

# PERSONALIZATION IN THE AGE OF INTERNET OF THINGS: IMPLICATIONS FOR VIETNAMESE ENTERPRISES

---

**Dung Phuong Hoang**

*Faculty of International Business, Vietnam Banking Academy, Hanoi city, Vietnam*

**Abstract:** As an important dimension of the Fourth Industrial Revolution, the Internet of Things (IoT), a network of billions of intelligent connected “things” which can communicate to Internet and to each other, has widely expanded and changed the marketing environment. Accordingly, marketing strategies have been changed toward more “personalization”. In which the evolution of The IoT, on one side, increases the role of personalization in marketing as a core strategy in finding, winning, growing and maintaining customers as well as building sustainable competitive advantages, on the other side; facilitates more effective and comprehensive personalization due to the development and increasing use of Big Data and predictive analytics. Although with the support of IoT technologies, personalization enables customers to have better offerings at lower costs while marketers can gain more customer satisfaction, loyalty and response rates, some costs related to privacy risks and spam risks to customers as well as risks of irritating customers and required investment in technology, data collection and analytics are also increasing. Based on the context of IoT in Vietnam, the study will propose some managerial implications for Vietnamese enterprises in taking advantages of IoT in its infant stage for efficient personalization and stronger competitiveness.

**Keywords:** Internet of Things; Personalization; Marketing; Fourth Industrial Revolution

## 1. INTRODUCTION

Nowadays, broadband Internet is getting widely available while the cost of Internet connection is decreasing. In addition, the number of devices which are made with Wi-Fi capabilities and sensors built into them has been increasing rapidly. Especially, smartphone penetration rates in both developed and developing countries have grown at sky-rocketing speed due to reduction in technology costs. All of these factors are creating a storming evolution of the Internet of Thing (IoT), a network of everyday objects digitally interconnected to the internet and to each other (du Pre Gauntt and Stahl, 2016). According to Anthem Marketing Solution (2016), since 2008, the number of connected devices has exceeded the total world population. By 2020, it is estimated that there will be around 50 billion connected devices worldwide or on average, there will be about 6.5 connected devices per person. The global research on 499 leading

CMOs by The Economist Intelligence Unit (EIU) in 2016 has revealed that personalization was emphasized repeatedly in the survey results and interviews as a driving force for marketing success by 2020 upon the development and application of Big Data and predictive analytics enabled by IoT (du Pre Gauntt and Stahl, 2016). However, there has been no studies examining in-depth how the evolution of IoT transforms the framework of personalization in terms of what to personalize, personalize to whom, who does personalization as well as the execution of personalization and its values to both customers and marketers.

In Vietnam, IoT technologies are at their infant phases in which some preliminary applications have been already developed in telecommunications, banking, home architecture, transportation, automotive industries and projected public services. The emerging and inevitable IoT trend has gradually changed marketing environment,

especially customers' expectations and the way companies compete to each other. Vietnamese enterprises should in a position to take advantage of the IoT so as to create their own competitive advantages.

The study will firstly review the literature on the IoT and personalization and analyse how the IoT changes the role and execution of personalization so as to propose a conceptual framework of personalization within an IoT. In addition, based on the IoT context in Vietnam, the study will point out opportunities for Vietnamese enterprises in adopting personalization approach as well as propose some managerial implications for Vietnamese marketers in designing and implementing personalization strategies in the age of IoT.

## 2. THE CONCEPT OF INTERNET OF THINGS

Due to the growing importance and significant impacts of the IoT across various industries, business management fields and social life, the IoT has become a topic of many conversations and researches. However, there are still a lot of confusion and complexities around the term "Internet of things". Specifically, the literature reveals many different definitions of the IoT. The concept of IoT was first proposed by Kevin Ashton in 1999 in which the IoT was referred as objects which are uniquely identifiable interoperable connected upon the use of radio frequency identification technology (RFID) (Ashton, 2009). In other words, the use of RFID technology has initiated by the emergence of IoT starting with some applications in pharmaceutical production, logistics and retail (Fielding and Taylor, 2002; Guinard *et al.* 2009). The application of wirelessly sensory technologies, from the birth of wireless sensor networks (WSNs), intelligent sensing, Web2.0, low energy wireless communications, cloud computing since 2005 to the launch of smart things with mobile computing and connected devices since 2012, has remarkably enhanced the sensory capabilities of devices and transformed the concept of the IoT upon different perspectives (Jiang *et al.*, 2014 ; Li *et al.*, 2013; Ren *et al.*, 2012; Tao *et al.*, 2014 ; Wang *et al.*, 2014). According to IERC (2013); Kirtsis (2011) and Li *et al.* (2012), IoT represents "dynamic global network infrastructure with self-configuring capabilities based on

standards and interoperable communication protocols" in which physical and virtual 'things ' have their own identities and attributes with capabilities of using intelligent interfaces to create an integrated information network.

