

The effect of organizational and environmental antecedents on e-commerce adopting mode choice: an empirical study in Taiwan

INTRODUCTION

Facing the threat of global market and vastly changing in information technology, e-commerce has boomed as a pervasive business phenomenon. It happens both in developing and developed countries especially in Asia-Pacific region. The investigation from eMarketer (2014) indicates that B2C e-commerce sales worldwide recorded annual growth rate of 13.1% which up to 1.922 trillion US dollars in 2016, then Asia-Pacific grew fast and occupied most shares about 35.1% among the investigated regions. In Taiwan, there are 0.61 billion revenues of B2C e-commerce with a growth rate about 15.89% and it may attain 12.52 billion in 2017 (Institute for information industry, 2015). This trend of online shopping brings great shock of firms whose business never touch the virtual market, pushes them to develop and adopt e-commerce. Although, e-commerce seems to offer an attractive chance for firm growth, for instance, as Cao (2014) states that companies who adopt e-commerce have broader product categories and unlimited opening hours to sell, trace and gather accurate information of consumer behaviors easily, extend the customer base, enjoy cost advantage due to sharing in inventory holding and so on (Zhang, 2009), firms are still proceeding guardedly to decide whether they should adopt e-commerce inside. The challenge is that e-commerce adopting means to develop and introduce a new virtual business model into firm, it costs large amount of resources and investments and may corrode the efficiency of original operation (Lu, Tang & Xing, 2009; Ofek, Katona & Sarvar, 2011). Thus, it is a tough decision for firms to consider whether should concentrate on original operation or extend the business into virtual market.

E-commerce adoption is a popular topic to explain how firms extend the business into virtual market and previous scholars have discussed several related issues such as the relationship among IT investment, IT outsourcing and firm performance (Bharadwaj, Bharadwaj & Konsynski, 1999; Tam, 1998), the influence of internal and external environmental factors on e-commerce adoption (Lee, Hwang & Kim, 2007; Melville, Kraemer & Gurbaxani, 2004; Sila, 2013, Wareham, Zheng & Straub, 2005) and the effectiveness under different institutional environment (Zhu & Thatcher, 2010). While e-commerce adoption (EC adoption) on the whole has obtained much attention in academia, a crucial question is overlooked and remains unanswered: which EC adopting mode should a firm use while stepping into the virtual market, which is in turn shaped primarily by various organizational and environmental factors. In order to fill this void in the existing literatures, this paper is aimed to focus on the impact of these organizational and environmental factors on different EC adopting modes instead of the intention and willingness of adopting e-commerce. We believe that as long as the real effects on different EC adopting mode are clear, this scientific evidence can support firms which are going to entering virtual market decision-making.

Besides, when firms determine to adopt e-commerce, another operational issue has to be concerned

which is how to exchange, reallocate and manage the resources, value chain activities and routines from different channels. Previous studies indicate that when virtual channel and physical channel possess favorable cooperation and complementation, firms can obtain several benefits such as subsidizing cost, providing value-add service to customers, increasing customer trust and expanding market efficiently (Steinfield, Bouwman & Adelaar, 2002; To & Ngai, 2006; Chen, Chan & Cheng, 2011; Lucia-Palacios, Verhoef, Kannan & Inman, 2015). However, some studies hold opposite opinions. They argue that if firms cannot resolve the conflicts between different channels, it brings negative influence on the performance (Lu et al., 2009; Ofek et al., 2011). Although scholars have done several researches to clarify the issue, they still have not expressed a distinct and superior mechanism to manage and coordinate both virtual and physical channels. Therefore, the study attempts to reply the following three research questions:

- 1) What are the primary organizational and environmental components for firms required for e-commerce adoption? And
- 2) To what extent do those organizational and environmental factors influence different EC adopting modes choice? And
- 3) How to integrate virtual operations (e-business) with real operations (bricks-and-mortar business)?

Accordingly, this study assesses the effect of two groups components on EC adopting mode choice. We first identify the organizational (internal) factors which may restrain EC adoption by conducting preliminary interviews and widespread literatures and focus on three environmental (external) factors based on institutional theory. We then proceed to test our research hypotheses using Taiwanese questionnaire data collection. By utilizing multinomial logistic regression analysis, the results demonstrate the degrees of association between each influential factor and EC adopting modes. The findings provide scholars and strategy-makers systematic insights into the role of organizational (internal) and environmental (external) factors in EC adopting mode decision-making.

In summary, this study has theoretical and practical implications. Theoretically, it extends the extent the research of EC adopting by studying EC adopting mode choice. Previous research has noted the positive influence of influential factors on the intention and willingness of EC adopting (Lee et al., 2007; Melville et al., 2004; Sila, 2013, Wareham et al., 2005), but has not examined how organizational and environmental antecedents affect the choice of EC adopting mode firms employ while stepping into the virtual market. Our research extends the previous literature and establishes a new link between influential factors and the choice of EC adopting mode. Besides, by clarify the issues how to integrate virtual operations with real operations in a firm, this paper provides a comprehensive conceptual framework about cross-channel integration process. Practically, the results of this study can support and help firms to make a clear and accuracy EC adopting mode decision before entering virtual market. Meanwhile, firms can understand how operate different channels smoothly so that brings more synergies and less conflicts.

The subsequent sections are organized as follows. Section 2 discusses the research background which including the EC adopting mode and their benefits and drawbacks for firms. Section 3 reviews relevant studies, in alignment with the research model and hypotheses constructed in this study. Section 4 demonstrates the methodology on how this research was designed and pursued. Section 5 presents statistical analysis results based on the responsive questionnaires. Research findings and implications are discussed in the last section.

CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

E-commerce and the adopting mode

E-commerce has become a mainstream for firms to run their businesses in 21st century, therefore the issue which is called e-commerce adoption (EC adoption) attracts both academic and practical attentions for recent two decades (Bharadwaj et al., 1999; Cui & Pan, 2015; Lee et al., 2007; Melville et al., 2004; Sila, 2013; Zhu & Thatcher, 2010). In the lens of EC adoption, scholars had deliberated a series of influential antecedents about the intention of EC adoption (Al-Qirim, 2006; Kim, Song & Koo, 2008), the extent of EC adoption (Molla & Licker, 2005) and the technologies of EC adoption (Kurnia, Karnali & Rahim, 2015). Although previous literature reviews have provided insights into EC adopting, there are still some unsolved mystery boxes waited to open especially the adopting mode of e-commerce. In this paper, we defined EC adopting as that allow firms to employ Internet-enabled technologies sell products to their customers (Alsaad, Mohamad, & Ismail, 2017).

According to practical observations, firms tend to expand business into virtual market via three modes including using existing online shopping platforms, building official online shopping mall and merging and acquiring related companies. We divide them into two categories, partial controlling and full controlling. Partial controlling adopting mode is to cooperate with existing online shopping platforms such as Amazon and eBay which provide a series of services such as basic technology infrastructure, high website exposure rate, easier customers' shopping experience, warehouse for stocks and delivery service. Indeed, via existing online shopping platforms, it allows firms to enter virtual market with a quicker way, invest less upfront capital expenditure, resources and endure less risk in EC adopting. However, firms would suffer some restrictions including receiving incomplete customers' information, limited product items to sell and extra commission fee for sold products. Conversely, entering virtual market by building official online shopping mall or merging and acquiring related companies constitute a better way for firms to extend entire products items online, access intact customers' information and hold more flexibilities in e-commerce operation. Nevertheless, full controlling adopting mode bring their own set of risks, mainly related to high cost of system-building, serious new-old routine conflicts, more resources demands and longer adaptive time. Hence, the choice of EC adoption mode for firms can be seen as a trade-off between the wish to efficiently enter the market, reduce financial and business risks which would lead to partial controlling adopting mode, and the need to preserve widespread customers' information and hold a

long-term vision of e-commerce growth, which would instead recommend more cautious full controlling EC adopting mode. We believe that choosing EC adopting mode is a complex decision-making which not only be influenced by cost-benefit analysis but organizational and environmental factors.

Theoretical background and hypothesis development

We take the concepts of Technology-Organization-Environment (TOE) framework and institutional theory in this study. The TOE framework which was proposed by Tornatzky and Fleischer (1990) has been utilized in many studies as a foundation to discuss issues of new technology adopting (Elahi & Hassanzadeh, 2009). However, in order that our study concentrates on understanding how organizational and environmental factors identified from both extant literatures and practical phenomena affect the EC adopting mode choice, we employ TOE as the guideline and supplement with institutional theory to better comprehend the underlying mechanisms influence EC adopting mode. Below is the briefly summary of the employed theories.

TOE framework

TOE framework indicates that when a firm consider to adopt new technology, there are some imperative factors of three dimensions which need to be concerned. Technological imperative elements ponder the compatibility (Al-Qirim, 2006; Chong & Pervan, 2007), the security and risks (Quayle, 2002; Riquelme, 2002), the usefulness (Dembla, Palvia & Krishnan, 2007) and other attributes of information system as important drivers to adopt. Organizational imperative elements consider the vital determinants of both managerial and internal context of a firm. It contains the IT knowledge, commitment to the innovation and some innovativeness tendencies of managers (Chong & Pervan, 2007; Yu, 2007) and some organizational features such as human resources (Oh, Teo & Sambamurthy, 2012; Quayle, 2002), financial structure (Grandon & Michael, 2004), organizational culture (Lee et al., 2007; Scupola, 2008) and other factors may affect adoption. Finally, environmental imperative elements which focus on external influences from the external pressure of market, institutional and the eReadiness of socio-economic forces (Doh & Kim, 2014; Ekeledo & Sivakumar, 2004; Kim et al., 2008; Zhu & Thatcher, 2010). In this study, we reorganize TOE framework with the observation and the preliminary interview from practicers of firms which are developing e-commerce and find out that compared to the effectiveness of IT system, organizational and environmental attributes are more important in EC adopting. For example, a IT manager which worked in the biggest 3C retailer in Taiwan pointed out that “to run our online business, we need talents who have competence to handle cross-channel affairs,” “if our TMTs are willing to put more commitments in our online business, it helps the online operation.” Therefore, we integrate technological imperative factors into organizational dimension and concentrate on four key elements that may either enhance or reduce a firm’s EC adopting mode choice when it decides to extend business into virtual market. These are a firm’s (1) management support, (2) perceived organizational

readiness, (3) financial slack resources and (4) perceived organizational identification. Our hypotheses claim that these factors are vital main effects on firms' EC adopting mode choice to the virtual market.

Organizational (internal) factors and EC adopting mode choice

Management support. For firms, e-commerce has been seen as an innovation which are difficult to predict the outcomes and lead to higher potential risks (Caruana, Ewing & Ramaseshan, 2002). Miller & Friesen (1978) define risk-taking as the degree of which managers can stand to allocate internal resource in activities. Some researches had been shown that if top executives have risk-taking characters, innovation can be successfully adopted (Grandon & Pearson, 2003; Lertwongsatien & Wongpinunwatana, 2003) and encourage employees to apply innovative and high-risk strategies (Quinn, 1985). Moreover, greater management support represents that top executives have higher IT background and commitments to the e-commerce (Molla & Licker, 2005). They comprehend that comparing with partial controlling adopting mode such as existing online shopping platform, investing full controlling adopting mode to extend virtual market will undertake more risks, require huge resources and financial investments and take much time to build and integrate information system. Based on higher risk-taking and commitments, firms with higher management support are willing to take risks in investing full controlling adopting mode, thus we hypothesize,

Hypothesis 1: Firms with greater management support are more likely to employ full controlling adopting mode to extend virtual market rather than partial controlling adopting mode.

