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Research Paper

Internet of Things based Customer Relationship Management – A Research Perspective

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Abstract

Objectives: To study the impact of Internet of things (IoT) on the Customer Relationship Management process and evaluate the benefits in terms of customer satisfaction and customer retention. Methods: An extensive literature review was conducting wherein the constructs of CRM and IoT are studied. Various preliminary information on IoT and CRM system along with the components of Digital enablers have been evaluated. References from research papers, journals, Internet sites, statistical data sites and books were used to collate the relevant content on the subject. The study of all the relevant scenarios where there is a possible impact of IoT origin real time data on CRM was undertaken. Findings: Customer demands are continuously evolving and it is very relevant for all the organizations to align and keep pace with the change. Organizations need to be customer centric and agile to the changing market scenarios. Evaluation of the trends in mobile internet vs desktop internet was also conducted to validate the findings. Application: The usage of real time data emerging out of the IoT landscape has become a reality with the data transmitted over the Internet and consumed by the CRM system. It improves the control on the customer relationship function helping the organizations to operate within healthy and sustained profit

Keywords: *Agile CRM ; Customer Relationship Management; CRM, Internet of Things; IoT;*

1. Introduction

1.1 Customer:

Customer is a person or an organization who intends to or is involved into a purchase transaction of a product or service with an organization. Seldom there is confusion in the terms customer and consumer. We observed that customer is the person who is involved in a purchase transaction; consumer is the person who actually uses the product or services. A customer can become a consumer as well [1].

1.2 Customer Relationship Management (CRM):

Businesses have different strategies to run their business wherein customer relationship management makes its place to one of the most important strategy. CRM integrates sales, marketing and customer service dynamically to generate value for the company as well as for its customers creating a win- win [2]. CRM presents a path-breaking framework that is strategic in nature for creation of a successful CRM policy [3]. CRM generates business value when implemented to its full potential and helps getting in the outside in view from the market. Profoundly CRM is not an IT initiative but a business policy/strategy to derive business value that is enabled by IT to produce business value and compulsorily have a Top – Down management agenda [4].

1.3 Internet and internet of things (IoT):

Industrial revolution gave rise to the need of data/information transfer between different locations over the web. Information technology made it possible through the innovations in the network domain and Internet stood out clearly as the fastest and most trustworthy mode of data/information communication [5]. Since inception, internet has turned omnipresent and has influenced all aspects of business and technology creating an unquestionable space in our lives [6]. The journey of internet from a micro network to a macro network has been a rampant forming a global network [7]. The term "Internet of Things", was coined by Kevin Ashton, in the year 1999, to elaborate on the network connecting objects (sensors) in the physical world to the Internet. Globally billions of things are connected in an incessant way over the internet and transfer data/information in the IoT landscape[8].

2. Literature Review

2.1 Paradigm shift – Traditional marketing to Relationship marketing:

Transactional marketing is all about a one-time sale transaction done with the customer to boost the sale volume which could be to achieve a short term target taken by an organization [9]. The approach apart from having the disadvantages such as no connects or long-term relationship with the customers has some inherent benefits. Inventory carrying cost is very high especially for a finished good warehouse. With a targeted transaction of sale, the organization can get rid of costly inventory and immediate release of cash flow into the business. It is generally accomplished with the help

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of tools such as discounting etc. to get rid of non-moving and slow moving inventory [10]. Instead of focusing on long-term value creations this type if marketing ideally works on discounting and is executed at a relatively low cost. It is also characterized with a very low emotional quotient with the customer who profoundly is a price oriented and not loyal to the brand [10]. The result of such a sale transaction is obviously a low margin affair and a volume game to achieve the targets. The direction of communication with the customer is necessarily unilateral [11]

2.2 Relationship Marketing:

In contrast to the above relationship - marketing is a long-term goal oriented and focused on customer requirements. Paramount importance is given to the customer in this case to secure the future sales for the organization. It involves building strategies targeted at profitable exchanges via understanding customer demands/choices. Customer satisfaction and retention are facilitated by relationship marketing. Win-win is created with value exchanges where the efforts are made to drive long-term promises [11]. Repeated contacts between the customers and the service/product providers facilitates relationship marketing. In case of service domain in the absence of a physical product, it becomes all the more important [12]. Long-term association of the customer makes him known to the organization. Marketing literature spoke about the relationship marketing in the year 1980. Since the importance was well understood, it cascaded like wild fire among the firms and industries that were already facing fierce competition [13]. Fulfillment of promises is the base for the relationship to exist and strengthen. Since the customer is not in a position to evaluate the firm until he experiences the services, quality of service offered to the existing customers sets the grounds [12]. Therefore, literature states that marketing strategy should include customer service decisions.

