essential component of analytics capability, allowing firms to remove or modify features as required. Similarly, Zhang et al., (2009) pointed out that the modularity facilitates IT to be reorganized and amplified when it needs changes; so the modularity progresses technology capabilities, taps business opportunities, and improves firm's performance.

5.3 Customer Analytics Personnel Expertise Capability

Personnel expertise capability refers to the ability (e.g., skills or knowledge) of analytics personnel to execute, given customer centric responsibilities in the data-rich environment. This 'know-how' knowledge counts as capabilities and generates a firm's competitive advantage (Gupta & George, 2016). Studies highlight that an analytics professional must be proficient in four discrete talent sets. Firstly, technical knowledge (e.g., proper management of databases and networking) refers to the understanding of mechanical fundamentals, including programming languages and equipped systems. Secondly, technology management knowledge (e.g., technique management, use of imagery tools, and operations) refers to the experience on specific resource management in the data-rich environment to attain a firm's desired goal. Thirdly, business knowledge (e.g., awareness of business units and goals) refers to the understanding of the business environment and a range of business tasks. Finally, relational learning (e.g., collaboration with business functions) refers to the capability of analytics personnel to interact and communicate with the group of people from various business functions (Melville et al., 2004; Ravichandran et al., 2005; Bhatt & Grover 2005; Aral & Weill, 2007; Kim et al., 2011; Akter et al., 2016).

Table 2 Dimensions of Customer Analytics (CA) Capability

Constructs	Exemplary studies	Key findings
1. CA Management Capability <ul style="list-style-type: none"> • Planning • Decision making • Coordination • Control 	LaValle, (2011); Ross et al., (2013); Kim et al., (2012); Barton & Court, (2012); McKeen & Smith, (2015)	Managers must systematically perform analytics planning process. Management must take their analytics investment decision appropriately. The capability of the coordination is required among the analysts and support staffs, and the ability of customer analytics controlling should be executed efficiently.
2. CA Technology/Infrastructure Capability <ul style="list-style-type: none"> • Connectivity • Compatibility • Modularity 	Morris, (2006); Davenport & Harris, (2007b); Fink & Neumann, (2009); Zhang et al., (2009); Barton & Court, (2012); Gupta & George, (2016); Akter et al., (2016); Storey & Song, (2017)	Customer analytics infrastructure capability is to ensure the connectivity among the different customer-centric data which consequently helps to build a more significant management of customer relationship and compatibility helps to synchronize overlapping data and to fix missing information for real-time decision making, and Modularity is also merely allowing firms for removal or modification of features to, or from, the model.
3. CA Personnel Expertise Capability <ul style="list-style-type: none"> • Technical • Technological • Business • Relational 	Aral & Weill, (2007); Kim et al., (2011); Kim et al., (2012); Gupta & George, (2016)	The ability of analytics professionals to execute customer-centric responsibilities in the data-rich environment. This 'know-how' knowledge count as capabilities and generate a firm's competitive advantage. Personnel expertise should know technical elements, including operational systems, programming languages, and database management systems.
4. CA 4P Mix-Modeling Capability <ul style="list-style-type: none"> • Incorporation • Allocation • Assessment 	Keller & Lehmann (2006); Srinivasan et al. (2010); Fischer et al. (2011); Hui et al, (2013); Hanssens et al. (2014); Andrews et al., (2015); Wedel & Kannan, (2016); Verhoef et al., (2016)	Advanced customer-centric models are required to incorporate big data such as VAR model (combining 4P and attitudinal metrics) improve sales prediction and recommendation for customer-centric marketing mix allocation.

