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Yang Lei

Yiying Zhang

Waiman Cheung

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Cultivating Service Diversification: A Cross-level Study

(Work in Progress)

Yang Lei*, The Chinese University of Hong Kong, China, yanglei@baf.cuhk.edu.hk

Yiying Zhang, The Chinese University of Hong Kong, China, zhangyiying@baf.cuhk.edu.hk

Waiman Cheung, The Chinese University of Hong Kong, China, wcheung@cuhk.edu.hk

ABSTRACT

Positive effects of firms' service diversification on competitive advantages have been documented. However, how to achieve service diversification remains unclear. Although studies point out information technology (IT) can enhance service diversification, the effects of specific ITs need further investigation. This study proposes a conceptual model to study the effects of four specific ITs usage on service diversification from resource-based view. Moreover, we investigate the moderating effect of macro innovation environment. Firm-level data were collected from 690 logistics firms in 23 cities in China. Our results show that all four ITs contribute to service diversification. Macro innovation environment negatively moderates the relationship between emerging technologies and service diversification.

Keywords: service diversification, management information systems, internet-of-things, logistics information platform, big data, macro innovation environment.

*Corresponding author

INTRODUCTION

Firm business diversification, in terms of entering into a related or unrelated business, is considered to be an important role for firms' long-term benefits (Hitt et al., 1997, Narasimhan and Kim, 2002) which may bring competitive advantages, where the "business" means either product or service. Specifically, as service can be regarded as special products, following the definition of product service (Wan and Hoskisson, 2003) the service diversification is defined as a firm's diversification into more than one service market. Recently, the benefits of service diversification on firm performance have drawn scholars' attention (Giachetti, 2012, Nath et al., 2010). They argue that by enlarging their service portfolio, firms can more efficiently use of their underutilized resources and capabilities, and thereby benefit from scope economics (Nayyar, 1993). Moreover, expanding the total package of services offered helps firms attract new clients or more fully serve existing clients by offering bundles of services (Hitt et al., 2006). For example, Alibaba start Ant financial to provide financial service in 2014 beyond its e-commerce business. Based on the large volume of customers on taobao.com, its financial service succeeds in producing firm performance. Such positive service diversification-performance linkage is confirmed by prior studies (Kor and Leblebici, 2005). Through the benefits of service diversification have been recognized, how firms can successfully achieve service diversification remains unclear to both academia and practitioners.

Prior studies suggest that information technology (IT) can enhance firm diversification from resource-based view (RBV), which describes firms' resources are valuable, rare, imperfect imitable, and non-substitutable (VRIN), can help firms to achieve competitive advantage (Barney, 1991). Adapting RBV into IS discipline, IT has been regarded as such kinds of resources, which may lead to firm diversification. On the one hand, IT may help firms to reduce coordination and control cost, thus to increase the scope of their business activities (Gurbaxani and Whang, 1991, Liu and Ravichandran, 2008). For example, management information systems (MIS), such as enterprise resource planning systems, can help firm integrate internal resources, and further enables firms to replicate and propagate administrative innovations across different service market (Chari et al., 2008). On the other hand, IT, such as big data and social media technology, can help firms keep in touch with their existing customers by extracting and analyzing valuable customer data (Lam et al., 2016). Firms can learn from their customers, and further fulfill their customers need with diversified service. IS scholars also suggested in order to achieve higher level of firm diversification, firms need more investment in information technology, which strengthening the important role of IT in helping firm diversification (Dewan et al., 1998, Liu and Ravichandran, 2008, Ray et al., 2013).

However, there are still some research gaps remained when linking IT with service diversification. First, prior papers suggest that the benefits of different ITs are different (Hendricks et al., 2007). For example, as the knowledge of mature technologies, such as MIS and platforms, has been well documented and explored, it is easier for firms to make use of and benefits from such ITs. However, for emerging technologies, such as big data as well as artifact intelligence, their knowledge is not well documented. Firms may enjoy the benefits of adopting emerging technologies as early movers (Huda et al., 2018), while they may also face challenges because of the limitation knowledge of such technologies (Jin and Li, 2012). Thus, the effects of different ITs are different for firms to achieve competitive advantages. In diversification researches, most researchers only consider the general IT

investment. However how specific IT, mature technologies and emerging technologies respectively, influences service diversification remains unknown. Accordingly, this study aims to further this line in the literature.

Second, prior studies mainly focus on the effects of firms' internal resources, such as IT, as well as environment within focal firms on diversification. However, several papers suggest that macro (country-level) environment plays an important role in firm diversification (Marano et al., 2016, Wan and Hoskisson, 2003). Moreover, even within a same country, different macro environment in each city is also different affect their local firms differently (Ma et al., 2013). The macro environment, such as city innovation environment, may enhance firm service diversification by providing a more creative environment, developing more service. In service diversification literature, the effects of macro level factors, such as city innovation environment, have not yet been fully investigated. Therefore, it is necessary to investigate the effect of macro environment, such as city innovation environment, on firm service diversification.

