

# *The Opportunities and Challenges of Big Data for Companies in the Digital Economy Era*

Yujia Zhang<sup>1, a, \*</sup>

<sup>1</sup>*Brunel University London, Uxbridge, Middlesex, London, England*

*a. zhyujia94@163.com, 455762452@qq.com*

*\*corresponding author*

**Keywords:** big data, digital economy, opportunities, challenges

**Abstract:** Digital economy has experienced huge development in the world. Along with this, big data has become a top concern within digital economy from both academics and practitioners in recent years. This paper analyses the opportunities and challenges of big data under the digital economy era from the perspective of company. Several main opportunities and challenges are put forward according to previous related studies, such as being beneficial to decision making, changing the rule of business competition, data privacy and security, as well as price discrimination and errors from big data etc. Overall, it is believed that big data could be transformed to big values and bring various opportunities. However, the potential challenges should be paid great attention as well. At the end, conclusion and future recommendations are provided based on analysis.

## **1. Introduction**

Digital economy has experienced a rapid development over the years [1]. There are a wide range of aspects included in digital economy, such as new digital model, big data and robotics technologies etc. According to previous research, it can be seen that there is a growing trend of adopting big data for different uses, such as data analytics and decision-making. This research focuses on big data specifically due to its increasing importance. From the report by Cisco, it is expected to have around 50 billion devices connected to the Internet by 2020, which could be the driving force for data development and usage. According to various research and news, big data has created a wide range of opportunities in various aspects. To be more specific, big data can be considered as a powerful driver in enhancing productivity and efficiency, as well as improving innovations [2] [3]. Hence, it is important to understand this concept in this data-driven economy. However, the fast development of big data has also brought some challenges, which cannot be neglected.

Based on this, this critical research analyses the opportunities and challenges of big data for companies in the digital economy era. Firstly, this research introduces digital economy and big data with academic resources. After that, potential opportunities and challenges are illustrated with industrial examples. Lastly, conclusion and recommendations are provided based on analysis.

## 2. Digital Economy and Big Data

Digital economy has raised great concerns because of the rapid development in recent years [1]. It is defined as “goods or services whose development, production, sale, or provision is critically dependent upon digital technologies” [4]. The driving factors for this phenomenon are economic changes, political changes and technological innovations [5]. According to an empirical report, digital economy can be considered as the economic activities that adopt digital information as important production drivers with current information network, leading to the growth and optimization of economic framework. It adopts modern information networks and communication technologies, such as the Internet and big data etc., which can then change social connections, enhance productivity and innovation [6]. According to previous research, digital economy has experienced great development not only in developed countries, but also in developing countries [7].

In the digital economy, data has become a new factor of production that drives economic development, and the increasing interests towards big data could be the driving force for the changing of business models and innovations [8]. According to the research of European Commission [9], cross-border data flow created around 2.8 trillion economic value in 2014, which exceeded the value of goods trade in the world. In terms of the definition, big data plays an important role in the digital economy, which is considered as a type of disruptive technology, because it changes the existing economic processes and sectors, consumer behaviours, as well as business models [10] [11]. Moreover, in academic research, big data is usually analysed via the four V’s, including volume, variety, velocity, and veracity [2]. Specifically, these terms are associated with large volume, a wide range of variety, a high degree of velocity and proven application [2]. Big data can be assessed in real time, such as social media platforms [7]. Furthermore, the development of sensor technology and the willingness of companies to have as much data as possibility have resulted in a huge growth in the volume of data they can gain [12]. Big data could bring various benefits to different companies, for instance, searching engines could correctly predict their customers preferences and interests, and online shopping platforms can provide product recommendations to their users based on their previous search behaviours [13]. Nowadays the expectation of big data is more than just the quantity and quality of data. However, the critics about adopting big data in relation with data privacy and other issues have also increased in the world, especially in developing countries [7]. Following part will further analyse the potential opportunities and challenges.

## 3. Opportunities from Big Data

### 3.1. Help Companies Make Decisions

Obviously, the development of big data can bring a wide range of opportunities to the world. Firstly, as mentioned above, when combining with ideal data analytical approaches, big data can be beneficial to decision making for companies to some extent [2]. To be more specific, data analysis enables companies to transfer data to insights [3]. Because of this, the association between big data and proper data analysis are essential in different industries and sectors [3] [14].

