EasyChair Preprint

№ 1615

Assessing Performance and Customer Satisfaction with Artificial Intelligence: a Case Study

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October 9, 2019

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Research full-length paper

Track N°05

Abstract

In recent years, artificial intelligence (AI) technologies have been widely used in the service sector, but the debate regarding the application of these systems is characterized by extreme positions. is. This paper is aimed to investigate the impact of artificial intelligence on customer satisfaction. The methodological approach adopted is qualitative. In particular, we conducted a single-case study on the Chinese ecommerce giant, JD.com. Data were collected from the official reports of the company. JD.com is suited to this research because it employs its own artificial intelligence (JIMI) since 2012. Our research reveals that an AI system implemented may improve the corporate profitability and, consequently, the customer satisfaction.

Keywords: AI; CRM; Customer Satisfaction; Service company Performance.

Introduction

Recently, artificial intelligence has made numerous progress in many fields and significant impacts on all aspects of our society, employment, companies and life in general have been recorded. The terms of "Artificial Intelligence" includes high profile applications in Autonomous Vehicles (AV), intelligent robots, automatic translations, medical and law usages (Makridakis, 2017). The use of artificial intelligence may positively impact on the consumer' satisfaction and on the business performance. Although the debate about the relationship between artificial intelligence application and performance is still in infancy, different studies (e.g. Manikonda et al.,2017) revealed that users are emotionally positive and optimistic towards the progress of AI. The confidence seems to be important element of a successful Artificial Intelligence technology. About the industry of activity, the service sector seems to be at an important point regarding productivity industrialization rate, similar to the industrial revolution in manufacturing that started in the eighteenth century (Canbek, 2020; Wirtz et al., 2018).

In order to investigate the impact of artificial intelligence on customer satisfaction, we adopted a qualitative methodology. In particular, we conducted a single-case study on the Chinese ecommerce giant JD.com which employs its own artificial intelligence, called as *JIMI*. Data were collected from the official reports related to the period 2012-2018.In this way, this paper aims to explore the existence of a possible association between the implementation of AI technologies and customer' satisfaction, within a firm operating in the service sector.

Our paper contributes to the extant literature about the artificial intelligence because our work intends to verify the existence of a link between the implementation of AI technologies and the customer' satisfaction. The authors, based on the empirical literature (e.g. Reinartz et al.,2004) believe that by improving the customer 'satisfaction the firm may also enhance its business performance.

The rest of paper is structured as follows: The Section 2 reviews the literature; while the section 3 contains the methodology. Subsequently, the section 4 includes our results and in the last section discuss our findings and our study's implications, highlighting important future research avenues.

2. Literature review

In recent two decades, artificial intelligence has made numerous progress in many fields and has been extensively used in many applications, especially for business activities and firm development. In the management literature, the AI is considered as a field of computer science devoted to creating computing machines and systems that perform operations analogous to human learning and decision-making.

As the industrial and digital revolution, the forthcoming artificial intelligence revolution is predicted to have significant impacts on all aspects of our society, employment, firms and life in general. Particularly, the term of "Artificial Intelligence" includes high profile applications in Autonomous Vehicles (AV), intelligent robots, automatic translations, medical and law usages (Hoadley & Lucas, 2018; Makridakis, 2017).

However, the impact of AI technologies can be even more profound than that of both the Industrial and digital revolutions put together. Artificial Intelligence (AI) has gained considerable prominence during the last decade. Nowadays, citing the work of Wirth (2018), it's time to embrace AI.

The 1995 paper (Makridakis, 1995) predicted that by 2015 "the information revolution should be in full swing" and that "a single computer can, in addition to its traditional tasks, also become a terminal capable of being used interactively for the following." (pp. 804-805). In particular, the implementation and the development of artificial intelligence has been enabled by the use of big data, along with markedly enhanced computing power and cloud storage (Lai & Hung,2018). A Framework of Cloud and AI based Intelligent Hotel., across all sector (Chaffey & Ellis-Chadwick; Topol, 2019). It is obvious that as marketers and consumers simultaneously adopt Artificial Intelligence services, the process of exchange between the buyer and seller is being fundamentally altered. Indeed, through the use of Internet and social media customers, anytime and anywhere recommend to other customer a product or a seller, communicating globally (Marinchak et al., 2018).