We study the problem in logistic industry, as more and more firms rely on third party logistics service (Alkhatib et al., 2015, Jharkharia and Shankar, 2007). The service diversification is important for both service providers to compete and their clients firms to enjoy. We focus on four important technologies of logistics firms: two mature technologies, management information systems (MIS) and logistics information platform (LIP), as well as two emerging technologies, internet-of-thing (IoT) and big data usage respectively. In this paper, we propose a cross-level conceptual research model that investigates the influence of four specific ITs usage on firms service diversification based on resource-based view. Moreover, one macro environment factor - city innovation environment is also included. The cross-level model is tested using data from 690 logistics firms within 23 major cities in China. Our results show that all four kinds of IT usage are positively related with service diversification, while mature technologies, MIS and LIP, contribute more. Furthermore, the city innovation environment positively affects firms' service diversification. The interactions between city innovation environment and two emerging technologies, IoT and big data respectively, are negative and significant. This study contributes to diversification literatures by confirming the importance of IT on service diversification. First, the study fills the research gap and limited knowledge of the effects of specific IT on service diversification. Although we use data from logistics firms, we believe that the results can be generalized to other industries. Second, this study contributes to RBV literature by considering macro environment, city innovation environment. In the study, we provides a more complete picture of how this external environment influence firms competitive advantages, rather than only looking into internal resources. We explain the results by the rareness advantages of emerging technologies.

MODEL

Based on resource-based view, we propose a conceptual model to investigate the effects of specific ITs and service diversification in logistics firms, as shown in Figure 1. This cross-level model includes firm and city levels. At the firm level, mature technologies, MIS and LIP, and emerging technologies, IoT and big data, are hypothesized to influence firm service diversification. At the city level, city innovation environment is considered as a moderator, which may influence the relationship between specific IT and service diversification. More detailed discussion of each hypothesis is as follows.

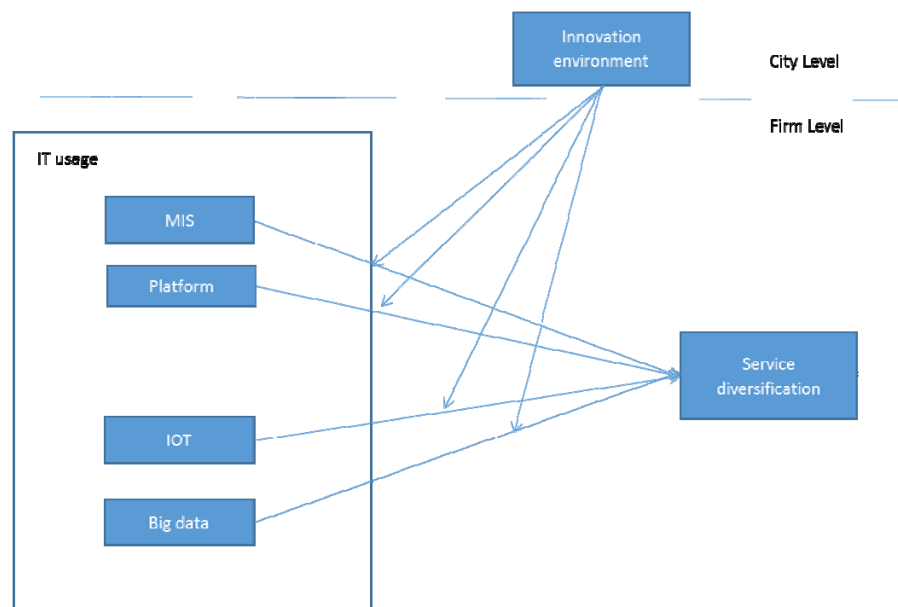


Figure 1: Research Model

Management Information System

Management information system (MIS) serves as an important technology investment for managers, which contains such as enterprise resource planning systems (ERP), warehouse management systems (WMS), supply chain systems (SCM) and so on. As one of the traditional information system, it has been widely used in many industries for many years. With abundant usage history, the usage is widely spread and the instructions are well documented. Therefore, we consider MIS as a typical mature technology. The management information technology enables firms efficiently integrating and processing a large scale of internal information which improve firms' internal process capability (Rai et al., 2006). For example, the widely used enterprise resource planning systems (ERP) facilitate integrated and real-time internal resources planning and customer response (Bradford and Florin, 2003). In the field supply chain management, warehouse management systems (WMS) automatically and constantly save the data about the products which in turn increase firms' operation efficiency (Chiang et al., 2011). Such IT-enabled information management capability is found to be critically related with firms' ability to integrate internal as well as external resources (Mithas et al., 2011). Service diversification creates internal coordination requirements, such as the sharing of related resources across multiple lines of business or organizations (Dewan et al., 1998). With the facilitation of MIS, firms could effectively coordinate their internal resources and achieve service diversification. Accordingly, we hypothesize that more usage of management information systems leads to higher firm service diversification.