The differences in defining the IoT have been explained by Greene (2015) that "there is no hard and fast definition of the Internet of Things, in part, because it is so new and continues to evolve. Even five or ten years from now, we will likely be calling the IoT something different". Overall, the IoT definition proposed by International Telecommunication Union (2012) may be the most general and comprehensive in which IoT is defined as "a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies" since it demonstrates the core features of IoT (i.e. digital interconnection of things) while admitting that IoT technologies are still evolving.

According to the road map of the IoT's evolution summarized by Li *et al.* (2015), advanced sensor fusion, faster wireless connectivity and predictive analytics are expected to dominate the IoT technological base by 2017. Thereby, a new array of definitions about the IoT may be coined in the coming time.

Due to the rapid evolution and application of IoT, the numbers of objects and devices which can interact within an IoT have increased rapidly ranging from devices for customer usage such as smartphones, headphones, wearable devices, household appliances, etc. to devices applicable for various business sectors such as industrials, retailing, restaurant, home services, etc. The widespread of IoT has changed the way people work and live as well

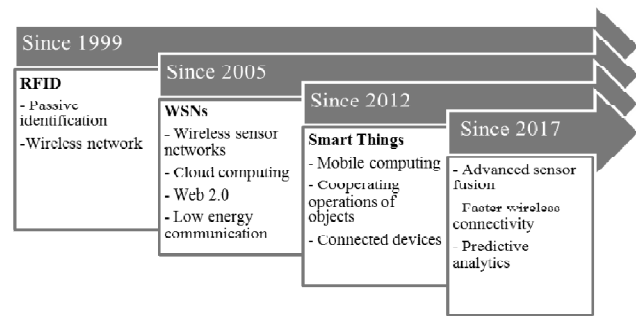


Figure 1: Evolution of IoT (Li *et al.*, 2015)

as their expectation, therefore, transformed customer behaviour while opening up endless opportunities for innovation, creativity and data-driven base in marketing. In which, there is a factor which play an increasingly important role in managing customer satisfaction and loyalty since the emergence and evolution of the IoT, that is personalization.

The following parts will discuss the concept and role of personalization as well as how the IoT facilitates and makes personalization a crucial competitive edge of every firms.

### 3. THE CONCEPT OF PERSONALIZATION

Personalization is not a new concept in marketing; in fact, the first personalization practice has been adopted to direct marketing letters since the 1870s (Ross, 1992). The term was first conceptualized by Peppers and Rogers

(1993) as an integral part of one-to-one marketing which helps resolve the information overload and the “one size fit all” issue. Due to the development of advanced technology, especially in communication, information processing and production, many aspects of marketing can be personalized that makes personalization have many different meanings ranging from customizing the products or services to tailoring visual layout and content of promotional messages as well as website interactions, to name a few examples. Consequently, the literature reveals no common conceptual framework of personalization, instead, personalization is defined differently based on what to personalization, who does personalization and to whom to personalize (Fan and Poole, 2006) as well as how to personalize and goals of personalization. Table 1 below shows these dimensions extracted from various definitions of personalization.

**Table 1**  
**Definitions of personalization (developed for this study)**

<i>Author</i>	<i>Definition</i>
Adomavicius and Tuzhilin (2006)	“Personalization tailors certain offerings (such as content, services, product recommendations, communications and e-commerce interactions, which is in fact a facet of comparison-shopping agents) by providers (such as e-commerce websites) to consumers (such as customers and visitors) based on knowledge about them, with certain goal(s) in minds”
Coner (2003)	“Personalization is performed by the company and is based on a match of categorized content to profiled users”
Desai (2016)	“Personalization is the process of providing customized information, presentation and structure of the website based on the need of the user”
Doug Riecken (2000)	“Personalization is about building customer loyalty by building a meaningful one-to-one relationship; by understanding the needs of each individual and helping satisfy a goal that efficiently and knowledgeably addresses each individual’s need in a given context”
Fan and Poole (2006)	“A process that changes the functionality, interface, information access and content or distinctiveness of a system to increase its personal relevance to an individual or a category of individual”
Hanson (2000)	“A specialized form of product differentiation, in which a solution is tailored for a specific individual”
Imhoff <i>et al.</i> (2001)	“Personalization is the ability of a company to recognize and treat its customers as individuals through personal messaging, targeted banners, special offers on bills, or other personal transactions”
Murthi and Sarkar (2003)	The point when a firm decides which marketing mix is most suitable for an individual customer based on previous collected customer data
Peppers <i>et al.</i> (1999)	“Customizing some feature of a product or service so that the customer enjoys more convenience, lower cost, or some other benefit”
Roberts (2003)	“The process of preparing an individualized communication for a specific person based on stated or implied preferences”
Wind and Rangaswamy (2001)	“Personalization can be initiated by the customer (e.g. customizing the look and contents of a web page) or by the firm (e.g. individualized offering, greeting customer by name etc.)”