Currently, progresses in AI focus on certain sectors of the economy, like service. Because of the shape of preferences, the economy is evolving towards a service sector economy. Thus, the service firms are important candidates for our study because they are characterized by the highest industrialization rate, similar to that of the industrial revolution in manufacturing began in the eighteenth century (Wirtz et al., 2018).

In particular, service robots are system-based autonomous and adaptable interfaces that interact with humans and deliver service to an organization of consumers. Then they are able to make autonomous decisions based on the data they receive by external sensors (Pagallo, 2013).

According to Wirtz et al. (2018), to ensure the success of service robots, organizations are required to do innovation' investments that integrate service robots into their offerings. In this sense, is incumbent upon firms' managers the need to apply new technologies that be right for their organizations. There are same factors that must be considered by firms' managers to determine if their business can apply new technology.

These factors are referred to internal/external business and technological environment, as well as to organizational readiness and trading partner support, financial impact and workflow productivity (Khazanchi,2005). Consequently, managers who are able to do investments in IT, enhance their firms' performance along two essential dimensions: profitability and growth (Dibrell et al., 2008).

In addition, businesses that demonstrate timely responsiveness and rapid and flexible product innovation are likely to build a competitive advantage (Tanabe & Watanbe 2005).

With reference to the AI technologies, the findings in the literature are inconsistent (Moberg & Blomberg,2019). A natural starting point for understanding the impact of AI is to examine how it is discussed over time. The debate regarding the application of the AI systems is characterized by two extreme positions.

On the one hand, the pessimists worry this excessive progress. Even before the birth of modern science, academics were interested in the potential implications of technological growth. Just think of the "creative destruction" of capitalism during which older ways of working were superseded by advances in technology.

They worry that when AI machines will replace humans, making all our decisions for us. According to another stream of literature, AI technologies will have negative implications on life in general and above all on employment.

As stated by other authors (Sachs et al.,2015 AI revolution is "paradox of robotic productivity". Innovations that increase the productivity of robotic investments are likely to lower robotic and total output and lower the lifetime utility of future generations. For this reason, the authors claimed the need of policies that redistribute income cross generations in order to can ensure that of this robotic productivity benefits all generations. To the extent that workers produce outputs that are imperfect substitutes of the outputs of robots, workers will experience a rise in demand for their products, and this can result in a virtuous circle of rising wages, savings, and production. So, the probability that a rise in robotics productivity may immiserates future generations is dramatic.

About the future of AI technologies, Harari (2016) asked himself "What is more valuable: intelligence or consciousness?". However, the author admitted that nobody really knows how technology will evolve or what its impact will be on human and firm life. As the AI will continue to evolve and work its way into a wide variety of applications, it is difficult to predict just how much value AI will generate. According to Baum (2014) humanity is going through a risk of failure that derives from risky emerging artificial general intelligence (AGI) technologies. These technologies may be disruptive and have downsides. In addition, rapid advancements in robotics and artificial intelligence hide the danger that in the future robots would be able to do diverse tasks, currently implemented only by humans. Hence business will start to recruit robots rather than human employees and robots will be perceived as threat by human employees, fueling anti-robot technophobic Neo-Luddism movement (McClure, 2018).

Fast and Horvitz (2017) found out that worries of loss of control of AI, ethical concerns for AI, and the negative impact of AI on work have increased over time. However, also the hopes for AI in healthcare and education have grown in recent years.

Regarding the optimistic vision about the AI technologies and in response to destructive predictions of technological progress, proponents of the AI technologies stated that this advancement will spur innovation and create opportunities, by allowing to people to free from routine work. Particularly, Autor (2015) emphasized the complementary between labour and automation that raises the labour demand, wages and the productivity. Thus, the implementation of artificial intelligence technologies helps the companies operating in different economic sectors to decrease costs, generate additional revenues, improve product quality and, finally improve competitiveness in the market.

