

# **The Impact of Atmospheric Factors on M-commerce Performance – A Mixed-Methods Study**

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## **ABSTRACT**

According to a global forecast by e-Marketer (2016), e-commerce sales are expected to reach \$4 trillion by 2020 and 49.2% Statistica (2019) is forecasted to be generated from mobile commerce, m-commerce is a substantial and significant business channel that should demand every focus.

The study of factors that impacted retail business performance has a long history. Kotler (1973) introduced the concept of “atmospherics” and suggested that retail stores should create the right atmospheres to proactively impact sales. Factors such as store layout, in-store music and scent on customers in-store sales behaviour were heavily researched and validated. (Turley and Milliman 2000). With the advent of internet and e-commerce, “atmospheric factors” derived from physical retailing were picked up and applied to virtual stores, e-commerce Manganari et al., (2011) and subsequently, m-commerce Um (2016) forming the prevalent methodology and frame of reference in the subject matter. At the same time, there were also findings from other “non-atmospherics” studies with various factors such as “perceived usefulness” Tan et al., (2010); “security and site design” Nilashi et al., (2015) that would impact m-commerce performance. Outside of the academia, practitioners were also pushing diverse views on e-commerce or m-commerce success factors that were influencing the industry in many ways.

Given this context, the objective of this study is to find synergy from the current knowledge base and address the following research questions with a “Mixed Methods” research approach:

1. What is the impact and role of atmospheric factors on m-commerce performance as measured by metrics such as site visits, conversion and sales?
2. Can the above research question be validated with company-level performance data?

The researcher initiated the qualitative research by synergizing the major learnings from literature from 2000 to 2018 and engaged a 10-industry expert panel to solicit their views on the research question. The content and points from these semi-structured interviews on the expert panel were further consolidated into a comprehensive 10-factor m-commerce performance scorecard as a testing instrument. The researcher then initiated the quantitative research and invited 3 industry experts to use this scorecard to rate site performance of the Top 200 m-commerce businesses in 2015-2016 according to Internet Retailer. Using these scores and corresponding financial and operational metrics such as visits, sales, and conversion available in the Internet Retailer database, the researcher further ran SPSS factor analysis and structured equation modelling SMART PLS analysis on 3 regression constructs. In addition, using sales volume figures as a proxy for company size, a supplementary analysis on whether company size will change the regression results was also performed.

Finally, a model set of 3 factors (Social engagement, System stability and Mobile platform applications) impacting on the Site visits growth was proven to be statistically valid. This result was further analysed in “triangulation” with the findings from literature and expert interviews to formulate insights and discussions for the above-defined research questions. Managerial implications of these learnings have been suggested as well as directions for future research.

## **DECLARATION**

I, Philip Chan, declare that no portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institutes of learning.



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## CHAPTER 1 INTRODUCTION

### 1.1 Motivation

According to estimates from Statista, (2019) see Fig. 1.1, US mobile commerce (hereafter referred to as m-commerce) accounted for 34.5% of total e-commerce sales in 2017. By 2020, the proportion is expected to become 49.2%. Referencing forecast from eMarketer (2016) in Fig. 1.2, global retail e-commerce sales will hit \$4 trillion by 2020, and applying the 49.2% of mobile vs total e-commerce percentage, m-commerce sales can reach \$2 trillion by 2020.

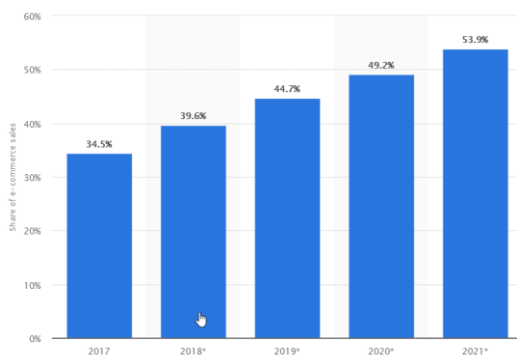


Figure 1.1 2017-2021 US mobile commerce sales vs total e-commerce Statista (2019)

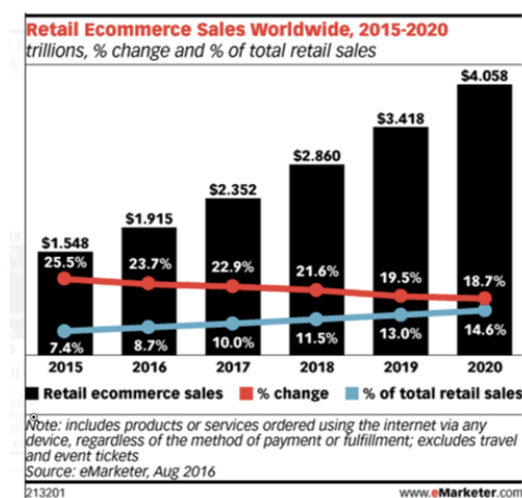


Figure 1.2 2015-2020 Global retail e-commerce sales worldwide eMarketer (2016)

M-commerce with a huge market potential of US\$2 trillion represents an interesting marketing channel that is worth extensive research efforts. However, the “industry” of e-commerce or m-commerce is still relatively new without clear delineation of boundaries. According to (Kleijnen et al., 2007), m-commerce was defined as a type of electronic commerce available only on wireless mobile devices. M-commerce can also be regarded as an extension of e-commerce (Kleijnen et al., 2007) as most e-commerce players can offer mobile versions of their sites as part of their platform services. However, M-commerce is widely regarded as a separate business channel (Kleijnen et al., 2007) that creates new value for customers and advancement of e-commerce by enabling consumers to buy and sell goods or services from almost anywhere, conveniently using their own mobile phones or tablet devices. In addition, m-commerce is much more than another type of e-commerce because m-commerce has facilitated and reinforced new industries and services such as mobile banking and money transfer; location-based services and mobile marketing; digital content purchases, and delivery; omnichannel retailing with m-commerce re-invigorating traditional physical retailing. While the broad meaning of m-commerce can cover areas in mobile shopping, mobile banking and mobile payment, this study will focus on mobile shopping or retailing.

As a professional operator of an online retail business in watches and jewellery, I am very motivated to have a deep understanding in m-commerce as the subject matter is not only a topic of massive commercial interest and industry significance but also an important part of my professional life. Specifically, what are the key factors that would lead to success in m-commerce? What can a practitioner learn from the vigorous academic research in the subject and conversely, what are the insights that practitioners can offer? Hence, besides conducting a doctoral academic research project as part of my DBA program, I look forward to obtaining usable results that can positively impact my business.

## **1.2 Research objectives**

Besides addressing my motivation and expectation in this study, I have formulated the following research objectives that will shape my approach and interpretation of the potential research gap, the research method used and the outcome.

As the starting point of this research is factors impacting a new and rapidly changing business phenomenon such as m-commerce, it is necessary to look at both existing academic literature based on past research results as well as current learnings and observations from practitioners. However, both sources of information carry certain weakness. For academic literature, since the subject of m-commerce is a relatively recent business phenomenon that is still evolving due to technological and environmental changes, it will be difficult to expect one set of comprehensive theory with all the support data to explain every factor impacting m-commerce. It is much more probable that multiple numbers of theoretical perspectives exist and continue to develop. On the other hand, observations and insights from practitioners are very often accumulated from daily practice without going through structured validation processes. As such, the complex nature of m-commerce requires a more synergistic approach that can cover a wider spectrum of theoretical foundation as well as insights from the practitioners to capture the latest development as well as to maximize the validity and potential applications of this research.

Besides a “synergistic” approach, the second objective that is important to a dynamic and practical research subject such as m-commerce is whether the findings can be validated by data at the company level. From an initial review of literature on the subject, it was discovered that quite a lot of earlier studies particularly from 2000-2010 (Appendix I) had been based on opinion surveys backed by random users or convenient student samples. While such are certainly valid methodologies and have made contributions in illustrating consumer behavioural responses in m-commerce, this is a clear gap that calls for more

research that can be validated by company operation and finance data. These research results will be much more convincing in the world of m-commerce managers.

To sum up, by synthesising the perspectives from both academic and industry sources with different theoretical underpinnings and verifying the findings with quantitative tools and representative companies' data, it is my objective for this research to contribute in both academic knowledge of this subject as well as to make substantiated and actionable insights for managers of e-commerce or m-commerce.

### **1.3 Organisation of this study**

Based on my motivation and research objectives as set out in the above sections, this study is structured as a “Mixed-Methods Research” which will cover inputs from both academic literature and insights from expert panels from the industry to form the qualitative findings. Quantitative analysis will follow on the hypothesis formulated under the qualitative findings to draw new insights on the research subject. Below is a description of the content and layout of each chapter in this study.

Followed by an introduction in Chapter 1, Chapter 2 is a literature review and summary of the 107 relevant articles from 2000 to 2018 that studied factors impacting the performance of e-commerce and m-commerce, outlines the research gap and identifies the questions that will guide the research study. Chapter 3 explains in detail the research strategy, design of the study. This will be followed by descriptions on the research methods and data collection process used in both the qualitative and quantitative analysis. In Chapter 4, the first half describes the qualitative analysis and illustrate the findings from the survey of the expert panel and how these inputs together with the key points from the literature review are synthesized in formulating the various hypothesis and models to be tested in quantitative

analysis using statistical tools such as SPSS and Smart PLS-3. The complete statistical analysis and results will be documented in the second half of the chapter. Chapter 5 revisits and further explore the research questions by triangulating the findings from the literature, expert interviews as well as the statistical analysis. Finally, in the concluding Chapter 6, the findings and value-added of this study will be stated together with its academic and managerial implications as well as recommendations for future research directions.

## **CHAPTER 2 LITERATURE REVIEW**

### **2.1 Introduction**

This section outlines the background of this literature review and explains how this review was undertaken and structured. The study of factors that impacted the retail business performance has had a long history. One of the major themes identified was the perspective of “atmospherics”. Kotler (1973) was one of the first to introduce the concept of “atmospherics” and suggested that retail stores should create the right atmospheres to proactively manage customers’ shopping behaviour. It was not until the turn of the century that Turley and Milliman (2000) consolidated a comprehensive review supported by a series of empirical studies that validated the impact of atmospherics concepts such as store layout, in-store music and scent on visiting customers and their in-store sales behaviour. With the advent of internet and e-commerce, these concepts of “atmospheric factors” derived from physical retailing were picked up and applied to virtual stores, e-commerce and subsequently, m-commerce. At the same time, there were also plenty of studies using framework other than “atmospherics” investigating factors that impacted the performance of the retail business.

This literature review is focused on the period starting in the year 2000 when discussion of e-commerce business performance began to flourish and up to 2018. The development of related literature could be broadly classified into two phases;

1. 2000-2010 (where literature focused on PC-based web e-commerce)
2. 2010-2018 (where much more literature on social & m-commerce emerged)



To initiate this literature review, a systematic electronic search was performed for relevant journal articles in journals such as (Journal of Retailing, Journal of Marketing, European Journal of Marketing, Information System Review, International Journal of Electronic Commerce, International Journal of Retail & Distribution Management, Internet Research, Journal of Business Research, Journal of Computer-mediated Communication, Journal of Electronic Commerce Research, Journal of Interactive Marketing, Journal of International Marketing, Journal of Service Marketing, Psychology & Marketing). In addition, periodic searches were performed using academic search engines (e.g. ProQuest, IEEE, Social Science Citation Index) as well as Google Scholar with keywords and phrases such as "Atmospherics", "Virtual-atmospherics", "Mobile-commerce", "Success factors in mobile-commerce", "Impact of atmospheric factors in mobile-commerce", "Online shopping intention", "Mobile online shopping intention", "Online purchasing behaviour", "Mobile online purchasing behaviour". Based on the data collection methods as described above, 107 articles were identified to be directly relevant to the research. A summary of the key contents in these studies was itemized and classified into two groups in Appendix I and Appendix II. The 107 studies captured here included both web and mobile commerce. The studies specific to mobile commerce were marked as "Mobile".

From the 107 studies reviewed, 56 were identified as based on "Atmospherics" and or a "SOR" approach. S-O-R was an abbreviation for Stimuli – Organism – Response. This paradigm was adapted from environmental psychology by Mehrabian and Russell (1974) and had been the basis for many physical and online and store atmosphere studies to link environmental cues which form stimuli(S) to customer's emotional state(O) and led to specific (R) response behaviour. This "atmospherics" and or "SOR" framework was widely used in the period 2000 to 2010 and as illustrated in Turley and Milliman (2000) this approach traced back to "atmospherics" studies in "brick and mortar" retail business. Hence,

the “atmospherics” and or “SOR” approach was the mainstream framework of analysis in addressing the subject of e-commerce performance. Section 2.2. below captures the detailed discussion of this approach and its insights. A complete summary of these 56 studies could be found in Appendix I.

The rest of the 51 studies reviewed indicated various “non-atmospheric” and or “non-SOR” approaches using several distinctive analytical frameworks and methodologies. Although this group of studies might not be the mainstream particularly in 2000-2010, they added substantial relevant insights to the understanding of factors affecting e-commerce performance. For example, these groups of studies drew insights from the Technology Acceptance Model (TAM) Davis (1986), the Consumer Decision Making Model (Engel and Blackwell, 1982), it was Click-Stream Analysis, Lee et al., (2001), that brought in new discussions of how “perceived ease of use”, “social factors”, “IT infrastructure”, “effectiveness of mobile platform” and moderators of culture, technical proficiency of users impacted e-commerce performance. Section 2.3 below covers these approaches and the insights these studies brought into the understanding of e-commerce performance. A complete summary of these 51 studies can be found in Appendix II.

To further illustrate the discussion in section 2.2 and 2.3, Figure 2.1 below provides a graphical representation of the distribution of these 107 reviewed papers from a time perspective interlocked with a methodological dichotomy of “atmospherics/SOR” and “non-atmospherics/SOR” approaches. As indicated in the diagram from 2000 to 2010, 35 out of the 49 (or 70%) articles were based on “atmospherics” and or “SOR” approach. This distribution indicated the relative popularity and strong consistency in using a similar approach in the studies of “brick and mortar” retail shop studies and “atmospherics” concepts being applied in the virtual world of e-commerce performance. At the same time, there were also other important approaches used in studying e-commerce performance. As indicated in the diagram

in Figure 2.1, these studies represented 30% of studies during 2000-2010 but from 2010 to 2018, this trend completely reversed. The number of studies using “non-atmospherics/SOR” approaches increased to 37 out of 58 or (63%). This reverse trend could have reflected the new complexities in e-commerce and the ubiquities of wireless network and m-commerce. New dimensions such as social network and enriched device usability enabled by new mobile technologies came into the picture. These new factors and more complex environment had driven studies towards the use of different analytical approaches such as click-stream analysis leveraging available big data directly collected from m-commerce systems. Therefore, this literature review might have started with “atmospherics/SOR” approach but extended into “non-atmospherics” factors to look at the changing role of “atmospherics” studies as well as exploring the significance of both approaches.

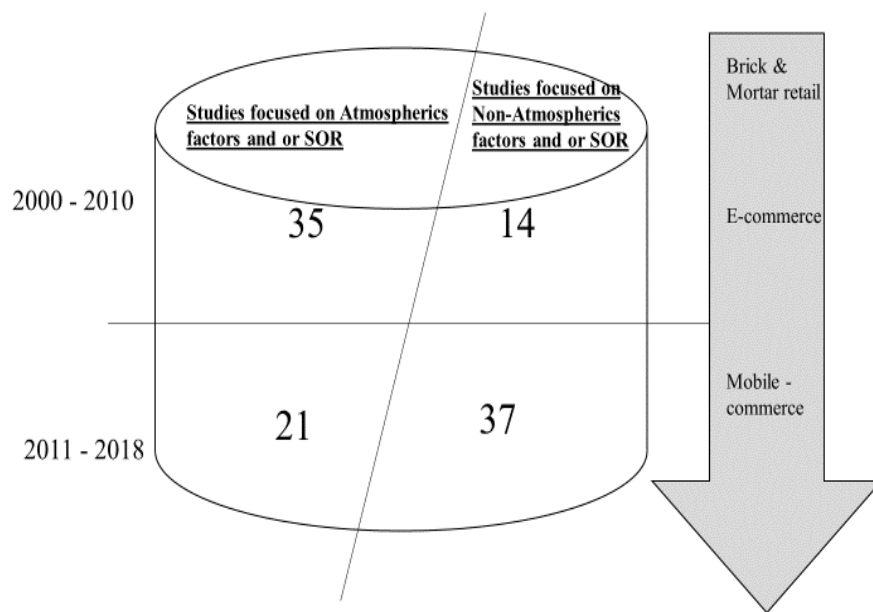


Figure 2.1 Distribution of reviewed literature in their study approaches in 2010 - 2018

Source: Author

In the remainder of this chapter, section 2.2, 2.3 and section 2.4 consolidate the findings and contributions from both “atmospheric/SOR” and “non-atmospheric/SOR”

approaches. These sections detail analysis about how these findings highlighted several key areas of “User experience”, “Social engagement”, “Information system and technology factors” and “Moderators” impacting e-commerce performance. This is followed by section 2.5 that addresses the key differences of e-commerce and m-commerce based on current observations and what the implications and potential changes in the “atmospherics” of both industries are. Finally, the chapter concludes with a summary and analysis of the identified research gaps as well as how the research questions of this study have been formulated.

## **2.2 Review of “Atmospheric” studies and applications of the SOR approach**

This section is divided into 3 parts with 2.2.1 addressing the origin and development of “atmospherics” studies as well as how the “SOR” model was first deployed. In the following section 2.2.2, there is a detailed discussion about how the “SOR” model was extended to “online atmospherics” studies and the development of general analytical frameworks. Finally, in section 2.2.3, the findings and contributions to the understanding of e-commerce performance of these “atmospherics and SOR” studies are discussed.

### **2.2.1 The origin of atmospheric studies**

According to Kotler (1973), “atmospherics” was defined in sensory terms such as ‘sight’, ‘sound’, ‘scent’ and ‘touch’. Several other researchers had called for a classification system of specific environmental features (Donovan and Rossiter, 1982). In the literature, different typologies had been proposed to classify the traditional store environment.

Baker (1986) developed a typology composed of three critical dimensions: ambient, design and social factors. “Store ambient factors” referred to non-visual, background conditions in the environment, including elements, such as music, lighting, scent and

temperature. “Store design factors” represented store environmental elements that were more visual and had a functional and/or aesthetic character. While “functional design elements” included aspects such as layout, comfort, and privacy. “Aesthetic design elements” included factors such as architecture, colour, materials, style, and cleanliness. “Social factors” related interactions with other people in the store. The “people” component of the environment included both store employees and customers (see also Bitner (1992), who presented a typology of “Servicescapes” i.e., the physical surroundings of the place where a service was delivered or consumed, based heavily on the Baker framework).

Berman and Evans (2001) pointed out “store atmosphere” was made up of several elements of the store environment: “the exterior of the store” (e.g., storefront, display windows, size and height of the building, surrounding areas and stores), “the general interior” (e.g., flooring, colour, lighting, dressing facilities, personnel, merchandise, cleanliness), “store layout” (e.g., space allocation, product grouping), and “interior (point-of-purchase) displays” (e.g., assortment, posters, electronic displays). Turley and Milliman (2000) completed the typology proposed by Berman and Evans (1995) by including a fifth category of “human variables”. In their article, Turley and Milliman (2000) projected a very comprehensive list of empirical studies that had validated the findings of store atmospherics concepts.

Before the discussion of how atmospherics studies were applied in the online world, it is necessary to highlight one of the most popular analytical frameworks that had been used in all these atmospherics studies. In fact, out of the 107 articles reviewed in this section, 56 of these studies had used this framework. This model was known to be the Mehrabian and Russell S-O-R paradigm (referred to as the SOR model below) S-O-R was an abbreviation for Stimuli – Organism – Response. The paradigm was adapted to environmental psychology by Mehrabian and Russell (1974); This model had been the basis for many physical and

online and store atmosphere studies to link environmental cues which form stimuli(S) to customer's emotional state(O) and led to specific (R) response behaviour. Figure 2.2 below illustrated the process.

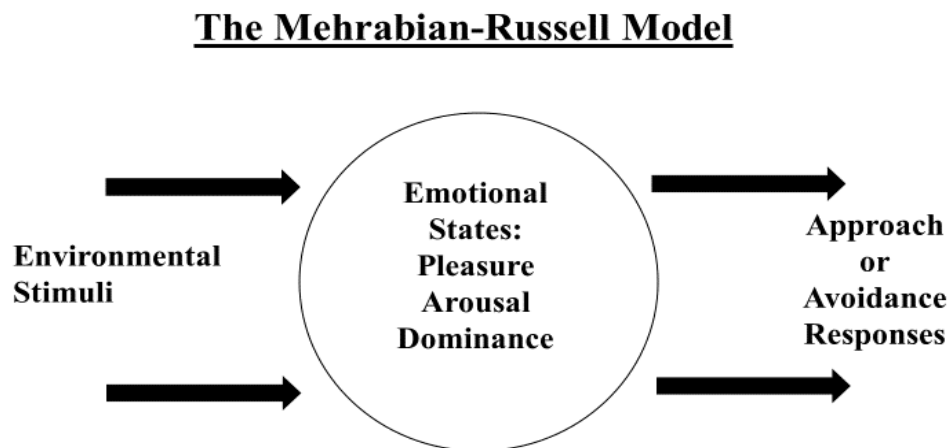


Figure 2.2 The Mehrabian-Russell Model Source: Donovan & Rossiter (1982) p.42

To further elaborate, environmental stimuli(S) produced an emotional state that could be characterized in three different dimensions: pleasure, arousal and dominance. Pleasure-displeasure referred to the degree to which the person felt good, happy or satisfied in the situation. Arousal-non-arousal referred to the degree to which a person was excited, stimulated, alerted or active in the situation. The SOR model referred to subjective arousal, defined as the subjective experience of energy mobilization Russell and Feldman (1999), while objective arousal was defined as the release of energy collected in the tissues. Duffy (1962); Kaltcheva and Weitz (2006), Dominance-submissiveness referred to the extent to which the individual felt in control of, or free to act in the situation. Mehrabian and Russell (1974); Donovan and Rossiter (1982).

From the Organism (O) perspective, the emotional states, which were pleasure, arousal and dominance, were uncorrelated, except for pleasure and arousal. Mehrabian and Russell (1974) and Donovan and Rossiter (1982) proposed that in a pleasant environment, high arousal led to an approach response and an unpleasant environment with high arousal would lead to an avoidance response. Similarly, in a neutral environment, high and low arousal states would lead to avoidance responses while moderate arousal would lead to an approach response. In more recent applications of the model, the dominance dimension has been dropped. In a study by Donovan and Rossiter (1982), a lack of independence was found in the dominance dimension, as it could be predicted from the other two dimensions. However, some researchers advocated its inclusion in online environments due to the difference between online and offline retail environments (Sautter et al., 2004). This was because, in an offline setting, the retail environment was totally under the control of the store manager, though customers could openly voice their opinions. In an online environment, a customer might have the feeling that he had no control over the environment because he could not communicate with any staff directly.

On the (R) response part of the model, Mehrabian and Russell (1974) and Donovan and Rossiter (1982), described the four aspects of the approach and avoidance behaviours as:

1. A desire physically to stay in (approach) or to get out of (avoid) the environment
2. A desire or willingness to look around and to explore the environment (approach) versus a tendency to avoid moving through or interacting with the environment or a tendency to remain inanimate in the environment (avoidance)
3. A desire or willingness to communicate with others in the environment (approach) as opposed to a tendency to avoid interacting with others or to ignore communication attempts from others (avoidance)
4. The degree of enhancement (approach) or hindrance (avoidance) of performance and satisfaction with task performances.