H1. The usage of MIS technologies is positively related with firm service diversification.

Logistics Information Platform

Platform technology is considered as one of the critical resources for the corporates (Sedera et al., 2016, Yoo et al., 2012). With the facilitation of technologies, more and more business are moving their business into platforms (Alegre et al., 2016). Therefore, platform technology is also considered as a mature technology as it is familiar to the society nowadays. IS researchers have pointed out the emergence of platform technology impacts organizational strategies, structures and process (Sambamurthy and Zmud, 2000). The platform technology affects firms' performance in the following ways. First of all, the ability of platform technology connecting with other system facilitate firms transfer data between its suppliers (Rai and Tang, 2010). Such connection enables firms sharing and processing external resources as well as varies kind of information in time. Second, the digital platform of processes and knowledge can change information-based value propositions, forge value-chain collaborations with partners that competitors cannot easily duplicate, and rapidly exploit emerging and untapped market niches (Sambamurthy et al., 2003). Therefore, platform technology helps firms adapt the environment changes more quickly. Third, the ease development and deployment of the digital platform enables firms' argument for the existing business or provision of new services (Armbrust et al., 2010). Further, the platform technology provides easy usage experience for customers and suppliers which enhance the product adoption and diffusion (Nylén and Holmström, 2015). As a result, higher usage of platform technology increases the probability of diversification success. In logistics industry, logistics information platform provides various functions for firms to integrate cross-functional applications to create connectivity across a range of complementary applications and facilitate the exchange of complementary information between firms (Rai et al., 2006). For example, the analysis function enabled by logistics information platform provides logistics firms with the ability to predict the market need, and further develop various services to fulfill. Based on the above reasons, we hypothesize the more usage of logistic information platform (LIP) increase the level of service diversification.

H2. The usage of LIP functions is positively related with firm service diversification.

Internet of Things

Atzori et al. (2010) defined Internet of Things (IoT) from three perspectives which are internet-oriented (middleware), things-oriented (sensors) and semantic-oriented (knowledge). IoT refers to the technology for integration of the physical world information into computer-based system by embedded electronics. With a short usage history, it is regarded as an emerging technology. With the development of related technologies such as Radio Frequency Identification (RFID), Wi-Fi and sensor network technologies, IoT technologies are used in logistics industry recently (Jedermann et al., 2006, Leung et al., 2014, Mok, 2010), which make information collection and communication invisibly embedded in the environment. IoT technologies are supposed to benefit the process to firm diversification. Because firms need to accommodate more complex environment as they are operating in multiple business markets. The IoT helps firm collect data in the environment by embedded sensors. Moreover, with extra information available, firms are more likely to provide more service based on the data. For example, with the facilitation of the IoT, firms are able to extract data while customer are using product. As a result, the IoT not only helps firms improve their products but also enables them provide more new services to fulfill customers' needs (Bartolomeo, 2014). Thanks to the IoT, different market information could be effectively collected and integrated, simultaneously. Therefore, we hypothesize that IoT technologies positively affect firm service diversification.

H3. The usage of IoT technology is positively related with firm service diversification.

Big Data

Big data refers to firms' management, processing and analyzing a large scale of data sets (Wamba et al., 2015). Big data, which considered as an emerging technology becomes popular in recent years. Big data enhances firms data-driven decision making capabilities (Provost and Fawcett, 2013). Data-driven decision process makes firms proactive and forward-looking in the market, decrease firms' customer acquisition cost, and enhance firms' revenue (Liu, 2014). Deployment of customer data analytics enables firms gain meaningful customer insights, engage with customers on an appropriate level, and ultimately benefit financially (Germann et al., 2014). With the high capability of data processing, big data allows firms extracting business intelligence from petabyte-scale data in nearly real time (Tambe, 2014). Specifically, in supply chain field, predictive ability based on big data is critical to reducing cost, achieving efficiency, responding to the market timely, improving power in relationship with suppliers, as well as enhancing sales and operations planning capabilities (Schoenherr and Speier-Pero, 2015). As a result, big data and predictive analytics improves business value and firm performance (Gunasekaran et al., 2017). In summary, big data helps firms find the promising new market to enter while decreasing the new market entrance cost. Accordingly, we hypothesize that the usage of big data technologies benefits firm service diversification.