Hence, computerization would both substitute workers that do activities that are comparatively routine-task intensive, and complement workers that do non-college labour activities, which have proven challenging to automate, by enhancing physical and adaptability (Autor,2015). Accordingly, the terms adaptability means the capability of the strategy to absorb the external shock of any scenario (likely, unlikely, and even improbable) without excessive risky contingency plans (Masch,2016).

Makridakis (2017) stated that firms that use AI technologies have vast opportunities for both new products/services and immense productivity. In this way, the implementation of AI systems may avoid

the dangers in terms of increased unemployment and greater wealth inequalities. Despite the criticism, in recent years robots have been widely used in industrial context (Johnson et al., 2014; Schwartz et al., 2016) and a new boom in AI has been triggered, especially in high demand fields such as cloud computing and big data (O' Leary, 2013).

Zheng et al. (2017) stated it is necessary to introduce human cognitive capabilities into AI systems to develop a new form of AI, namely hybrid-augmented intelligence. In their research, the authors claimed the importance of the development of human-computer cooperative hybrid augmented intelligence on the basis of discussing the limitations of existing machine learning methods.

Indeed, the traditional robots widely used in industrial contexts (Johnson et al., 2014; Schwartz et al., 2016) have the problem of simplification of instructions, which makes them difficult interact with humans and carry out complex tasks.

By introducing human-computer collaborative hybrid augmented intelligence, the cloud robot is one of the fastest fields of transforming hybrid-augmented intelligence into commercial applications.

In recent years, technologies such as augmented reality have been widely used in game and entertainment industry. Moreover, social platforms such as Facebook shopping websites push related information to users by making personal preference analysis. This process may be more accurate and efficient through the development of human-computer cooperative hybrid augmented intelligence (Zheng et al.,2017).

The use of artificial intelligence may positively impact on the consumer satisfaction and on the firm' performance. On the performance side, the application of AI method may come different benefits within the organization (Wang et al.,2009). However, the debate about the relationship between artificial intelligence application and performance is still in infancy.

Kurzweil (2005) predicted a "science fiction", utopian future with AI technologies that could revolutionize everything, by allowing humans to use the speed, memory capacities and knowledge sharing ability of computers. In addition, AI may displace human work, makes human work easier or frees us from needing to work at all. So, humans may spend their time in activities to what they are interested in. Kurzweil (2005) predicted that computers and robots will reach human intelligence around 2029.

Moreover, the author called "Singularity" a time that will bring "The dawning of a new civilization that will enable us to transcend our biological limitations and amplify our creativity. In this new world, there will be no clear distinction between human and machine, real reality and virtual reality". So, singularity will bring different benefits to humanity and AI or expert systems help us make better decisions

If the AI reaches and surpasses human levels of intelligence, a set of different considerations apply. Prior studies (Bostrom & Yudkowsky,2014) believe that Kurzweil and AI supporters vastly underestimate the potential angers which can arise from machines and robots incorporating AI technologies. Thus, as computers and robots will be available in large numbers, then people will not be motivated to work, leaving computers/robots to do all important decisions.

In the next decades, all customer interactions, especially in the service sector, will take place without humans (Schneider, 2017). However, Huang and Rust (2018) stated the importance for employability of human skills. Indeed, the authors predicted that service workers who want to work, they will have to upgrade their empathetic and intuitive skills as "soft" people skills will be of crucial importance for employability. Rapid technological advances are also changing how the internet of things affects users' preferences and needs (Andrè et al., 2018). About this aspect and in particular the perceptions of consumers, Manikonda et al. (2017), investigating on how the public perceives the progress of AI by their posts shared on Twitter, argued that tweets about AI are overall more positive compared to the general tweets. The empirical findings of the study conducted by Manikonda et al. (2017) revealed

that users are emotionally positive (and optimistic) towards the progress of AI. The confidence seems to be important element of a successful Artificial Intelligence technology.

Similarly, an empirical work by Fast and Horvitz (2016) revealed that in recent years the discussion on AI has increased and is more optimistic than pessimistic.