Donovan and Rossiter (1982) adapted these behaviours to a retail environment, relating (1) physical behaviour to store patronage intentions, (2) exploratory behaviour to in-store search and exposure to retail offerings, (3) communication behaviour to interact with sales personnel and performance and (4) satisfaction to the repeat-shopping frequency and reinforcement of time and money spent in the store.

In summary, the SOR model postulated that consumers would spend more time and possibly money in stores if they could feel pleasant and in a state of high arousal as triggered by the environmental cues of the stores.

### 2.2.2 Extension of the SOR Model to online atmospherics studies and development of general analytical frameworks

Eroglu et al. (2001) introduced the SOR model to the internet context as below:

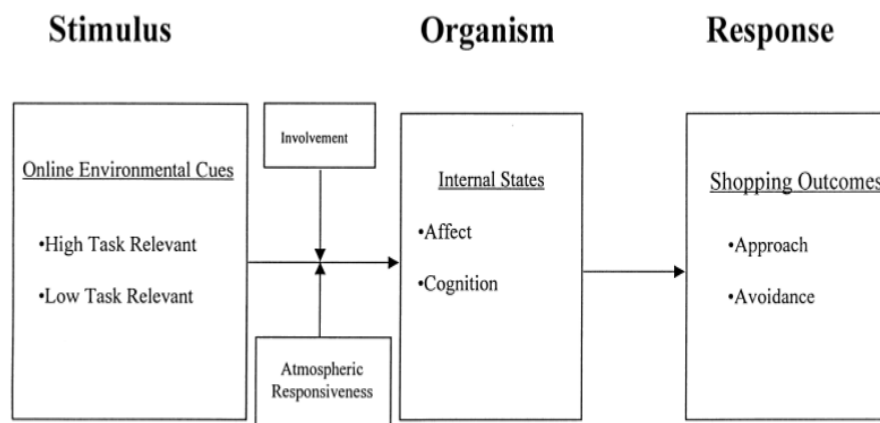


Figure 2.3 SOR model applied to the internet context

Source: Eroglu et al., (2001) p177

Compared to the original SOR model, the model by Eroglu et al., (2001) replaced Environmental Stimuli with Online Environmental Cues, which was divided into the categories “High Task-Relevant” and “Low Task-Relevant”. High task-relevant cues



contained information related to the shopping goals, such as price, product description or return policies. Low task-relevant cues did not affect the completion of any demanding tasks but rather for leisure reading or information consumption. The model also added Involvement and Atmospheric Responsiveness as moderators between stimuli and the organism. Involvement referred to the degree of personal relevance to the shopping goal. Atmospheric responsiveness was defined as the tendency to base patronage and purchase decisions on the stores' physical design and condition (Grossbart et al., 1991). The cognitive state in the organism referred to everything that went in the consumers' minds concerning acquisition, processing, retention and retrieval of information. In an online store environment, it meant how consumers interpret the information provided on the screen, chose from alternative sites and products as well as their attitudes toward the virtual stores (Eroglu et al., 2001).

While the Eroglu et al., (2001) model had enriched the original SOR model by articulating a valid set of variables for empirical studies under the context of online retail atmospherics, some challenges remained when all the site atmospheric cues were to be broadly classified as High Task-Relevant and Low Task-Relevant cues. It would at times be difficult to clearly distinguish between high-task and low-task orientation and identify which were the important dimensions and variables that were impacting shopper's behaviour. However, the Eroglu et al., model (2001) had led to a lot of studies testing different variables in layout, design, aesthetics, background colour, navigation etc.: Stevenson et al.,(2000); Szymanski et al., (2000); Dailey (2002); Liang and Lai (2002); Menon and Kahn (2002); Kim et al.,( 2003); Lee et al., (2003); Gorn et al., (2004); Vrechopoulos et al., (2004); Richard (2005); Biers and Richards (2005); Griffith (2005). Therefore, Eroglu et al., (2003) also developed another article that summarized the empirical research results of using the SOR framework.

It was noted that these studies were mainly focused on single factor validation of colour, layout or music and the correlation with consumer arousal and satisfaction. However, these early studies were not validated by large empirical data sets from online users and most of them were built on survey results of 100-300 student samples, these studies did gradually build up the empirical database that illustrated the validity of individual virtual atmospheric cues such as colour, layout and design did positively impact consumer behaviour.

Building further on the Eroglu et al., (2001) model and the Lewison (1994) framework on Store Environment, Manganari et al., (2009) developed an extended model of online store environment in Figure 2.4 below

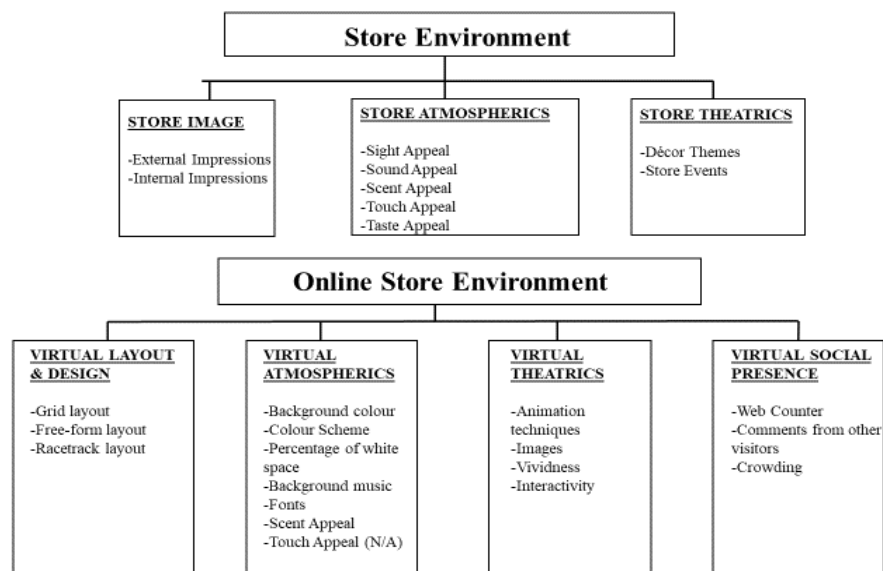


Figure 2.4 The Online Store Environment Framework

Source: Manganari et al., (2009) pp 1141

In the conventional store environment theory, Lewison (1994) developed a theoretical framework that explains the retail store environment and consists of three basic components: (1) store image; (2) store atmospherics; and (3) store theatrics. Vrechopoulos et al., (2004) adapted the conventional retail environment components to the corresponding determinants of the virtual retail environment. Specifically, the Virtual Component

Presentation Framework (VCPF) was introduced, which consists of three factors: (1) virtual layout and design; (2) virtual atmospherics; and (3) virtual theatrics. Manganari et al., (2009) extended this and proposed the Online Store Environment Framework (OSEF) as a more comprehensive typology of the online store interface. The fourth dimension of virtual social presence was also added to recognize that there were more and more interactions between the website and the customers through the web counter and visitors' comments.

In addition to providing a more detailed articulation of the virtual atmospheric factors which would form the environmental stimulus (S), the Manganari et al., (2009) model functions similarly to the same or early versions of SOR paradigm (Mehrabian and Russell, 1974) which suggested that consumers' internal states mediated the relationship between the environmental stimulus and individual's responses. As described in Figure 2.5, Manganari et al., (2009) further illustrated under the context of the SOR model, how the concepts of Navigation strategy would act as the moderator and provided more specific sample factors such as Goal Attainment, Search and Experimental Orientation.

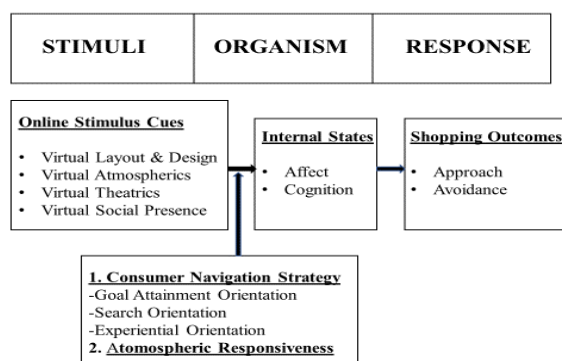


Figure 2.5 SOR Model applied to OSEF  
 Source: Manganari et al., (2009) pp1142

Manganari et al., (2010) also applied the OSEF into the mobile commerce and came up with the Mobile Store Environment Framework (MSEF) as at Fig 2.6 in below.

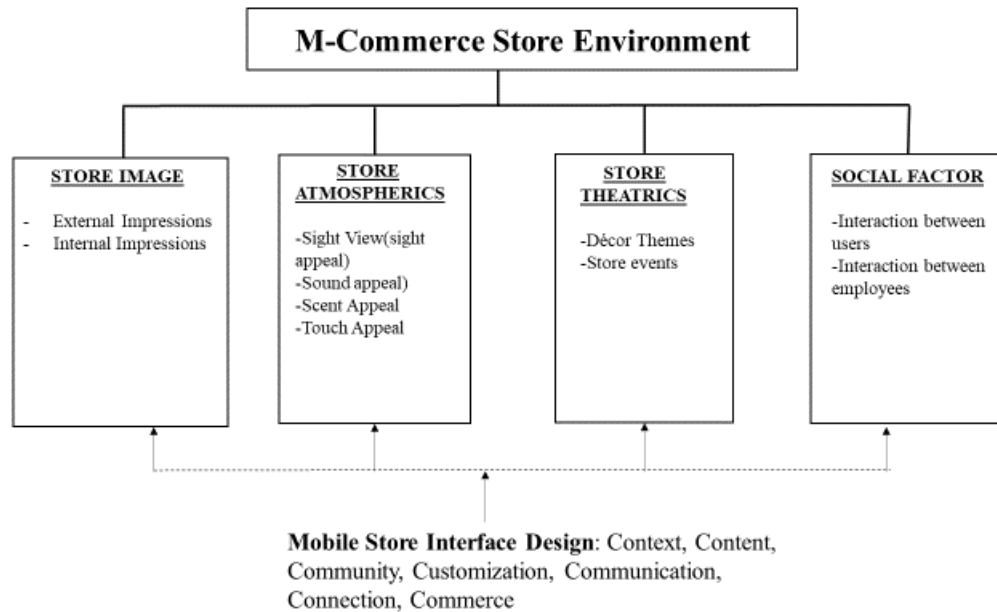


Figure 2.6 Mobile Store Environment Framework

Source: Adapted from Mobile Store Environment Framework, Manganari et al., (2010 pp. 353)

As compared with the Online Store Environment Framework in Figure 2.4, the mobile version in Figure 2.6 was identical with respect to the composition of key atmospheric dimensions such as store image, store atmospherics, store theatrics and social factor. However, Manganari et al., (2010) did single out that the critical differences between these two frameworks was in the particular importance of how user interface design for mobile devices would impact these atmospheric dimensions. As discussed at length in Manganari et al., (2010), Lee and Benbasat (2004) conducted a comparative analysis of m-commerce customer interfaces and illustrated the importance of seven mobile user interface design factors which were namely: Context, Content, Community, Customization, Communication, Connection and Commerce. Manganari et al., (2010) further pointed out that the most distinctive feature of m-commerce was the facilitation of enhanced information network

access (Stafford and Gillenson,2003) and m-commerce was conducted through users' heavy interactions through their mobile device interface. Therefore, the design and development of effective mobile interfaces (i.e. device and interface) was a major determinant for the penetration and growth of m-commerce. Based on this discussion, the impact of mobile store interface design was superimposed in the dotted lines on the original MSEF to help differentiate with the OSEF in Figure 2.4

Compared to the Eroglu (2001) SOR framework, the Manganari et al., (2009) model made contributions in the following ways: First, the Manganari et al., (2009) model extended more deeply into the key aspects of virtual atmospherics beyond high task or low task descriptions, instead several ideas were put forward: Store atmospherics was denominated into sight, view, sound, flow, and design, Store theatrics that dealt with the aspect of store ambience, and lastly, the social factor which addressed the interaction with customers and employees were added. Secondly, the OSEF had inherited the same typology in traditional physical retail atmospherics studies which facilitated an easier comparison between online and offline retail environments. Thirdly, Manganari et al., (2010) developed the MSEF with adaptations from the OSEF model in 2009 and highlighted the impact of mobile user interface design on the MSEF. This opened a new question to researchers about how m-commerce could be analysed based on the same web model. In section 2.4.5, this question will be further discussed given the unique challenges in mobile commerce as well as insights from some of the research results of all the 107 reviewed studies as well as other literature.

### **2.2.3 Important insights and contributions of “atmospherics” and or SOR framework**

The most notable contributions from the “atmospherics” or “SOR” approach have been in the areas of (1) web site Layout/Design, user navigation and experience (2) Colour,

music and product presentation (3) Store image, interactivity and store atmosphere and how these “atmospherics” factors impacted user preference and actual behavioural choices.

From the web layout/design dimension, reviewed studies(see below) had explored and verified that the impact of simple/non-complex website background and easy to use design facilitated user navigation and would help to induce user trust, create shopper satisfaction and pleasure, thereby enhancing positive site attitude and increased purchase intention/sales.

Table 2.1 List of Studies focusing on site layout/design/navigation & user experience

No.	Year & Authors	Factors identified to have impacted e-commerce or m-commerce
A1	Stevenson et al., (2000)	Simpler backgrounds elements indicated more positive impacts on attitude toward the brand, purchase intention and attitude toward the website
A7	Eroglu et al., (2003)	Empirical testing confirmed the effect of the impact of site atmospherics and site aesthetics on shopper attitudes, satisfaction and various approaches/avoidance behaviour as a result of the emotions experienced.
A13	Vrechopoulos et al., (2004)	Grid layout was identified as being more effective
A18	Griffith (2005)	A tree web site structure was perceived to be easier to use and facilitated greater elaboration and response than a tunnel structure.
A19	Martin et al., (2005)	Medium web-site complexities found to be favourable in impacting consumer brand attitudes, web site attitudes and purchase intentions.
A20	Mazursky et al., (2005)	Consumer search processes were affected by different on-line interfaces with different advantages to each depending on the search situation. The sequence of the search was found to impact shopping duration and number of examined brands.
A24	Tractinsky et al., (2006)	Aesthetics impression of a web site was formed after a very brief exposure to the site. Site aesthetics was found to impact considerable variance in individual evaluations on the site.
A25	Zviran et al., (2006)	Website adhering to user-based design principles led to greater satisfaction and success.
A26	Cyr et al., (2006)	Visual design aesthetics did significantly impact perceived usefulness, ease of use and enjoyment. All of which ultimately influenced the user's loyalty intentions towards a mobile service.

A37	Manganari et al., (2011)	Empirical tests confirmed virtual layout and design on user pleasure, trust and usage based on data from the online travel industry.
A50	Lin et al., (2016)	Visual complexity and background colour contrast of website had significant effects on consumer's emotional responses. A well-designed website with adequate visual complexity and figure-background colour contrast could create the desired environment to attract and retain consumers.

Besides addressing the impact of overall web design on user behaviour, several key factors were also focused and tested in these studies: grid [A13] Vrechopoulos et al., (2004), search [A20] Mazursky et al., (2005), and layout pattern [A18] Griffith (2005) and [A37] Manganari et al., (2011). In addition, as a more subjective aspect of site aesthetics and its impact also emerged in the discussions as in [A7] Eroglu et al., (2003) [A24] Tractinsky et al., (2006) and was empirically confirmed to have impacted on consumer behaviour.

In summary, one additional insight was identified in the study [A26] by Cyr et al., (2006), that web layout/design/aesthetic factors had impacted consumers with respect to the perceived ease of use and perceived usefulness. This could be interpreted as a valid illustration of how TAM theory Davies (1986) could supplement the SOR framework (Donovan & Rossiter, 1982).

The second aspect that the “atmospherics and SOR” approach focused upon was in substantiating the impact of site background colour, music and product presentation. The related studies are outlined in Table 2.2 followed by discussions of the key findings.

Table 2.2 List of Studies focused on colour, music and product presentation

No.	Year & Authors	Factors identified to have impacted e-commerce or m-commerce
A6	Menon et al., (2002)	Confirmed the impact of product presentation on shoppers' level of arousal and pleasure and subsequent user experience and purchase.

A9	Lee et al., (2004)	Higher fidelity images led to greater user attention to the products. Motion on a dynamic web interface demanded greater user attention; therefore, an interface with higher fidelity and motion led to greater user attention span and usage.
A10	Gorn et al., (2004)	Colours that induced more relaxed feeling states led to higher perceived quickness and user satisfaction.
A16	Biers & Richards (2005)	A trend for two of the three tested products showed more positive attribute scores when featured on a blue or purple background
A30	Jacob et al., (2009)	Background music contributed to the sales of a florist shop.
A31	Cheng et al., (2009)	Background music and colour were elements of the environment that provided for an effective method of influencing online shopper's mood states
A32	Kim et al., (2009)	Product presentation had a significant effect on consumer's emotional responses and there were positive relationships among consumer's emotional cognitive and cognitive responses.
A50	Lin et al., (2016)	Visual complexity and background colour contrast of website had partially significant effects on consumers' emotional responses. A well-designed website with adequate visual complexity and figure-background colour contrast could create the desired environment to attract and retain consumers.
A51	Kim & Shin (2016)	Confirmed visual environmental cues contributed to better emotional states and led to satisfaction toward e-commerce.
A52	Pelet et al., (2016)	Confirmed effects of mobile website's colour contrast on behavioural intentions to buy, revisit and recommend.
A53	Lineta et al., (2016)	Confirmed that atmospheric factors such as colour, graphics and layout had a significant impact on consumers' state of pleasure and arousal impacted their intention to purchase.

In [A6], Menon & Kahn (2002) demonstrated that visual presentation of site content had significantly affected the state of users' pleasure and arousal which, in turn, impacted their browsing and purchasing behaviours online. In [A9], Lee et al., (2003) illustrated the importance of high-fidelity images on user attention and recall. In [A10], by Gorn et al., (2004) and [A16] Biers, K & Richards, L (2005) the impact of background colour was fully



shown with respect to how it affected user's attitudes toward selected products. Besides colour, some studies centred on the effect of site music on sales, [A30] Jacob et al.,(2009), and studies that examined the cross-effect between combinations of atmospheric variables such as music and colour [A31] Cheng et al.,(2009), product presentation and colour [A32] Kim et al.,(2009), design and colour [A50] Sheng et al.,(2016), and, perceived dominance and colour [A52] (Pelet & Taieb, 2016). There was one unique attempt in examining colour and scent in [A51] Kim & Shin (2016) which showed valid empirical results towards user's pleasure and arousal emotions with different combinations of colour (from website) and scent (emitted from the testing environment). One more recent study, [A53] Lineta et al., (2016), confirmed that the atmospheric factors of colours, graphics and layout had a significant impact on the state of pleasure and arousal which in turn impacted intention to purchase; this was explored in the context of an apparel online website.

The third major focus and contribution from the “atmospherics and SOR” approach were in the areas of store image, interactivity and store atmosphere. The related studies are listed in Table 2.3 followed by discussions of the key findings.

Table 2.3 List of Studies focused on-site image, interactivity and store atmosphere.

No.	Year & Authors	Factors identified to have impacted e-commerce or m-commerce
A2	Coyle et al., (2001)	Level of interactivity and level of vividness in websites helped created more enduring consumer attitudes.
A11	McKinney & Letecia (2004)	Results showed that some atmospheric variables influenced satisfaction for all consumers, regardless of shopping orientation but some were contributors to satisfaction for specific shopping segments.
A15	Ballantine (2005)	Level of interactivity and amount of information had a significant effect on consumer satisfaction.
A17	Fiore et al., (2005)	The path-analysis model revealed significant paths between hedonic value and resulting emotional pleasure and arousal variables. A pattern of significant paths was also found

		between the three variables and global attitude willingness to purchase and willingness to patronize the online store.
A45	Ching et al., (2016)	Verified a model of 3 major factors: atmosphere, image and trust of online storefronts influencing customer's patronage and purchase intention.

In [A2], Coyle and Thorson (2001), proposed the concept of ‘telepresence’ which was driven by the level of site interactivity and vividness. Research results confirmed that participants who experienced a higher level of site interactivity and saw a higher level of vividness created more enduring positive attitudes and had a strong concept of the telepresence image on the site. This strengthened image would positively support their intention to engage with the site. [A17], Fiore et al., (2005) also illustrated through a path-analysis, a strong pattern and linkage of positive attitude and willingness to purchase with high image and interactivity with site. [A15], Ballantine (2005) also stated the same positive correlation but also pointed out that the positive correlation could be negatively affected if there would be too much information on the site. In [A45], Ching et al., (2016) undertook a very enlightening empirical study with a sample of 588 online shoppers that confirmed that three major factors; site atmospherics, site image and consumer trust on the online storefronts affect customer's patronage and purchase intention of the physical stores of the brand. Similarly, in [A11], McKinney's (2004) results showed that some atmospheric variables influenced satisfaction for all consumers regardless of their shopping orientation, but some were only contributors of satisfaction for specific shopping segments.

### **2.3 Review on “Non-atmospherics” and or “SOR” studies**

In addition to the Eroglu et al., (2001) SOR Model and the Manganari et al., (2009) OSEF Model as reviewed in the 56 studies in Appendix I, there were quite a variety of

analytical methods other than “atmospheric” and or “SOR” approaches that were used in e-commerce or m-commerce performance studies. A total of 51 such studies were identified and summarized in Appendix II. These 51 studies exhibited quite distinctive frameworks; some could be generalized as common ones while many diverse cases were difficult to classify into specific groups.

The first framework was the Technology Acceptance Model (TAM) as proposed by Davis (1986). As illustrated in Davis (1986), TAM was set out to predict the acceptability of information system deployment and to identify the necessary system modifications to improve user acceptance. Table 2.4 below listed these 12 studies and insights into the important factors that impact e-commerce or m-commerce performance.

Table 2.4 List of Studies based on Technology Acceptance Model

No.	Year & Authors	Factors identified to have impacted e-commerce or m-commerce
B4	Childers et al., (2001)	Perceived usefulness & perceived ease of use impact by website navigation/design
B13	Ko et al., (2009)	Ease of use, usefulness, instant connectivity with user adoption
B14	Tan et al., (2010)	Ease of use, usefulness, trust and social influence impacted customer usage intention
B18	Shen (2012)	TAM & Social presence impacting user adoption of social commerce
B19	Shen et al., (2012)	System usefulness and Information usefulness affected customer continued usage
B20	Hung et al., (2012)	Perceived usefulness and customer confirmation/trust impacted continued usage
B24	Chong (2013)	Perceived usefulness, ease of use, enjoyment, trust impacted continued usage intention
B26	Mishra (2014)	User attitude and perceived behavioural control impact usage and adoption

B27	Mirusmonov et al., (2014)	Ease of use, personalization, connectivity impact user utilitarian and hedonic value
B28	Lu (2014)	Personal innovativeness, social influence impact usage and continuance intention
B41	Liu et al., (2016)	Site aesthetic formality impact perceived ease of use
B48	Chen et al., (2018)	Perceived usefulness & ease of use impacted purchase intention mediated by Flow

The above studies show how the usage of TAM and variables enriched the understanding of the interactions between atmospheric variables and TAM variables, such as perceived ease of use and usefulness. For example, (B48) Chen et al., (2018) pointed out that it was the “Flow” of the site that affected users’ perception of usefulness and ease of use; (B4) Childers et al., (2001) & (B41) Liu et al., (2016) also illustrated the relationship between site aesthetics and site design impacting perceived ease of use; (B18) Shen (2012) & (B14) Tan et al., (2010) discussed how perceived ease of use and usefulness worked with atmospheric variables such as social presence to impact the adoption of social commerce. On the other hand, the challenge was that TAM explained the relationship between some independent factors and user adoption/usage, but atmospheric research was attempting to explain how environmental or atmospheric factors would trigger user’s emotions/arousal and lead to satisfaction/purchase behaviour. This end state might be much more than initial adoption and usage.

