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# Generating Marketing Outcomes through Internet of Things (IoT) Technologies

Beenish Tariq <sup>1</sup>, Sadaf Taimoor <sup>2</sup>, Hammad Najam <sup>3</sup>, Rob Law <sup>4</sup> , Waseem Hassan <sup>1</sup>  
and Heesup Han <sup>5,\*</sup> 

<sup>1</sup> NUST Business School, National University of Sciences and Technology, Islamabad 44000, Pakistan; binish\_sh@live.com (B.T.); waseem.hassan@nbs.nust.edu.pk (W.H.)

<sup>2</sup> Institute of Business Administration (IBA), Karachi 75270, Pakistan; staimoor@iba.edu.pk

<sup>3</sup> Independent Researcher, Islamabad 44000, Pakistan; hamad.najam@gmail.com

<sup>4</sup> School of Hotel and Tourism Management, The Hong Kong Polytechnic University, TSE East, Kowloon, Hong Kong, China; rob.law@polyu.edu.hk

<sup>5</sup> College of Hospitality and Tourism Management, Sejong University, 98 Gunja-Dong, Gwanjin-Gu, Seoul 143-747, Korea

\* Correspondence: heesup@sejong.ac.kr

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**Abstract:** This paper highlights the effectiveness of data stored from the operational use of Internet of Things (IoT) technologies for generating marketing-related outcomes, such as business intelligence for product development, product support, and customer relationship management (CRM), by exploring this research domain under the lens of the well-established means–ends theory. This study conducted a multidisciplinary literature review to develop the conceptual framework. Moreover, a smart refrigerator was chosen as an example to demonstrate how the analysis of data stored from the operational use of IoT devices can help generate marketing outcomes such as new product development, customer support, and CRM. The study articulates that IoT technology helps in furthering the objectives of CRM along with other strategies of business growth and success. Using a practical example backed by a sound theoretical framework, this study will not only help practitioners to empirically test this significant yet under-explored topic but will also help elucidate that, by embedding IoT devices in their products, business managers can ensure business longevity. Furthermore, it explains how the IoT can provide support to improve communication ties between the product manufacturer and consumer through product support and CRM strategies.

**Keywords:** Internet of Things (IoT); new product development; product support; relationship management

## 1. Introduction

The Internet of Things (IoT) is an intelligent innovation that has linked and enabled the smart interaction of discrete constructs to open a plethora of services to entities near and far. The pivotal role of Information Communication Technology (ICT) in developing IoT products enables users to not only control and supervise their activities but even opens up a new avenue of value co-creation [1,2] by promising easy access to customer data, which promotes the establishment of personalized customer contact [3]. Ashton [4] highlighted the idea of the Internet of Things (IoT) by embedding radio frequency identification tags into products. The radio frequency identification tags used active or passive sources of energy, were supported by batteries or surrounding radio waves, and provided information regarding the location and environment [5]. Based on this idea, it can be concluded that the IoT has the potential to develop better marketing outcomes through new product development, product support, and customer relationship management. According to [6], the IoT has the power to

improve the depth of market research. They further elaborated that the data taken from Internet-based devices or products can be used to identify the usage patterns and the geolocations of the users. The data taken from these devices or products can then be studied along with socioeconomic factors to investigate the needs of consumers [7]. Apart from the utility of this data for generating marketing outcomes, there is a need to understand the confidentiality concerns associated with such data [8]. For this purpose, there are certain legislations around the globe to protect consumer data, for example, the Data Protection regulation [9] in the UK, the European Union General Data Protection Regulations [10] in Europe, and the Consumer Protection Act 2005 in Pakistan [11].

The extensive data available through Internet-based devices or products can provide more comprehensive information, other than where and when the device is being used [12]. For instance, incorporating low-cost motion, temperature, or other types of sensors in the products or devices can help shed light on how the device is being used by the consumer. Besides, cognitive computing carried out by sensors will enable marketers to infer consumer preferences [13], for example, which settings or modes are preferred or repeatedly used by consumers while using internet-based devices or products. This information will help manufacturers to understand the preferences of consumers for a product, and hence it can be used to improve the product by developing in-depth business intelligence. Furthermore, geolocation data coupled with socioeconomic or psychographic data will enhance the new product development process [14–16], product support [17], and customer relationship management [18].