5.4 Customer Analytics 4P Mix Modeling Capability

The effectiveness and capability of customers' value creation can be improved through the 4P mix, with models (models help to measure and improve the performance of firm's marketing mix) and algorithms (Wedel & Kannan, 2016). Appropriate modeling to analyze big data helps to identify demographic factors, competitor's offerings and overall market trends which allow firms to improve the product, favorable price, meaningful promotion, and to set up adequate distribution channels (Verhoef et al., 2016; Wedel & Kannan, 2016). However, conventionally, marketing mix models aim to set up the marketing budget, based on the sales and marketing expenditure. In fact, this process is not sufficient, and eventually, managers are more concerned about the firm's marketing actions, performance, and consumer attitude matrix (Keller & Lehmann 2006). Likewise, Srinivasan et al. (2010) developed a consumer mindset metrics, to improve marketing activities and a sales response. To predict and explain customer choices more rigorously, Godes & Mayzlin (2004) showed the measurement process of word of mouth (WOM); Chevalier and Mayzlin, (2006) discussed the idea of online reviews; and Moe (2003) suggested click streams data. In the model of 4P mix stratum, Hanssens et al. (2014) also developed the concept of consumer mindset metrics and attitudinal metrics in Vector Autoregressive (VAR) models to track down the firm's sales performance and recommendations for marketing mix allocation. Albers (2012) presented plans for developing decision aids for optimal marketing mix allocation, although, a most favorable distribution of resources requires a vigilant study of how expenses should be circulated across segments. Fischer et al. (2011) recommended a heuristic approach to decipher the marketing mix budget allocation problem for multi-segment countries firms. Hui et al., (2013) and Andrews et al. (2015) emphasized on quasi and natural experiments that enable the investigators to assess the causal effect of marketing variables which helps to attain firm's better performance. Thus, although the causality assessment in the marketing mix model has received extensive attention in academia, industry managers have not exposed their concern in the analytics capability aspect yet. Thus, the recommendation is to develop a 4P mix modeling capability to allocate marketing resources and assess the overall marketing variables effect.