A second distinctive analytical framework that also represented a significant departure from the “atmospheric and SOR” model could be identified in the study; [B42] Lo et al., (2016) used a “Consumer Decision Making Model” framework (Engel and Blackwell, 1982) and referenced the “Two Factor Theory”, (Hertzberg, 1993) to come up with an interesting finding that indicated “user experience” and “site design” were mostly “hygiene factors” while “sales promotion” was the “motivation factor” that contributed to impulse purchase in

the various stages of the consumer decision-making process (need recognition; information search; pre-purchase evaluation; transaction and post-sales). This study not only provided comprehensive insight into how user experience, site design and sales promotions were impacting consumer behaviour in each stage of the consumer decision-making process but also pointed out the distribution of these motivation and hygiene factors were rather uneven in the consumer decision process. This finding had important implications for e-commerce website designers in how they could plant triggers for online purchase behaviour.

Aside from the distinctive characteristics of the approaches listed above, this study was similar to most of the studies under the review, the level of analysis was established at the “micro” perspective of consumers and the consumer decision making process rather than behaviour at the company level. Moreover, this study also focused on general web-commerce rather than m-commerce and further extension of this framework into other studies was yet to be seen.

For the rest of the 38 studies in Appendix II, most were based on results from expert panels or statistical factor analysis to identify the important factors, moderators or mediators that impacted consumer preference or usage of e-commerce and m-commerce. Table 2.5 below illustrates examples from these studies:

Table 2. 5 List of Studies based on other methodologies

No.	Year & Authors	Factors identified to have impacted e-commerce or m-commerce
B2	Liu & Arnett (2000)	Information, service quality, system use, playfulness and system design quality
B3	Szymanski et al., (2000)	Convenience, site design and financial security
B10	Xu et al., (2006)	Convenience, ease of use, trust, ubiquity, security, bandwidth, pricing, devices, battery life handset design, location-sensitive
B11	Choi et al., (2008)	Content reliability, availability, the perceived price level of m-internet transaction
B23	Gao (2013)	Website & information quality, navigation, response time, visual appeal, interactivity

B35	Fong & Wong (2015)	User's attitude, the intensity of social & peer pressure, perceived use, localization
B36	Nilashi et al., (2015)	Security, design and content factors
B43	Young et al., (2016)	Information quality, ease of use, responsiveness, security, visual appearance, trust, interactivity, personalization, fulfilment
B49	Faulds et al., (2018)	Customer-retailer interconnectedness, consumer empowerment, Proximity-based consumer engagement, Web-based consumer engagement.

The above studies were mostly associated with research on adoption and usage of mobile commerce, with 6 out of these 9 examples listed above focused on m-commerce. Although these studies might not have been structured around particular theories and reflective of a multi-disciplinary approach, they did bring new insights and factors that were not otherwise considered in the Eroglu (2001) or Manganari (2009) models. For example, security, interactivity, personalization, localization, bandwidth, pricing, devices and battery life. The new insights that were brought by these studies were these factors that were identified as impacting on m-commerce performance and were not related to factors found in typical atmospherics studies; for example, the price level of mobile internet service [B11] Choi et al., (2008) or handset design/battery life [B10] Xu et al., (2006) which were very specific to the study itself and therefore difficult to generalize.

Since 2015 with the advent and application of big data technologies, there had been more evident use of massive clickstream analysis and linear programming models in the analysis of key factors that could impact the performance of e-commerce. The concept of clickstream analysis is to collect, analyse and report aggregate data about which pages a website visitor has visited and in what order. Clickstream analysis is not a recent invention, one of the earliest publications on how clickstream analysis could be applied to online store dates back to 17 years ago, see Lee et al., (2001). Based on a user's clickstream data pattern

on web-browsing and purchasing behaviour at check out, deeper understanding of the user's behavioural implications was made possible due to advancement in computer processing and storage technologies. There were 4 specific studies that leveraged these techniques; these are described in Table 2.6 below.

Table 2. 6 List of Studies using Clickstream data analysis

No.	Year & Authors	Factors identified to have impacted e-commerce or m-commerce
B32	Lee et al., (2015)	Clickstream analysis of 0.7 million consumers on four online shopping sites from March 1st to March 24th, 2014 was performed. A substantial portion (24%) of consumers in a general-purpose marketplace (like eBay) were found to be discovering items from external sources (e.g., price comparison sites), while most (>95%) of consumers in special-purpose shopping sites directly access items from the sites themselves. This study also revealed that item <u>browsing patterns and cart usage patterns were important predictors of the actual purchases.</u> This model claimed to have achieved over 80% accuracy in predicting consumers' purchases across the four online shopping sites.
B39	Chong et al., (2016)	The study was based on Amazon.com as the source of data with a focus on electronic devices such as cameras, televisions, Hi-Fi system etc. 12,000 texts reviews were used in sentiment analysis and data. These data were further analysed using a neural network to come up with predictive models. <u>The generated predictive model could predict sales volume based on input variables from online reviews, online promotional strategies and online sentiments.</u> The authors found that the interplay effects of these variables sometimes became even more important variables than the individual variables themselves.

B47	Wang & Wattal (2018)	This study was constructed from a linear programming analysis using a 2-year data set of customer's demographics and weblogs of customer's actions on the brand's fan page from a leading fashion retailer in China. Research results confirmed <u>the impact of introducing a store on social media fan pages had not been welcomed by social media users and led to reduced engagement by the fans and reduced actual online sales.</u>
B50	Kim & Kim (2018)	Based on a quantitative analysis of a data set of 3679 deals from Korean social commercial sites such as Coupang, this study <u>validated the importance of customer's voluntary sharing of deal information via social networks in social commerce. Research results confirmed that the effect of Facebook 'likes' and Twitter tweets were statistically significant with the volume of deal sales.</u>

The usage of clickstream and 'big data' plus analytical tools such as neural networks had contributed new dimensions for linking consumer purchase with onsite behaviour as well as social engagement. Besides, new models were built with improved accuracy in statistical projections of behaviour metrics and sales. However, it was still relatively difficult to replicate these studies as access to specific firm's data was needed and a high level of computing resources would be needed to scrape data and analyse these data that would come in massive scale. Due to the depth of data needed to establish each case, it would also be relatively difficult to get a more horizontal view across multiple sites and industries to generate results that could cover a wider perspective.

#### **2.4 Consolidated findings from the different approaches in the reviewed literature**

The objective of this section is to synthesize the findings discussed in sections 2.2 and 2.3 that summarized the different approaches in the 107 reviewed articles. While section 2.2 had focused on the 56 "atmospherics and/or SOR" approaches and the insights factors impacting on e-commerce or m-commerce performance, section 2.3 outlined the various methodologies and insights from the 51 studies on "non-atmospherics and/or SOR"



approaches. To build on this, the following section is sub-divided into 5 parts to illustrate how the “atmospheric/SOR” and non-atmospheric/SOR” perspectives can be combined and contributed towards enhanced understanding in the areas of:

Section 2.4.1 - User Experience

Section 2.4.2 - Social Engagement

Section 2.4.3 - Other relevant information system and technology factors

Section 2.4.4 - Moderators

Section 2.4.5 – Difference between e-commerce & m-commerce

#### **2.4.1 From Layout/Design and Atmospherics to User Experience**

As discussed in section 2.2, the “atmospherics” or “SOR” approach had made extensive contributions in the areas of (1) Web site Layout/Design, user navigation and experience (2) Colour, music and product presentation and (3) Store image, interactivity and store atmosphere and how these “atmospherics” factors impacted user preference and actual behavioural choices. From the review in section 2.3 that summarized the findings under various “non-atmospherics and or SOR” approaches, there was quite a lot of similarity in focus and findings of how design factors, navigation and site interactivity had impacted e-commerce performance. Table 2.7 below illustrates these key concepts and the factors addressed in these studies:

Table 2.7 List of non-atmospherics/SOR studies related to site design/layout/user experience

No.	Year & Authors	Factors related to Site Design/Layout and User Experience
B2	Liu & Arnett (2000)	Information, service quality, system use, playfulness and system design quality
B3	Szymanski et al., (2000)	Convenience, site design
B10	Xu et al., (2006)	Convenience, ease of use

B12	Choi et al., (2008)	Content reliability
B14	Tan et al., (2010)	Perceived ease of use and perceived usefulness impact consumer attitude
B15	Li et al., (2011)	Convenience and media richness
B19	Shen et al., (2012)	System usefulness
B23	Gao (2013)	Website & information quality, navigation, response time, visual appeal, interactivity
B25	Fong & Wong (2015)	User's attitude, perceived use and localization
B26	Mishra (2014)	Perceived behavioural control
B27	Mirusmonov et al., (2014)	Simplicity, personalization and intimacy
B32	Lee et al., (2015)	Browsing pattern and cart usage pattern
B33	Xun (2015)	Consumer conscious decision-making process
B34	Dehghani & Tumer (2015)	Users' attitude and perceived use
B36	Nilashi et al., (2015)	Design and content factors
B41	Liu et al., (2016)	Aesthetic formality impacting perceived ease of use, pleasure and satisfaction
B42	Lo et al., (2016)	User experience and site design as hygiene factors
B43	Park & Gretzel (2016)	Ease of use, responsiveness and visual appearance interactivity
B46	McLean et al., (2018)	Ease of use, customization convenience driving customer experience
B48	Chen et al., (2018)	Perceived usefulness and perceived ease to use related to flow
B49	Faulds et al., (2018)	Consumer empowerment, proximity-based consumer engagement, web-based consumer engagement, customer-retailer interconnectedness
B51	Thakur (2018)	Customer engagement

The identified factors in these “non-atmospherics/SOR” studies such as website design, ease of use, simplicity in navigation, perceived usefulness and convenience echoed similar findings from “atmospherics/SOR” studies. There was a significant amount of solid

empirical work from both “atmospherics or non-atmospherics” approaches that could support the importance of site layout design and site image/interactivity. However, there had been much more detailed exploration in “atmospherics/SOR” studies that addressed the impact of colour and music as well as factors such as “site image”. Another difference in the “non-atmospherics/SOR” studies was that “atmospherics” components such as “site design/layout”, “ease of use” and “perceived usefulness” were only part of a multiple-factor model or factor portfolio together with other “non-atmospherics” components such as “security”, “system stability” that impacted e-commerce performance. This trend of combining both “atmospherics” and “non-atmospherics” factors had contributed to a wider perspective in analysing the new complexities in m-commerce and had become more widely used since 2010 as the proportion of “non-atmospherics/SOR” studies increased to 37 over 51 from the base of reviewed literature.

Another important emerging theme from both these “atmospherics/SOR” and “non-atmospherics/SOR” studies centred around the concept of “User Experience”. As could be seen from the table above, most of the studies would address the concepts of perceived usefulness, ease of use, convenient system design and how these factors would ultimately enhance user experience. As concluded by Lo (2016), User experience and Site design should be classified as hygiene factors to e-commerce performance.

#### **2.4.2 From Social Cues to Social Engagement**

Manganari et al., (2009) did not elaborate much about how virtual social presence together with the elements of web-counters, crowding or how other visitors make comments will affect user’s web commerce behaviour. The only comment was the impact of virtual social presence and there were no other details documented. Since then, there have been substantial changes in website design and how social networks became integrated with and

created an impact on e-commerce websites. Several notable trends were: the increasing role of third-party social networks such as Facebook, Twitter, Instagram Weibo and Wechat. Guo et al., (2011) pointed out that the three roles of the social network in online shopping were: information passing, price of trust and consumer choice. It was quite common for e-commerce sites to have social log-in which was utilizing the massive membership of the social network and the pervasiveness of the network. As an example, in 2017, Facebook had over 2 billion monthly active users and 72% market share in social login (Statista, 2017). Additionally, the social network was an extremely important channel for e-commerce sites to use to obtain and pass information from their customers, indirectly promote product and pricing information and affect consumer choice. Besides external social network presence, the social presence architecture of an e-commerce website would also need to consider customer online reviews (OCR) and the usage of external bloggers or Key Opinion Leaders (KOL) in influencing consumer behaviour. Hence, all these elements were an important part of the extended social presence of the e-commerce site.

Out of the 107 studies reviewed, there were 19 studies, see Table 2.8 below that were directly related to social factors or cues. 16 of these studies were only put forward after 2010. “Atmospherics/SOR” studies represented only 7 of the total and 11 of the studies used “non-atmospherics/SOR” approaches which reflected the more recent prevalent focus in the last 8 years on social factors and contributions made from the “non-atmospherics/SOR” studies.

Table 2.8 List of studies related to social factors

No.	Year & Authors	Factors related to Social cues or factors
A27	Wang et al., (2007)	Social cues led to positive arousal and pleasure
A29	Bisson et al., (2009)	Social aesthetics, social dimension of design, social visual cues.

A33	Manganari et al., (2009)	Virtual Social presence in the Online Store Environment Framework.
A34	Manganari et al., (2010)	Social Factor in the Mobile Store Environment Framework.
A38	Albert & Hersinta (2012)	Social network sites contributed to on-line purchases.
A48	Kang. & Lee (2016)	Social presence resulted in greater pleasure and arousal for users.
A49	Kim et al., (2012)	User-Generated Content (UGC) had a significant impact on consumer's emotional and cognitive responses.
B22	Jaradat & Al Rababaa (2013)	Illustrated Social Influence
B28	Lu (2014)	Social Influence
B31	Setenay et al., (2015)	Social capital and trust positively influenced online word-of-mouth
B34	Dehghani & Tumer (2015)	Facebook ads enhanced brand image and equity through contributing to the user's purchase intention.
B35	Fong & Wong (2015)	The intensity of social & peer pressure
B39	Chong et al., (2016)	Online reviews, online promotional strategies and online sentiments predicted product sales.
B40	Elwalda et al., (2016)	Online customer reviews impacted customer's purchase intention
B44	Thach et al., (2016)	87% of respondents confirmed social media impacted their purchase decision.
B45	Lohse et al., (2016)	Positive Online customer reviews (OCR) led to lower return rates, higher sales after returns and better conversion rates.
B47	Wang et al., (2018)	Store on social media fan pages was not welcomed by social media users and had reduced customer engagement with the fan pages and decreased sales.
B50	Kim & Kim (2018)	Social network sharing such as Facebook "likes" was found to be statistically significant impacting deal sales
B51	Thakur (2018)	Online review intention as an important mediator in user satisfaction and engagement.

The first "atmospherics/SOR" study on the social factor was [A27] Wang et al., (2007) which pointed out that social cues in websites led to positive arousal and pleasure and contribute to user patronage. Based on a qualitative survey of 26 expert web designers [A29], Bisson et al., (2009) advanced the concepts that social dimension of web-design, social visual

cues and interactivity were important factors impacting user's attitude towards the site. A similar finding at [A38] Albert & Hersinta (2012) was based on structured interviews of 15 industry informants who confirmed the contribution of Facebook to on-line purchases of their sites.

More extensive discussions on the social factor could also be found on the “non-atmospherics/SOR” side; [B22] Jaradat & Al Rababaa (2013) stated that social influence was the most significant determinant for user behaviour in m-commerce. [B31] Setenay et al., (2015) discussed how social capital or social presence online affect the online word-of-mouth in the Facebook platform. The strength of the influence of trust and social capital increased through the opinion-seeking and giving path. Based on the trust in their ‘Friends’, users would be more willing to rely on the product information their ‘Friends’ supply. Facebook ads were also shown to have enhanced brand image and equity thus led to positive purchase intention. [B34] Dehghani & Tumer (2015), [B44] Thach et al., (2016), [B50] Kim & Kim (2018).

Another key area in the social factors was the impact of online customer review (OCR) and user-generated content (UGC) on consumer behaviour. [B39] Chong et al., (2016) conducted a big data artificial intelligence projects that leveraged on Amazon.com data plus 12000 texts reviews used in sentiment analysis. Results of this study indicated that online reviews, online promotional strategies and online sentiments could predict product sales. In [A49], Kim et al., (2016) confirmed that positive brand-related UGC had a significant effect on consumers' emotional and cognitive responses. In [B45] Lohse et al., (2017) noted that positive OCR led to lower return rates and high sales after returns as well as better conversion rates.

In summary, [A48] Kang & Lee (2016) showed social presence working together with other factors such as a well-designed website interface was confirmed to create an optimal online environment for desirable service experience and good customer retention.

#### 2.4.3 Other relevant Information System and Technology Factors

One of the major contributions from the “non-atmospherics/SOR” studies was in exposing various technology and information systems that created an impact on performance in e-commerce and particularly m-commerce. These 13 studies in Table 2.9 below have been listed for reference. Information system and technology factors were not focused and defined as part of “atmospherics” in traditional “atmospherics/SOR” literature. However, from these studies, it was evident that these factors were relevant and added incremental dimensions and understanding about how consumers’ behaviour were impacted in e-commerce or m-commerce.

Table 2.9 List of non-atmospheric/SOR studies related to IT and technologies factors

No.	Year & Authors	Information system and technology factors
B3	Szymanski et al., (2000)	Financial security
B5	Hopkins et al.,	System reliability, e-retailer image
B10	Xu et al., (2006)	Security, improvement of bandwidth, crystal-clear spacing, more powerful devices, personalization, battery life, handset look/design, location service
B11	Choi et al., (2008)	Availability
B19	Shen et al., (2012)	Wireless networks, mobile devices and applications affected system quality and system usefulness
B23	Gao (2013)	Website response time, visual appeal, interactivity
B24	Chong (2013)	Transactions, location-based services and entertainment activities
B25	Fong & Wong (2015)	Perceived cost and trust, perceived enjoyment
B27	Mirusmonov et al., (2014)	Mobility and connectivity

B34	Dehghani & Tumer (2015)	Reliability of technology, growth of m-commerce organization, user education and legal support
B36	Nilashi et al., (2015)	Security
B37	Liu et al., (2016)	Screen size
B43	Park & Gretzel (2016)	Information quality, security/privacy, trust, fulfilment

From these studies, two key dimensions could be extracted: First, key component metrics surrounding the e-commerce system or infrastructure; availability, capability, connectivity; security, interactivity, response time and reliability. Second, specific to m-commerce systems: battery life, mobility, perceived cost and trust, screen size, security, mobile devices, stability of the wireless network, mobile applications, perceived usefulness and location services. However, one important note to make was some of these identified factors could be “time-sensitive”. For example, the limitations in bandwidth, screen size or battery life were extremely evident in the earlier days of m-commerce, but due to recent breakthrough in mobile technologies, the limitations of from these areas were less significant or might even bring upon new opportunities.

#### **2.4.4 Important Moderators identified in the reviewed literature**

Apart from a strong list of online atmospherics studies accumulated from the past 18 years, the understanding about the impact of atmospherics on consumer behaviour had also been enriched with the identifications of moderators in building these hypotheses. The first moderator identified was Culture. In [B1], Fink et al., (2000) already illustrated that cultural affinity was the key moderator because the impact of site atmospherics under a predominant culture could not be generalised to another culture. In [B8], Hu et al., (2004) showed that most design factors triggered the same impressions in Japanese, Chinese and UK respondents



but still some design factors had special culture-dependent characteristics which would need to be further localised hence the moderating effect of culture was still prevalent. [A28] Davis et al., (2008) articulated a case on the variation in behavioural and emotional responses to online store atmospherics moderated by a collectivist and individualistic cultural value system. In [A39] Wang (2013), confirmed the impact of site design aesthetics on product views and web purchasing intent as well as the moderating effect of the cultural difference between Brazil and Taiwan. In [B16] Kailani & Kumar (2011), identified culture as the main moderator to perceived risk and acceptance of online purchase based on an empirical study across three cultures: USA, India and Jordan.

Similar to culture, the demographic background of the users was also one of the key moderators identified. [B9] Steenkamp et al., (2006) undertook a very large empirical research study that covered 8886 consumers from 16 fast-moving consumer products companies in 23 countries. The research results showed that perceived web site value and its drivers were predictably moderated by the geopolitical and societal environment in which consumers resided. In the qualitative analysis [A36] by Hunter & Mukerji (2001), the authors pointed out the importance of tailoring website atmospherics according to the characteristics of the target market and suggested incorporating consumer preferences. [B17] Punji (2011) validated the correlation between consumption values and online purchase behaviour and consumer demographics was identified to be the moderator. Finally, in [B25] Chong (2013), it was found that content, location-based services and entertainment had significant relationships with m-commerce usage and activities but age and educational level which was key elements of consumer demographics appeared to have a significant impact on this relationship.

The third significant moderator identified was Gender. [B29] Tsuchiya et al., (2014) illustrated the impact of high and low task cues on consumer's attitudes towards the website

but it was also found that gender had a moderating effect. In the absence of low task-relevant cues, males developed less favourable attitudes toward the site and the brand while females' attitude remained consistent across both experimental conditions. In [A40] Chung et al., (2015) studied the impact of web atmospherics and web site trustworthiness on website stickiness. Gender was identified as the moderator. In one of the more recent studies [A55], Wang et al., (2017) tested the relationship between background music and user-perceived enjoyment and usefulness of the site. Gender was found to be a significant moderator in the correlation. However, in the same year, [A54] Islam et al., (2017) validated the relationship between atmospheric factors such as information quality, system quality and interactivity with customer engagement and brand loyalty but the moderating effect of gender could not be validated.

All the 13 discussions about moderators were listed in Table 2.10 below. In conclusion, the moderating effect of culture, demographics or gender were suggested to have a significant impact on e-commerce or m-commerce performance in both “atmospherics/SOR” or “non-atmospherics/SOR” studies. However, there were still some inconclusive cases where more quantitative research was required to further substantiate the relationship.

Table 2.10 List of studies related to the discussion on moderators

No.	Year & Authors	Discussions on moderators
A28	Davis et al., (2008)	Collectivist and individualist cultural value systems.
A36	Hunter & Mukerji (2011)	Culture and demographics characteristics of the target market
A39	Wang (2013)	Differences in the cultural context of Brazil and Taiwan.
A40	Chung et al., (2015)	Gender as moderator.
A54	Islam & Rahman (2017)	Gender as moderator.

A55	Wang (2017)	Gender as moderator.
B1	Fink et al., (2000)	Impact of the predominant culture
B8	Hu et al., (2004)	Design factors had special culture-dependent characteristics need to be localized.
B9	Steenkamp et al., (2006)	Perceived website value and its drivers moderated by the institutional context in which the consumers live.
B16	Kailani & Kumar (2011)	Culture as the main moderator to perceived risk and acceptance of on-line website.
B17	Punj (2011)	Consumer demographics as moderator.
B25	Chong et al., (2013)	Age and education level as moderators.
B29	Tsichla et al., (2014)	Gender as moderator.

#### 2.4.5 Should atmospheric analysis in m-commerce and e-commerce be different?

From the 107 review studies, 21 articles focused on m-commerce and all these studies were undertaken after 2006. As pointed out in the earlier section, the Manganari et al., (2010) model on mobile commerce was not much different from his original OSEF model in 2009. Therefore, the studies in m-commerce that were covered in this review mainly followed the 3 main approaches below:

A: Using the same SOR framework and empirically testing similar atmospheric factors.