There are several applications available in smartphones that are internet-based and provide data on customer preferences, for example, the Nest learning thermostat and Hive from British gas applications, which help manage the heating and lighting systems of a house. Similarly, the June intelligent oven has a food ID software that can detect what you are feeding to the software and recommend a cooking program. Likewise, with the WIFI-enabled smarter coffee machine, you can wake up, tap a button on your smartphone, and get a notification when your coffee is ready. You can even schedule it remotely, so there is a piping hot cup of coffee waiting for you when you get up [19]. Similarly, in Pakistan, a new application is about to be launched, named “Car Chabi”, which will enable users to monitor their car, turn it on and off, and lock and unlock it by using their smartphones [20].

Such smartphone applications not only provide convenience to the customers, but they also provide an opportunity to further build and improve relationships with the customers [21–23]. In addition, these Internet-enabled devices or products have opened a new arena for manufacturers as they are now able to better provide product support and services (e.g., guiding the customers on how to optimally utilize a product with the minimum use of energy) [24]. Similarly, customers’ recorded patterns/preferences while using the product can also play a vital role in the new product development process to launch new models of the product. Authors like [25] and [26] supported the importance of business intelligence for the new product development process. Hence, the IoT can provide actual real-time in-depth data about how, where, and when the product is being used by the customers. Reference [27] described that Internet-based products can provide business intelligence on a customer level to allow companies to find new ways for developing better products and increasing customer value.

Although the data gathered through the IoT provides key insights to manufacturers about new product development, product support, and customer relationship management (CRM), little is known about this phenomenon [28]. Existing literature reveals that IoT devices provide an opportunity for organizations to better integrate their operations and supply chain systems to generate industrial benefits [29]. Similarly, other studies focused on the adoption of IoT technology by end users [1,30,31]. Subsequently, Kumar and Dixit [32] presented conceptual frameworks to understand the role of the IoT for generating superior firm performance. In the meantime, some studies have highlighted the effectiveness of developing better relationship marketing strategies [33]. In the same vein, studies by [34] focused on privacy concerns of consumers for IoT devices, Balaji and Roy [1] focused on value co-creation strategies via IoT technologies, and [35] focused on the relationship journey

between customers and IoT objects. However, these studies do not specify any conceptual framework particularly designed for the manufacturing sector and helping the sector develop a broad overview that relates marketing outcomes for these organizations to IoT devices. Hence, using the means–end approach, this paper aims to fill this void in the literature. This study aims to explore the IoT’s implications on product development, product support, and customer relationship management in the light of Research Questions (RQs) 1–5 (Section 3: Conceptual Model and Methodology). This study will help marketers draw behavioral inferences through customer data provided by the IoT, thereby helping create coherent marketing strategies.

## 2. Literature Review

### 2.1. Internet of Things (IoT)

The IoT is a new concept coined by Kevin Ashton in 1999, who along with his team, explained this phenomenon by linking objects using the Internet via Radio Frequency Identification (RFID) tags [4]. The IoT includes sensors or tags that can be connected through the Internet [36]. The IoT will create a lot of business opportunities for manufacturers and service providers around the globe. This is because Internet connectivity provides Internet intelligence to physical products and converts them into smart products (e.g., smart cities and smart homes) [28,37]. The IoT provides abundant opportunities to be exploited by companies and societies as a whole [33,38–40]. These include applications for cars with built-in WIFI-controlled sensors, chips attached to farm animals, heart monitoring devices, temperature or light controlling systems, washing machines, refrigerators, coffee machines, and so forth [27,41]. Most of these IoT devices are new and will expand into nearly all walks of life [42]. According to [43], the number of IoT devices is going to increase to twenty billion devices by 2020. Though the IoT is going to create tremendous opportunities for the manufacturers of Internet-based smart products, there exists only a handful of studies on the effectiveness of the IoT for generating marketing outcomes [28,44].