These findings are shared by Gaines-Ross (2016) who stated the positive perceptions of these individuals toward AI technologies. In this sense, the customer satisfaction improves business performance by enhancing and driving up customer loyalty (Buttle, 2004). and business performance (Kamakura et al. 2002); the other is the link between customer loyalty and profitability (Reinartz & Kumar, 2000).

As customer satisfaction is correlated with firm' performance (Chi and Gursoy,2009), it is important that firms adopt a customer-centric logic (Reinartz et al.,2004). In this sense, AI technologies implementation may be useful to improve customer satisfaction.

In Table 1 we summarize the major inventions of AI revolutions, existing and new, widespread used inventions by the year 2037 (Makridakis,2017).

AI Revolution (Brain power)	
Years	Mental tasks
1990	Neural net device read handwritten digits
1993	Robot Polly navigates using vision
1997	Deep Blue defeats the world chess champion
1998	Robotric toy Furby learns how to speak
2005	Robot ASIMO serves restaurant customers
2009	Google's first self-driving car
2011	Watson computer beats Jeopardy's champions
2016	AlphaGo defeats GO champions using neural learning algorithms

Widespread use of	
Years	Mental tasks
202?	Computer translations
202?	Self-driving cars
202?	Deep neural learning
203?	Machines reach human intelligence

Table 1. Inventions of AI revolutions

3. Methodology

The methodology's section is structured as follows: the subsection 3.1 is the research approach; the subsection 3.2 is the presentation of the case study; while the last subsection contains the data analysis.

3.1. Research approach

Qualitative case study methodology provides tools for researchers to study complex phenomena within their contexts. When the approach is applied correctly, it becomes a valuable method for health science research to develop theory, evaluate programs, and develop interventions.

This approach is valuable for health science research to develop theory, evaluate programs, and develop interventions because of its flexibility and rigor (Yin, 2003).

So, when should you use a case study approach? According to Yin (2003) a case study design should be considered when: (a) the focus of the study is to answer "how" and "why" questions; (b) you cannot manipulate the behaviour of those involved in the study; (c) you want to cover contextual conditions because you believe they are relevant to the phenomenon under study; or (d) the boundaries are not clear between the phenomenon and context.

To validate the case study tool in this study we try to suggest that perhaps these classic case studies succeeded because of their fortuitous timing in the early stages of the field and the extraordinary skills of their authors, and in spite of the limitations of single setting research. The authors of the classic case studies clearly recognized the close methodological relationship between theory-building research and its mirror, theory-testing research. Such methods are simply good science (Eisenhardt & Kathleen, 1991).

3.2 The case study

The empirical case study to detect the existence of a possible association between the implementation of IA technologies and customer satisfaction, within a company that operates in the service sector concerns the company JD.com.

Chinese ecommerce giant JD.com was established in 1998 and since 2005 shifted to pure online operation. Currently, it offers a wide selection of authentic, high-quality Chinese products at competitive prices and delivers them to customers' doors in a speedy and dependable manner.

Adhering to the same core values of authenticity and reliability that define the shopping experience, JD.com aims to provide consumers around the world with an innovative and robust ecommerce platform through close cooperation with domestic suppliers in China.

JD.com is China's largest online retailer and its biggest overall retailer. Furthermore, the company is a member of the Fortune Global 500.

Jd.com offers a world-class set of online retail services to its about 200 million users. The number of active customers account had increased from 25.9 million to 305,2 million in the period 2012-2018, leading JD.com in the top 10 listed retailers in China. In net revenues, JD.com has reported an increase of about 40 % from the previous year (Company filings, 2018).

The corporation is committed to ensuring the highest standards of product quality, clearly defined by mission, vision, JD's core values and its own innovation policy. The mission aims to make life carefree and joyful; while the vision aims to become the most trust worthy company in the world. In this study, we mainly focus on JD's core values (that include customer first, integrity, passion) and innovation (to be better, keep learning).

The company aims to ensure customer satisfaction in several ways, but always through the systematic implementation of AI systems.