Perceived organizational readiness. Many researchers have pointed out that firms possess better cross-channel integration capabilities, the greater readiness they hold (Lee et al., 2007; Melville et al., 2004). It can be divided into four important cross-channel capabilities which related to the activities of human resource, information technology, logistic and marketing. First of all, Oh et al. (2012) define cross-channel HR capability as the extent of employees whose knowledge and skills are sufficient to deal with virtual operations. Firms which adopt full controlling adopting mode to extend virtual market heavily rely on internal talents to develop, maintain, operate IT systems and coordinate across different channels, thus they need superior cross-channel HR capability. In contrast, by adopting partial controlling mode into virtual market, firms cooperate with existing online shopping platform and apply the extant IT infrastructure and system, the supplier will provide assistances and guidelines for firms to use its platform so that firms can lessen the problem of lower cross-channel HR capability. Secondly, we consider the influence of cross-channel IT capability on EC adopting mode choice. Cross-channel IT capability shows the degree whether firms have adequate competence to exploit new IT infrastructure, solve the compatibility problem between extant and new IT systems, assist information transition, exchange and integration across different channels (Melville et al., 2004; Ngai & Wat, 2002). When firms are lack of cross-channel IT capability, it may be a large probability to outsource their online business to existing online shopping

platform. For example, one IT manager from a Taiwanese household appliances firm who we interviewed said "one reason we use online shopping platform to start our virtual business is that we don't have enough IT capability to build own official online shopping mall." Hence, we infer that with less cross-channel IT capability, firms tend to choose partial controlling EC adopting mode.

Because physical and virtual channel require different logistic processes to facilitate inventory control, warehouse management and product delivery, cross-channel logistic capability is a key factor for firms to develop e-commerce (Peterson, Zeithaml & Malhorta, 1997). Cross-channel logistic capability represents the extent to which organizational original logistic process can support virtual channel (Chen et al., 2011). For firms without cross-channel logistic capability, it increases the costs and adaptive time to ream and adjust their extant logistic processes, thus they can enhance the efficiency and performance if they cooperate with outside partners (Seth, 1990; Shelton, 1988). Based on the result of preliminary interview, an interviewee indicated that in order to complement the logistic service for online business, they collaborate with online shopping platform which provide faster delivery service and extra warehouse to reduce inventory pressure. Therefore, we deduce that less cross-channel logistic capability a firm possesses, the greater possibility of partial controlling EC adopting mode may be chosen. Finally, cross-channel marketing capability is also a vital factor which expresses the ease of keep consistent marketing campaigns across multiple channels of a firm (Berman & Thelen, 2004). There is a huge difference between traditional marketing and online marketing because their target audiences have different characteristics then firms have to run distinct campaigns to satisfy their demands apart (Ward, 2001). For example, Werbler (2008) discovered that online customers were more sensitive to price and promotion information, had lower loyalty and higher purchasing power, therefore, firms had to run some special campaigns for their online customers such as price sale, content marketing and posting promotion information on social media (Zhang, 2009). These campaigns are not usually employed in traditional marketing activities so sometimes firms which have no experiences in online business do not understand how to operate new online marketing campaigns. If firms own greater cross-channel marketing capabilities, they may consider to take full controlling EC adopting mode because they have more knowledge and skills to deal with new online target audience without assistance from other partners. We thus hypothesize the following.

Hypothesis 2a: Firms with less cross-channel HR capability are more likely to employ partial controlling adopting mode to extend virtual market rather than full controlling adopting mode

Hypothesis 2b: Firms with less cross-channel IT capability are more likely to employ partial controlling adopting mode to extend virtual market rather than full controlling adopting mode.

Hypothesis 2c: Firms with less cross-channel logistic capability are more likely to employ partial controlling adopting mode to extend virtual market rather than full controlling adopting mode.

Hypothesis 2d: Firms with less cross-channel marketing capability are more likely to employ

partial controlling adopting mode to extend virtual market rather than full controlling adopting mode.

Financial slack resources. Research has shown that firms with greater financial slack resources are abler to engage in innovative activities and capture a larger portion of the associated firm growth and benefits (Penrose, 1959; Bourgeois, 1981; Daniel, Lohrke & Fornaciari, 2004). Financial slack resources are high-discretion, high-liquidity and ease of use to support a firm operations and new management practice development, hence, with greater financial slack resources, firms will be more willing to implement full controlling adopting mode into virtual channel that can lessen the pressure of high risk and high costs. We thus hypothesize the following.

Hypothesis 3: Firms with greater financial slack resources are more likely to employ full controlling adopting mode to extend virtual market rather than partial controlling adopting mode.

Perceived organizational identification. Employees with superior organizational identification means they hold the same values and objectives which can trigger their voluntarily to contribute for firm (Vancouver & Schmitt, 1991). According to the finding, Yoon & Thye (2002) illustrate that firms which strive for improving employees' organizational identification can also strengthen employees' commitment, stimulate interactive cooperation and experience sharing among members. Compare to employing partial controlling EC adopting mode, full controlling EC adopting modes may confront more rigorous and complex problems to deal with, and it is liable to be solved by smooth coordination among employees with greater organizational identification. We thus hypothesize the following.

Hypothesis 4: Firms with greater perceived organizational identification are more likely to employ full controlling adopting mode to extend virtual market rather than partial controlling adopting mode.

Institutional theory

Institutional theory has been used to study in technology adoption and organizational behavior in order to provide another theoretical lens to discuss the importance of environmental context on organizational actions (Oliveira & Martins, 2011; Teo, Wei & Benbasat, 2003). Based on institutional theory, firms not only looking for the efficiency and effectiveness during their decision-making process but concerns about how to obtain the legitimacy which is influenced by social and culture factors (Dacin, Goodstein & Scott, 2002). To obtain legitimacy, firms face three types of pressures including mimetic, coercive and normative pressures, then take isomorphic actions which is influenced by their competitors, trading partners, customers and government. Mimetic pressure means that firm is influenced by society and tends to imitate success of other organizations under an uncertainty environment. Coercive pressure comes from political partners such as regulatory parties and it may influence a firm's intention to adopt certain practice. Normative pressure boosts firm to

follow accepted norms in the environment (Al Nahian Riyadh, Akter & Islam, 2009; Kurnia et al., 2015). Therefore, we integrate institutional theory with TOE framework and focus on three key environmental elements that may either enhance or reduce a firm's EC adopting mode choice when it decides to extend business into virtual market. These are a firm's (1) perceived competitive pressures, (2) perceived customer readiness and (3) perceived government support. Our hypotheses indicate that these factors are vital main effects on firms' choice of EC adopting mode to the virtual market.