2.3 Customer Relationship Management (CRM):

Customer relationship management encompasses the knowledge about the customer to manage and serve the customer better. It's a customer centric approach, which is adopted by the organizations [14]. Since inception CRM is an integral part of business and still going strong [3]. The source to get market point of view is CRM. Misunderstanding CRM as software would be a blunder; on the contrary, it is a business process or a business strategy that information technology drives to derive business value. Therefore, it is quoted that CRM should be in the Top Management agenda and cannot be an island in the organization [3]. The three basic pillars i.e. relationship marketing, information technology and changing customer behavior are responsible for a customer driven business. Enablement of customized solution creation for the customers then becomes the single point agenda of the organizations than focusing on internal efficiencies. The flexibility of looking at individual customer needs is achieved with the help of CRM implementation [15]. The data captured from the system coupled with knowledge turns into information that is used for strategic decision making to decide on the customer interactions during sales and service. In order to acquire new customers, develop engagement strategies and retain customers, one of the most vital elements is customer service under the overarching umbrella of customer relationship management. Customer experience is of utmost importance when the organizations are battling the most important pie in the market that is driven by quality of service offered to the customers [15]. Customer delight is the next avenue for the organizations constantly achieving higher levels of customer satisfaction, while customer ecstasy proves to be the pinnacle which results in highest level of quality of service to the customer. Organizations today get a competitive advantage by offering a consistent customer experience at all touch points, regardless of channel [15].

In the scenario, just explained role of data is quite impressing on the success of the CRM implementation. Creation, collation, collaboration and transfer of data are the different steps in the data journey that are enabled by the internet that is a product of the advancements happening in the Information Technology domain. Internet facilitates the transfer of data between the different entities, which are miles apart from each other, and proves to be the fastest medium available today to do so [16]. Real time information possessed by the organization about the customer becomes one of the significant driving principles based on which digital businesses can focus on customer first philosophy. The data is gathered from automatic sensors fixed at appropriate data gathering spots and stored in a data warehouse to perform business analytics [17]. Some fundamental benefits were identified as the core value drivers for CRM. They include the following [18]:

1. Functionality and visibility to enable the sales force to target the profitable customers
2. Complete information about the customer enables cross selling across the channels through the various integrations
3. Increased Sales force efficiency due to the availability of data at their fingertips
4. High degree of personalization in the customer messaging
5. Product and services can be customized to meet the customer requirements as it is highly customer centric
6. Increased service efficiency and effectiveness
7. Dynamic pricing options

Automation, change management, enhancements with some integration was the focus of CRM since last two decades. However, there is a paradigm shift observed where CRM strategies today drive the real-time integrations of the value chain comprising of the customer, organization and extended organization [18]. Real time information supported business processes and technology platforms across multiple value chains in the extended organizations becomes the area of dominance for the markets to respond. The framework of CRM value chain integration and optimizing to facilitate the value creation for both customer and the organization then becomes the enterprise model [19]. Customer experience takes the front seat for driving the organizations goals. Whenever the customer interacts with the organization in any form, the response received by them contributes to the customer experience. Sale of product gives the customer a direct response most of the times except an online purchase while sale of service is the indirect contact with the organization. Indirect contacts even encompass some spot unplanned encounters with the representatives of the organization [20].

2.4 Types of CRM:

There are four distinctly identified types of CRM namely; Strategic CRM, Operational CRM, Analytical CRM and Collaborative CRM [4]. Delivering better value to the customers than the competitors and acquiring them with the customer centric focus remains the core of Strategic CRM. Leadership behavior and traits drive with a top down approach wherein formal systems are created within the organization to drive the resources to create customer values, reward systems etc. Selling and marketing of products and services are encapsulated in the Operational CRM where the focus is on automating the customer facing processes [4]. The operational CRM generates enormous data. This data also is augmented with the market intelligence data coming through different channels. This data is gathered into a single database from where it is retrieved to derive meaningful business analytics. The business intelligence layer stationed above it helps the managers in taking the right decisions. The dashboards are drawn to enable the facilitation of maximum customer value. In short the knowledge to take wisdom driven decision is aided by the Analytical CRM [4]. This is the precise reason for the popularity of the Analytical CRM which has now become an essential component of every CRM implementation [4]. Analytical CRM safeguards the values

that are driven by the operational CRM making it more effective and efficient. The Collaborative CRM is fundamentally an alliance of strategic and tactical business objectives that is mostly between different organizations for identification, fascination, development and retention of customers [21].