According to [45], with the advancement of technology, physical household products are becoming a source of big data and information. This intensive information about household products can provide an opportunity for manufacturers to discover new possibilities to improve the existing products or design new products [27]. Similarly, this huge data will provide an opportunity for organizations to introduce new customer-oriented services. In addition to the immense benefits of these Internet-based sensors or tags, they also have a low cost and low energy utility, which encourages manufacturers to embed them in products to utilize their benefits [46,47].

### 2.2. IoT and Marketing Outcomes

#### 2.2.1. IoT and New Product Development

The process of new product development plays a vital role in developing a sustainable competitive advantage for companies by using innovativeness [48]. The new product development process of any company starts with idea generation and ends at the product launch. This new product could be a physical product, a digital product, or a service. New product development itself can be defined differently. According to [49], there are six types of products that can be interpreted as new:

1. New-to-the-world products
2. New-to-the-firm products or new product lines
3. Additions to existing product lines
4. Improvements and revisions to existing products
5. Repositioning of an existing product (line)
6. Cost reductions through design or process innovation

This list includes both radical innovations and incremental innovations. Despite the effort incurred on new product development in the form of radical or incremental innovation, the success of new

products largely depends on the value that the new product is going to generate for its customers [50]. He further explains that the failure of new-to-the-world products is largely due to the uncertainty of the product development process. However, if successful, this product category can generate higher profits than any other category listed above.

The new product or service is likely to be more successful if customer requirements or customer needs are well incorporated. However, the said needs and requirements are not always known to the firms, and sometimes, even the customers themselves are not explicitly aware of them [51]. In addition, even if the firms are aware of the list of factors important to the customers, they are not aware of the top priority factors that create maximum value for the customers while using a product or service. This results in the development of a product that either partially fulfills the consumers' needs or does not fulfill their needs at all. In addition, sometimes firms overestimate the importance/utility of certain product features and thus are unable to generate the sale of the newly introduced (improved product) at a higher price.

Consumer data is one of the most important and useful sources of generating ideas for new product development [52]. In today's era of technological advancements and highly competitive markets, maintaining one's competitive advantage through new product development is becoming increasingly important for the survival and profitability of firms, especially in the long term [53]. According to [54], with the passage of time and technological advancement, firms are increasingly inclined toward customer inputs for innovations in products. In addition, [55] have also highlighted the importance of the Internet in the new product development process. The entire procedure of new product development could be improved using the intervention design, which allows the customers to provide input for new product development. This, in turn, can increase customer satisfaction [56].

However, the adoption of these IoT products creates certain concerns for customers as well. These include perceived usefulness, ease of use, and customer trust [57]. Similarly, the consumer's unwillingness to share personal data while using these IoT devices can hamper the adoption of these smart devices [58]. To reduce these kinds of risks, countries like the United States and Europe have introduced some regulations, for example, the General Data Regulation Protection. In summary, a lot more effort is required on the end of organizations to increase the adoption of IoT devices by assuring higher perceived benefits and lower perceived risks for customers.

### 2.2.2. IoT and Product Support

The extensive data available through IoT products can potentially provide the opportunity for companies to develop marketing strategies and communication campaigns [59]. Similarly, this customer-driven data allows companies to perform participative marketing along with designing marketing campaign strategies [60].

Furthermore, the utility patterns of a customer can also allow manufacturers to provide customer support for the right handling of the product and avoid underperformance of the products. In addition, according to [61], Internet-based products can also provide alerts about product changes, including the availability of new models, new features, software updates, and so forth.

However, there are some concerns regarding the privacy of customers about where and how the products are being used by consumers [59]. Hence, there is also an increasing need to develop proper regulations to protect the privacy of the consumers at the same time [9,10].

### 2.2.3. IoT and Customer Relationship Management

In addition to providing insights about new product development and product support, Internet-based products open up a new avenue for companies to direct their customer relationship management (CRM) efforts to particular customers and provide them with individualized experiences by catering to their particular needs [27]. Fast-paced advances in information technology render traditional approaches of CRM redundant and have bestowed on the discipline an integrated, web-enabled approach that links technology deployment to business initiatives [62]. This tightly