### 3.2. Offer Personalised Products and Services

Secondly, with the help of big data, companies could provide customers with more personalised suggestions and offers [3]. This is mainly based on the analysis of acquired big data [15]. For example, online shopping platforms can provide users with products or services suggestions according to their previous browsing and key words. This might enhance user experience during the process of making

purchasing decisions. After the real purchase, customers might also experience a high level of customer satisfaction to some extent. In addition, big data can help companies to improve product design in order to meet customers' requirements in an appropriate way [15]. This is also based on customers' preferences and interests, and appropriate data analysis is required. Moreover, consumer data can be used to optimise the influence of advertisements [15]. Specifically, it can help companies to find out whether the messages reach the targeting audience and then turn into overall economic benefits. And then, big data can also help companies to attract their targeting audience through targeting marketing activities [15]. According to previous research, big data can be used to track and monitor products activities, consisting of product situations, locations and usages etc. To be noticed, this function should be accessible for all customers in order to help companies to collect data. When customers meet problems with their products, big data can help to provide technical support in some aspects [3].

### **3.3. Change the Rule of Business Competition**

From a broad perspective, big data can decrease entry barriers to some extent, which can be regarded as public goods [13]. Specifically, new companies could gain big data in a cost-effective and time-effective, which helps them to better understand the market and customers before entering into a new market. However, it also enables some other companies to gain and use the same data, and then relatively increase the competition. One previous research expects more transparency in data sharing (historical data) in some specific industry, such as in the health care industry [16]. Specifically, the development and production of vaccine might require the sharing of big data in different companies all over the world. To be noticed, big data usage and benefits are not limited to digital platforms and companies, but also some other types of companies. For instance, banks, finance companies and in-store retailers also use a wide range of approaches to gain customers' data and analyse their information, such as through loyalty programs and self-developed apps. In this way, they can better understand customers' preferences and behaviours, and then make responding changes. In terms of price discrimination, according to previous research, it is about having different prices for different customers in the same product or service [12] [17]. From the perspective of companies, this might result in high profits and revenues within the competitive business environment to some extent, especially in the short-term run [17]. However, this strategy can be regarded as a double-side sword with potential drawbacks in the long-term run, and this will be further discussed in the following. Overall, it can be concluded that these opportunities and benefits are embedded in the whole product life cycle, from the beginning to the end.

## **4. Challenges from Big Data**

### **4.1. Data Privacy and Security**

Compared with a wide range of opportunities, there are several potential challenges from the development and usage of big data currently. First and foremost, according to previous research, it is widely believed that the collecting and adopting personal data might bring privacy and data protection issues [12] [18]. An empirical example is the Facebook–Cambridge Analytica Data Scandal in 2018. This breaking news is about Cambridge Analytica adopted personal data from users' Facebook without getting their consent, and these data was used for politics eventually. This issue is invasion of users' privacy and has brought huge impacts towards Facebook. Mark Zuckerberg has claimed that Facebook has made mistakes leading to millions of users' data gained for political uses. In regards of data from these users, they might be used for some economic objectives and politic objectives without

consents [18]. This can be considered as a business ethical issue. From the academic theory, business ethics refers to how individual moral norms are used to carry out activities and achieve goals of business companies [19]. Along with the entering into the ethical era, ethical related issues have gained increasing attentions among the public in the world [20]. This trend of the importance about business ethics requires companies to pay great attention and efforts towards developing corporate social responsibility and have business ethics during commercial activities [20]. Due to this, both companies and other related organisations, such as governments, have faced great challenges from big data. In order to solve this issue, some companies have already made relevant movements. For example, they develop complex systems and strategies in order to address the problem of data privacy. However, these actions which spend huge costs in both economy and time may not lead to the overall value for users [12].

#### **4.2. Price Discrimination**

Another challenge comes from the price discrimination. As mentioned above, price discrimination might lead to higher profits and revenues in short-term run within the competitive business environment, while there might be negative impacts in the long-term run perspective [17]. To be more specific, this behaviour might be found out by customers, which could lead to ending up purchasing and negative attitudes towards the brand or companies [13]. In addition, customers might reluctant to share their information in the future with this company [13]. They might feel a sense of dishonesty and unfairness in this way. Due to this, price discrimination is important for companies to thoroughly considered before adopting.

#### **4.3. Errors from Big Data**

Moreover, another perspective is that too much relying on big data could also create challenges for companies. For instance, the misusing of big data such as historical data [21]. Specifically, previous mistakes of big data have presented that predictions according to historical data might cause failure [21]. This further proves the importance of time-effectiveness of big data. In addition, research presents that behavioural data can be used to predict customer's interests, however, the effectiveness and reliability could decrease during the time [13]. However, some companies and organisations may not notice and understand this issue. Because of this, they have faced great challenges in gaining and using big data from users. Based on the pros and cons of quantitative research and qualitative research, a large amount of quantitative data can be analysed in a cost-effective and time-effective approach with a relative high level of accuracy. However, it has difficulties in enabling researchers to gain deeper understanding of the topic. This can be associated with the opportunities and challenges from big data.