2.5 CRM - Creation of Win-win:

It is becoming clearer that the role of sales person is changing. Traditionally he was the spokesperson and the brand ambassador for the brand, which in today's scenario seems to be misplaced. Customer is coming with a definite mindset with a lot of research going behind the thought process of selecting a particular product or service. Sales workforce who earlier used to be the face of the product and collect orders for the product has been replaced now with technology [22]. CRM is continuously evolving in managing the relationship with the customers whom a product or a service is sold. There have been various trends and milestones in this evolution journey of CRM giving rise to the different types of CRM. The job of operational CRM is to enable the transactions with the customer, but at the same time, it generates a lot of analytical data. This data is processed using advanced analytical techniques to recover many trends and aid the predictive models [4]. Another dimension to the above is the Social CRM that gives the power in the hands of the customer. They can voice out opinions, give feedback and share their ideas about products/services [23]. This proves to be another source of data that the organization needs to take into cognizance. By implementing CRM, organizations achieve a win-win state because of the benefits that are equal for both customer and organization. On one side while the customer gets the advantage of the a high quality of service increasing the customer satisfaction to a delight level, Organization realize higher customer retention, winning back previous customers and increased revenues not just by the sale of products but also by cross sell and up sell. The internal communication within the organization is improved as the focus is now changed to align to the customer expectations optimizing the marketing costs [23].

2.6 Quality of Service:

Capterra conducted a survey in which it was revealed that sales team uses customer relationship management as voted by 80% of the respondents while 45% voted for customer service [24]. Similarly, when the impact of CRM was questioned, customer retention and customer satisfaction scored the highest. Both these aspects are governed by the quality of service that is received by the customer from an organization, which also determines the customer experience.

Transactional marketing to relationship marketing shift that we have described earlier, hinges around customer satisfaction [25] [26]. Relationship Marketing encapsulates the establishing, developing and maintaining successful relational exchanges because of all the marketing activities [27]. The vital key to customer retention is to achieve and sustain customer satisfaction [28]. Customer satisfaction also covers the trust aspect in the minds of the customer when they are assured of better service from an organization. Most of the times it also determines the future sale for the organization sustaining the growth and maintaining the customers profitable. Quality of service bears a direct relationship with customer retention and customer loyalty towards the brand [29]. American Management Association (AMA) has stated that around 65% of repeat purchases are enabled by a good customer service [30].

2.7 Internet of things:

There has been a tremendous revolution in the information technology domain over the years and network domain is not deprived of the same. Today one of the most prominent channels emerging for collating and transmitting data over the web is Internet. It has sprung up as the most reliable and quickest means for sharing information[5]. Ubiquitous presence and impact on all business and technology aspects makes Internet command an undisputable place in our lives [6]. The global network as soon matured from a micro network to a macro network with the spread of internet increasing exponentially. The term coined for the network connecting objects i.e. sensors, in the physical world to the virtual world was "Internet of Things". An innovator and consumer sensor expert by the name Kevin Ashton in 1999 went ahead to declare the term which is used now quite frequently in the Industry 4.0 scenario. Billions of things get connected in the IoT landscape and information is transferred in an uninterrupted way over the internet [8]. Databases store this enormous data which is transmitted over the internet. Different business models are then built which retrieve this data in a consumable form to solve different business issues [7]. [31]define IoT as "a network of dedicated physical objects (things) that contain embedded technology to sense or interact with their internal state or the external environment". [32] define, "IoT as connecting intelligent physical entities (sensors, devices, machines, assets, and products) to each other, to internet services and to applications".

As we are aware of the fact that IoT has a tremendous impact on the world where the boundaries of the organizations have become virtual [33]. The basic principle of IoT includes the autonomous communication of physical objects, interconnected devices and services within the existing internet infrastructure [34]. It profoundly helps bringing intelligence to the physical products [35], thereby making all products smartly connected [36]. There are various application of IoT which span across numerous areas such as wearables, smart homes, smart cities, industrial automation and many more [37]. In order to further understand IoT, it is necessary to comprehend the different constructs of IoT.

2.8 Constructs of Internet of things [38]:

a. Interconnectivity: With regards to, IoT anything can be interconnected with the Global information and communication infrastructure. This forms the fundamental fabric on which the entire information gathered transmits between places and things.
b. Things related Services: The IoT is capable of providing things related services within the constraints of things such as privacy protection and semantic consistency between physical things and their associated virtual things. In order to provide thing related services within the constraints of things both the technologies in physical world and the Information world will undergo a change.
c. Heterogeneity: The devices in the IoT framework are Heterogeneous as they are based on different platforms and networks. They can interact with other devices or service platforms through different networks.
d. Dynamic Changes: The state of devices can change dynamically e.g. sleeping or waking up, connected or disconnected, as well as the context of the devices including location and speed. Moreover, the number of devices can change dynamically.
e. Enormous scale: The number of devices that are needed to be managed and then communicate with each other will be at least an order of magnitude larger than the devices connected to the current internet. The ratio of the communication triggered by these devices as compared to communication triggered by humans will noticeably shift towards device- triggered communication. Even more critical will be the management of the data generated and their interpretation for application purposes. This relates to semantics of data as well as efficient data- handling.