The first way is to ensure that the security mechanisms are adequate to protect your IT systems against third-party intrusions, viruses or hacker attacks, theft of information or data, or other similar activities.

Such future events could reduce customer satisfaction, damage the company's reputation and result in a substantial decrease in revenue.

The other way concerns online payment options. In order to have better control over compliance and to ensure customer satisfaction, a national compliance and last-mile delivery infrastructure has been built, supporting both direct online sales and strong relationships with suppliers in the development of the online direct sales business.

The main focus of this paper is about the customer experience derived from the strong competition. That's why JD.com is committed to optimizing the customer experience and achieving satisfaction. This commitment guides every aspect of operations, focusing on six main components: broad product offering, compelling online experience, superior customer service, competitive pricing, timely and accurate fulfilment and convenient payment options.

To ensure the best possible online experience for end-users, JD.com mainly uses AI technologies that generate personalized recommendations on the retail technology platform, based on the complete data that accumulate daily. The large scale of the business allows us to receive a set of comprehensive customer data that may provide a deeper understanding of customer interests and behaviours.

Technologies are widely used in a large number of retail scenarios: front-end technology that supports key customers, websites and mobile applications, and innovative omni-channel technology to support the retail ecosystem with new customer interfaces. In academic literature, the strong retail technology platform is considered as an important matter of research.

To develop the current business in an even better user experience, laying the foundation for future areas of growth, the company intends to further invest in technologies such as artificial intelligence, large data and other industry-leading technologies.

As of 31 December 2017, JD.com employed 11.938 research and development professionals to design, develop and operate its own technology platform. At the same time, it has built up a global team of artificial intelligence and supply-chain technology professionals, including many top-notch AI and supply-chain researchers and scientists[1].

The JD.com's corporation is making continuous efforts to develop the technological strength in artificial intelligence, exploiting the huge volume of data, to explore innovative business models.

The corporation believes that brand recognition and reputation among its customers and suppliers have contributed significantly to growth and success. Maintaining and improving the brand recognition and reputation is critical to business and competitiveness.

These factors include the ability to: provide a compelling online shopping experience for customers; maintain or improve customers' satisfaction with after-sale services; maintain the popularity, attractiveness, diversity, quality and authenticity of the products offered; increase brand awareness through marketing and brand promotion activities.

In December 2012, JD.com introduced a new member to its online customer service team: JIMI (JD.com Instant Messaging Intelligence).

[1] In September 2017, the company established the AI Platform and Research Division as a central component of the technological ecosystem. Automated learning, natural language processing and related computational approaches were also incorporated to continue to improve operations. As of the date of this annual report, applications of Artificial Intelligence technology include, among other things, the JIMI Intelligent Customer Service Assistant, the SKU Intelligent Selection System and the IA-based advertising platform. (JD.com Annual Report 2017).

After the acquisition of knowledge, human resources improve their abilities Similarly, through learning, JIMI's capability to undertake intelligent businesses is enhanced. People can learn in everyday life and on the job (online learning), or at educational institutions (offline learning), likewise JIMI also learns in both online and offline ways. JIMI's cognition is optimized when interacting with customers.

When providing customer service, JIMI's conversations with customers are exported regularly for offline assessment by experienced agents of account services. Hence, JIMI's answers and response engine can be further optimized. When JIMI works for the customer service, JIMI interacts with human agents devoted to the customer service, so its answers can be modified in real time (JD.com Annual Report 2015).

JIMI's customer profiling makes personalized service and AI an immediate reality. When providing customized and personalized services, JIMI can not only make customers feel ready at the beginning of the conversation but can also advise and accurately present products to customers and provide services adapted to customer needs. Like humans, JIMI learns continuously, so it grows "smarter" and achieves wider recognition from customers every day.

3.3 Data analysis

We have collected data from the official reports of the company JD.com.com which are also publicly accessible from the website of the Chinese Stock Exchange. JD.com is suitable for this search because it has been using its own artificial intelligence (JIMI) since 2012.

From 2012, the company began to adopt its own intelligence system. The purpose of this paper is to investigate the impact o of the implementation of AI technology on the company, and in particular on the customer satisfaction.