Despite various definitions of personalization, the literature review reveals that personalization has become more technology-based and data-driven so that marketing mix activities and provider-customer interaction, especially e-commerce interaction are widely tailor-made to suit customers' needs. As a result, customers or customer groups are treated individually for their personalized purchasing experience.

Upon reviewing researches and definitions of personalization, it is found that the evolution of IoT has supported the changes in what to personalize, who does the personalization, personalize to whom, the execution of personalization as well as benefits and costs related to personalization. The following part will further discuss how the IoT has transformed the conceptual framework of personalization

#### 4. PERSONALIZATION IN THE IOT AGE

Due to the rapid growing number of connected devices in the world, the IoT has been moving offline objects and experiences online so that customers and suppliers increasingly interact with each other through "things" (i.e. laptops, tablets, smartphones) on virtual environment (i.e. website) rather than face-to-face communication. Accordingly, the focus of what to personalize has expanded from customizing some features of a product or service so that customers' needs or goals are efficiently satisfied (Peppers *et al.*, 1999; Hanson, 2000; Doug Riecken, 2000) to "personal messaging, targeted banner ads, special offers on bills, or other personal transactions" (Imhoff *et al.*, 2001) then website experience or e-commerce interactions in which information access, interface, presentation and website structured are customized distinctly according to users' personal needs (Adomavicius and Tuzhilin, 2005; Desai, 2016; Fan and Poole, 2006).

Obviously, personalization practices require marketers to obtain adequate knowledge about customers in advance. Without Internet and connected devices, marketers can only acquire customer data by explicitly asking them through dialogues or survey or recording their demographic factors and previous purchasing behaviour which have already happened. As a result, marketers can only personalize offerings or messages to

those who are current customers or used to interact with the brands. Upon the emergence of Internet, Web 2.0 and cloud computing, the execution of personalization has changed in which the process of personalization starts right after a totally new visitor drops by an e-commerce website for information searching and initiated either by customers (i.e. when they explicitly disclose their personal information or customize the look or contents of the webpage) or by the e-retailer by implicitly recording customers' activities on the webpage and individualizing offerings. Moreover, in the new age of IoT with smart things when not only laptops, tablets or smartphones but also normal offline objects such as motor vehicles, household appliances, wearable things can be connected to Internet and to each other, the new storming evolution in personalization is coming. In which, real-time data from not only touch points with the brand but also from other multiple touch points can be collected. Thereby, marketers can personalize message, offerings and experience to those who even have not interacted with the brand before. Big data collected from multiple touch points within a IoT will provide a distinct and comprehensive profile of an individual such as demographics, psychographics, purchasing behaviours, what they click, what they are viewing, how long they stay at a particular page, their devices and locations and so on.

In the age of IoT, when every object and device can be connected while more and more companies compete by obtaining big data and using predictive analytics to create personalized offerings, message and transaction, customer expectation may change accordingly. Specifically, since they get used to enjoying personalized experience, they may expect personalization in every products and services they are considering to buy. Moreover, since customer satisfaction is resulted from customers' comparison of what they expect and what they receive (Cronin *et al.*, 2000), personalization will become one of the crucial strategy to gain customer satisfaction. Thereby, it is not just whether the company can personalize but how right, deep and wide the personalization should be the competitive edge of the firm in the future. Based on in-depth knowledge about the massive number of potential customers to whom the brand has not contacted before, the company must segment the market and identify the most valuable and suitable target market as

well as tailor the marketing mix activities to personalize offerings and communication in a right, different and appealing way so as to attract these target customers. Overall, the role of personalization in the IoT age is extended in which personalization is a key factor in not only growing and maintaining relationship with current customers but also finding and winning new customers. Figure 2 features the framework of personalization in the IoT age which is modified from Vesanen (2007).

According to Coner (2003), Godin (1999), Murthi and Sarkar (2003), Pitta *et al.* (2004), Raab (2005), Vesanen and Raulas (2006) and Wind and Rangaswamy (2001), the execution of personalization is a process based on interaction between the customer and the marketer. However, the author argues that within a IoT, personalization is resulted from not only customer-marketer interaction but also customer-things, marketer-things and things-things interlinks. Moreover, personalized marketing output which is believed to include everything from 4Ps: promotion/communication, product/service, price or delivery (Vankalo, 2004) should be extended to website experience such as a website's appearance, structure, content, interactions, etc. as well as process (i.e. how the transaction will be made, payment method, how customers can involve in the customization of the products or services).