Table 2.11 List of m-commerce studies using atmospherics and/or SOR approach

No.	Year & Authors	Factors identified to have impacted m-commerce
A26	Cyr et al., (2006)	Visual design aesthetics impacted perceived usefulness, ease of use and enjoyment which ultimately influenced user's loyalty
A34	Manganari et al., (2011)	Posited the Mobile Online Store Environment Framework

A42	Pelet & Taieb (2016)	Mobile website's colour contrast impacted behavioural intentions. Perceived dominance and trust towards the website had positive effects on behavioural intentions.
A43	Sohn (2016)	Perceived website complexity negatively influenced user satisfaction with mobile online shops.
A44	Um (2016)	Perceived interactivity and enjoyment impacted usage intention based on pleasure-arousal-dominance emotional state model.
A52	Pelet et al., (2016)	Impact of mobile website's colour contrast on behavioural intentions to buy, revisit and recommendation. Perceived dominance and trust towards the website also had positive effects on behavioural intention.
A56	Huang et al., (2018)	Impact of self-efficacy attributes conflicts and interpersonal conflicts impacted consumer's state of mind to create a state of emotional ambivalence which led to hesitation and finally abandoning their mobile shopping cart.

#### B. TAM framework:

Table 2.12 List of m-commerce studies using TAM framework analysis

No.	Year & Authors	Factors identified to have impacted m-commerce
B12	Ko et al., (2009)	Usefulness, enjoyment, ease of use positively impacted perceived value which had an important mediating effect on consumer's intention to adopt mobile fashion shopping
B14	Tan et al., (2010)	Perceived ease of use impacted Perceived usefulness and consumer attitude, trust and social influence affected customer intention to use m-commerce.
B19	Shen & Wang (2012)	Wireless network, mobile devices and applications impacted system quality and system usefulness. Localization, immediacy and customisation of mobile word-of-mouth determined information quality that impacted information usefulness.
B20	Hung et al., (2012)	Empirical validation of Expectation-Confirmation Model for m-shopping continuance by incorporating trust.
B24	Chong (2013)	Age and education level had significant relationships with m-commerce usage activities, but these relationships varied between content delivery, transactions, location-based services and entertainment activities.
B26	Mishra (2014)	Attitude and perceived behavioural control had a significant impact on m-commerce usage and adoption in India.

B28	Lu (2014)	User personal innovativeness remained as strong determinants of m-commerce continuance intention. Social influence changed the pattern of influence on continuance intention.
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C. Miscellaneous approaches that identified various factors that were drawn from statistical tests or expert panels:

Table 2.13 List of m-commerce studies that identified various factors

No.	Year & Authors	Factors identified to have impacted m-commerce
B10	Xu et al., (2006)	Convenience, ease of use, trust, ubiquity, security, bandwidth, crystal-clear spacing, pricing, devices, battery life handset design, location-sensitive.
B11	Choi et al., (2008)	Content reliability, availability, the perceived price level of the m-internet transaction.
B34	Dehghani & Tumer (2015)	Facebook ads enhanced brand image and equity. Both factors contributed to positive purchase intention. Reliability of technology, growth of m-commerce organization, profitability, user education and legal support identified as success factors of m-commerce business.
B35	Fong & Wong (2015)	User's attitude, the intensity of social & peer pressure, perceived use, localization.
B36	Nilashi et al., (2015)	Security, design and content factors impacted customer trust in m-commerce.
B46	McLean et al., (2018)	Ease of use, customization, convenience driving customer experience by impacting the level of enjoyment and timeliness in app usage.
B49	Faulds et al., (2018)	The consumer decision process is driven by customer-retailer interconnectedness, consumer empowerment, proximity-based consumer engagement, web-based consumer engagement.

In the above studies, there were very few discussions about how m-commerce atmospherics should or could be different from e-commerce. However, three studies mentioned significant areas of difference that could lend some insights. [B11] Cho et al., (2008) deployed a mixed-methods approach to come up with 9 key factors for both e-commerce and m-commerce. There were 3 unique factors for m-commerce: content reliability, mobile system availability and perceived price level of using m-internet transactions. These factors were identified as the most significant factors for m-satisfaction

and m-loyalty. [B37] Kim and Sundar (2005) showed a large screen size led to more effective and behavioural trust and thus impact on purchase intention. [B45] Lohse et al., (2017) indicated a weaker impact of online customer view in mobile than a desktop sales channel.

The above three studies touched on several main areas where m-commerce could have unique atmospheric challenges: one was clearly on the limitations of screen size that would create additional requirements about how layout, content and graphics should be displayed to project the best brand image and given users an excellent 'Flow'. Second, perhaps due to the more restrictive screen properties, the impact and effectiveness of OCR would need to be redesigned to mobile requirements. Third, the unique challenge of system reliability and cost of mobile internet services would be something specific to the environment of the m-commerce entity and the challenging conditions would also change with time.

For example, with the advance in mobile infrastructure technology to 4.5 and 5G, system availability and cost of using mobile data was significantly different from 10 years earlier when 3G was still in its infancy. Table 2.14 below summarized what could be the major difference between e-commerce and m-commerce and how these differences might have different atmospheric implications. Through this table and the findings in the above 3 studies, it could be seen that m-commerce should have a separate and different focus and analytical methods that could take care of its unique nature.

Table 2.14 Difference between E-Commerce & M-Commerce and potential implications in atmospherics

Source: Author

Potential Difference areas	E-Commerce (Desktop/Stationed devices)	M-Commerce (Mobile/Laptop/ Tablet devices)	Implications for mobile atmospherics
Physical Display	Relatively unlimited Screen size	Screen size limited to 12-15 inches but average at 5-6 inches	Layout Design, content atmospherics, interactivity that could work smoothly with a little keyboard but just touch and swipe. The high variety of screen sizes between different Operating Systems such as iOS, Android and Windows imposed

			significant challenges on achieving consistent user experience across different devices in m-commerce.
Operation	Mouse or touchpad control, keyboard	Touch, swipe, tap, keyboard not as usable	Layout Design, content atmospherics, interactivity that could work smoothly with a little keyboard but just touch and swipe. The high variety of screen sizes between different Operating Systems such as iOS, Android and Windows imposed significant challenges on achieving consistent user experience across different devices in m-commerce.
Connectivity	Connected to a fast internet	Mobile wireless but subject to reception quality and network stability	Mobile shoppers will have much less patience to endure complex layout, un-user-friendly control and navigation. Mobile shoppers will demand a much faster and accurate response from the m-commerce user interface, mistakes in navigation and inputs will be much less tolerated.
Power	No constraints on power	Limited by battery life	Mobile shoppers will have much less patience to endure complex layout, un-user-friendly control and navigation
Usage	Time to browse	Limited time in public transport and transit	Mobile shoppers will have much less patience to endure complex layout, un-user-friendly control and navigation. Mobile shoppers will demand a much faster and accurate response from the m-commerce user interface, mistakes in navigation and inputs will be much less tolerated.
Location	Fixed	Ability to move around, location-based service and compatibility with digital map	How to leverage location-based service with digital map and building directory service to enrich interactivity with mobile shoppers.
Cost	Relatively small network and usage cost	Network cost and usage cost	How to build the proper network and user interface to minimize user time spent in navigation & enablement of speedy completion of action or checkout.
Payment	Credit cards and various e-payment systems such as	Same with e-commerce but with much more	How to enable a smooth mobile payment process that would still support a simplistic and easy to

	Pay-Pal, Amazon Pay or Alipay.	challenges in payment access and credit verification.	use design, user-friendly atmospherics and interactivity while supporting the usage of non-keyboard-based access and verification methods such as fingerprints or face recognition.
Security	High and relatively stable	Very high risk in system access and network	Security needs to be designed into layout, design, atmospherics, interactivity
System reliability	High and stable	Very high user-perceived risk in system stability & access	How to build the appropriate trust and image in the brand so that users can see the value and functionalities of the site instead of the high risks in system stability and access
APP Community	Not as relevant	Important communities in Android and Apple users	How to implement a consistent APP strategy that could be most aligned with the independent mobile website
Social engagement	Relatively Text and content loaded with linkages to blogs, users' reviews.	Picture & video heavy and highly selective in linkage to the most relevant graphic content.	How to build the characteristics into layout, design, content, atmospherics, interactivity.

## **2.5 Summary, gaps in research and research questions**

In summary, the findings from the “atmospherics/SOR” as well as the “non-atmospherics/SOR” studies as discussed from sections 2.2 to 2.4 could be represented in the following diagram in Figure 2.7:



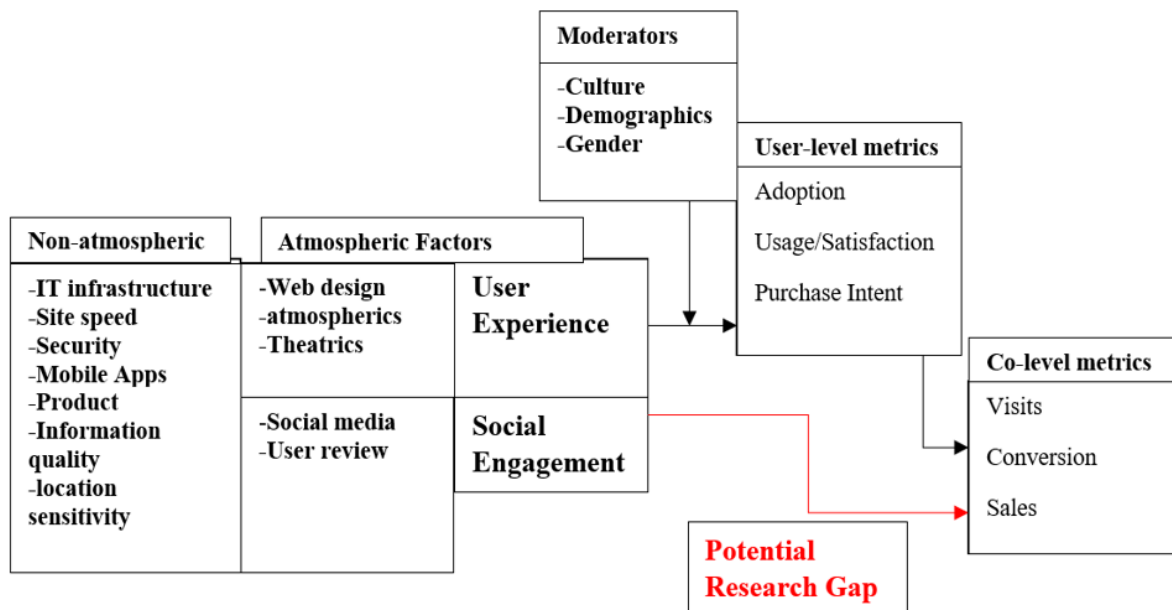


Figure 2.7 Summary of Literature Review & Research Gap (Source: Author)

The 107 reviewed articles indicated three major focus in addressing the questions of factors impacting e-commerce or m-commerce; SOR based atmospherics analysis was the first and most developed approach to illustrate how various atmospheric factors such as layout, design, site navigation impacted user preference and behaviour. From the extensive discussions, two emerging themes or key dimensions could be identified. One was “user experience” and the other was “social engagement” with detailed reference as per section 2.4.1 to 2.4.2 respectively. The third clusters of discussion examined “non-atmospheric” factors such as IT infrastructure, security, information quality as per section 2.4.3. As summarized in section 2.4.4. the last group of studies explored the moderators such as culture, demographics and gender on their impact between the relationship of atmospheric or non-atmospheric factors and the behavioural outcome studied.

From the above analysis and discussions, it can be seen that findings from “atmospherics and or SOR” studies had formed the core in the understanding of site design/navigation/atmospherics and had cumulated into the concept of “user experience” and

how it had impacted e-commerce performance. The knowledge base reflected a strong heritage from the past “atmospherics” studies in “brick and mortar” retail business particularly before 2010. The subsequent extensive use of “non-atmospherics and or SOR” approaches had substantially enriched this knowledge base to other new dimensions in social cues and social engagement as well as other information systems and technology factors. The combination of “atmospherics” and other new factors had become the trend in the more recent academic research direction particularly in the era of m-commerce. This development raised the question of what was the role of “atmospherics” factors in m-commerce performance, would “non-atmospherics” factors become more significant in the era of m-commerce? In additions, m-commerce represented the forefront of the industry highly researched and focused by industry practitioners, how would the industry see the changing role of these “atmospherics” factors in m-commerce. Could further synthesis be established on findings from “atmospherics” and “non-atmospherics” studies from reviewed literature as well as inputs from industry experts?

Besides the above potential research need, another gap also existed in the area of unit of analysis. For both “atmospherics” and “non-atmospherics” factor studies, the unit of analysis or the dependent variables were targeted at “User-level” behaviour metrics such as adoption, usage and satisfaction and purchase intent. As such, positive behaviour metrics at the user level was assumed to create a positive impact on company-level metrics such as visits, conversions and sales revenue. Most of the studies reviewed did not touch on or provide further analysis about how the increased user acceptance or user satisfaction would lead to positive results in company performance.

Most of the reviewed studies were based on survey data from students and communities and the reference was made mainly about user behavioural reactions from pleasure and arousal to satisfaction and intended usage. The exceptions were [B32] Lee et al.,

(2015), [B44] Thach et al., (2016), [B45] Lohse et al., (2017) [B50] Kim & Kim (2018), which used massive company-level data and related behavioural outcome with business results such as actual sales. There was a significant challenge in accessing this level of data and replicating these studies. However, a lot more insight could be gained if the atmospheric correlations with behavioural outcome could be also be considered together with company data and actual business results. Furthermore, m-commerce has been a fast-developing marketing channel and industry by itself, there was an active industry knowledge base from a growing group of practitioners. As such, they should have substantial insights on the subject.

Based on the above considerations on past research directions and existing research gaps, the research questions for this study were formulated as below:

1. What is the role and impact of atmospheric factors on m-commerce performance as measured by company level metrics such as site visits, conversion and sales?
2. Can the above research question be validated with company-level performance data?

## **CHAPTER 3 RESEARCH METHODS**

### **3.1. Introduction**

This section outlines the research strategy, epistemological position, methods, design, and data used in this study. Research methodology is defined as “the theory of how research should be undertaken, including the theoretical and philosophical assumptions upon which research is based and the implications of these for the method or methods adopted” (Saunders et al., 2009; pg.3). This section begins with an explanation of the various research strategies highlighting the “Mixed-Methods Approach” which is adopted in this research as well as a brief discussion on the epistemological implications of such an approach. This will be followed by a discussion about the research design and the appropriateness of the “Mixed-Method Approach”, then a detailed description on how the qualitative and the quantitative research is implemented as well as the data collection process will be provided. In the last section, the ethical considerations in this research are addressed. Data Analysis will be discussed in detail in Chapter 4 that follows.

### **3.2. Research Strategy**

#### **3.2.1. Choice of Approach**

Qualitative and Quantitative approaches are often used as the two main research methods in pursuing social science and business research. Each strategy has certain advantages and disadvantages. Qualitative approaches are better suited for mapping meanings, processes and contexts and answering “how” and “why” questions (Ritchie and Lewis, 2003). They offer the capacity to constitute compelling arguments about how things work in different specific contexts (Mason, 2002). The justification of pursuing a qualitative approach is very often based on the ability of qualitative data to offer insight into complex issues that quantitative data may not easily reveal (Eisenhardt and Graebner, 2007).

According to Flick (2014), the main purposes of quantitative research, on the other hand, are to isolate causes and effects, to measure and to quantify phenomena, to create research designs allowing the generalization of findings, and to formulate general laws. However, not all information can be obtained through structured data collection instruments, such as questionnaires (Bryman and Bell, 2011). Besides, there is often limited or no information on contextual factors that can help interpret the results or explain variations in behaviours of subjects of the study. Even under some situations, reduction of data to numbers may also result in information being lost or distorted (Bryman and Bell, 2011).

This research will employ the “Mixed-Methods Research” which is often referred to as the third methodological movement and has witnessed a rapid rise in popularity since the turn of the century (Cameron, 2011). This choice is based on the nature of the research subject identified as well as the appropriate fit between the research methods with the need of the enquiry process. This will be further discussed towards the conclusion of this section after the definition and advantages of mixed-methods research are fully addressed.

Upon synthesizing the inputs from 19 mixed-methods research leaders, Johnson et al., (2007) constructed a very comprehensive definition of mixed-methods research: “Mixed methods research is an intellectual and practical synthesis based on qualitative and quantitative research; it is the third methodological or research paradigm (along with qualitative and quantitative research)” According to Morgan (2007), mixed-methods research is based on the foundation of pragmatism and effectively leverages and combines the strength of qualitative and quantitative viewpoints to address the research question. The process of applying a mixed-methods approach involves the idea of “triangulation” or “multiple operationalism” (Campbell and Fiske, 1959, cited in Baran & Jones, 2016). The convergence of findings from two or more methods can also validate results and show that it

is not a “methodological artefact”. (Bouchard, 1976 cited in Baran & Jones, 2016). In Table 3.1 below, the pros and cons of mixed research can be seen more clearly:

Table 3.1 Strengths and weaknesses of Mixed Research (Johnson et al., 2007 pg.20)

Strengths	Weaknesses
Words, pictures, and narrative can be used to add meaning to numbers.	Can be difficult for a single researcher to carry out both qualitative and quantitative research, especially if two or more approaches are expected to be used concurrently; if may require a research team.
Numbers can be used to add precision to words, pictures, and narrative.	Researcher must learn about multiple methods and approaches and understand how to mix them appropriately.
In a two-stage sequential design, the stage 1 results can be used to develop and inform the purpose and design of the stage 2 component.	Methodological purists contend that one should always work within either a qualitative or a quantitative paradigm.
Can provide stronger evidence for a conclusion through convergence and corroboration of findings.	More Expensive.
Can answer a broader and more complete range of research questions because the researcher is not confined to a single method or approach.	More time-consuming.
A researcher can use the strengths of an additional method to overcome the weaknesses in another method by using both in research.	Some of the details of mixed research remain to be worked out fully by research methodologists. (e.g. the problem of paradigm mixing, how to qualitatively analyse quantitative data, how to interpret conflicting results.
Can add insights and understanding that might be missed when only a single method is used.	
Can be used to increase the generalizability of the results.	
Qualitative and quantitative research used together produces more complete knowledge necessary to inform theory and practice.	

Figure 3.1 below aims at representing the position of mixed-research methods more clearly by putting the qualitative and quantitative approaches as the two sides of a continuum. Pure qualitative and quantitative are on both sides of the end while a pure mixed-methods represents a mid-position deploying both qualitative and quantitative measures equally in the same study. There are also sub-positions of qualitative dominant or quantitative dominant mixed methods depends whether the starting point of the researcher as well as the relative proportion of qualitative and quantitative measures being deployed in the study.

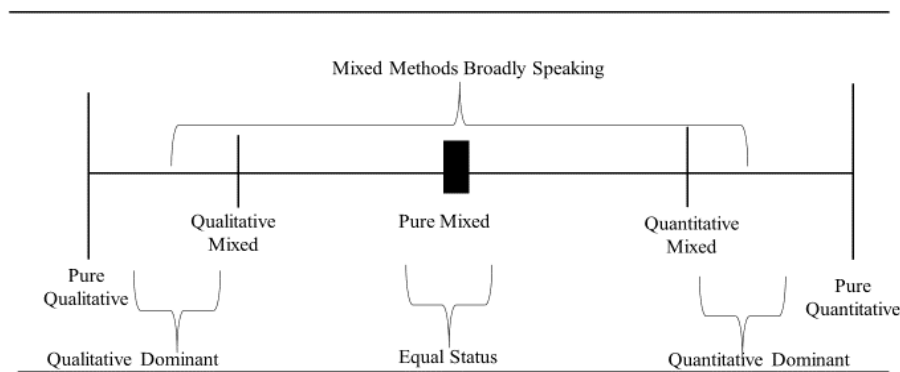


Figure 3. 1 Three Major Research Paradigms (Johnson et al., 2007 pg.124)

Comparing the description and advantages of using mixed-methods research against the research objective and questions of this thesis, it is deemed to be the best match considering the following aspects:

- a. New and rapidly evolving research subject: the subject of this research is on m-commerce and the research question is: the role of “atmospheric factors” in affecting the performance of m-commerce?. Given the discussions in the literature review, how “atmospherics” factors are applied in traditional “brick and mortar” retail has a relatively long history that extended for several decades.

“Atmospheric factors” as a subject of academic studies has been evolving from the traditional retail to the online and now to m-commerce world. As such, there are still not many established theories that can offer comprehensive explanations of the subject matter. At the same time, m-commerce remains a rapidly changing and growing phenomenon. While there are substantial publications and findings from the industry, these findings on m-commerce tend to be quite timely and up to date but perhaps not so much based on structured theories or vigorous quantitative studies. Instead, they might just be practical insights from industry experts based on their experience. Therefore, it would be best if findings from the latest academic writings could also be corroborated with insights from the industry. To implement this strategy, for example, expert interviews is one popular way to solicit insights on certain industry trends and behaviour and if the questions used in the expert interviews are structured around findings of academic articles, one side will “complement” the other and a more complete and structured understanding of the research subject can be “developed” (Greene, Carcelli and Graham, 1989)

- b. Depth and breadth as required by the research subject: The research question calls for understanding “how” atmospheric factors or otherwise impact the performance of m-commerce. This requires qualitative methods to explore more deeply into the “how” and “why” (Ritchie and Lewis, 2003). This enquiry will also call for an understanding of how the various factors work under specific contexts of m-commerce Mason (2002). If only qualitative methods are used, the research findings will tend to have limited validity on certain specific cases or context as defined by the breadth of the informants being interviewed as such it would be difficult to further generalize and apply by deduction Flick (2014). Besides, there



are so many types of m-commerce companies globally and their behaviour should be studied at a company level using available company-level data. To illustrate, if insights from qualitative enquiry can be used to build up a testable hypothesis and a model to run on statistical regression analysis against available company-level data, the quantitative method will help to “triangulate” and “expand” the research process (Greene et al., 1989).

Detailed discussions about how this research will utilize the mixed-methods strategy will be addressed in section 3.3 on research design. The next section will briefly review various philosophical approaches with a focus on mixed-methods research and clarifies the philosophical stance of this research.

### **3.2.2. Research Methodologies and Philosophies**

Saunders et al., (2009) put research philosophy as the most critical aspect relating to the development of knowledge and the nature of that knowledge concerning research. Accordingly, research philosophy contains key ontological and epistemological assumptions that define the basis of research strategy and the methods the researcher chooses as part of that strategy Saunders et al., (2009).

Table 3.2 below is a tabular representation of the “Research Onion” (Saunders et al., 2009) that illustrates the 4 common research philosophical positionings in business research. This table also shows the various layers of research methods, strategies and tactics that business researchers need to develop subsequently based on the specific philosophical positioning they choose.

Table 3.2 Philosophies & Approaches to Management Research

Source: Adapted from “Research Onion” Saunders et al. (2009) p.108

Philosophies	Positivism	Realism	Interpretivism	Pragmatism
Approaches	Deductive		Inductive	
Strategies	Equipment, Survey, Case Study, Action Research, Grounded Theory, Ethnography, Archival Research			
Choices	Mono Methods	Mixed Methods	Mono Method	
Time Horizon	Cross Sectional		Longitudinal	
Techniques & Procedures	Data Collection & Data Analysis			

Directly corresponding to the quantitative and qualitative research methods respectively are the research philosophies of positivism and interpretivism. According to Bryman and Bell (2011), positivism advocates “the application of the methods of natural sciences to the study of social reality and beyond”(pg.28). In a positivist approach, the focus is on a highly structured methodology to ensure replication, and the research result can be law-like generalisations like those derived by physical and natural scientists (Saunders et al., 2009). As such, the role of research is to test theories and to provide material for the development of law (Bryman & Bell, 2011).