The JD.com report 2012-referred to 2011- allows us to verify the customer satisfaction before the implementation of AI technology. On the other side, the following reports (2013-2018) allows us to verify the customer satisfaction during the implementation and development of AI technology.

The strategic objective followed by the corporation is to maximize the profitability and achieve a higher service quality by optimizing operational resources. Methodologies combining different data, such as measures of operational inputs, customer perceptions and behaviours and financial outcomes from multiple sources, are necessary to provide the firm not only an individual diagnosis and a comprehensive assessment, but also guidelines on the implementation (Kamakura et al, 2002).

We use two kinds of indicators: behavioural measures and business performance. The former group refers to consumers and their purchasing choices. The second group is purely objective and concerns the performance of the company under investigation.

In the first group we include: the annual active customer account on the web site, total orders fulfilled, loyal active customer base. To measure the business performance, we refer to the online orders.

The annual active customer account on the web site indicator considers a customer account that made at least one purchase during the twelve months, on the respective date, including both online direct sales and online marketplace.

The sophisticated business intelligence system leverages large customer database to create customized product recommendations to support push and targeted marketing. In this way, it is possible to better acquire new customers and increase revenue per active customer.

The total orders fulfilled refer to orders completely satisfied by the company for its customers without complications.

Client loyalty is measured by the average number of purchases by active users and it provides an insight into how confident customers are in society

The most effective and objective measure to measure performance refers to the number of orders. Revenues could also be used, but they are more subjective because the prices can also be affected by macroeconomic factors (inflation, exchange rate, etc. ...)

4. Results

4.1 Annual active customer account on the web site

This indicator considers a customer account that made at least one purchase during the twelve months, on the respective date, including both online direct sales and online marketplace.

The sophisticated business intelligence system leverages large customer database to create customized product recommendations to support push and targeted marketing. In this way, it is possible to better acquire new customers and increase revenue per active customer.

The annual active customer accounts on the 2012 website were 29.30 million but in 2013 an increase of 61.70% was recorded. As you can see in the Table 2, the biggest increase (103.80%) was recorded between 2014 and 2015. This result suggests the positive impact of the artificial intelligence system in the JD.com. According to the available data, from 2012 to 2017, the increases in basis points were all in double digits from 2012 to 2017, with the sole exception for the period 2017-2018 (Table 2). As the data for 2018 have yet to be updated, they were taken from the financial statement referred to the third quarter (Annual Report by Jd.com, Inc).

Years	Annual active customer account	Years
2012	29,30	-
2013	47,40	61,77%
2014	96,60	103,80%
2015	155,00	60,46%
2016	226,60	46,19%
2017	292,50	29,08%
2018	305,20	4,34%

Table 2. Variation of annual active customer account (% values)

4.2 Total orders fulfilled

As shown in the Table 3, in the core business the total orders fulfilled increased substantially from approximately 323.3 million in 2013 to 651.9 million in 2014, reaching to the sum of 1,263.1 million in 2015.

The increases, expressed in basis points per annum, are all above the value of 50. However, our data are not complete because we lack the data referred to the years 2011,2017 and 2018.

To check the progress, we can see that there was an increase of more than 110% in the two-year period 2013-2014. This result demonstrates ongoing improvement of the trend observed in JD.com (Annual Report by Jd.com, Inc).

Years	Total Orders Fulfilled (millions of RMB)	Variations (%)
2012	193,80	-
2013	323,30	66,82%
2014	689,00	113,11%
2015	1263,10	83,32%
2016	1775,4	40,6%

Table 3. The total orders fulfilled and the variations (% values)

4.3 Growing and loyal active customer base

We note a growing and loyal active customer base. Over the years, the customers have shown loyalty to JD.com through their increased activity levels. Client loyalty is measured by the average number of purchases by active users (Table 4).

In 2012, it was been recorded an average of 14.9 purchases, which had grown to about 16.6 in 2015. These values increase to approximately 30 purchases in 2017.