Obviously, customers benefit from better products, better services, more efficient communication and personal experience since the offerings and communication are personalized to match their specific preference (Coner, 2003; Godin, 1999; Hanson, 2000; Murthi and Sarkar, 2003; Peppers *et al.*, 1999; Pitta *et al.*, 2004; Roberts, 2003; Wind and Rangaswamy, 2001). On the other hand, personalization also comes with costs resulted from privacy risks, spam risks, time, and extra fees (Bardaki and Whitelock, 2004; Roman and Hernstein, 2004). However, when Internet of Things technologies are widely applied in industrials, retail, logistics and communication, costs and time to produce and deliver personalized products and services will gradually reduce while risks related to losing privacy and spam will increase. Overall, if privacy risks and spam risks can be resolved, value that customers receive upon the trade-off between

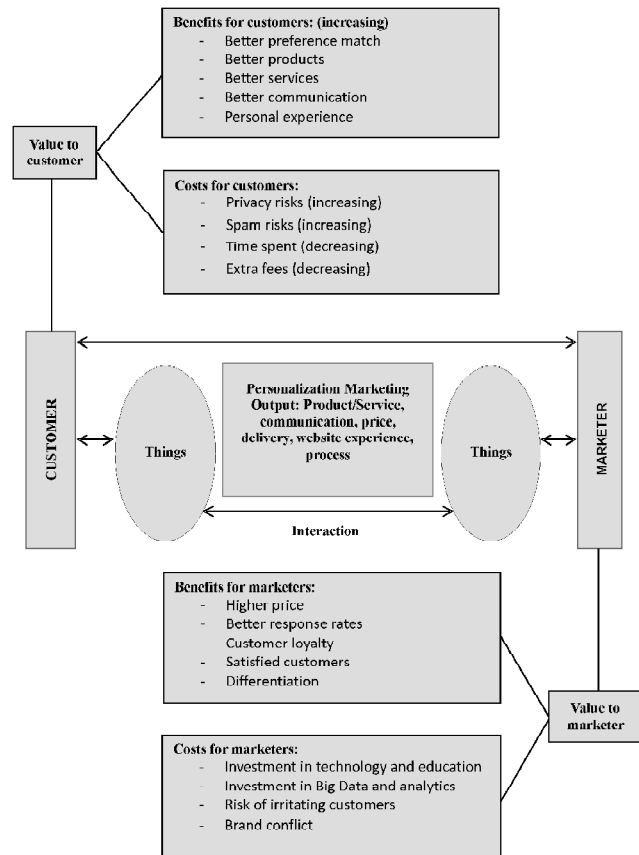


Figure 2: The framework of personalization in the IoT age (developed for this study)

benefits and costs resulted from personalization in the IoT age will increase. The attractiveness and importance of personalization, therefore, are enhanced upon the evolution of the IoT.

Regarding to value for marketers, the benefits and cost related to the adoption of personalization approach are considered. Benefits for the marketer include the ability to charge a higher price for the personalized offerings, better response rates, higher customer satisfaction and loyalty (Ansari and Mela, 2003; Hanson, 2000; Howard and Kerin, 2004; Peppers *et al.*, 1999; Rust *et al.*, 2000; Srinivasan *et al.*, 2002; Wind and Rangaswamy, 2001). Moreover, personalization presents a unique feature of products and services (Ball *et al.*, 2006) that forms competitive edges for the company. Since the IoT facilitates automate data collection and interpretation, Big data and predictive analytics resulted from the IoT will enable more efficient personalization practices. As a result,

the benefits of personalization to marketers in the IoT on short run will increase. However, in long run, the evolution of IoT may lead to wider adoption of Big Data with lower costs that makes the number of companies which can personalize communication and offerings higher. Thereby, although personalization still plays a key role in managing customer satisfaction and loyalty, the level of personalization required to achieve customer expectation, satisfaction and loyalty as well as encourage customer response may be higher. Moreover, as discussed above, the wide spread of IoT in industrials, retail and logistics will lower the costs of personalized products and services while many firms can access the Big Data and predictive analytics, marketers may no longer charge higher prices for personalized offerings. On the other hand, huge investments are required for technological procurement and installation, training employees, or buying big data and hiring data analytics agents while the risk of irritating customers is higher due to privacy invasion and spam (Jiang, 2004; Peltier *et al.*, 2003; Roman and Hernstein, 2004). Additionally, when products and services are personalized to those who have different and even opposite characteristics and behaviour, the brand image may be no longer consistent that leads to brand conflict, especially in the world of IoT where people are easily connected and compare what they have to each other. The value of personalization approach to marketers in the IoT, therefore, depends on their capacity and particular strategies in increasing benefits while reducing risks and costs related to personalization

Along with the evolution of the IoT, the role of personalization becomes more and more important. A recent global survey combined with in-depth interviews on 499 leading CMOs and senior marketers by the EIU has revealed that most CMOs agree on the ability to personalize customer experience through multiple touch points as a core marketing strategy and an essential tasks of marketing departments in order to create and strengthen brand values and customer loyalty from now to 2020. In addition, the Internet of Thing which is one of the three major technology-specific trends in the Fourth Industrial Revolution is the biggest driving force behind the growing importance and widely adoption of the personalization approach.