3. Digital transformation of Customer Relationship Management with Internet of things:

The internet of things landscape is characterized by the gathering of data automatically done by the physical things (sensors) that are connected to the global network and transferring it to a central repository [6]. The data is then collated and converted into meaning analytics to take appropriate and accurate decisions at different point in times depending upon the situation [6]. Apart for the above there other inherent benefits which an organization can enjoy by the usage of IoT origin data. The target although is always to achieve a higher level of customer satisfaction which should result into retention of the customer. The customer satisfaction is directly attributable to the customer engagement and customer experience received by the customer. The benefits elucidated are the ones that have a direct impact on the customer experience and dominating the customer satisfaction [23].

3.1 Promotional marketing [39]:

Based on the buying patterns of the customer and the inventory held within the warehouse, Organizations can send targeted and personalized marketing promotions directly to its customer. Location and context of the customer is established with help of the mobile channels, which is quite prevalent and effective. The promotions as stated earlier cannot be generic in nature and are personalized depending upon the buying patterns, preferences of the customer and the current context. At times the real-time promotions are also announced basis the customer location or some other triggers. The whole exercise is to keep the customer engaged and satisfied with the highest degree of personalization.

3.2 On-demand pricing [40]:

For certain business that are highly sensitive to price, right pricing at the right time becomes the key to success. On-demand pricing encompasses the ability to do the on-the-fly promotions using live streams of data. The models for price optimization in that case need not be executed on the static data but can take real time data, behaviors and events into cognizance before throwing the output in terms of a product price. Since the IoT devices are capable of collecting the data at an individual customer level, pricing for products and services can now be personalized for an individual. Since the connectedness is not just within the walls of the organization but much beyond due to the virtual connect, information about demands in different markets proves to be a lever to get most out of the product. This information is coming over a live stream of data and organization need to know realistically on how to utilize this information. Prices may also vary due to the change in terms of rise and fall of demand giving the organization a competitive edge over its competitors. This again works well with price sensitive customers who wish to take benefit of such short-term schemes [41]

3.3 Gen-next Customer Service [40]:

Customer service dominates the customer experience and in turn customer satisfaction the most. The moment an organization gets the handle of the data about the customers, their behavior, the interaction with the customer can be tailored according to what the customer likes. The customer understanding also gives an organization the facility to design highly targeted service campaigns to generate better ROI. IoT origin real time data gives an organization the flexibility to execute quick campaigns that can influence the customer decisions. There is a huge amount of data requirement by the service station and by the organization to input the same into a predictive analytical model. Service churn models are built by the organization to analyze the repeat customer and the reasons for him going off the service net. Customer information, location, preferences are the enablers for the predictions related to the service or to the problems faced by customers [42]. Special emphasis is given to the transparent communication with the customer during the customer service process keeping him engaged and connected. Connected customer further opens up the avenues of cross sell for the organization. It also imbibes trust in the minds of the customers towards the organization [42].

3.4 Informational Organization [42]:

In this type of organization, the informational flows freely and transparently within the organization internally. The data retrieved from the IoT devices is stored in a single repository every responsible individual in the organization can analyze the data as a whole. This generates a lot of trust among the employee and boosts their morale too. There are standard plugins for such data to retrieve and use the same in a dashboard so that the organizational time is not wasted and the efficiency on the floor is maintained. Effective and resourceful decisions are a result of a better reporting data. Decisions taken on the basis of real time data help the organization reap the rewards of Customer loyalty and long run profitability.