### **5. Conclusion**

In conclusion, this research critically analyses the opportunities and challenges of big data for companies in the digital economy era. Firstly, this research introduces digital economy and big data with academic resources. Secondly, potential opportunities and challenges are illustrated with industrial examples. As for the potential opportunities, big data can be beneficial to the companies in the process of decision making, and companies could provide customers with more personalised suggestions. What's more, big data can decrease market entry barriers and change the mode of commercial competition. In terms of the challenges of big data, data privacy issues, the problems brought by price discrimination, and misleading of historical data are discussed.

There are several suggestions based on previous analysis. First and foremost, in this data-driven economy, the importance of big data cannot be neglected, including the abilities of collecting data and analyzing data. For example, companies could invest more on big data analytics techniques, and concern about the quality of data. In addition, when using price discrimination, companies should take careful concern and understand the results, as it could result in both advantages and disadvantages simultaneously. Last but not least, companies should take business ethics and corporate social responsibility into consideration during gaining and using big data. This is due to the calling of the ethical era, and the increasing importance of business ethics. In the future, it is believed that big data could bring great value to the whole society.

## References

- [1] WEF, 2015. *Expanding Participation and Boosting Growth: The Infrastructure Needs of the Digital Economy*, World Economic Forum, Geneva.
- [2] Pagoropoulos, A.; Pigosso, D.C.A. and McAloone, T.C. 2017. *The Emergent Role of Digital Technologies in the Circular Economy. A Review*. *Procedia CIRP*, 64, 19–24.
- [3] Rymaszewska, A.; Helo, P. and Gunasekaran, A. 2017. *IoT powered servitization of manufacturing—An exploratory case study*. *Int. J. Prod. Econ.* 192, 92–105.
- [4] Kling, R. and Lamb, R. 2000. *IT and organizational change in digital economies*, in *Understanding the Digital Economy*, E. Brynjolfsson & B. Kahin (eds), MIT Press, Cambridge, MA, 295-324.
- [5] Global Development Institute. 2017. *Defining, Conceptualising and Measuring the Digital Economy*. Centre for Development Informatics, Manchester.
- [6] Yu, H. 2017. *Beyond E-Commerce: The Social Case of China's Digital Economy*. *China Perspectives*.
- [7] Hilber, M. 2016. *Big Data for Development: A Review of Promises and Challenges*. *Development Policy Review*, 34 (1): 135–174.
- [8] Wu, C., Cai, Y., Zhao, M., Huang, S. and Guo, Y. 2016. *Generating Computational Taxonomy for Business Models of the Digital Economy*. *Generating Computational Taxonomy for Business Models. DASFAA 2016 Workshops, LNCS 9645*, pp. 126–133.
- [9] European Commission. 2017. *Commission Staff Working Paper on the free flow of data and emerging issues of the European data economy*.
- [10] Dahlman, C., Mealy, S. and Wermelinger, M., 2016. *Harnessing the Digital Economy for Developing Countries*, OECD, Paris.
- [11] Kamp, B. and Parry, G. 2017. *Servitization and advanced business services as levers for competitiveness*. *Ind. Mark. Manag.* 60, 11–16.
- [12] Penkler, D. 2018. *Technology and Business Challenges of Big Data in the Digital Economy*. *Association for Computing Machinery*.
- [13] Nuccio, M. and Guerzoni, M. 2019. *Big data: Hell or heaven? Digital platforms and market power in the data-driven economy*. *Competition & Change*. 23(3) 312–328.
- [14] Jabbour, C.J.C.; de Sousa Jabbour, A.B.L.; Sarkis, J. and Filho, M.G. 2017. *Unlocking the circular economy through new business models based on large-scale data: An integrative framework and research agenda*. *Technol. Forecast. Soc. Chang.*
- [15] Porter, M.E. and Heppelmann, J.E. 2014. *How Smart, Connected Product Are Transforming Competition*. *Harv. Bus. Rev.* 92, 64–89.
- [16] Haucap, J. and Heimeshoff, U. 2014. *Google, Facebook, Amazon, eBay: Is the Internet driving competition or market monopolization?* *International Economics and Economic Policy*. 11(1–2): 49–61.
- [17] Kraemer, A. and Kalka, R. 2017. *How digital disruption changes pricing strategies and price models*. In: Khare A, Stewart B and Schatz R (eds) *Phantom Ex Machina*. Cham: Springer, pp. 87–103.
- [18] Mirchandani, M. 2018. *To delete or not to delete Facebook, that is the question*. *The Wire*.
- [19] Nash, L. 1993. *Good intentions aside: A manager's guide to resolving ethical problems*. *Harvard Business Review Press*.
- [20] Crane, A. and Matten, D. 2010. *Business ethics*. 3rd edition. Oxford: Oxford University Press.
- [21] Radinsky, K and Acriche, Y. 2016. *How to make better predictions when you don't have enough data*. *Harvard Business Review*.