## 5. INTERNET OF THINGS AND OPPORTUNITIES FOR PERSONALIZATION PRACTICES IN VIETNAM

IoT has already emerged in Vietnam and being received increasing concerns from not only technicians, marketers and businessman but also the government. Developing IoT applications is believed a crucial strategy to improve enterprises' publicity and foster socioeconomic development. The following facts imply the base and potential development of IoT in Vietnam:

- According to the report of Vietnam Ministry of Information and Communication at the Symposium on Digital Citizenship and Safer Internet Day 2017, 53 per cent of the Vietnamese population is online. In addition, Vietnam has been implementing many projects to expand the Internet coverage to rural and remote areas so that the Internet penetration rate will increase faster in next few years (Viet Nam News, 2017). The number of smartphones users in Vietnam will account for around 30% of total population by the end of 2017 (Statista, 2017). The wide coverage of Internet and popular use of smartphones create the base for the evolution and application of IoT in the country
- The first IoT-based products have been either imported or created and used in Vietnam. Besides smartphones, smart watches, smart TV and ATM which are adopted from foreign countries, Vietnamese technicians can create their own IoT-based products such as Smart Home (i.e. a product of BKAV), Smart Streetlight system (i.e. a product of S3 company), V-tracking (i.e. Vehicle tracking via Internet provided by Viettel), etc. In which, Smart Home has been installed at thousands of households and apartments in Vietnam and believed to become a popular trend among Vietnamese citizens in next few years.
- Many IoT Labs has been built in Vietnam under either public and private projects ranging from small-sized and self-sourced labs to professional ones invested by major telecommunication

companies such as Hoa Lac IoT Lap founded by D'IT, Intel and Dell.

- Vietnamese government and local authorities has launched “Smart City” projects to encourage more ideas to applying IoT for more connections, better modern lives, higher living environment quality and sustainable development. The recent free Wifi coverage in big cities and travel points such as Hanoi, Ho Chi Minh, Can Tho, Bac Ninh, Ha Long, Hoi An Da Nang, Da Lat and Hai Phong represents a very first step to create a favourable environment for IoT adoption.

On one side, the emergence of IoT in the country indicates a major and inevitable trend in technological environment which are affecting directly customer behaviour, business operation, manufacturing, logistics and competition. In which, as discussed above, personalization will be the key marketing success factor which helps enterprises take opportunities resulted from the IoT technologies and create their own competitive advantages. On the other side, the wide coverage of Internet and the emerging IoT in Vietnam has enabled companies, especially those operating in telecommunications, banking, finance and ecommerce to generate substantial database about Vietnamese consumers. In fact, leading telecommunications companies such as Viettel, Mobiphone and VNPT have established specialized divisions to either use or sell their data. As a result, Vietnamese companies currently have great opportunities to implement personalization strategy in finding, winning, growing and retaining customers as well as increasing values provided for both their customers and themselves.

## **6. IMPLICATIONS FOR VIETNAMESE ENTERPRISES AND SUGGESTIONS TO VIETNAMESE GOVERNMENT**

The IoT has emerged in Vietnam, and it is going to change the marketing environment especially customers' expectations and competition. The IoT will bring more benefits than threats for marketers if they are in a position to take advantage of the IoT in advance rather than being forced to change due to intense competition. The IoT,

on one side, increases the role of personalization in marketing as a core strategy in finding, winning, growing and maintaining customers as well as building sustainable competitive advantages, on the other side; facilitates more effective and comprehensive personalization due to the increasing use of Big Data and predictive analytics. Personalization, therefore, should be practiced and widely adopted in marketing activities of Vietnamese enterprises. The development of IoT and the increasing role of personalization bring opportunities for both Vietnamese enterprises which use Big Data for personalization strategy and also those which make money from offering new products and services in the age of IoT.

### **6.1. Vietnamese enterprises which use Big Data for personalization strategy**

In order to successfully design and implement personalization strategies in the age of IoT, Vietnamese enterprises should complete three important yet difficult tasks which are collecting and analysing Big Data of both current and potential customers; using Big Data for personalization strategy; and overcoming problems involved in personalization and IoT.