The changes are relatively similar. Moreover, changes in basis points have a sample variance of 3.03. This confirms that there is a low variability of values.

Years	Loyal active customer base	Variations (%)
2012	14,9	-
2013	16,6	11,41%
2014	18,7	12,65%
2015	21,8	16,58%
2016	25,7	17,89%
2017	30,7	19,46%

Table 4. The loyal active customer base and the variations (%)

The growth in the number of active customer accounts, the upturn in orders and the growing customer confidence are preconditions of revenue growth. This increase was primarily driven by success in attracting new active customer accounts, as well as by the success in attracting new orders from existing customers.

4.4 Orders by online services and revenues

The key is to ensure that behaviours monitored should be related to revenues and/or profitability (Kamakura et al., 2002). In addition, the amount of orders is a value that expresses the company's ability to generate revenues, that are driven by service quality perceptions driven, in turn, by operational inputs and employee efforts. We have also collected order data in 2011, which marks the period before the introduction of artificial intelligence in JD.com (Table 5).

Barely a year, and the value is almost doubled. Indeed, in 2012, the index saw an increase of 93%. In the following years there have been continuous increases in orders until they got the maximum value in 2017. We lack data of 2018, and this makes a complete analysis impossible.

Years	Orders online direct services
2011	20,888
2012	40,335
2013	67,018
2014	108,549
2015	167,721
2016	237,702
2017	331,824

Table 5. The orders online direct services (in millions of RMB)

The following figure (Fig.1) illustrates in detail the grow in customer orders in JD.com. The economic nature of the data is given by the number of orders multiplied by the average value of the products offered.

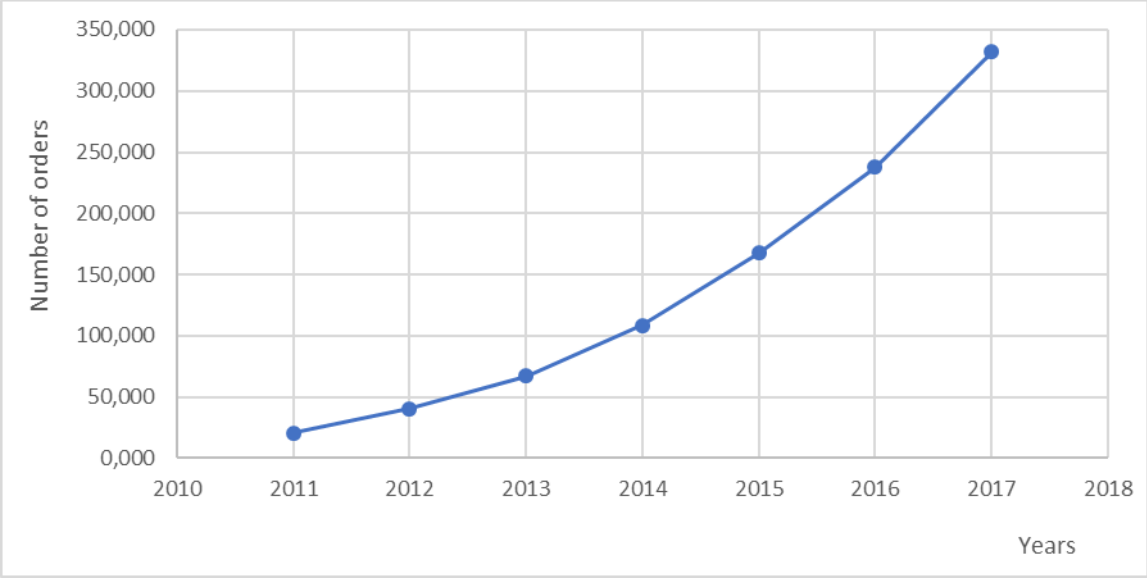

Figure 1. Orders on line direct services

In the table 6, we show the revenues originated from online orders. These data were taken from official sources, namely annual reports.

After the implementation of artificial intelligence in the company, a high increase in revenues has been recorded. As you can see in the Table 5, the revenues increased over the period considered with the most significant part of the increase taking place between 2011 and 2012 (around 96%). In the following years, the increase has always been below the value of approximately 50%.