On the other hand, interpretivism assumes the epistemological position that it is most important to understand differences between humans in their role as social actors (Saunders et al., 2009). Qualitative research strategy respects the differences between people and the objects of the natural sciences (Bryman & Bell, 2011). Therefore, interpretivism requires the researcher to “grasp the subjective meaning of social action” (Bryman & Bell, 2011) Interpretivists focus on understanding human behaviour from the participant’s frame of reference (Hussey & Hussey, 1997).

Positivist and Interpretivist approaches are often positioned as the two extremes of a continuum but in between, there are also two other important philosophical approaches to research, they are namely Realism and Pragmatism. Realism focuses on explaining observed phenomenon by analysing the underlying causes and mechanisms. As such, realist research tends to use in-depth historical analysis or longitudinal study of the business subject instead of quantitative or pure qualitative methods (Saunders et al., 2009).

From both Johnson et al., (2007) and Morgan (2007), pragmatism is often posited as the philosophical partner of mixed-methods research and an alternative to positivism-objectivists thinking. Pragmatism is defined as outcome-oriented and interested in determining the meaning of things (Johnson et al., 2007) or focusing on the product of the research (Biesta, 2010). It is characterized by an emphasis on communication and shared meaning-making to create practical solutions to social problems. It places primary importance on the research question (Tashakkori & Teddlie, 2003). Pragmatism is based on the belief that theories can be both contextual and generalizable by analysing them for “transferability” to another situation. The pragmatic researcher is similarly able to maintain both subjectivities in their reflections on research and objectivity in data collection and analysis.

This section is concluded by stating Pragmatism as discussed above is the philosophical stance of this research. In the next section, there will be further clarifications about how this philosophical stance and research methodology will shape the research design in terms of strategies, tactics used as well as data collection.

### **3.3. Research Design and Data Collection**

As discussed in the above section, this research will use a mixed-methods strategy to discover the role of atmospheric factors in impacting the performance of m-commerce. This strategy is deemed to be a good match in the “exploration” of a new and rapidly developing subject on how “atmospherics” factors are impacting m-commerce. The researcher intends to fully leverage the insights from both academic and industry sources on such a new subject as well as the process of “triangulation” between qualitative and quantitative data commonly deployed in mixed-methods research. Table 3.3 below summarizes the qualitative and quantitative studies involved in the whole research process from idea formulation, data collection and analysis. The subsequent Fig 3.2 will illustrate how the qualitative insights will be triangulated with quantitative findings to enrich the understanding of the research subject.

Table 3.3 Summary of the qualitative and quantitative research (Source: Author)

<b>Qualitative Analysis</b>	
1. Qualitative analysis using expert interviews	Time Frame
a. Conduct interviews with 10 selected industry experts to explore correlations between atmospheric factors and mobile commerce performance	Apr. 2014 - Jun. 2014
b. Analysis of interview findings to help formulate research models to be used in quantitative studies	Jul. 2014 - Oct. 2014
<b>Quantitative Analysis</b>	
2. Development of research models, data collection, analysis and conclusion	Time Frame
a. Formulate research models based on qualitative research inputs from the literature review and expert interviews	Jun. 2015 - Dec 2015
b. Gather and compile 183 company-level financial data based on Internet Retailer Top 500 Mobile Commerce Report	Jan. 2016 - Jun. 2016
c. 3 independent researchers asked to rate 183 sample mobile websites for user experience and social engagement based on a standard scorecard	Jul.. 2016 – Mar. 2017

d. Scores from 3 researchers on the 183 sample companies' user experience and social engagements run against financial performance through Smart PLS	Dec. 2017 - May. 2018
e. Conclusion and analysis	Jun.2018 - Oct. 2018

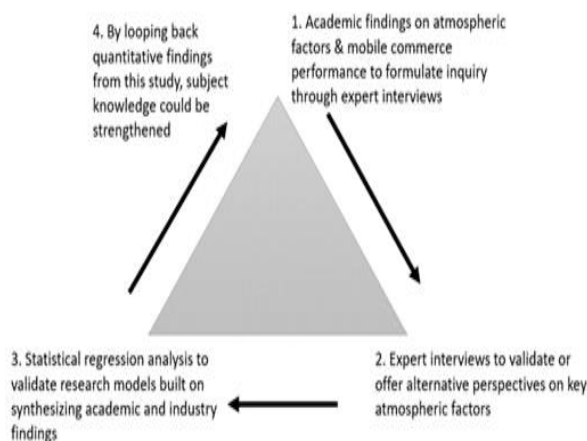


Figure 3. 2 Mixed-Methods triangulation and development in this research

Source: Author

### 3.3.1 Research Methods in Qualitative Analysis

#### 3.3.1.1 Preparation for qualitative analysis - Literature survey and development of questions in the interview guide

To prepare for the qualitative analysis, a comprehensive review of the relevant literature was initiated. Based on the data collection methods as described in section 2.1, 107 articles were identified to be more directly relevant based on our research question and discussion.

Grounded in the early part of this literature analysis starting from 2014, the following concepts and factors were identified as being central to the discussion in the academic literature. These concepts were re-formulated into questions to be used in the semi-structured

interviews conducted with the selected 10 industry experts. Justifications and details of the semi-structured interviews and related methodologies will be addressed in the next section.

Table 3.4 below captures how the findings from academic literature become part of the interview questions:

Table 3.4 Deriving interview questions from literature findings

Independent variables & Factors from Literature (Ref: Appendix I & II Summary Review of E-com/M-com atmospherics studies 2000-2018)	Questions (Partial questions from Table 1 Interview Guide)
Webpage background: Stevenson et al., (2000), Navigation: Childers et al., (2001) Design Quality: Liang & Lai (2002), Layout: Vrechopoulos et al., (2004), Background colour: Gorn et al., (2004) Design aesthetics: Cyr et al., (2006), Background Music: Jacob et al., (2009), Colour & music: Cheng et al., (2009), Virtual layout & Design: Manganari et al., (2009)	What's your view on-site atmospheric factors such as colour, music, navigation flow, fonts, content on the performance of mobile commerce?
Convenience & site design: Liu & Arnett Kirk (2000), Ease of Use: Childers et al., (2001), Store usefulness and trustworthiness: Heijden et al., (2004), Level of interactivity: Ballantine (2005), User-based design and website usability: Zviran et al., (2006), Virtual atmospherics & theatrics: Manganari et al., (2009), System usefulness & information usefulness: Shen et al., (2012)	What's your view on usability and user experience on the performance of mobile commerce?
Social cues: Wang et al., (2007), Virtual social presence: Manganari et al., (2009) Social commerce & presence: Shen (2012), Social media and factor: Albert & Hersinta (2012)	What's your view on promotional events and social engagement activities on the performance of mobile commerce?

Cultural affinity: Fink et al., (2000), Culture value: Davis et al., (2008)	What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile commerce?
Instant connectivity: Ko et al., (2009), Perceived Risk: Kailani & Kumar (2011), Location-based services: Chong (2013)	What's your view on how security and IT infrastructure might impact the performance of mobile commerce?
Visual product presentation: Menon & Kahn (2002), Information load: Huang (2003), Visual fidelity and motion: Lee et al., (2003), Information content effectiveness: Vrechopoulos et al., (2004), (2 Product presentation and music: Kim et al., (2009)	What's your view on product and service content and how they might have impacted the performance of mobile commerce?
Average internet usage, computer anxiety: Coyle & Thorson (2001) User attitude: Mishra (2014), Self-efficacy: Mirusmonov et al., (2014)	What's your view on the user's background and IT knowledge level impacted the performance of mobile commerce?
Country Origin: Fink et al., (2000)	Do you think there is any factor that is specific to your country that might affect the performance of mobile commerce?

### 3.3.1.2 Qualitative analysis using expert interviews

The second part of the qualitative research uses a “purposive interview approach” (Edwards and Holland, 2013) to obtain more in-depth and detailed views from a selected group of industry experts based on their knowledge and experience in m-commerce. This is deemed necessary particularly in the earlier years when this research in 2013-2014 was initiated, there were relatively very few academic studies in mobile commerce. The research subject of atmospheric factors was mainly discussed in the context of desktop web commerce. By contrast, discussions and publications in the industry on mobile commerce had already started. Besides, the topic of atmospheric factors and mobile e-commerce is very practical oriented, there is already quite a lot of expertise accumulated in industry. Hence,

industry experts will be one of the most accurate and timely sources of information about this research subject as well as these experts being all “living and breathing” in the industry.

Creswell (2003) noted that in qualitative research, “the intent is not to generalize to a population, but to develop an in-depth exploration of a central phenomenon”, which is best achieved by using purposeful sampling strategies. A random sampling strategy will be inappropriate for the exploration of the central phenomenon of this study because the purpose here is not to generate a representative sample and then generalize the results to other coordination mechanisms or other contexts, but rather to learn from people who are ‘information-rich’ and can best help to understand the specific interest of this research.

On constructing the panel of experts for interviews, a sampling strategy has been chosen that combines elements of variation based on the expert’s past industry experience in terms of their functional role as well as their geo-cultural background. Furthermore, “snowball sampling tactics” are deployed to generate all the suggested 10 industry experts to participate in the research. Snowball strategy is a form of purposeful sampling in qualitative research that “typically proceeds after a study begins and occurs when the researcher asks participants to recommend other individuals to study” (Creswell, 2003). The relative new subject of m-commerce and atmospherics plus the complexity involved is the decisive factors behind the choice of the snowball approach. The variation approach allows for obtaining this diversity and thereby accounting for the complexity of the problem at hand. It is “a purposeful sampling strategy in which the researcher samples cases or individuals that differ on some characteristic or trait” (Creswell, 2003). In consideration of the scope for this research and the availability of these industry experts as well as available time resources, a sample size of a total of ten expert interviews is deemed appropriate. The profile of the 10 informants is tabled at Table 3.5. It can be noticed that the geographical and cultural background of the experts are not as diverse as it could be with 5 coming with experience



covering China/Hong Kong area, one from each of US, UK, Korea and the Asia Pacific/S.E. Asia. From a functional experience standpoint, 3 are digital marketing managers or directors; 5 with technical experience ranging from graphic designs, analytics, operations & logistics, to platform management/CTO; one come from product merchandising and the remaining one is the Managing Director. From a product market focus perspective, 7 experts are involved in e-tailing of luxury and accessories goods, the other 3 experts are from apparel and consumer services.

Table 3.5 Profile of the Expert Panel in interviews

No.	Code	Position	Yr. of Exp.	Interview Date	Interview Type	Interview Location & Lang.	Country rep.
1	Expert A	Digital Marketing Director	10	11.4.2014	Face to Face	Hong Kong Chinese	Greater China
2	Expert B	Operation Director	10	18.4.2014	Face to Face	Hong Kong Chinese	Greater China
3	Expert C	China Digital Marketing Manager	7	25.4.2014	Face to Face	Hong Kong Chinese	Greater China
4	Expert D	Business Intelligence Manager	7	2.5.2014	Face to Face	Hong Kong English	S.E. Asia
5	Expert E	Senior Graphic Director	7	16.5.2014	Face to Face	Hong Kong Chinese	Greater China
6	Expert F	Head of Content	12	23.5.2014	Face to Face	Hong Kong Chinese	Greater China
7	Expert G	VP Product Mgt.	15	6.6.2014	Skype	NA English	US
8	Expert H	CTO	15	13.6.2014	Skype	Hong Kong English	UK
9	Expert I	Managing Director	20	20.6.2014	Face to Face	Hong Kong English	Asia Pacific
10	Expert J	Digital Marketing Manager of Korea	7	27.6.2014	Face to Face	Hong Kong English	Korea

In terms of the interview design, a semi-structured interview method was adopted in this research. Semi-structured interviews meant the interviewer began with a set of interview themes but was prepared to vary the sequence of the questions and the researcher was also prompted to ask new questions in the context of discussion (Saunders et al., 2009). The choice of the semi-structured interview approach was based on the following considerations as recommended by Creswell (2003):

- The semi-structured design should give the participants enough time to express their views and allow the researcher to follow up on ideas that might come out during the conversation.
- Interviewees should be allowed to compare among each other's responses as they were all responding to the same interview guidelines and questions.
- Semi-structured interviews not only facilitate assessing the participants' opinions but also their personal experiences.
- Participants should be asked on only Open-Ended questions to express their personal opinion and the researcher's view and influence should be minimized.
- Anonymity should be guaranteed to the participants and assurances should be made to them that the interview would not have any negative implications on their employing companies.

There are also a few disadvantages in semi-structured interviews; the preparation is a highly time-consuming activity for the researcher (King & Horrocks, 2004). Interviews are also time-consuming for interviewees, and this may cause problems in recruiting participants in some organizations and occupations (King & Horrocks, 2004). Interviews are also subject to the common problems of bias and poor recall (Yin, 2009).

To address the above challenges and ensuring the smooth execution of the interviews, all interviews in this study were recorded and transcribed. In some cases, the transcripts were

reviewed again by the interviewees and the interviewee could add or edit information. All interviewees were offered the opportunity to review and edit interview transcripts, none of them exercised this choice. As there were only 10 interviewees involved, software-based transcribing tools and coding tools in the likes of CAQDAS was not deployed in this research. This decision was in favour of a deeper interpretation of meaning and context of the data emerging from the interviews particularly 5 out of 10 of the interviews were conducted in Cantonese or Mandarin Chinese as Chinese was the preferred language for the five interviewees. Hence more efforts in manual interpretation were needed to avoid loss of meaning and information due to some of the more colloquial conversations. Having said that, all 5 interviewees and the researcher were bilingual in Chinese and English. Therefore, even the interviews were conducted in Chinese and the interview content was translated from Chinese into English, there was no issue in loss of meaning and there was no need to do any back-translations as both the researcher and the interviewees completely understood the questions and responses recorded in both languages. In additions, given the drawbacks in back-translation as discussed in at Douglas et al., (2007) and given the bilingual scenario of both the researcher and the interviewees, the process as described was deemed to be appropriate in dealing with this language issue arose in the expert interviews.

In the area of data coding and template analysis, a code is a label attached to a piece of data meaningful to the research.(King, 2012). The process of coding creates the pieces that will build-up to develop the template. Coding is the activity where data from the interview transcripts is tagged, classified and interpreted according to guidelines implicitly mandated by the research design to extract meaning and explanation. Hence, coding is not a mechanical-clerical act but requires researcher interpretation (Saldaña, 2009);

This research adopted a relatively simple coding scheme which would tag on all the key concepts and factors in site atmospherics discussed as well as their impact on mobile e-

commerce. Some of the codes were a priori defined based on the interview guide and literature findings, the experts might also come up with new ideas that would be coded differently. In the end, all these data would be consolidated as templates for analysis in deriving commonality and or difference. More details on the codes and templates would be addressed in Chapter 4 Data Analysis section 4.1

For the content used in the interview process, a list of guiding questions was compiled based on the original research questions as well as literature findings. The questions were used to guide the expert interviews to make sure that all respondents could be prompted to cover most of the areas that needed to be addressed in the interview process. However, this interview guide at Table 3.6 was not used for standardizing the data output, it merely provided a framework for the discussions and was intended to trigger and guide the experts' narratives.

Table 3.6 Interview Guide

1. How do you define success in a mobile e-commerce business/operation?
2. Can you give me some examples of successful/unsuccessful mobile e-commerce business based on your criteria mentioned?
3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business/operation?
4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?
  - If yes, why do you think it is the case?
  - If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples of the unique set of success factors for mobile e-commerce?
5. Based on the research results of academic journals in the past 15 years, I like to understand your perspective on what factors will create an impact on the performance of mobile e-commerce:
  - What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?
  - What's your view on usability and user experience on the performance of mobile e-commerce?

- What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?
- What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?
- What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?
- What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?
- What's your view on mobile apps and its impact on the performance of mobile e-commerce?
- Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?
- What's your view on the user's background and IT knowledge level impact the performance of mobile commerce?

6. Open ended question: expert informants given list of 14 design features that are key for the success (Table 3.7)

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Table 3.7 List of 14 design features

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**Features**

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- 1.GPS enabled store finder
  - 2.Click to call
  - 3.Mobile context-specific inputs
  - 4.Easy sharing
  - 5.Prepopulated forms
  - 6.Autofill
  - 7.Call to Action on first page
  - 8.Mirroring an OS
  - 9.Swipe, pinch, double tap
  - 10.Cross-platform cart
  - 11.Multiple payment methods
  - 12.Click & collect
  - 13.Simplicity
  - 14.Speed
- 

Source: Ben Davis, May 2014, [www.eConsultancy.com](http://www.eConsultancy.com)

### **3.3.2 Research Methods in Quantitative Analysis**

The objective of this section is to describe the methods, tools, data collection and compilation process involved in the quantitative analysis. The discussion about the hypothesis and the design of the regression model will be addressed in Chapter 4.2.2 on Regression models and testing of hypothesis.

#### **3.3.2.1 Methodology and Tools**

Following the mixed-methods approach, findings from literature and expert interviews were synthesized to formulate independent factors (atmospheric factors or others) to be analysed against dependent factors (performance metrics) that were used to illustrate the success of mobile commerce business. The objective of the quantitative analysis was to test the validity of the proposed research model against an available data set of 200 mobile e-commerce business. In the sample set selected, only Business to Consumers (B2C) sites were included and wholesale business or Business to Business (B2B) sites were deemed to have a different scope from the studies conducted and, therefore, not included in the sample.

As identified from the discussion in Chapter 2, there was a significant research gap in studying company level performance data as all the majority of the studies reviewed in the literature survey were based on data from sample end-users tested under a construct of atmospheric and other factors working under a SOR model (Eroglu, 2003)

Hence, the focus and key value of this quantitative research model were to validate a construct with a reasonable sample size of m-commerce business to derive incremental insights and learning from what researchers could normally get out of using either qualitative or quantitative research instead of a mixed-methods approach in this current research. Fig.3.3 below outlined the methodological flow used in this quantitative analysis.

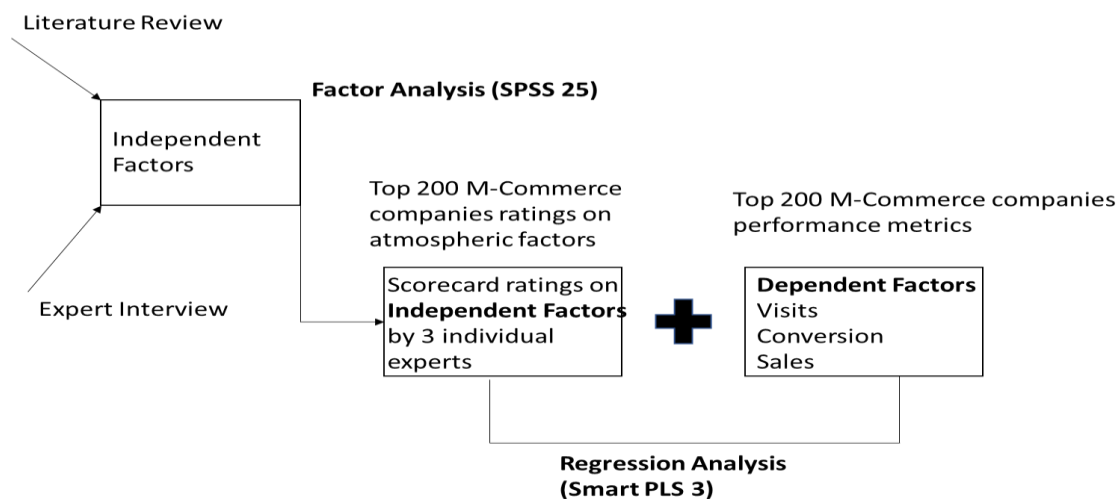


Figure 3. 3 Flowchart of Quantitative Analysis Methods and Tools (Source: Author)

In terms of tools deployed in this research, the latest and most common statistical package for business and social sciences -SPSS 25 was used in this study to perform factor analysis. This step was to ensure the factors identified from the literature review and the expert interviews would be fully analysed and explored for their correlations and this would help to structure the independent factor inputs to the regression model. Smart PLS 3 was used as the regression tool. Smart PLS is a statistical software with a graphical user interface for variance-based structural equation modelling using partial least squares path modelling. Apart from path models using PLS-SEM algorithm, the software could also compute standard statistics results assessment criteria such as T-tests and P-values. This software has become popular amongst researchers in social sciences, marketing and other commercial applications. Smart PLS software is also widely acclaimed by users who need to conduct regression and path analysis with a smaller sample of fewer than a hundred cases.

### 3.3.2.2 Data collection and data compilation

Regarding data collection, the sample size was set at the top 200 performing mobile e-commerce business after considering available resources and efforts to set-up the research model based on the required theory construct. These samples were all based on a business to consumer (B2C) model. Company-level data on key performance metrics such as visits and sales revenue was collected and converted to growth percentages from 2015 to 2016 to reflect the growth dimension. For conversion percentage, 2016 figures were used. The metrics of site visit and sales revenue and conversions were chosen as performance indicators based on findings from experts' interviews. (Details refer to Chapter 4.1) Upon constructing the data set according to the above requirements, 17 samples could not be included in the data set due to lack of some data fields in consecutive two years and some of the sites originated from countries using languages that posed difficulties even in translations; e.g. Russia, Brazil, Finland etc. The final count of sample companies was reduced to 183 in the data set being studied.

To address the need for collecting financial and operation data of m-commerce retailers, this study utilized one single source of company information subscribed from "Internet Retailer Top 500Guide.com". Internet Retailer was once owned by Thomson Reuters and has over 20 years of operation history in providing market intelligence on e-commerce. This database covered company rankings and estimated financial metrics from 2014-2016 on the Top 500 leading m-commerce companies worldwide. Top500Guide.com was the world's largest database of financial, operating and competitive information on the global e-commerce market. This interactive web site contained the latest annual online sales, rankings and scores of other metrics on each of the world's 3,200 largest retail web businesses. The data set also included growth rates, average tickets, web traffic, conversion



rates, marketing stats, and web site features. At the point of writing, this is the only available source of company-level data that would deem usable for this study.

The Top 500 mobile commerce database contained data from m-commerce business that belonged to retail chains and consumer brand manufacturers. Out of the Top 500, only the Top 200 m-commerce retailers were selected. The geographical distribution of the sample m-commerce retailers is 70% U.S, 20% UK & Europe, and about 10% from China. The sample-set of 183 companies apart from (29 mass merchants) were distributed into 16 vertical industries such as apparel and accessories, computer and electronics, houseware, food & drug, sporting goods, and specialities. The full list of the sample companies was in Appendix IV. On data compilation, a scorecard tool (Table 3.9) was constructed to provide aggregate ratings on the factors for each of the dimensions of independent factors. This was deemed to be the most effective way to provide the necessary measurement tools on the conceptual construct. To ensure objectivity, three independent expert examiners were engaged to come up with their objective assessments on the sample companies. Their nominal ratings were compared, counter-checked for reliability issues (Perreault & Leigh, 1989). Each category and item in the scorecard were developed based on the literature findings and insights from experts' interviews. Each of the factors is addressed below to illustrate how they were related to the reviewed literature and expert comments.