knit network approach allows for value co-creation, as it promotes open communication channels leading to collaboration and cooperation. This not only helps to build stronger and long-lasting relationships with customers [63,64] but also significantly reduces the cost of doing business [65]. The use of IoT products allows companies to develop closer relationships, and strengthen them over time, with end users by directly connecting to them and eliminating other channel partners (e.g., distributors or retailers) [66]. For example, general electric aviation (GEA) directly connects to its customers by eliminating other channel partners. The information available through sensors installed in the engines of airlines allows GEA to monitor the reasons for the underperformance of their engines, if any. Thus, both the customer and the company can revise the process of product consumption or product development by bringing improvements to them. This whole process develops a strong relationship between the company and the customers using IoT products [27]. Moreover, IoT products provide a chance to the marketers to dissect customer data on the segment level and develop products based on the needs of each separate segment. Technological advancement in the form of the IoT opens up a whole new horizon for customers' direct and indirect interactions with a company at different points in their decision-making journeys [63]. Many researchers have contemplated the explosion of consumer data that has emanated using CRM initiatives. However, there is a dearth of research that explores how IoT products will not only help marketers capture data but even make meaningful inferences from it, which will bestow companies with sustainable competitive advantages in terms of customer satisfaction. By allowing the firms to monitor consumers' usage data as well as increasing the economic switching cost [66] of moving to the new sellers, the IoT is claimed to play a pivotal role in creating a conducive environment for business innovation, adaptation, and success [28]. This claim is supported by the case study-based research conducted by [33], which uses examples of two organizations working in contrasting disciplines to show how CRM backed by IoT-based products can help organizations achieve and sustain competitive advantages. However, to date, there is limited research being conducted on this topic, which calls for further examination of the phenomenon [3].

### *2.3. Analysis of Customer-Driven Data*

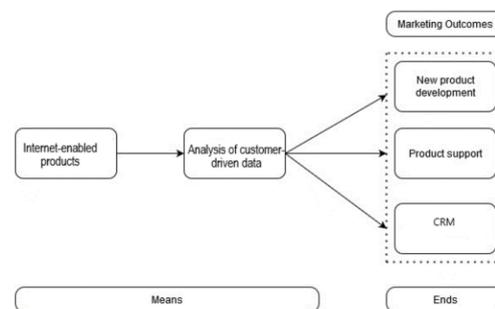
The data available with the help of the IoT is huge in volume, which calls for a need to determine which data out of this massive volume is most relevant and useful to draw inferences from for marketing outcomes, including new product development, product support, and CRM [44]. The data available through these IoT products can range from the customer profile (including customer demographics and geographics), customer preferences, utility pattern, time of usage of the product, and the frequency of use (heavy or light users). Hence, the data could be structured or unstructured in nature and, due to the huge volume, it would be hard to make sense of. In addition, the data is real-time and has uncertainty in terms of showing historical patterns as well, so it is unsuitable for analysis until it is stored and analyzed after a certain amount of time. However, if this data is stored and managed properly, it can potentially replace customer market research surveys in a cost-effective manner. Once the companies understand the importance of this customer-driven data available through IoT devices, they can analyze this data to generate marketing outcomes.

As already mentioned, data is huge in volume. It is a mixture of both structured and unstructured data and real-time in nature. There is a great need to develop systems and processes to define the purpose of analysis and analysis techniques because, without the development of the analysis process and systems, companies cannot generate marketing outcomes. This argument is supported by [67], who stressed the need for developing processes and systems for analysis of customer-driven data available through IoT products. The authors further claim that the underlying analysis techniques and processes are still underdeveloped to utilize this customer-driven data available through IoT products. Similarly, [3] stressed the importance of analysis of customer-driven data available through IoT products. They further explain that this customer-driven data will help companies design new business models to cater to the growing needs of customers. In addition, the storage of data is useless if the business objectives of the gathered data and means of analysis are absent [68]. Hence,

the object of generating marketing outcomes cannot be achieved if systems and processes of analysis are not well-defined.

### 3. Conceptual Model and Methodology

Conceptual models are necessary to integrate and illustrate the extant literature and to synthesize existing knowledge [69]. Conceptual models provide an opportunity to capture the generic knowledge from different disciplines that can provide support in different circumstances. Hence, the conceptual model presented in Figure 1 was developed by using the multidisciplinary literature review method, whereby the authors reviewed several generic constructs and sub-components before finalizing the key components of this model. The model was developed by a systematic grouping of ideas from different disciplines with similar themes [70]. Hence, the proposed conceptual model can be useful for companies to generate marketing outcomes by analyzing IoT products' customer-driven data. The treatment of CRM as an end rather than a means-based construct is backed up by prior literature carried out in information technology (IT) based contexts [71,72].