4. Relevance of the Subject

The market scenario is changing rapidly with changing policies, globalization and emerging markets. The consumers are subjected today to a variety of products that are available at a reasonable rate and choices. Therefore any decision that needs to be taken by the organization is no more an isolated task done in the offices but a connected and dependent task with the consumer [43]. The data required for taking decisions needs to be real time for the impact to be assessed and correction to be undertaking immediately. Apart from this, there are other reasons in support of implementation of IoT based customer relationship management such as:

- Trends in Customer Behavior
- Global Digital footprint
- Spread of Mobile Internet and Connected Customer
- The Technology Factor

4.1 Trends in customer behavior [44]:

Current trend visualized in the market is of pull from the customer. Due to globalization, today's customer is more educated, informed and highly demanding due to the knowledge and alternatives available in the market. Result of the same is observed in the customer behavior such as shopping time pressure, outsourcing trends, and substantial increase in ready-made including meals, fragmented customer markets and an overall position taken by the customer as against the manufacturer/producer [45]. Other reasons for the power shift include fewer hands in buying, networks and alliances and all of these have swung the control away from the manufacturers. Organizations Information systems are constantly challenged and under pressure for delivering the higher service level demanded by the customer. Higher service levels also translate into agility which the organizations need to exhibit to the customer. Therefore the presence of real time data generated from IoT landscape becomes a compulsion for the organizations to use and sustain the market pull [44].

4.2 Global digital footprint:

Forecasts around the market values and number of devices show a rapid growth of IoT in the coming years [46]. The global market value of IoT is expected to surpass 1 trillion USD mark by 2017 as compared to 600 billion USD mark in 2014 [46]. The number of connected devices worldwide is projected to increase from around 18 billion in 2015 to 50 billion by 2020 (IoT installed base by

category2014-2020, n.d.). The installed base of IoT devices is expected to excel from around five billion in 2015 to nearly 31 billion by 2020, with the consumer sector accounting for the majority of these units [46]. Looking forward in the future of IoT, we got to know that in 2014 the percentage of data consumed from embedded systems was only 8% of the "Target rich data" [47]. The contribution of this data is expected to reach 21% by 2020 [47]. The number of connectable things is also targeted to grow to 15%, from a meager 7% in 2013 [47].

4.3 Spread of mobile internet and Connected customer:

There are some key statistics for digital, social, and mobile media in 2016 that are unleashed in a report named "Digital in 2016", [48]. The most significant takeaways include the following numbers and percentiles reported:

- **3.42 billion** internet users, equaling **46%** global penetration;
- **2.31 billion** social media users, delivering **31%** global penetration;
- **3.79 billion** unique mobile users, representing **51%** global penetration;
- **1.97 billion** Mobile social media users, equating to **27%** global penetration.

To further analyze the above facts a three year horizon (2014 – 2017) was chosen to compare the data of sources of internet traffic globally. The stats for the year 2017 stand at Desktop source being behind at 43.41% to Mobile as source of internet that is at 56.59% [49]. The forecast annual run-rate of 366.8 Exabyte's of mobile data traffic for 2020 is equivalent to 120X more than all global mobile traffic generated just 10 years ago in 2010 [50].
This analysis brings us to a concept of connected customer. Connected customer is profoundly a customer who is in some way or the other consuming the digital content of an organization and remaining always in touch with the organization. It is very important for the organizations to be customer centric and propagate connected customer experience.
To sustain in business it is vital to know the customer and his needs. Being customer centric is the only way of survival for the businesses. Following benefits can be reaped with the customer centric approach [51]:

a. Organization can take a position of being empathetic and customer oriented brand and create a differentiator for themselves in the market
b. Productivity Increase with reduced cost
c. Boosted and motivated employee morale.
c. Profitability improvement with reduced price sensitivity
d. Better first time right ratio to the customer in order to prevent reworks
e. Pull for Repeat customers and creation of brand ambassadors.
f. Lower inventory costs with better market forecast.

4.4 The Technology factor [52]:

In order to achieve vivid improvements in the performance of an organization Information technology been recognized as an enabler to drastically redesign business processes since a long time [53]. Work practices changes along with the change management confronted due to the establishment of innovative ways to link a company with the customers, supplier and internal stakeholders [54]. Technological innovations fully support CRM to gather and analyze the data on customer patterns, infer behavior of the customer, service the customer timely and effectively, maintaining customized communications delivering product and service value to individual customers. Organizations in order to deal with the customer create a complete view of the customer usually called a 360 degree view so that the future interactions can be optimized with the learning from the past mistakes of the previous interactions [55]. The most crucial role in the CRM operations is of the effective management of information emerging from the data. More the real time data better would be the decision making and damage control.