Table 3.8 Design and Factors reference for the development of scorecard Source: Author

Factors	Reference
<b>User Experience</b> Site & Form layout  Input Efficiency/simplicity/accurate touch keyboards/ease in editing  Product presentation/listing descriptions/layout/image	<p>The concept of site and form layout has long been the focus of atmospherics studies for the last 10 years. (Cyr et al., 2006 ; Wu et al., 2016). Field description and help menus are more industry practice to strengthen site layout to provide maximum user comfort and experience.</p> <p>Ease of use and simplicity has been heavily researched and studied: Mirusmonov et al., (2014), Xu et al., (2009), Tan et al., (2010) Chong (2013) and therefore are key factors to be included in the scorecard measurement</p> <p>Nilashi et al., (2015) study discussed extensively content factors that include how products are presented, how product and content images are being laid out, so these elements are also critical measurement items in the scorecard. In additions, there are two most recent studies, one on screen size and video mode, Kim et al., (2015) and the second on colour contrast, Pelet and Taieb (2016) which also attested to the importance of product presentation and layout as dimensions of measurement</p>
Browsing & navigation/search/filtering & sorting/error messages  Checkout experience/account selection/clarity in cost & shipping options/multiple payment methods	<p>These factors are chosen as important measurements as they are more related to the concept of perceived usefulness and perceived ease of use as demonstrated by these studies: Ko et al., (2009), Tan et al., (2013). The more detailed descriptions on search, filtering &amp; sorting as well as error messages are more from suggested industry practices that can help to define how users can find and obtain information as well as the smoothness of the users to navigate around the site. These factors are considered as essentially important in terms of user experience.</p> <p>Xu and Gutierrez (2006) addressed the factors of Ubiquity and Clear pricing. Choi et al., (2008) also discussed the concept of the transaction process to gain user trust and adoption. These are the most directly related studies that pointed to the importance of the check-out process, clarity in cost and pricing options. The additions of multiple payment methods and account selection are important inclusions as part of the user experience factors assessment to reflect more current mobile website development as evidenced in industry practice.</p>
<b>Social Engagement Experience</b> Ratings/Reviews	<p>Fong and Wong (2015) discussed the idea of the intensity of social &amp; peer pressure in affecting user adoption and usage. These are direct concepts that we can see how ratings and reviews are performing on the websites. Hence, they are very important factors to measure as part of the social engagement experience</p>
Social & log-in	<p>In both studies of Jaradat et al., (2014), the concept of social influence was discussed. The idea of social influence was vaguely defined in the studies, but it has now become more apparent that social media engagement under the context of m-commerce has become more prevalent to the extent that mobile social commerce has already become a trend. Hew et al., (2016)</p>

Location activities & customer engagement through social network	The choice of including this factor is directly referring to this study by Chong (2013) that examine the impact of location-based services & entertainment activities on m-commerce site adoption and usage.
Mobile system stability & security	Xu, & Gutierrez (2006), identified security as one of the top 12 critical success factors of m-commerce. Dehghani & Tumer (2015), Reliability of technology identified as a key factor.
Mobile platform capability/mobile apps and dedicated mobile site	Mobile users spend 86% of their time in using mobile apps ti <a href="https://www.adweek.com/digital/mobile-users-spend-86-time-apps-32-gaming-17-facebook/">https://www.adweek.com/digital/mobile-users-spend-86-time-apps-32-gaming-17-facebook/</a> For many businesses, the winner is a combination of both. A <u>two-pronged mobile strategy</u> can leverage both a mobile site and an app for maximum distribution of your content. <a href="https://appprasser.com/app-better-than-website/">https://appprasser.com/app-better-than-website/</a>

In terms of data compilation, the following steps were followed to ensure proper scoring and reliable results:

- Three researchers with different cultural background and gender were assigned to use this standard scorecard to assess the 183 m-commerce sites.
  - Each assessment session on each m-commerce site lasted from 30-45 minutes to ensure all the aspects in the scorecard were tested thoroughly
  - the whole field-testing process took place in Aug. 2016 to Sept. 2016 and Jan. 2017 to Feb. 2017
  - The assessments were uniformly conducted in Hong Kong under ultra-fast broadband connectivity by using an Android widescreen (5.5 inches) smartphone.
  - The assessments were conducted with the mobile website of the m-commerce retailer without covering their mobile apps because some of the companies did not operate any mobile app, but they would either have a responsive site or a designated mobile website.
  - All the factors assumed the same weightings with a maximum of 10 points per factor.
- Details of the scorecard and the checkpoints on for each factor were at Table 3.9 For the factors in mobile platform coverage and system stability and security, the

examiner/experts would score based on their observation and the facts and figures about system uptime and mobile platform adoption technology available descriptions from Internet Retailer.

- The final scores from the three researchers were compared and counter-checked for accuracy. The three sets of scores are subject to a simple Consensus Estimate checking by calculating the Percentage Agreement from the three researchers. The Percentage Agreement on all the factors was listed as follows:

**A. User Experience**

1. Site layout	72%
2. Input Efficiency	78%
3. Product Presentation	73%
4. Browsing & Navigation	85%
5. Check out experience	83%

**B. Social Engagement**

1. Ratings & Review	92%
2. Social & log-in	93%
3. Location Activities	92%

C. System Stability and Security 96%

D. Applications of mobile platform technology 92%

Given the relatively high Percent Agreement between the three assessors, the mean score of the three was taken as the final score for hypothesis testing. (Stemler, 2004)

Table 3.9 Scorecard on Independent Factors

Source: Author

Independent Factors	Descriptions of Checkpoints	Scoring
Site layout, Form layout, Field descriptions guidance & Help	<ul style="list-style-type: none"> <li>✓ Label above field, sectioning discrete information</li> <li>✓ Clear indications of optional and required fields, no inline labels</li> <li>✓ Easy to follow guidance and help message</li> </ul>	1.0-10.0
Input Efficiency, simplicity accurate touch keyboards ease in editing	<ul style="list-style-type: none"> <li>✓ Hide redundant fields, no request on the same info, the single name field</li> <li>✓ Disable auto-correction and auto-capitalization, design of next and key buttons</li> <li>✓ Edit option available, updated progress status</li> </ul>	1.0-10.0
Product presentation, listing descriptions, layout images	<ul style="list-style-type: none"> <li>✓ List items include title and thumbnail, relevant cross-sell listings</li> <li>✓ No product information on a sub-page, have 2 primary buttons at the product page</li> <li>✓ Large &amp; compatible product images, detailed views and multi-angle of products</li> </ul>	1.0-10.0
Browsing and Navigation, search filtering and sorting, error messages	<ul style="list-style-type: none"> <li>✓ Support thematic queries, handle miss-spellings, offer suggestions</li> <li>✓ &gt;3 sorting options, multiple selections, within the same filter, show number of matches</li> <li>✓ Easy to understand error messages, direct to viable alternatives</li> </ul>	1.0-10.0
Checkout Experience, account selection & registration clarity	<ul style="list-style-type: none"> <li>✓ Ease for new account registration, allow for guest checkout</li> <li>✓ Show cost and speed of shipping options, international shipment</li> <li>✓ Display at least basic 4 credit card payments as well as other alternative payment methods such as Paypal</li> </ul>	1.0-10.0
Rating and Review	<ul style="list-style-type: none"> <li>✓ Existence &amp; prominent display of user ratings &amp; review</li> <li>✓ Update usage of ratings &amp; review</li> <li>✓ Channels for users to post reviews &amp; ratings</li> </ul>	1.0-10.0
Social & log-in	<ul style="list-style-type: none"> <li>✓ Existence of social log-in e.g Facebook, Wechat</li> <li>✓ Linkages of the mobile site to social networks such as Facebook, Instagram, Youtube and blogs sites</li> <li>✓ Presence of mobile site inside another social network such as Facebook, Instagram etc</li> </ul>	1.0-10.0

Location Activities	<ul style="list-style-type: none"> <li>✓ Existence of IP detection and re-direction</li> <li>✓ Usage of push notifications</li> <li>✓ Usage of language &amp; site information to be driven by location</li> </ul>	1.0-10.0
System stability & security	<ul style="list-style-type: none"> <li>✓ System up-time as reported in Internet Retailer</li> <li>✓ Existence of security measures and third-party endorsement on-site security</li> </ul>	1.0-10.0
Applications of mobile platform technology	<ul style="list-style-type: none"> <li>✓ Adoption of responsive, adaptive site technology, dedicated mobile site and or Mobile Apps</li> <li>✓ Observation on actual usage of mobile site and or mobile apps</li> <li>✓ The number of downloads in mobile apps.</li> </ul>	1.0-10.0

### **3.4 Ethical Considerations in this Research**

This mixed-methods study has been conducted with full reference to ethical guidelines. Based on the suggested procedures that cover qualitative, quantitative and mixed-methods studies by Creswell (2007), the following table will illustrate the necessary steps to ensure ethical aspects are in force.

Table 3.10 Ethical considerations and measures taken Source: Adapted from Creswell (2003) pg.132

Stages in research	Ethical considerations and actions
Beginning of study	<ul style="list-style-type: none"> <li>• Contact participant experts for the interview, fully inform them of the purpose of the study and obtain appropriate consent on their participation.</li> <li>• Find out about cultural, gender and other difference in interviewees' occupational background that are significant and need to be considered</li> </ul>
Collecting data	<ul style="list-style-type: none"> <li>• Discuss with interviewees on how their data will be used and how these data are related to the purpose of the research.</li> <li>• Stay to questions as formulated in the interview guide.</li> <li>• Interviewees were allowed to edit their responses.</li> </ul>

Analysing data	<ul style="list-style-type: none"> <li>• Multiple perspectives reported</li> <li>• Contrary findings reported</li> <li>• Expert interviewees remained anonymous and coded with numbers instead of their real name.</li> </ul>
Reporting, sharing and storing data	<ul style="list-style-type: none"> <li>• Data will be stored for 3 years</li> <li>• Report findings will be provided to all participating expert interviewees</li> <li>• Credit will be given to participants and advisers</li> </ul>

## **CHAPTER 4 DATA ANALYSIS**

### **4.1 Introduction**

The objective of this Chapter is to describe in detail the execution of the data analysis process for both the Qualitative and Quantitative portion of this Mixed-Methods research. The timing and schedule can be referred to Table 3.3 in Chapter 3. This chapter is broadly divided into two portions, the first being the qualitative analysis and the second being the quantitative analysis.

The whole section 4.2 is devoted to the analysis of the expert interviews which is the core data analysis in the qualitative research. This section is further divided into 7 sub-sections; with each sub-section addressing how the experts were responding to the key issues and based on the content analysis on their responses, insights on the issue are extracted. The 7 sub-sections from 4.2.1 to 4.2.7 will address the following agenda respectively: 1. Key success metrics 2. Atmospheric factors 3. Social factors 4. IT infrastructure 5. Mobile platform 6. Other cultural and demographic factors 7. The top 5 features experts would recommend. In the last sub-section 4.2.8, the 10 extracted important factors are summarized and these form the inputs to the data analysis process in the quantitative research that will be addressed from section 4.3 to 4.5. Transcribed interview records are in Appendix III.

The quantitative research data analysis process is divided into 3 parts. Section 4.3 focus on pre-regression analysis particularly to give account on using factor analysis (both EFA & CFA) to review the 10 identified factors from section 4.2. In section 4.4, regression models are formulated for hypothesis testing. Lastly in section 4.5, the results of the regression models using Smart PLS-SEM tool are posted. All these results from 4.2 to 4.5 are consolidated as findings for this mixed-method research. The findings will be put against the research questions for further discussions in Chapter 5.



## **4.2 Analysis of Expert Interviews**

The objective of this chapter is to extract, summarize and analyse the findings from the 10 expert interviews conducted as part of the qualitative study. All the 10 transcribed and translated interview records are included in Appendix III. Each informant interviewed was anonymously coded as an Expert starting from A to J and their response to each question was represented by an identifier such as (EXAR1) which meant Response to Question number 1 by Expert A.

This section consolidates the relevant interview content according to the following themes and focused questions that have emerged after several rounds of line-by-line content analysis. The themes are:

- a. The key success metrics that should be used to assess m-commerce?
- b. The atmospheric factors that impact the performance of m-commerce?
- c. The social engagement factors that impact the performance of m-commerce?
- d. The IT and security factors that impact the performance of m-commerce?
- e. The impact of the mobile platform and mobile apps used on the performance of m-commerce?
- f. Other relevant factors that impact the performance of m-commerce?

The following sections from 4.2.1 to 4.2.6 detail the findings and address how these insights might inform the next stage of quantitative analysis.

### **4.2.1 The key success metrics that should be used to assess m-commerce**

On this main theme, 8 out of 10 experts interviewed agreed that the key success metrics important to mobile commerce were (similar to those for desktop web-based e-commerce): visits, number of active users, conversions and sales revenue. Below was the

recap of 5 of these responses (Table 4.1). The key metrics as referred to in the interview records were underlined.

Following the discussions on the key success metrics, two other focused discussions were structured to solicit more details from the panel experts:

1. Are there other alternative success metrics that are relevant and examples of how these metrics are to be applied;
2. The unique dimensions on the success metrics of mobile commerce as compared with traditional desktop web e-commerce and m-commerce.

For the discussions on the question (1); Alternative concepts in measuring success for mobile commerce were mentioned; for example, the concepts of “soft” metrics such as user satisfaction, level of customer engagement, customer /third party ranking as per (EXGR1). (EXER1), referred to the concept of user experience and business objectives. As pinpointed by (EXHR1), from a technical perspective, site downtime, speed and technology adopted were also important side aspects that should be looked at to determine the success of mobile commerce. From the discussions recorded, these “soft” metrics were applied in the industry more as supplementary factors and there was no standardised methodology for how and when which measurements should be used.

Table 4.1 Quotations relating to key success metrics

Experts	Quotation Extracts	Reference
Expert F	<i>I will look at how the business objective of mobile commerce is being met by the platform regarding <u>key metrics such as visits, conversion and sales revenue as generated over time by the site.</u> <u>The elements of growth are also important as well as how these benchmarks are compared to similar business in the same categories.</u></i>	<i>EXFR1</i>
Expert G	<i>I will look at the “hard” metrics such as <u>visits, active customers, conversions and sales revenue which might be like desktop web-based e-commerce.</u> In additions, there might be other “soft” metrics such as user satisfaction, customer engagements and customer/third party comments and ranking that can be used as a reference.</i>	<i>EXGR1</i>

Expert J	<i>To me, several key metrics are important to define success, they are <u>visits, number of active users, conversion and sales revenue</u>. If applicable, I would also look at the ratio of desktop web-based e-commerce to mobile and examine their growth rate for 3-5 years.</i>	<i>EXJR1</i>
Expert E	<i>From our profession, mobile commerce is successful if it can attract users to use it and delighted the users with a great user experience which will lead to good business results that the mobile commerce business is targeted to do.</i>	<i>EXER1</i>
Expert H	<i>To me, a mobile commerce site is successful if the operation can excel in key metrics such as <u>site visits, no of active users, conversion and sales revenue</u>. As a CTO, I would also look at metrics such as site downtime, site speed, how various mobile technology is deployed for example whether the site is just merely a responsive site without good optimisation and whether mobile apps are even part of the channels to address the needs of their mobile users.</i>	<i>EXHR1</i>

The other important dimension for question (1) was in practice when an m-commerce player was to start up a successful business, how would the experts recommend them to plan this and what were some of the examples they could classify as a success. From the responses that are re-capped in Table 4.2 below, panel experts agreed on “starting from the business objective and target customers” and then building the business around the “best user experience” that could differentiate themselves from competitors.

Table 4. 2 Quotations relating to successful m-commerce business

Experts	Quotation Extracts	Reference
Expert A	<i>I-tunes The ideal place that I would start is the <u>business objective</u> and how this mobile commerce platform is going to fulfil the business mission</i>	<i>EXAR2&amp;3</i>
Expert B	<i>Taobao I would start from the business objective, who are <u>the target customers</u>, why customers should buy from you and how this mobile commerce platform can deliver a <u>unique user experience</u> to help the business to achieve business objectives.</i>	<i>EXBR2&amp;3</i>

Expert C	<i>One should start from <u>the target customers</u> and how the company's product offer or services will fit into the segment. Then we should look at what kind of <u>user experience and engagement</u> that the mobile commerce platform can offer to target customer segment and how that will differentiate from competitors.</i>	EXCR2&3
Expert D	<i>Amazon Start from <u>the user</u> and look at how the mobile commerce platform can meet the users' need in the most effective way</i>	EXDR2&3
Expert E	<i>Apple Shop I would suggest always <u>start with the users</u>. One common mistake that e-commerce business commit is <u>failing to put user experience at the forefront of development</u>.</i>	EXER2&3
Expert F	<i>Trip Advisor The starting place is the <u>target user in mind</u>. I would also add, we would also be practical to see from the perspective of the business. What can the business offer to users in the mobile environment and how the business will like to present its offer to the users in a very distinguishable way</i>	EXFR2&3
Expert G	<i>Amazon &amp; Bestbuy My priority will be "<u>User Experience</u>" and how to perfect the whole suite of building blocks such as basic atmospheric factors like site layout, customer input efficiency, product and content, navigation and ease, checkout etc. <u>To differentiate from potential competitors and grow site traffic, I will also look at the social engagement dimension as well.</u></i>	EXGR2&3
Expert H	<i>Amazon I would still say we should start with <u>the customer first</u>. Look at who is our target customers and how the business can add value to this group of customers. With these two in place, we can start configuration our technical solution to implement all the business concepts</i>	EXHR2&3
Expert I	<i>Tmall Start from the business objective and identify <u>the target audience</u> as well as the unique user value of the site to the target customers. With these three basic elements identified, design the site around how to deliver <u>the best user experience journey that would differentiate the site from others</u>. At the same time, prepare a growth plan base on how the site could enable social engagement amongst users as well as with external social media sites and blogs.</i>	EXIR2&3
Expert J	<i>11 Street I would <u>start with the target customers</u> and the country this mobile commerce is going to operate in. From my experience, the mobile commerce platform can have a chance to win if they can respect the customers and the environment, they are operating in.</i>	EXJR2&3

Regarding discussions on the question (2) about the uniqueness of success in mobile commerce, although there was a relatively strong agreement amongst the experts that the success metrics of desktop web-based e-commerce and mobile commerce were similar, the mobile environment imposed quite a lot of distinctive requirements on the delivery of users experience as well as social engagement. The most prominent ones were as pointed out by Expert F and Expert E; mobile commerce had to be implemented in a small, portrait screen environment, users had to complete their tasks using touch screen operation instead of enjoying a full-size keyboard with a mouse to point and click accurately. Besides, a lot of features available on a desktop such as easy multi-tasking and flash-support would not be available. All these unique environmental factors would increase the difficulties or impose different challenges for mobile commerce to achieve success. Table 4.3 below is a recap of some key comments with important concepts underlined.

Table 4.3 Quotations relating to the differences in desktop e-commerce vs m-commerce

Experts	Quotation Extracts	Reference
Expert F	<p><i>No, although there are similarities between mobile and desktop web-based e-commerce in key success metrics such as user experience, number of users, ability to convert and actual sales, there are a few key areas that are very different in how content can be delivered in a mobile commerce environment and drive a good user experience:</i></p> <ul style="list-style-type: none"> <li><i>a. <b>No, or limited, multitasking</b> - many devices still can't multitask, and even those that can, don't offer the power or flexibility of desktop multitasking. <u>This poor multitasking support can affect the way you design your mobile websites.</u> For example, consider including Twitter/Facebook sharing buttons on every page of your site, so that users don't have to copy and paste your page's URL to a different window or app to share the page.</i></li> <li><i>b. <b>Portrait screens</b> Most desktop displays have a landscape orientation; however, the opposite is true of mobile devices- most users hold their device in portrait orientation. <u>This is fuelling a trend toward mobile sites that are well-suited to a vertical orientation, resulting in design decisions, such as:</u></i></li> </ul>	EXFR4

	<ul style="list-style-type: none"> <li>• Fewer columns of content (a single column is ideal)</li> <li>• Not overly wide elements: This includes large multi-column tables, as well as extra-wide images, slideshows, Flash movies, and iframes</li> <li>• Navigation along the top rather than down the side</li> </ul> <p>c. <b>Failing Flash support</b> - On the desktop, Flash is almost ubiquitous, with over 90% of browsers having the Flash player installed. With the mobile web, however, it's a different story. No iOS devices run Flash. Android devices using version 2.2 or later can run Flash, although many users choose to turn it off since it can cause performance and stability problems. In all, well under half of the world's mobile devices are Flash-capable, and even when a device can run Flash, it's usually not a pleasant experience. Therefore, <u>a website relying on Flash is not going to be popular on mobile devices</u>. Fortunately, there are now ways that you can create a Flash-like experience for both mobile and desktop users without needing to use Flash itself. Modern web standards like HTML5, CSS3 and SVG allow you to create vectors, animations, games, interactive elements, and embedded videos that will run well on all modern mobile devices, Flash-enabled or not.</p>	
Expert F	<p>It is a definite no as the success of desktop web-based commerce does not necessarily translate to similar success in mobile commerce. Despite both shared quite a few basic similarities in terms of drivers of success such as user experience, ability to build and sustain traffic and finally ability to convert traffic into revenue, there are quite a lot of differences about mobile commerce that would determine performance level:</p> <ol style="list-style-type: none"> <li>a. <u>Mobile commerce platform will need to deal with smaller screens in physical size as well as fewer pixels</u>. A smaller display means that the user can see a lot less information. A small display will push more of page content below the fold and require users to scroll through the page to read. Therefore, for the site to work well, important information will need to near the top of the page and this information should be display in an easy-to-read font. The whole page layout needs to be usable and it needs to look good in a small browser window as well which all point to the need of a much simpler page layout design than a regular website.</li> <li>b. <u>Mobile commerce platform will need to cater for the use of devices with slower processors</u>. In general, mobile devices have much less processing power than</li> </ol>	EXFR4

	<p><i>desktop computers. This will mean if the site content is JavaScript-intensive, the pages will run very slowly. This requires a lot of optimisation that is easier said than done.</i></p> <p><i>c. <u>Most mobile devices are touch-based input.</u> The implications for mobile site designers are we must cater for unique such as imprecision in touch navigation finger movements dictated by the small screens. Another similar aspect that needs to be cautious is the usage of on-screen-keyboard which will also affect</i></p> <p><i>d. user's ability to input and complete the transaction as easily as in a desktop environment.</i></p>	
Expert E	<p><i><u>I could go on the long list but these major differences between a desktop web-based environment with a mobile environment impose tremendous challenges for the operator of mobile commerce in optimising their platform to come up with the best user experience for their customers.</u></i></p>	EXER4

#### 4.2.2 The atmospheric factors that impact the performance of m-commerce

In the interview process, the term “atmospheric factors” was not a “common term” that was widely used and understood by our experts. As evident from the key responses from the expert’s comments recapped in Table 4 .5 below, we could see that different experts were using slightly different wordings to describe what they understood to be “atmospheric factors”, but elements such as colour, navigation flow, fonts, product and service content were immediately recognized as within the realm of atmospheric factors. Seven out of the ten experts described atmospheric factors as “basic elements”, “fundamentals”, “hygiene-factors”, levers”. “building-blocks” that would impact “User Experience” and ultimately the performance of mobile commerce.

As precisely put by Expert G in his response, atmospheric factors were the basic elements that m-commerce business could manage to generate a desirable offer of user experience which in turn would determine the level of success by the m-commerce business.