Environmental (external) factors and EC adopting mode choice

Perceived Competitive pressures. Perceived competitive pressures reflects the extent of main competitors have adopted Internet-based e-commerce (Molla & Licker, 2005). When a firm locates in a greater competitive pressures which means most competitors have extended business into virtual market, it forces organization to adopt the same strategy actions to sustain competitive advantages (Alsaad et al., 2017; Kurnia et al., 2015). Except to institution pressures, the purpose for firms to adopt e-commerce is to respond to customer demands, decrease lead times, and enhance customization (Huo, Zhao & Zhou, 2014) which full controlling EC adopting mode can achieve but partial controlling EC adopting mode cannot. We thus believe competitive pressure can push firms to adopt full controlling mode and hypothesize the following.

Hypothesis 5: Firms which perceive greater competitive pressure are more likely to employ full controlling adopting mode to extend virtual market rather than partial controlling adopting mode.

Perceived Customer readiness. The most significant motivation of firms to extend online business is to create a tight relationship with customers and satisfy their demands (Chen et al., 2011; Kim & Park, 2005). The greater customer readiness represents that customers are convenient and easy to use electronic equipment and receive a lot of information online so that it increases their intention of online shopping. Under this environment, if firms adopt full controlling mode to expand online business, they can obtain accurate consumer behaviors information by tracing customer purchasing records and utilize the information to reform further strategies such as precision marketing. In contrast, in an environment of lower customer readiness, most customer seldom have online shopping behaviors due to the restrictions of technology and device. In contrast, in an environment of lower customer readiness, most customer seldom have online shopping behaviors due to the restrictions of technology and device. Considering the benefit-cost analysis, firms may tend to use partial controlling adopting mode. Therefore, we hypothesize the following.

Hypothesis 6: Firms which locate in a lower customer readiness region are more likely to employ partial controlling adopting mode to extend virtual market rather than full controlling adopting mode.

Perceived government support. Previous studies have demonstrated that governmental support in funding infrastructure projects and adoption schemes and initiatives provide direct and indirect positive impact on boosting faster e-commerce adoption (Molla & Licker, 2005). Zhu & Thatcher (2010) demonstrated that governmental subsidy and institutional regulations assist firms on the uptake of IT use and innovative business practice. It releases the heavy cost pressure of developing and implementing online operations, so improves the intention of developing and employing full controlling adopting mode. We thus hypothesize the following.

Hypothesis 7: Firms which perceive greater government support are more likely to employ full controlling adopting mode to extend virtual market rather than partial controlling adopting mode.

METHODOLOGY

Data set and Summary Statistics

The study is conducted in Taiwan for two segments. Firstly, we do preliminary investigation and interview with 2 executives and 1 industry analyst who are familiar with e-commerce operation to confirm the existing phenomena in practice and identify the conformation of key effective factors which contributed to the design of the research model. Secondly, a questionnaire instrument with multiple-item scales is developed by referencing the result of pilot study and previous literatures. It helps to refine the questionnaire and clarifies key organizational (internal) and environmental (external) factors which may affect firms to determine their EC adopting mode choice. After adjusting the questionnaire, we employ a systematic random sampling method to select appropriate experimental specimen from top 3000 Taiwanese enterprises which listed in Taiwan Economic Journal (TEJ) database and the survey instrument was sent to them via postal mail. The major respondent in this study are high-level managers (GM, IT/marketing division manager) whose duty are in charge of e-commerce operations. In all, we received 75 responses from 451 firms giving an overall response rate of 16.63%. After processing and deleting deficient information from the surveys, we had a final count of 61 valid questionnaires for an overall response rate of 13.53%. Some characteristics of respondents are shown in Table 1.

Table 1: Profiles of sample firms (n=61).

<i>Number of employees</i>	<i>Percentage</i>	<i>Revenues (B=billion)</i>	<i>Percentage</i>
Less than 200	52.5%	Less than NT 0.5B	37.7%
200-499	21.3%	NT0.5B- under NT1.5B	11.5%
500-799	8.2%	NT1.5B- under NT2.5B	11.5%
800-1099	3.3%	NT2.5B- under NT3.5B	8.2%
1100 and above	14.8%	NT3.5B and above	23%
		Unknown	8.2%
<i>Industry</i>	<i>Percentage</i>		
Manufacturing	31.1%		
Wholesale and retail trade	42.6%		
Others	26.2%		

Measurement

This study employs the survey which is developed to measure variables in the theoretical model demonstrated previously. All constructs and variables are measured by a multi-item scales on 7-point Likert format which ranging from 1, indicating “strongly disagree” to 7, indicating “strongly agree.” The indicators which are designed and adopted by previous literatures enhance the creditable of the questionnaire and others which are developed and complemented by the researcher strengthen the explanatory power of the research model. The measures are rearranged from existing researches, then extract and take the feedback from experienced scholars and practitioners in the field as the basis.

Dependent Variables. Our major foci in this research are the factors that would affect (a) whether a firm adopts Internet-based e-commerce to sell products or service and (b) the choice of EC adopting mode was made to implement virtual business. Thus, we construct *EC adopting mode* includes four different ways that firms develop and execute virtual business by merging and acquiring other companies which is coded as 1, using firms’ official website to engage virtual operations which is coded as 2, using existing online shopping platform to engage virtual operations which is coded as 3 and it is 0 if firms refuse to adopt e-commerce. To distinguish the difference of EC adopting mode, we define that merging and acquiring other companies and using firms’ official website to engage virtual operations belong to full controlling EC adopting mode. In the other side, using existing online shopping platform to engage virtual operations is called partial controlling EC adopting mode in this paper.