5. Conclusion

Increased connectivity due to the rising number of smart gadgets and wireless technology is bringing more and more people together and connecting them. Functions of the system are tuned in a way that they adapt to a change in their working detecting a change in the environment automatically. IoT is proven beyond doubts to be the technology of this generation where the physical world will be connected to the virtual enabling a data transfer over the internet. The trend is catching up and a wise call would be to adapt the same as soon as possible and embark the journey of customer satisfaction and customer retention[41]. Organizations need to replace their existing processes to suit the customer revolution since it's a hyper connected world with a fair amount of knowledge share. Social media too has become one on the most important sources of information that cannot be ignored by the organization if they wish to re-acquire lost customers, retain existing customers through customer satisfaction achieved by a higher level of quality of service. The service excellence is going to be the key for the organization. Therefore, to stay relevant, organizations will have to foster a one to one relationship with the customer with the help of IoT origin real time data [56]. It is actually a happy scenario that IoT collects all the customer information based on which CRM strategies is built. The more information an organization possesses about its customer, better would be the customizations and personalization's for the customer fostering the customer satisfaction and thereby retention [41].

6. Way forward [41]

This article presented the usage of IoT in the CRM area and the inherent benefits that are leveraged by the organization due to this amalgamation. Beyond doubts, we can state that the future of the systems that acquire data is going to be the Internet of things. Companies engaged in CRM carry an inbuilt advantage wherein with the help of real time data they can use the change in trend to their benefit. Currently there are almost all devices coming in the market with connectivity hence we can state that IoT is no more a conjecture but a reality. Organizations will receive a constant flow of information for decision-making. It would prove to be more than beneficial for any organization to imbibe and incorporate this rising trend into the CRM systems and reap the early entrant benefits cementing its position in the market as compared to the competitors. Customer experience is a prime driver for customer satisfaction with connected customer being an added advantage for the organization. Therefore, in the connectedness achieved with the help of IoT, the business strategy of an organization in today's scenario needs to include customer centric objectives as a part of CRM. This will facilitate to achieve customer satisfaction in-turn increasing customer retention and transforming customers into brand ambassadors.

References

[1] J. Chris, "Customer and Consumer Definitions", *Smallbusiness.chron.com*, 2017. [Online]. Available: http://smallbusiness.chron.com/customer-consumer-definitions-5048.html. [Accessed: 16- Oct- 2017].

[2] R. Chalmeta, "Methodology for customer relationship management", *Journal of Systems and Software*, vol. 79, no. 7, pp. 1015-1024, 2006.

[3] L. Ryals, S. Knox and S. Maklan, *Customer relationship management (CRM)*. [London]: Financial Times Prentice Hall, 2007.

[4] F. Buttle, *Customer relationship management: concepts and technologies*, 2nd ed. London: Routledge, 2009.

[5] P. Lou, Q. Liu, Z. Zhou and H. Wang, "Agile supply chain management over the internet of things", in *Management and Service Science (MASS)*, China, 2011.

[6] S. Yerpude and T. Singhal, "Internet of Things and its impact on Business Analytics", *Indian Journal of Science and Technology*, vol. 10, no. 5, pp. 1-6, 2017.

[7] S. Yerpude and T. Singhal, "Impact of Internet of Things (IoT) Data on Demand Forecasting", *Indian Journal of Science and Technology*, vol. 10, no. 15, pp. 1-5, 2017.

[8] H. Kopetz, *Real-time systems*. New York, NY: Springer, 2011.

[9] R. Brown, "Relationship Marketing vs. Transactional Marketing", *Yourbusiness.azcentral.com*. [Online]. Available: https://yourbusiness.azcentral.com/relationship-marketing-vs-transactional-marketing-5393.html. [Accessed: 20- Nov- 2017].

[10] N. Kokemuller, "What Are the Advantages & Disadvantages of Transactional Marketing?", *Bizfluent*, 2017. [Online]. Available: https://bizfluent.com/info-8087208-advantages-disadvantages-transactional-marketing.html. [Accessed: 15- Nov- 2017].

[11] V. Shah, "Differences Traditional Marketing vs. Relationship Marketing", *Selfgrowth.com*, 2017. [Online]. Available: http://www.selfgrowth.com/articles/differences-traditional-marketing-vs-relationship-marketing. [Accessed: 14- Nov- 2017].

[12] L. Berry, "Relationship Marketing of Services--Growing Interest, Emerging Perspectives", *Journal of the Academy of Marketing Science*, vol. 23, no. 4, pp. 236-245, 1995.

[13] C. Grönroos, "The Marketing Strategy Continuum: Towards a Marketing Concept for the 1990s", *Management Decision*, vol. 29, no. 1, 1991.

[14] R. Bose and V. Sugumaran, "Application of knowledge management technology in customer relationship management", *Knowledge and Process Management*, vol. 10, no. 1, pp. 3-17, 2003.

[15] J. Hartikainen and J. Hallavo, "Connected customer service |Tieto", *tieto.com*, 2017. [Online]. Available: https://www.tieto.com/industries/manufacturing/tieto-industrial-experience/connected-customer-service. [Accessed: 11- Dec- 2017].