(EXGR5.1) *“Atmospheric factor is a term that I would use to describe the basic elements perhaps more within the site that are building blocks for user experience. I would refer to 5 of these factors: Site and page layout, Ease and efficiency for user input, Product and content, Navigation and, lastly, checkout. UX designers must have such mobile perception in mind when they design the workflow for users to navigate, search, and interact with the content presented in the platform. I would say it is not product or content that necessarily affects the performance of mobile commerce but rather how the product or content is being displayed and leveraged as part of the overall user experience that is crucial.”*

The five factors identified; Site and page layout, Ease and efficiency for user input, Product and content, Navigation and checkout were consistent with the factors of Virtual layout & design, virtual atmospherics and virtual theatrics as identified by the Online Store Environment Framework, (Manganari et al., 2009). For example, the key components of the model were on the left and the 5 factors could be aligned on the right as below:

Table 4.4 Online Store Environment Model alignment with the 5 factors of atmospherics

Components	Factors
Virtual Layout & Design	(1) Site & Page layout
Virtual atmospherics	(2) Product & Content
Virtual Theatrics	(3) Ease and efficiency for user inputs, (4) Navigation, (5) Checkout

Another important focus in this theme was about a relatively common insight on atmospherics factors being the basic ingredients impacting the outcome of “user experience” which in turn affect the performance of m-commerce. Hence, the key role of a UX designer was to perfect the mix in these “atmospheric factors” to engineer the best possible “user experience” that would impact the outcome of the m-commerce business.



Table 4.5 Quotations relating to atmospheric factors

Experts	Quotations Extracts	Reference
Expert B	<p><u>Atmospheric factors such as site design, colour, navigation flow, fonts, site content are fundamental ingredients within the confine of the e-commerce site that will determine the overall user experience and level of satisfaction the users will have on the site.</u></p> <p><u>From my experience, usability and user experience are the most important factor in determining the performance of mobile commerce. User's bad experience in using the mobile commerce site will directly turn them away from the business to other competing business that could offer a better experience. The first step that mobile commerce operator will need to do is to create a pleasant mobile site design and flow so that users can be attracted to the site and continued in using the site. This is particularly important in mobile apps as it is shown in the recent research that if the users are not satisfied with the app in the first few days, they will discontinue using the app and uninstall the app from the phone completely engaging</u></p>	EXBP5.1
Expert C	<p><u>Atmospheric factors such as colour, navigation flow, fonts, site content are what I would call "hygiene factors" in shaping the overall user experience. These atmospheric factors will facilitate or deter the users to form a pleasant impression and interaction journey in each time when he uses the mobile platform. However, getting the atmospheric factors right alone could not ensure good performance of mobile commerce as the end game of these elements is to generate a favourable user experience so that they will be attracted to come to the site and continue to buy the product and services.</u></p> <p><u>... It is a time-proven rule in our industry that positive user experience will lead to user satisfaction and hence increased and sustained user traffic.</u></p>	EXCR5.1
Expert D	<p><u>.. Atmospheric factors are the fundamental levers that would impact the performance of mobile commerce. Navigation flow, site design, use of colour and fonts will directly impact the level of user experience and therefore user satisfaction.</u></p> <p><u>Being a key component of the atmospheric factor suite, product and service content (as well as how they are presented and structured) is the flesh of the mobile commerce offer and user experience. When users are engaging with the mobile commerce site, after they come in, they will be interacting heavily with the product and service content to do what they want to find out or buy so I would say this is the key part of the user experience offer that mobile commerce has to ensure they are doing their best job to ensure their success.</u></p>	EXDR5.1

Expert I	<i>I will group the following <u>5 elements</u> as “<u>atmospheric factors</u>”: <u>site layout, user inputs, product and content, navigation flow and the checkout experience</u>. <u>These are the fundamentals that will shape the overall user experience and level of satisfaction the user will have on his interaction with the mobile commerce entity</u>. As discussed above, due to the special constraints and restrictions imposed by the mobile environment, e-commerce must put user experience in the forefront of site development, “mobile-first” is important in ensuring the whole user experience could be backup and well-executed.</i>	<i>EXIR5.1</i>
Expert J	<i>As one key component in atmospheric factors, <u>product and service content</u> do impact the performance of mobile commerce..... Our experience shows that more than half of mobile consumer decision journeys last just a single day, compared with only 36% online. Besides, mobile shoppers visit on average fewer than two sites before making a purchase, versus 2.75 for online shoppers. M-commerce consumers are driven much more by impulse than by product features or prices: some 17% of mobile transactions in South Korea are made without prior research, compared with just 6 % of online transactions.</i>	<i>EXJR5.1</i>

#### **4.2.3 The social engagement factors that impact the performance of mobile commerce**

A majority view could be seen from the expert panel about social engagement and promotion activities representing the other pillars of equal importance to user experience in impacting the performance of m-commerce. Table 4.6 below highlighted the most representative comments in this theme. With good user experience, potential customers could be attracted to the site and their continued usage maintained. The growth based on a good user experience offer would still be more “organic” but if the mobile commerce business was to grow exponentially, the ability to enable great social engagement would be crucial. As Expert F argued this precisely, ...” *the mobile commerce site does not stand alone on its own. It must belong to a bigger part of a community where users of the site will find it necessary to interact with users within the site as well as other communities that are relevant and important to product and service interests.*”

The importance of social engagement was also well reflected in the Manganari et al., (2009) online store environment framework as virtual social presence. In illustrating how social engagement and promotion activities could create an impact on m-commerce performance, the experts in the panel did bring up the following focused questions that would be important to assess how m-commerce could drive social engagement:

1. Linkages and applications of on-site reviews and ratings

Expert J “.... *Looking at the context of Korean mobile commerce users with a high percentage of female housewives, they are instinctively always interested to refer to ratings and reviews of others.... depend on which vertical you are referring to a very high percentage of users will not purchase until they have seen some sort of user comments from blogs or they will not come to the site unless this is referred by their friends from Facebook or Instagram*” (EXJR5.3)

2. Social log-in would enable easy inflow of membership from external social media platforms such as Facebook, Instagram and Wechat. At the same time, marketing promotions could be implemented between mobile commerce sites and these social platforms.

Expert C “*In China as an example, it is quite common to find companies using games or context to encourage site users to initiate activities such as blogging about the purchase experience, upload pictures of the product or services to join lucky draws etc. From our experience, the more engaged the users are with the site, the more likely they will be loyal customers of the business*” (EXCR5.3)

3. The utilisation of location-based-services to facilitate online to offline interactions between physical stores and mobile stores.

Expert H “*I have seen a lot of industry reports that classified our current young generation who is the key patrons of mobile commerce as SoLoMo segment. The meaning of this is users are now savvy with all three-social media, location-based services and mobile commerce.*” (EXHR5.3)

Table 4. 6 Quotation related to user experience

Experts	Quotation Extracts	Reference
Expert B	<i>I think <u>social engagement is equally important as user experience as the most important driver for mobile commerce performance.</u> Users will need to be reminded of the site and promotional events and engagement with the users are crucial in continuing to maintain a loyal user group. It is even more important nowadays as the impacts of social media or blogs is so pervasive and viral. Therefore, <u>mobile commerce needs to have a strong presence and connectivity to social media network to maintain healthy growth.</u></i>	EXBR5.3
Expert C	<i>To create an impact on the performance of mobile commerce, the first step is to generate a good user experience. Then, <u>the second step is to promote the engagement of users with the site by promotional events and social engagement activities through social media connected to the site.</u></i>	EXCR5.3
Expert D	<i>If user experience is one pillar, social engagement is the other. <u>Good user experience is essential to keep the audience in the site and at least growing at an organic rate.</u> However, <u>social engagement will be most important to growing mobile commerce site in terms of traffic and revenue. Social engagement and promotional events are extremely important to any mobile commerce business to be connected to the social communities relevant to their users. By strengthening user social engagements and running promotional events such as lucky draws, games and content sharing, more and more users will be attracted to the site.</u></i>	EXDR5.3
Expert E	<i>If user experience is the inner core of makes a mobile commerce business successful, the outer core will be its ability in <u>social engagement.</u> To be a successful mobile commerce business, the site will need to enable users to have smooth connections to other social media channels as no site could just exist as an island, interactions with other social media channels such as Facebook, Instagram, blogging and recommendation sites is essential for users to share their experience, refer to others’ comments and interact within a meaningful user community. To grow the user base, the mobile commerce business needs to run promotional events and facilitate active social engagement for its</i>	EXER5.3

	<i>users. All this will directly impact the performance of the mobile commerce business.</i>	
Expert F	<i>What is becoming more important today is the mobile commerce site does not stand alone on its own. It must belong to a bigger part of a community where users of the site will find it necessary to interact with users within the site as well as other communities that are relevant and important to product and service interests. Therefore, <u>social engagement activities and promotional events are very often key to the success of mobile commerce to sustain and grow their customer base. Access to social media or bloggers/KOL's recommendations will be crucial for users to make their onsite purchase decisions.</u></i>	<i>EXFR5.3</i>
Expert J	<i>To me, this is the second most important for mobile commerce performance. Looking at the context of Korean mobile commerce users with a high percentage of female housewives, they are instinctively always interested to refer to ratings and reviews of others. At the same time, given the small screen and limited attention span nature of mobile users. In the early days of e-commerce, the desktop web interface interaction with users was a very much standalone experience. The impacts of other social media or blogs even if they existed were an external reference to the users. Nowadays, depending on which vertical you are referring to a very high percentage of users will not purchase until they have seen some sort of user comments from blogs or they will not come to the site unless this is referred by their friends from Facebook or Instagram. From findings in various industries, promotion events and activities have been the most effective ways to build up site traffic in terms of visits and time users engaging with the site content.</i>	<i>EXJR5.3</i>

#### **4.2.4 The IT infrastructure and security factors that impact the performance of mobile commerce**

As Expert I indicated, there were two views about how IT infrastructure and security factors influence the performance of mobile commerce:

*“..., the first perspective is with the prevalence of 3.5G migrating to the 4G mobile network and increasing strong mobile security technology on both system and devices, this factor has become more “necessary” but “insufficient” to determine success in mobile*

*commerce. For the earlier adopters' countries in e-commerce such as US and UK, IT infrastructure and security has been taken for granted. .... The second perspective is IT infrastructure and security will remain the critical factors that determine the performance of mobile commerce and I support this perspective."*

The predominant view from the expert panel was that IT infrastructure and security were extremely important factors impacting the performance of mobile commerce because they were heavily impacting the delivery of user experience and ability to socially engage with others. Table 4.7 below summarised the key comments from the panel. We could also see those different experts stressed the importance of IT infrastructure and security in impacting mobile commerce performance with different word descriptions but with similar strong sense weights: Expert C *"fundamental for the existence of a successful mobile e-commerce business"* (EXC5.4). Expert D *"air and water for the survival of the mobile commerce"* (EXDR5.4).

The impact of IT infrastructure on page load time and site speed demonstrated by comments from Experts E, F, H and I. Expert J, based on her Korean background, also gave a very vivid account in Korea on how mobile security had been specifically affecting the development model of mobile commerce and why security was still the number one top of mind issue for mobile commerce users

Table 4.7 Quotations relating to IT infrastructure

Experts	Responses and Comments	Reference
Expert C	<i><u>I would think a strong and healthy IT infrastructure is fundamental to the existence of a successful mobile e-commerce business. Perhaps more important is the security which is especially crucial for mobile commerce. Although mobile devices are very flexible and convenient, and users can access internet and mobile commerce platform anywhere anytime. The challenge is mobile device and network is much easier to be hacked and abused. Cases and incidents as such have been reported quite frequently that led to customers distrust.</u></i>	EXC5.4

Expert D	<i><u>IT infrastructure is what I would call the air and water for the survival of mobile commerce.</u> Very often, it is assumed to be there but not perceived as a competitive advantage. In fact, given the global pervasive 3.5/4G network as well as the widely deployed cloud-based network, mobile commerce business nowadays in most countries can always count on strong reliable support. <u>Security, on the other hand, is always the wild factor that no business dares to assume there will be no issue. The stronger the security the mobile commerce has, the better peace of mind the user will have in using the network. Hence, you may say IT infrastructure and security also reinforce user experience and in turn impact performance of mobile commerce.</u></i>	<i>EXDR5.4</i>
Expert E	<i><u>First, IT infrastructure impact performance of mobile by way of impacting site speed. Speed does matter.</u> According to research by Aberdeen Group, one second delay will mean 11% fewer page views, a 16% decrease in customer satisfaction and a 7% loss in conversions. Second, site security is even more important, particularly for transactions. Users will only be confident enough to make their first purchase and continue with his patronage.</i>	<i>EXER5.4</i>
Expert D	<i><u>The impact of IT infrastructure on the performance of mobile commerce is substantial. For example, site speed in eCommerce is widely accepted as one of the most important factors in driving revenue.</u> That's because speed has a major impact on conversion rates and site traffic. Take for instance that, according to a case study in the US, <u>51% of online shoppers in the US claimed if a site is too slow, they will not complete a purchase. During peak traffic times, 75% of consumers are willing to visit competitor sites instead of dealing with a slow loading page.</u> However, it must be noted that sit speed is not only determined by IT infrastructure alone, site design and content structure also play a significant part. In terms of security, like IT infrastructure, has been a very important underlying factor that will impact the performance of mobile commerce. No users will feel comfortable making purchases with a security compromised site. Therefore, the initial trust that the site could build with the users is extremely important.</i>	<i>EXDR5.4</i>
Expert G	<i><u>In my view, security and IT infrastructure is air and water for the survival of the mobile commerce, without a solid build-out, a smooth and satisfying user experience, ability to socially engage users are simply not possible.</u> These factors manifest itself in the form of system stability as measured by downtime, site speed, page loading speed as well as sophistication in site security measures. Very often, people including me would tend to take these factors as granted. These important factors would be taken as necessary but not enough. In a lot of times, a robust IT</i>	<i>EXGR5.4</i>

	<i>infrastructure and strong security network is what might end up differentiating one mobile commerce business from the other</i>	
Expert H	<p><u>Security and IT infrastructure would impact the performance of mobile commerce as they would shape the level of user experience for the site.</u> The first area is site speed: attention spans and patience are a delicacy in the world of mobile commerce. Slow-loading pages will turn customers away in droves. Even an extra second delay can end up costing you precious conversion. A recent survey found that pages with average loading times of around 2.4 seconds had conversion rates of 1.9 %. Pages that took <b>one</b> extra second to load resulted in a 27 % decrease in conversions!</p> <p>Regarding security, according to research conducted by Shopify, over 50% of all e-commerce internet traffic coming from mobile users will be as vulnerable as ever to the possibility of fraud. Fortunately, it is now becoming more standard practice for mobile commerce site to use a mobile-friendly user authentication that involves sending a one-time password (OTP) to a user via a separate means of communication (usually a text message or a voice call) which only the user has access to. And this one-time password expires within a short period. For increased security, phone numbers can be combined with device identifiers to ensure that users have access to not only the phone number they use as identifiers but also the mobile devices they have registered for use with the application. In this scenario, push notifications can be used to send verification codes that are automatically consumed by the mobile commerce application to provide a seamless experience for users.</p>	EXHR5.4
Expert I	<p>There are two views on this question, the first perspective is with the prevalence of 3.5G migrating to 4G+ mobile network and increasing strong mobile security technology on both system and devices, this factor has become more “necessary” but “insufficient” to determine success in mobile commerce. For the earlier adopters’ countries in e-commerce such as US and UK, IT infrastructure and security has been taken for granted. Whereas in fast developing and late adopters of mobile commerce, this is still something that will make and break. The second perspective is IT infrastructure and security will remain the critical factors that determine the performance of mobile commerce and I support this perspective. Using the example of site stability and site speed, we can never take this as granted. One second of the load time delay will have a significant negative impact on sales revenue. <u>I trust every e-commerce site will closely monitor the stability of their site, any moment of instability will potentially cause millions of dollars particularly during Black-Friday and sales season. The issue of security is even more obvious. I have personally seen sites being penalised</u></p>	EXIR5.4



	<u>in terms of user abandonment over the loss of trust due to transaction security compromised.</u>	
Expert J	<p><i>I will address the aspect of security first as most Korean users are very concerned about this subject. South Korea is a prime target for cyber-attacks due to the country's high network connectedness, advanced use of mobile devices, and significant intellectual property. <u>South Korea recognizes that cyber-security is a matter of national security. Although the country boasts one of the world's fastest and most mobile IT infrastructures, it also has an insecure infrastructure which is vulnerable to cyber-attacks.</u> The country has heightened its security protocols over recent years, following several high-profile hacking cases, including a cyber-attack on a Korea Hydro and Nuclear Power (KHNP) plant in 2014. Hackers have previously targeted government agencies in South Korea, which compromised sensitive information and endangered the welfare of government officials and civilian employees alike. Because of all this background, no users will dare to use any mobile site that has a security issue.</i></p> <p><i>The second aspect of IT infrastructure will affect mobile commerce in areas of mobile system stability and site speed. <u>As pointed out by many engineering experts, site speed is one of the biggest factors</u></i></p> <p><i><u>that would directly affect sales revenue. A one-second delay in load time means 7% loss in conversions. Imagine, it is not only slow, but site availability become on and off. This is especially disastrous in a mobile environment when the mobile user is expecting to finish off the transaction before the last strain of power!</u></i></p>	EXJR5.4

#### **4.2.5 The impact of the mobile platform and mobile apps usage on the performance of mobile commerce?**

There was some diversity of opinion on whether mobile apps were useful to mobile commerce as the growth and usage of dedicated and therefore fully customised mobile site, as well as adaptive site design, might have diminished the need for native mobile apps. This view was particularly stronger from experts with US and European background. It was claimed by these experts that users in the US and Europe were less willing to download a handful of apps into the phone and use them consistently. The counter-argument view was

from experts in China and Asia where they claimed the user trend was exactly the opposite. With the increasing diversity and personalisation that mobile users are expecting, most panel experts tended to agree that it was important to maximise the touchpoints for a mobile commerce site through the wide adoption of various mobile platform media such as dedicated mobile site and mobile apps as demonstrated as standard practice by the more sizable mobile commerce business. At Table 4. 8 below, representative views from the experts were extracted.

Despite the diversity of comments, one concluding view emerged, and this could represent the main-stream approach of major m-commerce companies was to adopt a flexible and wide mobile technology platform that included mobile site as well as mobile apps. As per the statement made by (EXIR5.7), “.....*I would advocate that the mobile commerce platform should be flexible in adopting responsive/adaptive site, a dedicated mobile site and mobile apps. The end game is to maximise customer touchpoints and offer the most compelling user experience. Mobile apps can offer a unique advantage in a high level of personalisation and become the greatest CRM tool by offering gift coupons, incentives, loyalty programs as well as the conduit for online to offline operations using location-based-services.*”

Table 4. 8 Quotations relating to mobile apps & platform

Experts	Quotation Extracts	Reference
Expert C	<u><i>In China, mobile apps are the dominant ecosystem for mobile commerce. To be successful in mobile commerce, it is almost a must for the business to have mobile apps in both IOS and Android. Android will give the mobile commerce access to the mass market but IOS is equally important to capture the high-spending segment in the market. Therefore, the mobile commerce business in China must be prepared to compete in the mobile apps market to gain users and maintain mind share and a high-level of user engagement to be successful.</i></u>	EXCR5.7
Expert D	<u><i>From our research and experience, loyal customers today expect an app from their favourite brands and if you don't have one, your most loyal and lucrative demographic base will think something is missing. Loyalty generation from mobile apps is one of the most important factors affecting the performance of</i></u>	EXDR5.7

	<p><i>mobile commerce. Through mobile apps, the mobile commerce business can offer gift cards and points programs that will provide its users with a solid incentive to download and continue to engage with the business.</i></p> <p><i>Another dimension that would be relevant is through the mobile app, the business can offer more personalised services and location-based on-line to off-line capabilities that will open up more business opportunities for mobile users.</i></p> <p><i>Finally, <u>the buyer's journey today is more fragmented than ever, and modern consumers will have more and more touchpoints that they like to leverage and engage with the mobile business. Hence, mobile apps is an important factor that would affect the performance of mobile commerce.</u></i></p>	
Expert E	<p><i>I understand that mobile web experience has improved immensely in the past few years and you will find more people doing the things they normally would do from their PC now turning to the smartphones. In such case what is the value of mobile apps? <u>I still find mobile apps is an important factor that will affect mobile commerce performance particularly in the Asia areas where smartphone users are very used to downloading and using all kinds of mobile apps, instead of typing URL and tried to find the mobile site they need to go.</u> Hence, a lot of retailers still find native mobile apps with a positive retail asset to have. Due to its simplicity relative to a full suite mobile site, mobile apps are welcomed by loyal customers. Retailers are found to use mobile apps to enable loyalty initiatives such as gift cards and points programs, giving customers a great reason to download the app and continue engagement with the retailers. In additions, retailers can use the data from the app to know their customers and extend more personalisation services and offer to their customers.</i></p>	EXER5.7
Expert F	<p><i>I think the mobile app has a great impact on the performance of mobile commerce simply because Websites are not always viewed in browsers! On the desktop, users nearly always surf the web in a browser. However, <u>86% of online smartphone time is spent on apps and only 14% is spent on web browsers.</u></i></p> <p><i><u>..That's why most companies that have a mobile site would also have a corresponding mobile app, particularly in Asia. Mobile apps will increase the touchpoints for the business and enable a high level of customisation towards users and enhance the engagement level with the user community.</u></i></p>	EXFR5.7
Expert G	<p><i>The mobile app is one of the very important front gates for mobile commerce besides a dedicated mobile site or a responsive and adaptive site configuration that can cater for a wide range of screen sizes. <u>Nowadays most large ecommerce business will be well equipped with all three; the main site, a</u></i></p>	EXGR5.7

	<i><u>dedicated mobile site and two sets of apps each for IOS and Android devices. With this preparation, large ecommerce business will be able to maximise their touchpoints with target customers. For example, according to surveys, IOS users are normally the high spending segment while Android users are more towards the mass. In additions, the usage of apps can allow a higher level of customisation and engagements with users. Hence, the wider the net mobile commerce could cast their net, the better they will achieve their business objective.</u></i>	
Expert H	<i><u>Normally, as a gatekeeper of the business's technology, I would not advocate proliferating and over-complicating the site with components that are more than necessary. However, I still see the value of having mobile apps despite the progress we have seen in the mobile web experience. The fact is native apps are still widely used even though it is harder to get people to download apps. Native apps represent a positive retail asset to have as they can enable a high level of customisation in services and functionalities and prove itself to be invaluable as a CRM tool. Most important of all is its ability to have a higher chance to engage with target customers as well as driving an active social engagement process with the user community.</u></i>	EXHR5.7

#### 4.2.6 The other factors that impact the performance of mobile commerce

This section highlighted the panel's thoughts on some of the factors that had been discussed in past industry and academic literature but could not be classified as "atmospheric", "Social", "IT infrastructure & Security" nor "Utilization of mobile technology". While the full discourse of the experts on these subjects could be referenced to Appendix II, these factors were deemed by the expert panel that it would be difficult to quantify and directly attribute them to impacting performance on m-commerce.