#### ***Collecting and analysing Big Data***

Big Data can offer huge benefits to all Vietnamese enterprises of all sizes. Although the IoT adoption in Vietnam is still limited due to its complexity and high costs of technologies involved, it does not mean that Vietnamese enterprises cannot access to the benefits of IoT for their personality strategy since the Big Data has already been available for them to collect and exploit. In order to tap into Big Data and turn it into insights and value, businesses can select or combine two options which are outsourcing data collection and analytics and/or investing their own Big Data infrastructure.

Regarding the option of outsourcing, currently, there have been only few companies in Vietnam which officially sell data, namely Viettel, Mobiphone and VNPT while others do not collect customer data or consider customer data something private and secret, therefore, do not want to share or sell. Even if they are willing to sell data, each company may possess just a piece of “customer truth” based on the data set it has, and unfortunately, they may

not know each other to exchange and build the comprehensive one. Although Vietnamese enterprises can rely on market research agency to order what types of data they want, they must bear high costs in long run since market trends may change quickly while losing control over the truthfulness of data

Building own Big Data infrastructure is a long-term effective yet complicated solution in which a business needs to make investments on essential infrastructure elements including data collection, storage, analysis, and output or visualization. Specifically, data may come from both internal sources (i.e. sales records, customer database, social networking sites, feedback, email archives, etc.) and external ones (i.e. buying data from other companies). In order to source and read data, besides traditional tools such as survey or handwriting and typing records, depending on type of data to be collected, there are many advanced options for Vietnamese enterprises to adopt such as sensors, apps, CCTV video and beacons. Moreover, encouraging potential and current customers to disclose their information via forms on websites or tracking social media profiles are also effective data collection methods with low costs. If a business has little technical knowledge, it can cooperate with a data company to build and install the system while still managing and tracking the whole data collection process. Once data is gathered, it should be stored for later analysis. Nowadays, thanks to the development of Cloud Computing, businesses can store huger amount of data with lower costs and more flexibility than using regular hard disks or setting up data warehouse. Finally, so as to analysing and turning data into insights, business can look for some software offered by IBM, Oracle, Google, Cloudera, Amazon Web Services, Microsoft HDInsight. The advantage of building Big Data infrastructure is that businesses can have high control over the quality and value of Big Data. Though this option may be costly in short run, however, upon the rapid development of IoT and the emergence of new start-up firms in this field, the cost of setting up Big Data infrastructure will reduce in the near future.

#### ***Using Big Data for personalization strategy***

After acquiring Big Data, businesses can gain insights about who and where their targets customers are as well

as their purchasing behaviour, tastes or preferences. In order to incorporate this knowledge into marketing strategies and personalize customers' experience, Vietnamese enterprises should firstly understand the value of the customer orientation and follow this philosophy as their vital business culture in every daily marketing activity across all customer contact points. In doing so, all employees should be trained to be customer-oriented. Moreover, each marketing decision should be started with the questions such as "Who is the customer", "How customers will perceive it and whether they perceive differently"; "How the customers like to be treated or communicated", "Is it beneficial and suitable for different customer groups"; "How different customers may react to it", etc. While answering such questions, businesses must use information from Big Data and that is the effective way for them to include Big Data in designing personalization strategy. Furthermore, Vietnamese enterprises should update and adopt new technology to personalize their offerings and communication to customers as much as they can so that each customer will be treat personally in the way they want at lower costs.

#### ***Overcoming problems involving in personalization and the IoT***

As discussed above, when data sets are shared and personalization is adopted in marketing, customers may face privacy and spam risks while marketers may face the risks of irritating customers and brand conflict. In order to reduce the privacy and spam risks, every enterprise should firstly understand the value of data and consider it as a "commodity" which can be traded or exchanged for profits or benefits. Specifically, since such data is provided by the customers either implicitly or explicitly, the customers, as the sellers, should be asked to decide whether they are willing to provide it, to whom the data will be transferred and for what purposes. Besides, customers should have some benefits in data exchange. Upon the customers' approval, each company which owns the data can resell it to each other while the customers are well-informed and prepared for what may happen since they have already sold their information. Moreover, enterprises should allow customers to have an option to "opt-out" whenever they do not want to connect with them anymore as a way to respect to customers. Finally,



the brand conflict resulted from personalization practices can be resolved by well-defined target customer selection and positioning before personalization strategy is tailor-made.