Independent Variables. We divide key influential indicators into two groups: organizational (internal) factors and environmental (external) factors. The constructs of organizational (internal) factors influence include management support, perceived organizational readiness, financial slack resource and perceived organizational identification. *Management Support* captures whether managers have sufficient knowledge, capability, ambition and the extent of risk-taking about developing internet-based e-commerce (Thiesse, Staake, Schmitt, & Fleisch, 2011; Elahi & Hassanzadeh, 2009). We consider *perceived organization readiness* into four parts which relative to *cross-channel HR capability* that demonstrates whether employees have knowledge and skills to exploit the IT infrastructure and their comprehension of cross-channel activities (Molla & Licker, 2005; Oh et al., 2012), *cross-channel IT capability* that examines the degree of organizational ICT base, the experience with network based applications and the flexibility of present systems to overcome cross-channel IT issues and share information across multiple channel (Chen et al., 2011; Molla & Licker, 2005), *cross-channel logistic capability* that tests the extend of supportiveness of cross- channel activities by original logistic process such as inventory, distribution, warehousing, product delivery efficiency (Berman & Thelen, 2004; Chen et al., 2011) and *cross-channel marketing capability* that shows the ease of keep consistent marketing campaigns across multiple channels (Berman & Thelen, 2004).

Previous researches had been pointed out that firms with greater financial resources are able to engage in developing and adopting new management practices (Elahi & Hassanzadeh, 2009), thus we concern *financial slack resource* as that whether companies possess adequate financial resource to assist new e-commerce development and execution. In addition, *perceived organizational identification* is also included in the model which represents the employees' self-willingness to voluntarily sustain e-commerce activities hold by company (Wang & Hu, 2013).

We also believe that environmental factors can affect firms' decision-making of their EC adopting mode, therefore this study examines the influence through three constructs. *Perceived competitive pressures* which measure the extent of main competitors have adopted Internet-based e-commerce. *Perceived customer readiness* is measured by the degree which firms' target customers allow an electronic conduct of business (Molla & Licker, 2005). Then we investigate the force of *perceived government support* and its propensity to model the accelerate for e-commerce for firms (Chong & Pervan, 2007; Molla & Licker, 2005).

Control Variables. We estimated firm size and firm age that might influence the willingness of EC adoption of firms (Chong & Pervan, 2007). *Firm size* was the total number of employees and used the natural log of it (Kurnia, et al., 2015; Ekeledo & Sivakumar, 2004). This can influence the adoption of e-commerce in a firm. We measured *firm age* by two ways. Firms which had adopted e-commerce, we calculated as a number of years by subtracting the year the firm was founded from the year of the EC adopting year. Others which have not adopted e-commerce, we calculated as a number of years by subtracting the year the firm was founded from 2015. (Chong & Pervan, 2007; Norman, Butler & Ranft, 2013). We exam this variable because that older firms usually come with larger inertia and hence the possibility of implementing online business is reduced.

Data analysis

We employed three steps to verify the instruments. Initially, we evaluate the reliability of each construct by Cronbach's alpha. Overall, each construct has reached the alpha values range between 0.743 to 0.935 which are considered satisfactory above the acceptable value of 0.7 (Nunnally, 1978). Then, factor analysis is used to exam the validity of the constructs. We found out that KMO is 0.722. and the cumulative extraction sums of Squared loadings is 81.175%. Finally, we used b multinomial logistic regression to assess the impact of organizational and environmental factors on EC adopting mode considered in this study. The summary of EC adopting mode and reliability assessment are shown in Table 2 and Table 3.

Table 2: Summary of EC adopting mode.

EC adopting mode	Valid survey responses	Adopters N (%)
Non-adopters	61	18 (29.5)
Partial controlling mode	61	15 (24.6)
Full controlling mode	61	11 (18.0)

EC adopting mode	Valid survey responses	Adopters N (%)
Hybrid controlling mode (use both partial and full controlling mode)	61	17 (27.9)

Table 3: Results of construct reliability assessment.

Factors	No of items	Mean	Std. deviation	Cronbach's alpha
Management Support (MS)	3	4.99	1.27	0.897
Cross-channel HR Capability (CHRC)	3	4.13	1.42	0.921
Cross-channel IT Capability (CITC)	4	4.10	1.40	0.923
Cross-channel logistic Capability (CLC)	3	4.11	1.44	0.787
Cross-channel marketing Capability (CMC)	3	5.03	1.20	0.794
Financial Slack Resource (FSR)	3	4.91	1.40	0.935
Perceived Organizational Identification (POI)	3	5.71	0.81	0.919
Perceived Competitive Pressures (PCP)	3	4.01	1.29	0.872
Perceived Customer Readiness (PCR)	2	4.64	1.20	0.743
Perceived Government Support (PGS)	3	4.99	1.13	0.823

In this paper, we use exploratory case study to solve t and explain the issue how to integrate virtual operations with real operations in a firm. In this exploratory study, we intentionally selected five firms as the samples for two reasons: first, they have larger firm size so that it will be more complex and serious difficulties to integrate different channels and second, they all adopt full controlling EC mode to extent their virtual business. We did not limit our interviewees to any specific industries. We sent e-mail with the interview questions first to explain the purpose of our study; one week later, we called again if no response from a firm. We finally talked to two firms. Table 4 shows the basic information of the firms interviewed.

During the interview, we first explained the purpose of this study to the interviewee, asked for the permission to tape the conversation and then followed by showing our interview questions. We informed the interviewee that he/she could choose not to answer any question if he/she felt so. The interview questions as a guideline for gathering information were: (1) please describe the background of the firm and the interviewee; (2) please describe the virtual operation (e.g., how the firm deliver products to customers); (3) please describe the real operation (e.g., how the firm deal with inventory); and (4) please describe the difficulties and benefits to run two different channel at one time (e.g., what kind of conflicts appear). We transcribed the data for further analysis.

Table 4: Case study samples.

Firm	Position of the interviewee	Firm size	Tenure	Interviewed length
T	IT manager	Employees: 1400 Capital: NT\$: 550,000,000	15 years	2 hours

Firm	Position of the interviewee	Firm size	Tenure	Interviewed length
K	Dean of marketing and e-marketing department	Employees: 3000 Capital: NT\$ 1,600,000,000	2 years	1 hour.