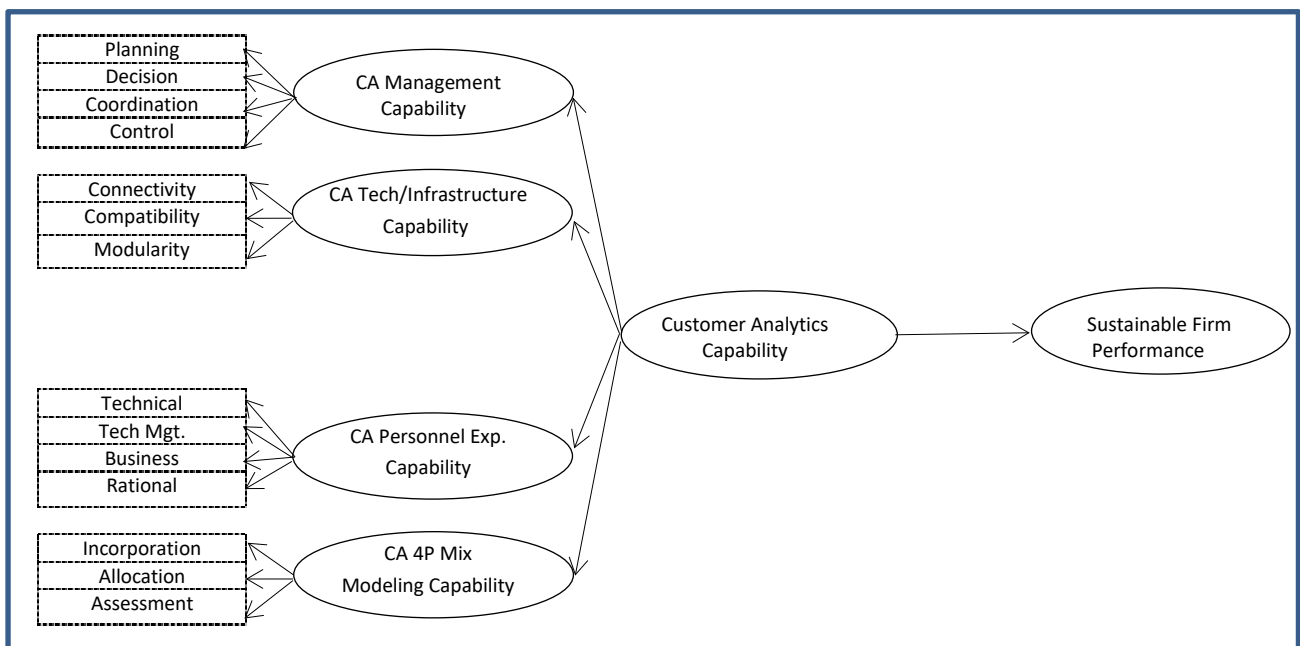


Fig.1 Customer Analytics capability dimensions & Sustainable firm performance Model.

6 Customer Analytics Capability and Sustainable Firm Performance

Previous researchers investigated the importance of analytics capability in the big data environment and performance of a firm (e.g., Akter et al., 2016). While much research has reported the benefits of customer analytics (e.g., Verhoef et al., 2010; Erevelles et al., 2015), relatively little or no attention has been committed to understanding the customer analytics capability and firm's performance. Our study presumes that if a firm satisfies the needs of the customers through the customer analytics, and consequently, if the firm achieves the customer analytics capability by fulfilling the above dimensions, that would create a long term positive effect on the firm's profitability. A company can generate more customer lifetime value, and subsequently, would likely sustain excellent performance.

7 Future Research, Challenges, and Opportunities

There are challenges for the managers of firms to personalize the product, especially for the individual customer. Managers' ability to introduce and use the advanced algorithm to process heterogeneity in the behaviors of individual consumers are essential to secure customer lifetime value (Wedel & Kannan, 2016). According to Sonnier (2014) and Buhalis and Amaranggana, (2015) managers can introduce personalization analytics in the firm level not only for developing product or services but also for setting up the price, promotion and distribution channels for the target customers. Furthermore, in the competitive market environment, customers' expectation is raising to get a seamless experience in all the channels. Thus, firms need to achieve the channel integration analytics capability where they will be able to assemble and integrate to deploy data technology resources in the offline and online channels to meet the customers' expectations. Channel integration can be formed appropriately through inside-out capabilities (analytical and technical skills), outside-in capabilities (market responsiveness) and spanning capabilities (change management after combining inside-out and outside-in capabilities) (Hosseini et al., 2017). Furthermore, privacy and security is also a challenge for the firm. Customers expect secure transaction and want to get an assurance from the firm level regarding the highest level of privacy (Miller & Tucker 2011). Thus, firms need to address this issue seriously and must have achieved the capability of data protection in term of privacy and security issue.

With the ongoing development of analytics for big data, many firms can detect the entire path of customers purchase across channels and multiple devices to improve explanations and predictions on the customer's future purchase pattern. These provide further opportunities to consider the specific content that should be personalized and also helps to make the tailored contents for individual customers using individual-level insights.

8 Conclusion and Implications

This chapter has reviewed the concept of customer analytics and more importantly, has addressed the customer analytics capability dimensions in the key domains of management capability, technology/infrastructure capability, personnel expertise capability, and 4p mix modeling capability. Table 2 summarizes the aspects of customer analytics capability, and that would be expected to work at the interface of econometrics, statistics, and marketing to attain sustainable business growth. Analysts must have in-depth knowledge on customer-centric activities, programming and in contemporary marketing. The analyst of the firm must work as intermediaries between the marketing manager and decision makers. Internal marketing would be necessary to build up the capacity of customer analytics. Through the process, firms can

generate value for the ultimate customer, and in return, can capture the value again from the customer, and that will lead to achieving the sustainable highest level of performance.

Managers and analysts need proper training and also required to play a vital role within the organization to carry out customer analytics tools. Firms need to invest in developing skillful, talented employees, and analytics models to gain a sustainable competitive advantage. Therefore, practitioners can benefit from specialized training and can use their skills within the organization to achieve sustainable business growth.

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