### **Vietnamese enterprises which make money from offering new products and services in the age of IoT**

The increasing role of personalization in the age of IoT also implies many opportunities for Vietnamese enterprises, especially start-up firms in offering new ranges of products and services which are highly personalized, therefore, would be extremely competitive in the market as well as supporting services which help other firms in collecting, analysing and using Big Data for their personalization strategy. Specifically, despite the benefits of personalization in marketing, many Vietnamese firms may find difficult to set up and manage their own Big Data infrastructure due to limitations in financial budget or human resources. As a result, in the coming time, demand on training, advising, designing and doing marketing research, collecting data from internal and external sources, middleman in data exchanging, developing apps, data storage, data analytics and data presentation, etc. will be very high. These are valuable sources to generate new business ideas.

### **Suggestions to Vietnamese government**

Similarly to enterprises, Vietnamese government can also encourage governmental offices to gather information from citizens for personalizing public services as a way to enhance citizens' satisfaction. Moreover, when the "Smart city" projects come into life, citizens' data can be generated and collected from multiple contact points that will then support Vietnamese government itself and may be shared to other Vietnamese enterprises in personalizing products, services and communication.

In the age of IoT where the value of data is acknowledged, "data" will become a sensitive commodity which may benefit the users while creating inconveniences and risks to the owners. So as to protect the rights of the customers and data owners while encouraging the pass by new laws and regulations regulating the disclosure, exchange and usage of personal data in business context. Moreover, the government should make and implement

policies to encourage the formation of data exchange market where "data sellers" and "data buyers" can meet up and exchange officially and legally to build more comprehensive and effective Big Data serving personalization strategies.

### **REFERENCE**

- Adomavicius, D. & Tuzhilin, A. (2006). Personalization technologies: A process-oriented perspective. *Wirtschaftsinformatik*, 48 (6), 449-450.
- Ansari, A. & Mela, C. (2003). E-customization. *Journal of Marketing Research*, 40, 131-145.
- Anthem Marketing Solutions (2016). *The Internet of Things: Background and Marketing Impact*. Anthem Marketing Solutions.
- Ashton, K. (2009). That 'internet of things' thing. *RFID Journal*, 22 (7), 97-114.
- Ball, D.; Coelho, P.S. & Vilares, M.F. (2006). Service personalization and loyalty. *Journal of Services Marketing*, 20 (6), 391-403.
- Bardaki, A. & Whitelock, J. (2004). "How ready are customers for mass customisation? An exploratory investigation", *European Journal of Marketing*, 38 (11/12), 1396-417.
- Coner, A. (2003). Personalization and customization in financial portals. *Journal of American Academy of Business*, 2 (2), 498-504.
- Densai, D. (2016). A study of Personalization Effect on Users' Satisfaction with E-commerce websites. *Journal of Management & Research*, 6 (2), 51-62.
- Doug Riecken (2000). Personalized views of personalization. *Communications of the ACM*, 43(8), 26-28.
- du Pre Gauntt, J. & Stahl, G. (2016). *The path to 2020: Marketers seize the customer experience*. The Economist Intelligence Unit.
- Fan, H. and Poole, M.S. (2006). What is personalization? Perspectives on the Design and Implementation of Personalization in Information Systems. *Journal of Organizational Computing*, 16 (3/4), 179-202.
- Fielding, R. T., & Taylor, R. N. (2002). Principled design of the modern web architecture. *ACM Transactions Internet Technology*, 2 (2), 115-150.
- Godin, S. (1999). *Permission Marketing*. New York: Simon & Schuster.