RESULTS

To determine the validity of our hypotheses concerning organizational and environmental elements of EC adopting mode, multinomial logistic regression analysis is applied and we also prepare a correlation test in Table 5 to verify the multicollinearity between the constructs and the results have shown that there are no warrant multicollinearity concerns for all constructs although there are some statically significant relationships (Hair, Black, Babin, Anderson & Tatham, 1998). The overall model is significant with a χ^2 of 57.837 ($p < 0.05$). Wald tests of significance and the odds ratios (ORs) for the pairwise group comparisons for all variables are also demonstrated in Table 6 and Table 7. Before examining the hypothesis, we test the influential elements between non-adopter and adopters with both partial and full controlling adopting mode in the sample separately. The results have shown that with different comparative group, there are distinct variances of the influential factors. Firstly, we discover that firm age (Wald = 3.148, $p < 0.1$, OR = 9.392), financial slack resource (Wald = 2.933, $p < 0.1$, OR = 0.300), management support (Wald = 3.878, $p < 0.05$, OR = 4.525) and perceived government support (Wald = 7.328, $p < 0.01$, OR = 0.194) significantly affect the likelihood of non-adopt EC relative to full controlling EC adopting mode. These findings represent that the higher a firm's age and management support, the higher the likelihood to adopt e-commerce with full controlling adopting mode. Besides, with lower financial slack resource and lower perceived government support of a firm, the higher the likelihood to adopt e-commerce with full controlling adopting mode. Secondly, we also examine the relationship between non-adopter and adopter with partial controlling mode of e-commerce and find out that higher cross-channel HR capability (Wald = 4.438, $p < 0.05$, OR = 6.103) and less perceived government support (Wald = 6.404, $p < 0.05$, OR = 0.271) of a firm, it has higher possibility to adopt partial controlling mode such as existing online shopping platforms to extend business into virtual market.

Hypothesis 1 predicted that the extend of management support would influence the relative likelihood that a firm choose partial controlling or full controlling adopting mode when it determines to extend virtual business. The coefficient for management support (14.326, $p < 0.01$) provides support for this hypothesis and the results shows in Table 6 display that management support have a positive effect on the likelihood of partial controlling adopting mode relative to full controlling adopting mode (Wald = 3.572, $p < 0.1$, OR = 3.566) which means Hypotheses 1 are supported. Hypothesis 2a to 2d verify the effectiveness of organizational readiness in the decision of EC adopting mode. Based on the results from Table 6, we realize that both hypothesis 2c and hypothesis 2d are non-significant and only cross-channel HR capability (8.018) and cross-channel IT capability

(10.190) are significant at $p < 0.05$. H2a predicted that the less a firm's cross-channel HR capability, the higher the likelihood of partial controlling EC adopting mode relative to full controlling EC adopting mode. The results in Table 8 provide support for H2a (Wald = 4.024, $p < 0.1$, OR = 0.163) in that the greater cross-channel HR capability of a firm, the bigger possibility to choose full controlling EC adopting mode. H2b (Wald = 6.694, $p < 0.01$, OR = 11.207) is also supported and indicated that a firm with greater cross-channel IT capability, the bigger possibility to choose full controlling EC adopting mode.

Drawing on the results in Table 7, a summary of findings appears in Table 8 indicating: a) there are significant positive or negative influence of factors, and b) an insignificant influence of some factors. These two tables demonstrate that there are six factors which are cross-channel logistic capability, cross-channel marketing capability, perceived organizational identification, perceived competitive pressure, perceived customer readiness and firm size have no significant influence on the EC adopting mode in every situation.

Besides, Table 9 shows the summary of interview findings about how to integrate virtual operations with real operations in a firm.

Table 9: Summary of case studies

Events	Company T	Company K
EC adopting mode	partial controlling adopting mode then change to hybrid adopting mode	Full controlling adopting mode
Goal of e-business	Provide customer omni-channel service	Increase reputation and appellation rate
Selling products	both channel sell the same product but sometimes there are limited products only sell online	both channel sell the same product
Pricing	same product price but sometimes there are promotions online	during business hours, same product price, others online products have lower price
Warehouse and inventory	own warehouse and cooperate with logistic company	own warehouse and physical stores
Delivery	own logistic system and cooperate with logistic company	own logistic system and cooperate with logistic company
Performance	both channels using the same performance evaluation mechanism,	use different performance evaluation mechanism in different channels

Events	Company T	Company K
evaluation	focus on the sales	

DISCUSSION

This study concentrates on the impact of these organizational and environmental factors on different EC adopting modes instead of the intend and willingness of adopting e-commerce. We have settled the problem about which EC adopting mode should firms employ while stepping into the virtual market, which is in turn shaped primarily by various organizational and environmental factors. In the study, we separate our samples into three groups which are non-adopter, adopter with partial controlling EC mode and adopter with full controlling EC mode, then we compare these groups in pairs.

The results have shown that firm age and management support have positive significant on the likelihood of non-adopt EC relative to full controlling EC adopting mode. It means that a firm with longer business year and greater management support on developing and implementing online business, the higher possibility to choose full controlling EC adopting mode such as self-building official shopping website when it decides to extend virtual business. The finding is consistent with previous studies which indicated that firm age and management support in an organization have influence to EC adoption (Alsaad et al., 2017; Chong & Pervan, 2007; Sila, 2013). On the other hand, financial slack resource and perceived government support have negative significant on the likelihood of non-adopt EC relative to full controlling EC adopting mode which represent that when a firm has not enough financial resource and perceives less government support, it may determine not to extend virtual business. We, then, verify the relations between all influential factors and likelihood of non-adopt EC relative to partial controlling EC adopting mode. We find out that if a firm with greater cross-channel HR capability, it will tend to use partial controlling EC adopting mode such as existing online shopping platform to operate virtual business when it decides to step into virtual market. The results also indicate that lower perceived government support will decrease a firm's intention to develop and implement e-business. From these two inspections, we understand that there are different antecedents to affect the decision of EC adopting mode of a firm. We argue that compare to partial controlling EC adopting mode, full controlling EC adopting mode is more complex and costly, therefore financial slack resource and management support are more important to develop and implement e-business. Meanwhile, when a firm determines to employ partial controlling EC mode, although the cooperate firm will provide IT system, technology and service inside the organization, there is still a demand of talent who has capability to handle and manage multichannel affairs.