**Figure 1.** Conceptual Model. CRM: Customer Relationship Management.

There are multifarious household Internet-based products available on the market that offer a wide range of functions, including those of smart washing machines, TVs, kitchen robots, ovens, coffee makers, and refrigerators, and so forth [73].

However, to demonstrate the conceptual model, the example of an Internet-based smart refrigerator has been used as a generic product without specifying any manufacturer. The following research questions are addressed to support the proposed concept of generating marketing outcomes through IoT products:

- RQ1: How important and challenging is the analysis of big data obtained through the Internet of things (IoT) to generate marketing outcomes?
- RQ2: How is the customer-driven data from the IoT going to support the new product development process?
- RQ3: How can we improve new models by monitoring the usage patterns, preferences of customers, commonly used features, and omitting the unnecessary features to make the products simpler and more effective for the customers?
- RQ4: How will customer-driven data from the IoT bolster the product support process (in terms of providing customized support or product guidance to the customers and improving the product performance by right handling)?
- RQ5: How will customer-driven data from the IoT support the customer relationship management process (in terms of sending new product alerts/notifications, updating software for a better performance of products, and advising the customers about the product according to their individualized needs)?

## 4. Results and Discussion

As already mentioned, this study selected the Internet-enabled smart refrigerator to demonstrate the concept of generating marketing outcomes through the IoT. Hence, this example will be used throughout the discussion section.

### 4.1. Analysis of Customer-Driven Data

The first aspect of the concept of generating marketing outcomes through the IoT is the analysis of customer-driven data available through the operational use of IoT products. So, in the first place, organizations are required to develop systems and processes for analyzing huge, structured, and unstructured data available through the operational use of these products. The most important factor that helps to define the systems and processes is the business objective for the analysis of customer-driven data, which is generating marketing outcomes in our case. Once the objective is clearly defined, the tools of analysis can be selected accordingly.

For instance, if the company wants to analyze the usage pattern, preferences (which settings or modes are used by different consumers), or usage frequency of different segments that use a particular IoT product, different statistical analysis tools can be used. These tools include analysis of variance (ANOVA) [74] or frequency analysis via chi-square analysis [75], which can be used for monitoring the differences in usage among varied groups (segments) of customers.

Similarly, predictive analysis (linear or multiple regression analysis) techniques can enable the companies to predict changes in customer actions or the likelihood of exhibiting behaviors by the customers [76]. Apart from this linear modeling, other techniques include non-linear modeling analysis, for example, artificial neural networks that can help study more complex consumer behaviors [77]. Apart from understanding the need to develop the system or process of analysis of customer-driven data, there is also a need to determine the frequency of analysis of the available data, that is, should it be more frequent (daily, weekly, or monthly) or should the analysis be done after a quarter or once a year? The frequency of analysis can be defined based on the business objectives and the nature of the product.

### 4.2. IoT and Marketing Outcomes

#### 4.2.1. IoT and New Product Development

The example of a smart refrigerator is used to demonstrate the concept that the IoT can help design new products, improve existing products, introduce new models with improved and better features, and omit unnecessary features to simplify the products and make them user-friendly. Hence, a smart refrigerator company can monitor the actual usage patterns of the actual consumers by studying the whole population of that smart refrigerator rather than studying a sample via market research, for example, "How do customers customize the temperature for each compartment available in the refrigerator?"; "What is customized as the biggest compartment (in terms of size)?"; "What is the temperature selected?"; "Do customers use the hot water dispenser of the smart refrigerator, as well as the cold one?"; "Does the entire family interact with the refrigerator by registering them with the refrigerator?"; "Is the grocery feature being used by the customers frequently?"; and, finally, "What are the most and least frequently used features?". Based on this data, the company can introduce a refrigerator addressing the need of customers for big compartments for a particular purpose (fridge or deep freezer). If all the family members register with the refrigerator, it allows the manufacturer to consider the whole family when it embarks on a new product development process based on family members' profiles. Similarly, if the hot water dispenser is rarely used by the users, this feature can be omitted in the future to make the smart refrigerator more cost-friendly and energy-efficient. In addition, what other features need to be added to the grocery replenishment system (e.g., alerts on smartphones about the availability of a particular grocery item at a nearby store, discount alerts at different stores about the grocery items about to expire in the refrigerator, etc.)? Apart from this, geographic data