- Guinard, D., Trifa, V., Pham, T., & Liechti, O. (2009). Towards physical mash ups in the web of things. *Proceeding IEEE Sixth International Conference on Networked Sensing Systems (INSS 09)*, Pittsburgh, PA , 196 –199.
- Greene, J. (2015). TIM Lecture Series: The Internet of Everything: Fridgebots, Smart Sneakers, and Connected Cars. *Technology Innovation Management Review*, 5 (5), 47-49.
- Hanson, W. (2000). South Western, Cincinnati, OH: *Principals of Internet Marketing*.
- Howard, D. & Kerin, R. (2004). The effects of personalized product recommendations on advertisement response rates: the try this. It works! Technique. *Journal of Consumer Psychology*, 14 (3), 271-80.
- IERC (2013). *Coordinating and building a broadly based consensus on the ways to realise the internet of things in Europe*, [assessed 2017 May 21], available from [http://www.internet-of-things-research.eu/pdf/Poster\\_IERC\\_A0\\_V01.pdf](http://www.internet-of-things-research.eu/pdf/Poster_IERC_A0_V01.pdf)
- Imhoff, C., Loftis, L. & Geiger, J. (2001). *Building the Customer-Centric Enterprise, DataWarehousing Techniques for Supporting Customer Relationship Management*. New York: John Wiley & Sons.
- International Telecommunication Union (2012). Overview of the Internet of things. *Series Y: Global Information infrastructure, Internet Protocol aspects and next-generation networks*, Y.2026
- Jiang, P. (2004). The role of brand name in customisation decisions: a search vs. experience perspective. *Journal of Product and Brand Management* , 13 (2), 73-83.
- Jiang, L., Xu, L., Cai, H., Jiang, Z., Bu, F., & Xu, B. (2014). An IoT oriented data storage framework in cloud computing platform. *IEEE Transactions on Industrial Informatics*, 10 (2), 1443 – 1451.
- Kirtsis, D. (2011). Closed-loop PLM for intelligent products in the era of the internet of thing. *Computer- Aided Design*, 43 (5), 479 – 501.
- Li, S., Xu, L., & Wang, X. (2013). Compressed sensing signal and data acquisition in wireless sensor networks and internet of things. *IEEE Transactions on Industrial Informatics*, 9 (4), 2177 –2186.
- Li, S.; Xu, L.D. & Zhao, S. (2015). The internet of things: a survey. *Information Systems Frontiers*, 17, 243-259.
- Li, Y.; Hou, M.; Liu, H. & Liu, Y. (2012). Towards a theoretical framework of strategic decision, supporting capability and information sharing under the context of Internet of Things. *Information Technology and Management* , 13 (4), 205–216.
- Murthi, B. & Sarkar, S. (2003). The role of the management sciences in research on personalization”, *Management Science*, 49 (10), 1344-1362.
- Peppers, D. & Rogers, M. (1993). *The One to One Future: Building Relationships One Customer at a Time*. New York: Currency/ Doubleday.
- Peppers, D., Rogers, M. and Dorf, B. (1999). *The One to One Fieldbook: The Complete Toolkit For Implementing a 1 to 1 Marketing Program*. New York: Double Day.
- Peltier, J., Schibrowsky, J. & Schultz, D. (2003). Interactive integrated marketing communication: combining the power of IMC, the new media and database marketing. *International Journal of Advertising* , 22 (1), 93-115.
- Pitta, D., Franzak, F. & Little, M. (2004). Maintaining positive returns in the value and supply chain: applying tomorrow's marketing skills. *Journal of Consumer Marketing*, 21 (7), 510-519.
- Raab, D. (2005). Advanced personalization. *DM Review*, 15 (4), 55-57.
- Ren, L.; Zhang, L.; Tao, F.; Zhang, X.; Luo, Y., & Zhang, Y. (2012). A methodology towards virtualization based high performance simulation platform supporting multidisciplinary design of complex products. *Enterprise Information Systems*, 6 (3), 267–290.
- Roberts, M. (2003). *Internet Marketing: Integrating Online and Offline Strategies*. Boston: McGraw-Hill.
- Roman, E. & Hearnstein, S. (2004). *Opt-in Marketing*. New York: McGraw-Hill.
- Ross, N. (1992). *A history of direct marketing*. New York: Direct Marketing Association.
- Rust, R., Zeithaml, V. and Lemon, K. (2000). *Driving Customer Equity: How Customer Lifetime Value Is Reshaping Corporate Strategy*. New York: The Free Press.
- Srinivasan, S., Anderson, R. and Ponnayolu, K. (2002). Customer loyalty in e-commerce: an exploration of its antecedents and consequences. *Journal of Retailing*, 78 (1), 41-50.
- Statista (2017). *Number of smartphone users in Vietnam from 2015 to 2021 (in millions)*, [assessed 2017 May 21], available from <https://www.statista.com/statistics/467739/forecast-of-smartphone-users-in-vietnam/>
- Tao, F., Zuo, Y., Xu, L., & Zhang, L. (2014). IoT based intelligent perception and access of manufacturing resource towards

- cloud manufacturing. *IEEE Transactions on Industrial Informatics*, 10 (2), 1547 – 1557.
- Vankalo, M. (2004). *Internet-Enabled Techniques for Personalizing the Marketing Program*. Swedish School of Economics and Business Administration, Helsinki.
- Vesanen, J. & Raulas, M. (2006). Building bridges for personalization – a process model for marketing. *Journal of Interactive Marketing*, 20 (1), 1-16.
- Vesanen, J. (2007). What is personalization? A conceptual framework. *European Journal of Marketing*, 41 (5/6), 409-418.
- Viet Nam News (2017). Viet Nam strives to up internet oversight, [assessed 2017 May 21], available from: <http://vietnamnews.vn/economy/351694/viet-nam-strives-to-up-internet-oversight.html#E3a76PmYYhtK27E7.99>,
- Wang, C., Bi, Z., & Xu, L. (2014). IoT and cloud computing in automation of assembly modeling systems. *IEEE Transactions on Industrial Informatics*, 10 (2), 1426 – 1434.
- Wind, J. and Rangaswamy, A. (2001). Customerization: the next revolution in mass customization. *Journal of Interactive Marketing*, 15 (1), 13-33.