Besides, we also discover that management support and cross-channel IT capability have positive significant effect on the likelihood of partial controlling EC adopting mode relative to full controlling

EC adopting mode. We believe that developing own IT system and in charge of entire virtual business by self is more complex, difficult, costly and time-cost, hence, without greater management support and enough IT talents, a firm could not be successful. And even when a firm has greater cross-channel HR capability to assist multichannel affairs, without technical and financial support, it will not adopt full controlling mode to extend the virtual business.

From our samples, we discover that some firms use both partial and full controlling EC adopting mode to extend their virtual business. We call it hybrid EC adopting mode and have examined our model again. The results have been shown in Table 10 and indicated that with greater management support, firm size and cross-channel HR capability, a firm tends to use hybrid EC adopting mode such as existing online shopping platform or self-building official shopping website when it decides to extend business into virtual market. However, when a firm perceives less government support, it may determine not to extend virtual business. The results also demonstrate that when a firm obtain greater management support, it will take hybrid adopting mode instead of partial controlling EC adopting mode only. Interestingly, the results indicate that with lower perceived organizational identification, firms would not develop virtue business in hybrid adopting mode. We argue that because it costs more expenditures and resources to develop and implement two systems at once and it also takes a lot of time on coordination and cooperation between employees from different departments. Organizational identification can strengthen employees' commitment, stimulate interactive cooperation and experience sharing among members, hence, a firm with greater organizational identification can deal with more rigorous and complex problems and smooth coordination among employees (Yoon & Thye, 2002). Finally, we understand that cross-channel IT capability is important for choosing hybrid adopting mode compared to using full controlling EC adopting mode only. We argue that under hybrid adopting mode, firms have to not only self-build a new IT system but also need to combine it with outsider system. It enlarges more IT talents demands in the organization. A revised summary of all findings appears in Table 11.

CONCLUSION

Although there are numerous studies investigated how organizational and environmental factors influence the intention and willingness of EC adoption of firms. However, there are few empirical studies explore how these factors affect the decision-making of EC adopting mode for firms. This research applies adjusted TOE framework and institutional theory to investigate the association between both organizational and environmental factors and EC adopting mode choices. By employing a survey of 61 Taiwan-based firms to test the hypotheses, the result shows that firm age and management support have positive significant on the likelihood of non-adopt EC relative to full controlling EC adopting mode, however, financial slack resource and perceived government support hold opposite effects (negative significant). We, then, find out that if a firm with greater cross-channel HR capability, it will tend to use partial controlling EC adopting mode when it decides to step into virtual market and lower perceived government support will decrease a firm's intention to

develop and implement e-business. We also discover that management support and cross-channel IT capability have positive significant effect on the likelihood of partial controlling EC adopting mode relative to full controlling EC adopting mode, meanwhile, even when a firm has greater cross-channel HR capability to assist multichannel affairs, without technical and financial support, it will not adopt full controlling mode to extend the virtual business. Finally, we realize that with lower perceived organizational identification, cross-channel IT capability and management support, firms would not develop virtue business in hybrid adopting mode.

In summary, this study has theoretical and practical implications. Theoretically, it extends the extent the research of EC adopting by studying EC adopting mode choice. Previous research has noted the positive influence of influential factors on the intention and willingness of EC adopting (Lee et al., 2007; Melville et al., 2004; Sila, 2013, Wareham et al., 2005), but has not examined how organizational and environmental antecedents affect the choice of EC adopting mode firms employ while stepping into the virtual market. Our research extends the previous literature and establishes a new link between influential factors and the choice of EC adopting mode. Besides, by clarify the issues how to integrate virtual operations with real operations in a firm, this paper provides a comprehensive conceptual framework about cross-channel integration process. Practically, the results of this study can support and help firms to make a clear and accuracy EC adopting mode decision before entering virtual market. Meanwhile, firms can understand how operate different channels smoothly so that brings more synergies and less conflicts.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

In this research, we address the role of organizational and environmental factors in EC adopting mode decision-making which firms tends to extend virtual business. However, the finding has some limitations. Firstly, we focus on the EC adopting mode choice in this study and neglect the outcomes of the decision. Future studies can add time difference performance such as three years after adopting e-commerce. Moreover, we used managers' perception as the measure lens. Although it has been frequently employed with perceptual measures as appropriate indicators of measurement in empirical studies (Lee et al., 2007; Melville et al., 2004; Sila, 2013, Wareham et al., 2005), future researchers can try to find company's archival and actual performance to verify the outcome in the relationship. The results are also restricted by the sample size and future research can gather more samples by broadly sending questionnaire. Finally, we used Taiwan firms as the sample which is a specific context. For future research, it is recommended that other countries would be considered.

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Table 5: Correlation matrix for EC adopting mode choice (n=61)

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Firm age	1.00											
2. Firm Size	0.056	1.00										
3. MS	-0.170	-0.118	1.00									
4. CHRC	-0.025	0.063	0.508**	1.00								
5. CITC	-0.116	0.050	0.456**	0.769**	1.00							
6. CLC	0.015	-0.027	0.260*	0.508**	0.507**	1.00						
7. CMC	0.162	0.007	0.446**	0.360**	0.219	0.260*	1.00					
8. FRS	0.061	0.082	0.453**	0.523**	0.707**	0.408**	0.342**	1.00				
9. POI	-0.106	0.014	0.369**	0.313*	0.296*	0.247	0.424**	0.341**	1.00			
10. PCP	-0.076	0.344**	0.475**	0.359**	0.253*	0.275*	0.502**	0.273*	0.466**	1.00		
11. PCR	0.075	0.170	0.336**	0.609**	0.400**	0.290*	0.303*	0.120	0.276*	0.592**	1.00	
12. PGS	-0.029	0.033	0.189	0.319*	0.236	0.080	0.061	-0.028	0.132	0.305*	0.452**	1.00

Note: * p < 0.05; ** p < 0.01.