[16] N. Tolia, M. Kaminsky, D. Andersen and S. Patil, "An Architecture for Internet Data Transfer", *Usenix.org*. [Online]. Available: https://www.usenix.org/legacy/events/nsdi06/tech/full_papers/tolia/tolia_html_rev/. [Accessed: 01- Dec- 2017].

[17] S. Yerpude and T. Singhal, "Augmentation of Effectiveness of Vendor Managed Inventory (VMI) Operations with IoT Data – A Research Perspective", Serialsjournals.com, 2017. [Online]. Available: http://www.serialsjournals.com/serialjournalmanager/ pdf/1505390310.pdf. [Accessed: 12- Oct- 2017].

[18] K. Richards and E. Jones, "Customer relationship management: Finding value drivers", *Industrial Marketing Management*, vol. 37, no. 2, pp. 120-130, 2008.

[19] J. Chan, "Toward a Unified View of Customer Relationship Management", *The Journal of American Academy of Business,*, vol. 6, no. 1, pp. 32- 38, 2005.

[20] C. Meyer and A. Schwager, "Understanding Customer Experience", *Harvard Business Review*, pp. 1 - 11, 2007.

[21] R. Iriana and F. Buttle, "Strategic, Operational, and Analytical Customer Relationship Management", *Journal of Relationship Marketing*, vol. 5, no. 4, pp. 23-42, 2007.

[22] C. Bucholtz, "https://www.crmbuyer.com/story/82567.html", *CRMBUYER- The essential guide for CRM System purchases*, 2015. [Online]. Available: https://www.crmbuyer.com/story/82567.html. [Accessed: 15- Nov- 2017].

[23] S. Khoshafian, "Digital Transformation of CRM through Internet of Things (IoT)", *Pega*, 2015. [Online]. Available: https://www.pega.com/insights/articles/digital-transformation-crm-through-internet-things-iot. [Accessed: 19- Dec- 2017].

[24] K. Hollar, "CRM Industry User Research Report", *Capterra.com*, 2015. [Online]. Available: http://www.capterra.com/customer-relationship-management-software/user-research. [Accessed: 16- Dec- 2017].

[25] C. Grönroos, "The relationship marketing process: communication, interaction, dialogue, value", *Journal of Business & Industrial Marketing*, vol. 19, no. 2, pp. 99-113, 2004.

[26] J. Sheth and A. Parvatlyar, "Relationship Marketing in Consumer Markets: Antecedents and Consequences", *Journal of the Academy of Marketing Science*, vol. 23, no. 4, pp. 255-271, 1995.

[27] R. Morgan and S. Hunt, "The Commitment-Trust Theory of Relationship Marketing", *Journal of Marketing*, vol. 58, no. 3, p. 20, 1994.

[28] P. Kotler., *Marketing management: analysis, planning, implementation, and control*, 8th ed. Englewood Cliffs, N.J.: Prentice-Hall, 1994.

[29] M. Faulkner, *Customer management excellence*. Chichester: Wiley, 2003.

[30] J. Tschohl, *Achieving excellence through customer service*, 5th ed. USA: Best Sellers Publishing, 1996.

[31] K. Steenstrup and D. Dale Kutnick, "The Internet of Things Revolution: Impact on Operational Technology Ecosystems", *Gartner*, 2015. [Online]. Available: .https://www.gartner.com/doc/3036118/internetthings-revolution-impact-operational. [Accessed: 05- Nov- 2017].

[32] R. Rio and S. Banker, "IoT Changes Logistics for the OEM Spare Parts Supply Chain", *Logisticsviewpoints.com*, 2014. [Online]. Available: https://logisticsviewpoints.com/wp-content/uploads/IoT-Changes-Logistics-for-the-OEM-Spare-Parts-Supply-Chain.pdf. [Accessed: 09- Nov- 2017].

[33] B. Nguyen and L. Simkin, "The Internet of Things (IoT) and marketing: the state of play, future trends and the implications for marketing", *Journal of Marketing Management*, vol. 33, no. 1-2, pp. 1-6, 2017.

[34] L. Atzori, A. Iera and G. Morabito, "The Internet of Things: A survey", *Computer Networks*, vol. 54, no. 15, pp. 2787-2805, 2010.

[35] D. Hoffman and T. Novak, "Emergent Experience and the Connected Consumer in the Smart Home Assemblage and the Internet of Things", *SSRN Electronic Journal*, 2015.

[36] B. Ngyuen and D. Cremer, "The Fairness Challenge of the Internet of Things | The European Business Review", *Europeanbusinessreview.com*, 2016. [Online]. Available: http://www.europeanbusinessreview.com/the-fairness-challenge-of-the-internet-of-things/. [Accessed: 17- Nov- 2017].