Years	Revenue-Online direct services (in millions of RMB)	Variations (%)
2011	21,129	95,85%
2012	41,381	67,56%
2013	69,340	65,88%
2014	115,020	57,40%
2015	181,042	43,02%
2016	258,920	39,94%
2017	362,332	-
2018		

Table 6. Revenue from online direct services and variations (% values)

5. Discussion and conclusion

In order to investigate the research question, we have adopted the single case methodology. This approach enables the researcher to know how and why, considering how a phenomenon is influenced by the context within which it occurs. For the novice research a case study is an excellent opportunity to gain tremendous insight into a case (Baxter & Jack,2008).

Our empirical research shows the improvement of JD.com, using some performance indicators.

Parameters related to consumer behaviour such as the annual active customer account on the web site, total orders fulfilled, loyal active customer base have considerably improved.

Moreover, the indicators concerning the business performance such as the orders by online and the revenue got better this shows that they are which has also improved with the constant implementation of artificial intelligence.

The increase in all revenues is a consequence of customer satisfaction that has been manifestly improved when the artificial intelligence has been used.

By March 2016, the implementation of the artificial intelligence system in the company led the customer satisfaction rate above 80% (Annual Report, 2017). As the company was growing exponentially in profitability, JIMI was designed not only to improve the customer satisfaction, but also to identify and stop human resource bottlenecks, through innovative technologies.

The profitability in terms of revenues showed a significant trend in the years 2012-2014. In the period 2015-2017, the trend began to slow, remaining at significant levels.

In summary, our results show that a service firm, may improve the customer's satisfaction by implementation of AI technologies. As the customer satisfaction is correlated with corporate performance, the firm may improve its profitability and competitiveness in the market.

In addition to the adoption of AI, there are also other factors that improve the performance. The choice of basing the parameter on AI is based on highlighting its impact and not considering the factors common to all companies in the same sector such as: quality of the information, response time, website security.

Online shopping offers consumers new channels to experience visual and informative stimuli that support or discourage consumer intentions. The wealth of information and the simplicity of information when it is improved increases consumer satisfaction (Kim et Stoel, 2004; Hausman et Siekpe, 2009).

Consumers perceive a website as useful for transactions when response times, considered as a variable of website quality, are minimum (Salehan et Negahban, 2013). Website response time is defined as the delay that a consumer experiences when seeking to observe information online (Galletta et al. 2006).

The security of the website implies the protection of consumers from monetary fraud (Bressolles et al., 2014). Security is indicated that website transactions should be considered trusted by users, as confidence in the security of the website has significantly influenced the intention to re-use.

Website security has become one of the most important values desired by consumers over the years, it is one of the key dimensions of the quality of the website perceived by users (Barrera et Carrion, 2014).

This paper is not free from limitations. Firstly, the methodological approach adopted, that is the single case methodology. Future studies should contain the adoption of multiple cases. Multiple cases have the powerful to create theory because they permit replication and extension among individual cases. Replication simply means that individual cases can be used for independent corroboration of specific propositions (Eisenhardt et al.,1991).

Hence, our results cannot be generalized. This research was based on a single enterprise, rather than on multiple enterprises, and this limits the validity of casual links of the results. Future research should analyse companies operating in the same sector, as well as in different sectors.

Secondly, the estimation of the AI parameter. In our paper, it has been measured how the adoption of AI is positively correlated with performance (behaviours and business). However, it has not been demonstrated how the AI implementation affects the corporate performance. Due to budget limitation, we used the official information from the website and the official accounting documents that guarantee the transparency.

Thirdly our paper does not show an increase in the use of AI technology may affect a company's business performance in the future. This is due to the methodological approach used. Future research should consider a full-fledged research that considers standard techniques, such as the interviews.

We found out that the increase in the performance is not constant over the years (Table 5 and Table 6). So, it is therefore interesting to examine precisely how far JIMI may represent a competitive advantage of JD.com, by increasing both the customer satisfaction and the performance. This remain an important issue for future research.

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