Table 6: Model Fitting and Likelihood Ratio Tests (partial controlling mode VS full controlling mode)

Model	χ^2
Overall model	57.837*
Control variables	
Firm age	5.503
Firm Size	6.197
Independent variables	
MS	14.326**
CHRC	8.018*
CITC	10.190*
CLC	2.075
CMC	1.097
FRS	3.428
POI	5.092
PCP	3.698
PCR	0.308
PGS	13.457**

Note: * $p < 0.05$; ** $p < 0.01$.

Table 7: Predictors of EC adopting mode for Taiwan firms.

Variables	non-adopter relative to full controlling mode adopter			non-adopter relative to partial controlling mode adopter			partial controlling mode adopter relative to full controlling mode adopter		
	β	Wald Statistic	Odds Ratio	β	Wald Statistic	Odds Ratio	β	Wald Statistic	Odds Ratio
Control Variables									
Firm age	2.240	3.148	9.392 ⁺	0.197	0.034	1.218	2.042	2.642	7.710
Firm size	1.168	0.945	3.216	0.992	0.759	2.695	0.177	0.034	1.193
Independent variables									
MS	1.510	3.878	4.525*	0.238	0.115	1.269	1.271	3.572	3.566 ⁺
CHRC	-0.007	0.000	0.993	1.809	4.438	6.103*	-1.816	4.024	0.163*
CITC	1.443	2.467	4.233	-0.974	1.234	0.378	2.417	6.694	11.207**
CLC	-0.280	0.406	0.756	-0.431	1.017	0.650	0.151	0.151	1.163
CMC	-0.388	0.443	0.679	-0.508	0.947	0.602	0.121	0.044	1.128
FSR	-1.204	2.933	0.300 ⁺	-0.501	0.652	0.606	-0.704	1.160	0.495
POI	1.143	1.435	3.135	0.262	0.101	1.300	-1.405	2.158	0.245
PCP	1.217	2.119	3.377	1.339	2.536	3.816	-0.122	0.018	0.885
PCR	-0.287	0.195	0.750	-0.001	0.000	0.999	-0.286	0.186	0.751
PGS	-1.640	7.328	0.194**	-1.304	6.404	0.271*	-0.335	0.400	0.715

Note: ⁺ $p \leq 0.1$; * $p \leq 0.05$; ** $p \leq 0.01$.

Table 8: Summary of the findings.

Variables	non-adopter relative to full controlling mode adopter	non-adopter relative to partial controlling mode adopter	partial controlling mode adopter relative to full controlling mode adopter
MS	+	(N)	+
CHRC	(N)	+	-
CITC	(N)	(N)	+
CLC	(N)	(N)	(N)
CMC	(N)	(N)	(N)
FSR	-	(N)	(N)
POI	(N)	(N)	(N)
PCP	(N)	(N)	(N)
PCR	(N)	(N)	(N)
PGS	-	-	(N)

Note: - means that the factor influences EC adopting mode negatively and significantly.

+ means that the factor influences EC adopting mode positively and significantly.

N means that there is insignificant influence of this factor on EC adopting mode.

Table 10: Predictors of EC adopting mode for Taiwan firms (hybrid mode)

Variables	non-adopter relative to hybrid mode adopter			partial controlling mode adopter relative to hybrid mode adopter			Full controlling mode adopter relative to hybrid mode adopter		
	β	Wald Statistic	Odds Ratio	β	Wald Statistic	Odds Ratio	β	Wald Statistic	Odds Ratio
Control Variables									
Firm age	1.723	2.299	5.599	1.525	1.976	4.596	-0.517	0.206	0.596
Firm size	2.117	3.735	8.308 ⁺	1.126	2.415	3.082	0.949	1.379	2.584
Independent variables									
MS	2.032	6.620	7.633**	1.794	6.451	6.015*	0.523	0.826	1.687
CHRC	1.313	2.749	3.716 ⁺	-0.496	0.463	0.609	1.320	2.662	3.742
CITC	-0.569	0.435	0.566	0.405	0.286	1.499	-2.012	5.320	0.134*
CLC	0.019	0.002	1.019	0.451	1.481	1.569	0.300	0.622	1.349
CMC	-0.307	0.340	0.735	0.201	0.158	1.223	0.080	0.022	1.084
FSR	-0.805	1.497	0.447	-0.305	0.246	0.737	0.399	0.430	1.490
POI	-1.386	2.260	0.250	-1.648	3.511	0.192 ⁺	-0.243	0.089	0.784
PCP	0.724	1.103	2.063	-0.615	0.561	0.541	-0.493	0.378	0.611
PCR	-0.221	0.105	0.802	-0.220	0.118	0.802	0.066	0.013	1.068
PGS	-1.116	4.348	0.328*	0.189	0.165	1.208	0.524	1.069	1.689

Note: ⁺ $p \leq 0.1$; * $p \leq 0.05$; ** $p \leq 0.01$.

Table 11: Summary of the findings. (add hybrid mode)

Variables	non-adopter relative to full controlling mode adopter	non-adopter relative to partial controlling mode adopter	non-adopter relative to hybrid mode adopter	partial controlling mode adopter relative to full controlling mode adopter	partial controlling mode adopter relative to hybrid mode adopter	Full controlling mode adopter relative to hybrid mode adopter
MS	+	(N)	+	+	+	(N)
CHRC	(N)	+	+	-	(N)	(N)
CITC	(N)	(N)	(N)	+	(N)	+
CLC	(N)	(N)	(N)	(N)	(N)	(N)
CMC	(N)	(N)	(N)	(N)	(N)	(N)
FSR	-	(N)	(N)	(N)	(N)	(N)
POI	(N)	(N)	(N)	(N)	-	(N)
PCP	(N)	(N)	(N)	(N)	(N)	(N)
PCR	(N)	(N)	(N)	(N)	(N)	(N)
PGS	-	-	-	(N)	(N)	(N)

Note: - means that the factor influences EC adopting mode negatively and significantly.
 + means that the factor influences EC adopting mode positively and significantly.
 N means that there is insignificant influence of this factor on EC adopting mode