H4. The usage of big data is positively related with firm service diversification.

City Innovation Environment

Macro environment has been found to positively influence firm diversification (Wan and Hoskisson, 2003). Besides the direct effect, macro environment is also claimed to affect the relationship between IT and firm competitive advantages (Melville et al., 2004). Thus, we posit that macro environment outside firms may also influence the relationship between IT and service diversification. However, the effects of macro innovation environment may be different for specific IT. Considering the hype cycle of technologies, we divide information technologies into either mature technologies or emerging technologies (Daim et al., 2006). For example, management information systems and platform technologies are mature technologies; on the other hand, IoT technologies and big data are emerging technologies.

For mature technologies, referring to those widely adopted technologies (Agarwal and Audretsch, 2001), the knowledge of their initial faults and inherent problems, as well as how to use successfully, has been well documented. Firms are easier to access to such kinds of knowledge, and can benefits from such technologies. Moreover, in a high innovative environment, firms are provided with more resources and support, which may further develop competitive advantages although it is difficult for mature technologies, compared to firms in a lowly innovative environment.

For emerging technologies, referring to novel technologies which have radical novelty, relatively fast growth, coherence, prominent impact and uncertainty and ambiguity characteristics (Rotolo et al., 2015), the situation may be different from mature technologies. Considering these characteristics, rareness is expected to be a critical advantage for the emerging technologies. In a better innovation environment, firms are provided with more knowledge and support with emerging technologies. Through, with the knowledge, firms in a better innovation environment can adopt and use emerging technologies with less uncertainty (Alvesson 1993). This may not lead to more competitive advantages for firms in a better innovation environment as others can also enjoy the knowledge to adopt emerging technologies. In a lowly innovative environment, although knowledge is less documented about emerging technologies, firms adopting and using emerging technologies are often early birds with less competitors. The advantages of first movers have been explored a lot by prior studies (Lieberman and Montgomery, 1988, VanderWerf and Mahon, 1997). Thus, the rareness of emerging technologies is more significant for a less innovation environment than a more innovation environment. We posit that emerging technologies may benefits firms more in a less innovation environment to their competitive advantages, such as service diversification. Based on the above discussion, the hypotheses are given.

H5a. Innovation environment positively moderate the relationship between mature ITs and service diversification.

H5b. Innovation environment negatively moderate the relationship between emerging ITs and service diversification.

METHODOLOGY

A survey company helped to collect the data. First, we selected 23 major cities in China, comprising 4 independent municipalities and 19 provincial capitals. An online survey was designed, and the link was send to firms' CEO, CIO, or high-experienced managers of each firm. They were asked to fill the questionnaire. The data on demographic information, their firm's IT usage, and provided service were collected. The firm implemented strict survey quality control during the data collection process. After they finished the questionnaire, we make follow-up phone-calls to make sure that each respondent seriously took the survey. Overall, 690 samples without any missing values were finally collected, with 30 samples in each city.

Given the multilevel natures of our research model (i.e., firms nested within cities), we adopt the multilevel model to analyze the data. Multilevel model is used to deal with the non-independence of observations obtained from lower-level units nested within higher-level units (Bliese and Hanges, 2004, Huang et al., 2016, Kozlowski and Klein, 2000). In this study, aside from the

relationships at the firm level, we test the effect of upper-level (city level) moderator: the cross-level effect of city innovation environment on the within-city effect of firms IT usage on firms' service diversification.

Before multilevel analysis, we firstly examine the degree of non-independence among the lower-level (member level) observations. Following Bliese (2000), we use HLM 7 to examine whether the data justified aggregation of firms service diversification. We use the null model without any predictors to estimate the between-group variance to determine whether the hierarchical linear model is applicable: with firms' service diversification as the outcome. The variance is substantial and statistically significant (0.474, $p < 0.001$). The intra-class correlation coefficient is 0.03. This suggests there are differences between different groups: the firms nested within each city were not independent. Given these results, the multilevel model is applicable to the hypotheses testing in our study. Following Bliese (2000), we conducted multilevel analyses using random coefficient modeling (which is also referred to as hierarchical linear modeling) (Gavin and Hofmann, 2002) in the Nonlinear and Linear Mixed Effects program for HLM 7 (Raudenbush et al., 2011). We group-mean center firms different IT usage and service diversification, and then added their group-mean back to the Level 2 intercept-only model as covariates for the cross-level interactions. The Level 2 moderator, city innovation environment, was grand-mean centered to reduce multicollinearity.

RESULTS

Details of our analysis results and managerial implications will be discussed during the conference.

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