can be coupled with socioeconomic data to highlight the sub-segments and their specific needs to introduce a wide range of models of the same refrigerator having a variety of features, as per the needs of those sub-segments.

#### 4.2.2. IoT and Product Support

Customer-driven data from the operational use of the IoT can also provide product support to the users of smart products. For example, the company can provide solicited or unsolicited advice or guidance to customers on how to best utilize the refrigerator, keeping energy efficiency in consideration. In addition, with detailed information available through the Internet about the things stored in the refrigerator, the company can provide support to the customers about the temperature at which stored products in the refrigerator can remain fresh for the longest duration of time. In addition, if the items stored in the refrigerator are greater than its capacity, which can affect the performance of the refrigerator, the company can guide and notify the customer about it. Apart from this, for any kind of guidance about the installation or functionality of any feature, customers can seek support from the company. This solicited or unsolicited product support will lead to better customer experience and customer satisfaction.

#### 4.2.3. IoT and Customer Relationship Management

The installation of a smartphone application in order to use a smart refrigerator will not only help the organization eliminate engagement with customers through discrete touchpoints, but rather augment their experiences by subtle engagements being carried out as part of everyday social practice. This indicates that the smart refrigerator will be receiving incessant data regarding customer usage of the product and impact them over the entire length of their purchase and post-purchase behavior. This tracking of consumer usage across time will help the organization provide services like remote repairs and customization of the product, thereby contributing to the sustenance of CRM strategies.

IoT-based products might also help the manufacturer mold consumer product usage behaviors by linking benefits to actual product usage. For instance, through the mobile application, the manufacturer can track if the user is regularly maintaining the product as advised in the product manual. This positive behavior can be reinforced by linking it to some non-monetary rewards that will not only result in a happy customer but even strengthen ties between the enterprise and the customer.

Lastly, embedding IoT technology in its products will enable organizations to reduce consumer bargaining power by increasing economic switching costs. Customer data saved on the IoT device of the refrigerator would be lost if the consumer chooses to shift to a competitor, thus making the customer prefer the manufacturer's product over another's. Longer and more involvement with the product will ensure that customer stays on board, fearing the loss of user-centric longitudinal data. These are some of the ways in which the IoT will contribute toward devising a CRM strategy for the manufacturer.

## 5. Conclusions

### 5.1. Theoretical Implications

Using the means–end approach coupled with the example of an Internet-based smart refrigerator, this study demonstrates the concept of generating marketing outcomes through IoT devices. The presented conceptual model supports the literature that has established the importance of analysis of customer-driven data available through the operational use of IoT products. It also supports the concept of generating marketing outcomes (e.g., new product development, product support, and improved CRM through the operational use of the IoT). This study will help to develop a theoretical ground for future theoretical and empirical research. Future research can benefit from an empirical analysis of the proposed model for a wide range of household IoT devices.

## 5.2. Practical Implications

The study will help manufacturers understand the intricate link between IoT-based devices and an organization's success. Application of the means–end approach will help them extrapolate the benefits emanating from the use of IoT technology to a wide range of products, thus not only creating sustainable business strategies but also ensuring the advancement of commercial goals in an era of cutthroat competition. Furthermore, this study has conceptually demonstrated that IoT devices can provide marketing support to organizations if they have established data analysis and mining systems.

## 5.3. Limitations

This study has some limitations, which include the analysis of data based on the description of a household IoT-based refrigerator. Furthermore, this study focused only on household items and only discussed the following marketing outcomes: new product development, customer support, and CRM. Future research can benefit from an empirical analysis of the proposed model for a wide range of IoT devices and new marketing phenomenon, for example, customer willingness to share their personal data to use IoT devices.

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