[37] A. Das, P. Pathak, C. Chuah and P. Mohapatra, "Uncovering Privacy Leakage in BLE Network Traffic of Wearable Fitness Trackers", *Proceedings of the 17th International Workshop on Mobile Computing Systems and Applications - HotMobile '16*, 2016.

[38] O. Vermesan and P. Friess, *Internet of Things Applications - From Research and Innovation to Market Deployment*. Aalborg: River Publishers, 2014.

[39] A. Wilson, "Internet of Things & The Future of CRM", *Rolustech.com*, 2018. [Online]. Available: https://www.rolustech.com/blog/internet-things-future-crm. [Accessed: 08- Nov- 2017].

[40] F. Palermo, "A New Frontier for CRM: The Internet of Things", *CMSWire.com*, 2015. [Online]. Available: https://www.cmswire.com/cms/internet-of-things/a-new-frontier-for-crm-the-internet-of-things-029120.php. [Accessed: 16- Nov- 2017].

[41] M. Uppal, "Top 5 Reasons Why CRM and the Internet-of-Things Will Influence Customer Engagement - Financesonline.com", *Financesonline.com*, 2017. [Online]. Available: https://financesonline.com/top-5-reasons-why-crm-and-the-internet-of-things-will-influence-customer-engagement. [Accessed: 18- Dec- 2017].

[42] "The 6 Biggest Benefits of CRM", *Salesforce.com*. [Online]. Available: https://www.salesforce.com/hub/crm/benefits-of-crm/. [Accessed: 02- Dec- 2017].

[43] N. Raassens, S. Wuyts and I. Geyskens, "The performance implications of outsourcing customer support to service providers in emerging versus established economies", *International Journal of Research in Marketing*, vol. 31, no. 3, pp. 280-292, 2014.

[44] H. Wilson, E. Daniel and M. McDonald, "Factors for Success in Customer Relationship Management (CRM) Systems", *Journal of Marketing Management*, vol. 18, no. 1-2, pp. 193-219, 2002.

[45] J. Sheth and R. Sisodia, "Consumer behavior in the futur", *Electronic marketing and the consumer*, pp. 17 - 37, 1997.

[46]"IoT installed base by category 2014-2020", *Statista*, 2015. [Online]. Available: https://www.statista.com › Technology & Telecommunications › Consumer Electronics. [Accessed: 24- Nov- 2017].

[47] A. Nabulsi, "The Digital Universe of Opportunities", *Slideshare*, 2014. [Online]. Available: https://www.slideshare.net/ abdullah_nabulsi/idc-digitaluniverse2014-33810387. [Accessed: 12- Nov- 2017].

[48] S. Kemp, "Digital in 2016 - We Are Social UK", *We Are Social UK*, 2016. [Online]. Available: https://wearesocial.com/uk/special-reports/digital-in-2016. [Accessed: 01- Dec- 2017].

[49] "Statcounter - Web Analytics Made Easy", *Statcounter*, 2018. [Online]. Available: http://gs.statcounter.com/platform-market-share/desktop-mobile-tablet. [Accessed: 13- Dec- 2017].

[50] S. Jose, "10th Annual Cisco Visual Networking Index (VNI) Mobile Forecast Projects 70 Percent of Global Population Will Be Mobile Users", *Newsroom.cisco.com*, 2016. [Online]. Available: https://newsroom.cisco.com/press-release-content?articleId=1741352. [Accessed: 16- Nov- 2017].

[51] S. Cook, *Customer Care Excellence*, 6th ed. London, GBR: Kogan Page, Limited, 2008.

[52] I. Chen and K. Popovich, "Understanding customer relationship management (CRM)", *Business Process Management Journal*, vol. 9, no. 5, pp. 672-688, 2003.

[53] T. Davenport and J. Short, "The new Industrial Engineering: Information Technology and Business Process Redesign", *Sloan Management Review*, vol. 31, no. 4, 1990.

[54] J. Champy and M. Hammer, *Reengineering the corporation*. [Place of publication not identified]: HarperCollins e-Books, 2014.

[55] W. Eckerson and H. Watson, "Harnessing customer information for strategic advantage: technical challenges and business solutions", *Industry Study*, vol. 6, 2000.

[56] V. Afshar, "2016 - The Year of Connected Customer", *HuffPost*, 2015. [Online]. Available: https://www.huffingtonpost.com/vala-afshar/2016-the-year-of-connecte_b_8833496.html. [Accessed: 02- Jan- 2018].