These factors could be grouped under the following sub-themes and the corresponding expert views were captured hereunder:

##### 1. Demographics & culture

Expert C: *"From my experience, it is difficult to say factors such as user demographics, culture or prior technical knowledge are determining the performance of mobile commerce.*

*For example, it is generally believed that tech-savvy young male will use mobile commerce more frequently as they have prior knowledge, interests and fit right in the demographics of mobile commerce users. However, in the Greater China area, young female office workers are a very large and important segment that are actively using mobile commerce app such as VIPShop.com. It is estimated that over 60% of their total revenue came from mobile commerce and over 80% of users were young female.*

*In terms of culture, it is extremely difficult to assess. In general, it is perceived that mobile commerce is more supported by the Asian culture as people are very used to carrying and looking at their smartphone all the time while for Western Europe, the cultural norm in using smartphone tends to be less extensive and pervasive. However, these observations are certainly not conclusive, and the results could be different from time to time. (EXCR5.5)*

Expert E: “Demographics and cultural factors are always an important underlying factor that is impacting the performance of mobile commerce particularly in the phase of adoption. However, I do not see these factors as having long term impact once the mobile commerce business passed the stage of adoption. Moreover, when a mobile commerce platform can truly deliver good user experience and value to its users, that should transcend boundaries in culture and demographics” (EXER5.5)

## 2. User’s background and IT knowledge

Expert F: “*I believe the performance of mobile commerce might be better if all their users have a stronger IT knowledge as well as an open and trusting attitude in the usage of mobile devices. However, I would say the design and set up of a successful mobile commerce site should not be predicated on their users should be tech-savvy users. On the contrary, if the site could be designed around simplicity, even children and senior citizen could have an*

enjoyable user experience, then this mobile commerce site would enjoy a high level of success than others". (EXFR5.9)

Expert H: *"I certainly think user's background and IT knowledge level will support the usage mobile commerce particularly in the adoption stage, but I cannot see user's background and IT knowledge should be the gating factor for the performance of mobile commerce. On the contrary, just as we can see happening in China, India and Indonesia, the mobile commerce has become the catalyst leading to faster adoption of technologies and we can see there is a lot of successful mobile commerce business there". (EXHR5.9)*

### 3. Specific country environment

Expert I: *"I guess every country has some specific country environment that affects the adoption and performance of mobile commerce. We have seen that in Korea, China, Hong Kong and SE Asia. Just like demographics and culture, these factors are more external and sometimes given and therefore not much could be changed as a business level. The only thing to do is to fully understand them and try to leverage or deal with them". (EXIR5.8)*

#### **4.2.7 The Top 5 design features impacting performance of mobile commerce**

Towards the end of the interview, expert informants were given a list of 14 design features that are key for the success of mobile e-commerce, experts were requested to offer their top 5 selection. The context of this question was to understand how the expert panel would put their ideas in actual votes if they were to select the top 5 features to implement for successful mobile commerce. It was evident from results in Table 4.9 which indicated the votes from the experts heavily concentrated in dimensions of User Experience and Social Engagement.

Table 4. 9 Ranking Results of the Top 5 key success features for mobile commerce

Ranking	Expert A	Expert B	Expert C	Expert D	Expert E	Expert F	Expert G	Expert H	Expert I	Expert J
1	Simplicity	Simplicity	Speed	Speed	Mobile context specific inputs	Simplicity	Simplicity	Simplicity	Simplicity	Simplicity
2	Mobile context specific inputs	Speed	Easy Sharing	Easy Sharing	Simplicity	Mobile context specific inputs	Speed	Speed	Speed	Speed
3	Autofill	Mobile context specific inputs	Mobile context specific inputs	Mobile context specific inputs	Prepopulated forms	Autofill	GPS enabled store finder	Mobile context specific inputs	Mobile context specific inputs	Mobile context specific inputs
4	GPS enabled store finder	Prepopulated forms	Multiple payment methods	Autofill	Easy Sharing	GPS enabled store finder	Easy Sharing	GPS enabled store finder	Easy Sharing	Call to action on first page
5	Click & collect	Click & collect	Click & collect	Click & collect	Mirroring an OS	Click & collect	Multiple payment methods	Multiple payment methods	GPS enabled store finder	Easy Sharing

Below is their top 5 most popular ranking and how they relate to the main discussion:

1.Simplicity (7)	User Experience
2.Speed (7)	User Experience
3.Mobile context specific inputs (7)	User Experience
4. Easy Sharing (6)	Social Engagement
5. Click & Collect (5)	Social Engagement/Location-based services.

#### 4.2.8 Summary

Based on the discussions and views as expressed by the panel experts, the following factors were highlighted as important to impact the performance of mobile commerce and they have been taken to the next stage quantitative analysis. These factors were:

1. Site and page layout
2. Input efficiency and ease in editing
3. Product and content descriptions
4. Site Navigation and ease
5. Checkout Experience
6. Usage of ratings and reviews
7. Usage of social login and linkages to external social media network
8. Utilization of location-based activities and other customer engagement through social network
9. Mobile system stability and security
10. Mobile platform capability in leveraging responsive sites, mobile apps and dedicated mobile site.



### **4.3 Pre-regression analysis: Factor Analysis and Internal Reliability Tests**

Following the findings from the qualitative analysis in the above section, we had identified ten factors that were observed to be impacting the performance of the financial metrics of mobile ecommerce business as per section 4.2.8 above. The first five factors could be broadly classified into the area of “User-Experience” as all the industry experts had been referring to and these factors also fell in line with discussions in the academic literature on “Atmospherics-factor” Manganari et al., (2009). The second batch of factors from 6-8 was more related to how the mobile commerce platforms were leveraging the social network. These factors were referred to by the experts as “Social-engagement”. The group of 3 factors also match discussions in academic literature in the atmospheric factor of “Social input” (Thach, 2016). The last two factors, on the other hand, were quite different as to whether mobile system stability and security as well as the whole mobile platform capability would not be normally classified as “atmospheric factors” and certainly had not been referred to in previous academic literature. However, these two factors were referred to as important and rather unique factors affecting metrics performance of mobile commerce platform. The discussion of system stability and security, as well as platform strength, could be found in the analysis of non-atmospheric factors literature (Park, 2016).

It was important to perform factor analysis and internal reliability tests on the data set collected on 183 companies before proceeding to build regression models and paths. An exploratory factor analysis (EFA) via SPSS 25 would be first used to identify how these 10 factors could be organized and then a confirmatory factor analysis (CFA) using Smart PLS 3 would also be performed to provide as a parallel check. The results of the EFA was outlined in the tables below:

Table 4.10A Exploratory Factor Analysis on the 10 independent factors

**Factors Descriptive Statistics**

	Mean	Std. Deviation	N
Layout	6.9124	1.27059	183
Input	6.7341	1.25408	183
Product	7.2976	1.52222	183
Navigation	6.3605	1.38980	183
Checkout	6.7098	1.22748	183
Review Ratings	6.3860	2.37757	183
Social Log in	6.1662	2.89503	183
Location & Activities	6.2811	2.60557	183
Stability & Security	7.3163	1.06619	183
Mobile platform	7.4138	1.15392	183

**Item-Total Statistics**

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Layout	60.6655	118.316	.804	.777	.834
Input	60.8437	119.604	.764	.751	.837
Product	60.2803	114.405	.781	.688	.831
Navigation	61.2173	117.349	.759	.716	.834
Checkout	60.8681	118.710	.820	.745	.834
Review Ratings	61.1919	109.740	.537	.400	.853
Social Log in	61.4116	95.140	.684	.565	.843
Location & Activities	61.2968	101.437	.646	.489	.843
Stability & Security	60.2616	142.088	-.043	.189	.879
Mobile platform	60.1641	132.573	.310	.278	.863

**Scale Statistics**

Mean	Variance	Std. Deviation	N of Items
67.5779	142.141	11.92229	10

## ➔ Factor Analysis

[DataSet2] C:\Users\Philip Chan\Desktop\DBA Final data 12.29.sav

Correlation Matrix <sup>a</sup>											
		Layout	Input	Product	Navigation	Checkout	Review Ratings	Soical Log in	Location & Activities	Stability & Security	Mobile platform
Correlation	Layout	1.000	.818	.779	.751	.744	.467	.539	.617	.077	.185
	Input	.818	1.000	.740	.727	.743	.408	.593	.527	.041	.143
	Product	.779	.740	1.000	.722	.726	.506	.544	.572	.031	.206
	Navigation	.751	.727	.722	1.000	.798	.506	.519	.535	.039	.121
	Checkout	.744	.743	.726	.798	1.000	.545	.605	.602	-.029	.218
	Review Ratings	.467	.408	.506	.506	.545	1.000	.478	.388	-.189	.162
	Soical Log in	.539	.593	.544	.519	.605	.478	1.000	.558	-.100	.406
	Location & Activities	.617	.527	.572	.535	.602	.388	.558	1.000	-.091	.234
	Stability & Security	.077	.041	.031	.039	-.029	-.189	-.100	-.091	1.000	.218
	Mobile platform	.185	.143	.206	.121	.218	.162	.406	.234	.218	1.000
Sig. (1-tailed)	Layout		.000	.000	.000	.000	.000	.000	.000	.150	.006
	Input			.000	.000	.000	.000	.000	.000	.290	.026
	Product				.000	.000	.000	.000	.000	.336	.003
	Navigation					.000	.000	.000	.000	.300	.051
	Checkout						.000	.000	.000	.350	.002
	Review Ratings							.000	.000	.005	.014
	Soical Log in								.000	.088	.000
	Location & Activities									.111	.001
	Stability & Security										.002
	Mobile platform										

a. Determinant = .002

### KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.889
Bartlett's Test of Sphericity	Approx. Chi-Square	1147.599
	df	45
	Sig.	.000

Table 4.10B Factor Analysis – 3 Components identified with Eigenvalues above 1

#### Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings <sup>a</sup>
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	5.397	53.968	53.968	5.397	53.968	53.968	5.303
2	1.230	12.304	66.272	1.230	12.304	66.272	1.428
3	1.019	10.187	76.459	1.019	10.187	76.459	2.005
4	.618	6.176	82.635				
5	.460	4.600	87.235				
6	.375	3.749	90.984				
7	.323	3.228	94.212				
8	.240	2.405	96.617				
9	.190	1.903	98.520				
10	.148	1.480	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

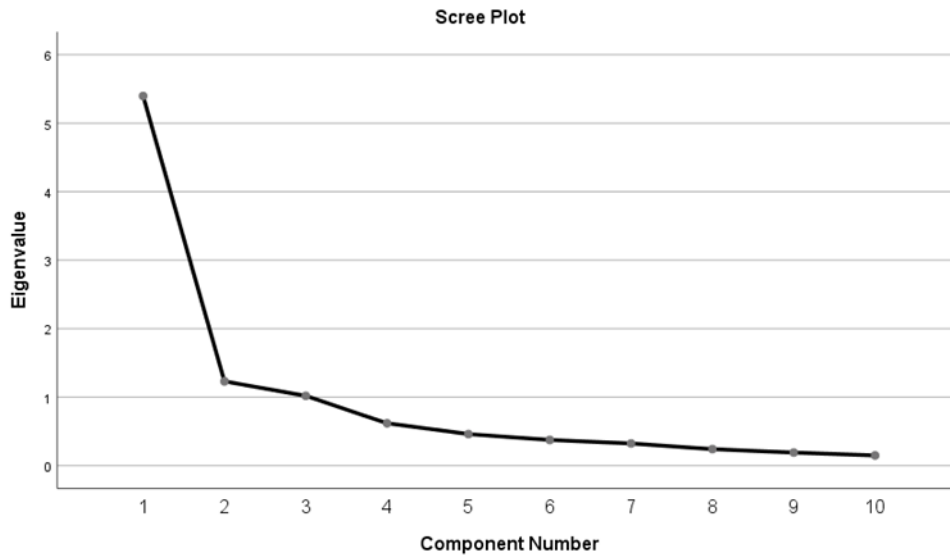


Table 4.10C Factor Analysis – Component Matrix of the 3-4 emerged factors

**Pattern Matrix<sup>a</sup>**

	Component		
	1	2	3
Layout	.943	.114	-.043
Input	.928	.094	-.074
Product	.883	.043	.004
Navigation	.929	.049	-.110
Checkout	.867	-.056	.043
Review Ratings	.469	-.422	.155
Soical Log in	.465	-.239	.492
Location & Activities	.599	-.175	.213
Stability & Security	.148	.949	.164
Mobile platform	-.105	.168	.977

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 7 iterations.

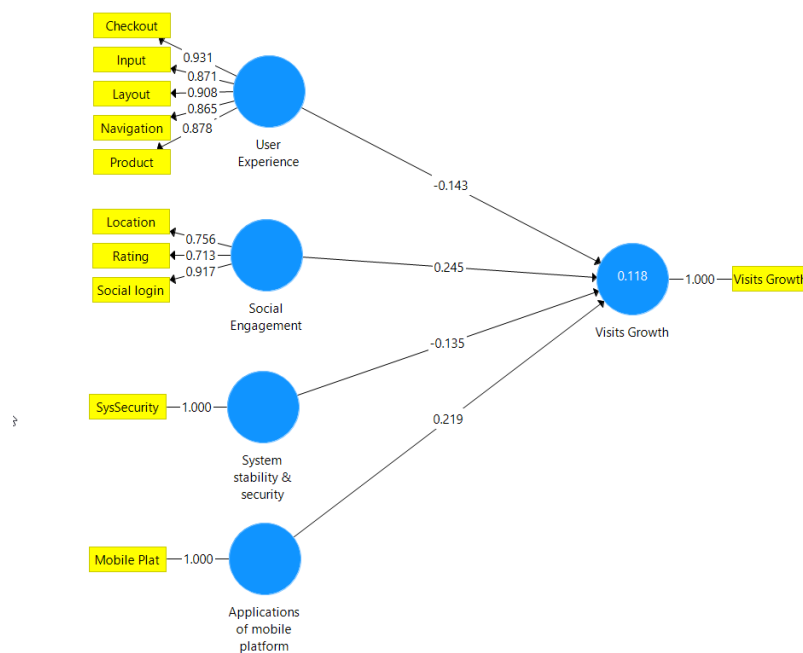
Exploratory Factor Analysis was performed and indicated 3 components could pass the standard setting of Eigenvalues above 1. Kaiser (1960) (Table 4.10B) KMO ratings of 0.889 (Table 4.10A) also indicated a valid correlation between the factor matrix. Kaiser (1974). In terms of the rotation method, Direct Oblimin was used to recognize that some factors might be correlated with one another.

Amongst the two major components of factors identified, component 1 focused around user experience and social engagement factors as listed in items 1-8, it was also evident that these 8 factors were all showing high coefficients from 0.469 – 0.943. Component 2 was highlighted by the factor of site system stability with coefficients of 0.949 and Component 3 by applications of a mobile platform which indicated coefficients of 0.977. On the first component, it would also be possible to consider the social engagement factors as a separate group factor in the construct as the three social factors were also showing a relatively coherent coefficient from 0.465 to 0.499.

As part of the pre-regression analysis, a confirmatory factor analysis (CFA) was also performed on the 10 factors identified above using Smart PLS 3. Figure 4.1 below illustrates the results from the CFA based on the proposed hypothesis of the 10 independent variables impacting the dependent variables of visits growth.

Figure 4.1 Confirmatory Factor Analysis of the 10 independent factors

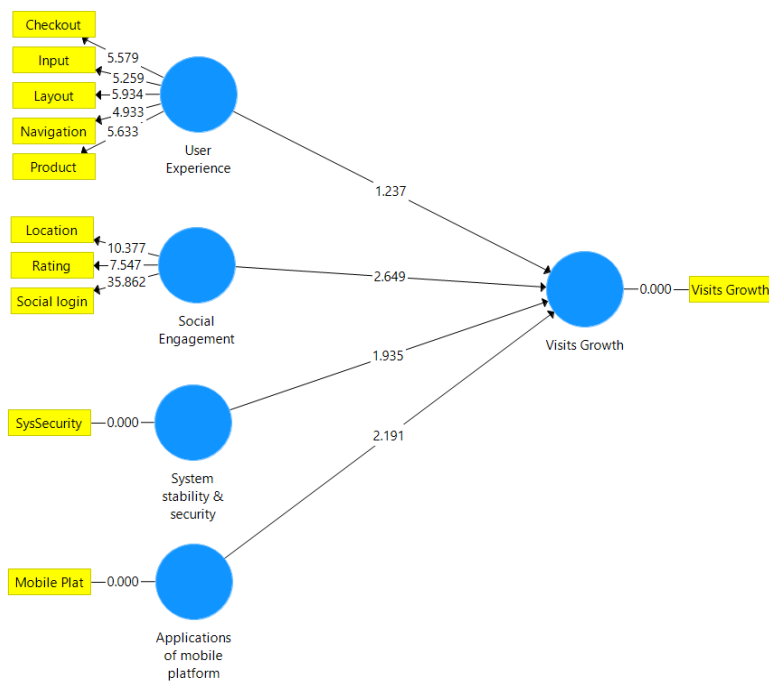
#### PLS-SEM Construct output



## Outer Loadings

Matrix	Application...	Social Engagement	System stabilit...	User Experience	Visits Growth
Checkout				0.931	
Input				0.871	
Layout				0.908	
Location		0.756			
Mobile Plat	1.000				
Navigation				0.865	
Product				0.878	
Rating		0.713			
Social login		0.917			
SysSecurity			1.000		
Visits Growth					1.000

## Bootstrapped Construct output



## Outer Loadings

Mean, STDEV, T-Values, P-Value...	Confidence Intervals	Confidence Intervals Bias Corr...	Samples	Copy to Clipbo	
	Original Sample (...)	Sample Me...	Standard D...	T Statistics ( O...	P Values
Checkout <- User Experience	0.931	0.852	0.196	4.741	0.000
Input <- User Experience	0.871	0.812	0.166	5.243	0.000
Layout <- User Experience	0.908	0.842	0.165	5.497	0.000
Location <- Social Engagement	0.756	0.746	0.068	11.157	0.000
Mobile Plat <- Applications of mobile platform	1.000	1.000	0.000		
Navigation <- User Experience	0.865	0.815	0.183	4.733	0.000
Product <- User Experience	0.878	0.814	0.164	5.349	0.000
Rating <- Social Engagement	0.713	0.703	0.081	8.846	0.000
Social login <- Social Engagement	0.917	0.919	0.026	35.357	0.000
SysSecurity <- System stability & security	1.000	1.000	0.000		
Visits Growth <- Visits Growth	1.000	1.000	0.000		

## Path Coefficients

Mean, STDEV, T-Values, P-Values		Confidence Intervals		Confidence Intervals Bias Corrected		Samples	
	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDE...	P Values		
Application...	0.219	0.229	0.100	2.191	0.029		
Social Enga...	0.245	0.218	0.093	2.649	0.008		
System stab...	-0.135	-0.134	0.070	1.935	0.053		
User Experi...	-0.143	-0.099	0.115	1.237	0.216		

## Construct Reliability and Validity

Matrix	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AV...
Application...	1.000	1.000	1.000	1.000
Social Enga...	0.730	0.893	0.841	0.641
System stab...	1.000	1.000	1.000	1.000
User Experi...	0.939	1.117	0.951	0.794
Visits Growth	1.000	1.000	1.000	1.000

### Discriminant Validity

Fornell-Larcker Criterion		Cross Loadings		Heterotrait-Monotrait Ratio (H...	
	Application...	Social Enga...	System stab...	User Experi...	Visits Growth
Application...					
Social Enga...	0.388				
System stab...	0.218	0.184			
User Experi...	0.201	0.901	0.050		
Visits Growth	0.249	0.255	0.127	0.068	

### Model\_Fit

	Fit Summary	rms Theta
	Saturated ...	Estimated ...
SRMR	0.055	0.055
d_ULS	0.202	0.202
d_G	0.152	0.152
Chi-Square	161.720	161.720
NFI	0.865	0.865

From the PLS model results of the CFA analysis, the 5 factors of user experience (checkout; layout; input; navigation; product). and the 3 factors of social engagement (location; rating; social log-in) were all showing strong loadings in the range of 0.7 to 0.9 which pointed to validity as user experience and social engagement as two major independent groups of variables together with other two separate independent variables; system stability/security and mobile platform.

In additions, bootstrapped results of the CFA model indicated the hypothesized set of 4 independent variables construct (user experience, social engagement, system stability & security and applications of the mobile platform) impacting the dependent variable of visits growth was in general statistically significant as evident by a higher than 1.96 in T-statistics as well as P-values of lower than 0.05. The exception was user experience which could not meet the significance criteria. This exception would be addressed in more details in the regression analysis in the subsequent sections.



Model fit parameter SRMR was 0.055, lower than 0.08 which indicated the overall model fitness. A value of less than 0.08 (Hu and Bentler, 1999) could be considered a good fit. The other metrics in Construct Reliability (Cronbach Alpha, AVE) and Determinant Reliability also did not show any out of range numbers which indicated the overall results from this CFA analysis reflected similar results as illustrated by the earlier EFA. However, it should be noted that the independent variable group of “User Experience” could not pass statistical significance testing and this would be further demonstrated under the regression analysis in the subsequent sections.

#### **4.4 Regression models and testing of hypothesis**

Based on the insights from literature, expert interviews, as well as the factor analysis in the section above, 10 independent factors (atmospheric and otherwise) representing 4 main dimensions, could be identified. At the same time, the expert interviews also confirmed three key performance metrics of Site Visits, Sales and Conversion. These three factors were examined in this study as dependent factors to be regressed against the identified independent factors. The Hypothesis identified based on the findings from qualitative analysis were summarised and illustrated as follows in Fig.4. 2 to Fig.4, 4 below:

H1: Score in User Experience positively influence growth in monthly site visit;
H2: Score in Social Engagement positively influence growth in monthly site visit;
H3: Score in System Stability positively influence growth in monthly site visit;
H4: Score in Applications of Mobile ecommerce platform positively influence growth in monthly site visit;
H5: Score in User Experience positively influence growth in site sales revenue;
H6: Score in Social Engagement positively influence growth in site sales revenue;
H7: Score in System Stability positively influence growth in site sales revenue;
H8: Score in Applications of Mobile ecommerce platform positively influence growth in site sales revenue;
H9: Score in User Experience positively influence site conversion;
H10: Score in Social Engagement positively influence site conversion;
H11: Score in user System Stability positively influence site conversion;
H12: Score in user Applications of Mobile ecommerce platform positively influence site conversion

Fig 4.2 Site Visits Growth Model

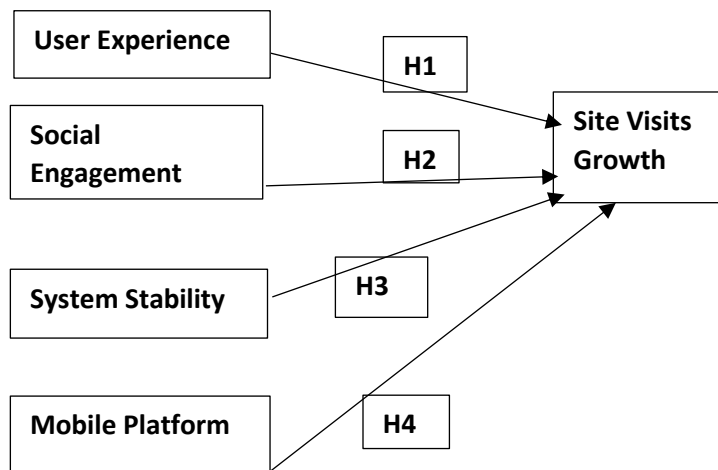


Fig 4.3 Site Sales Growth Model

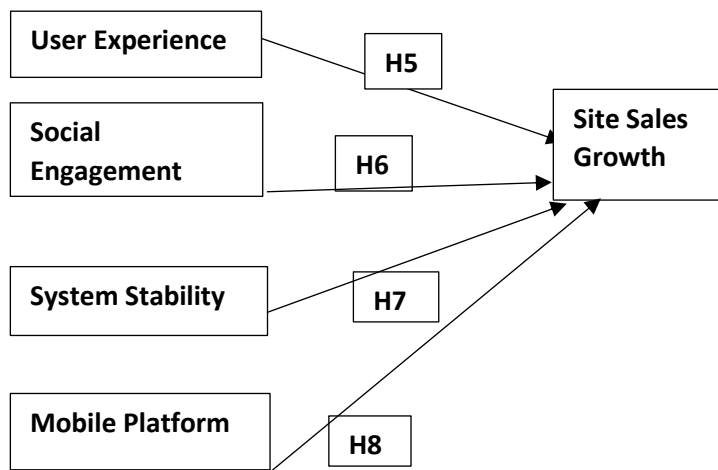
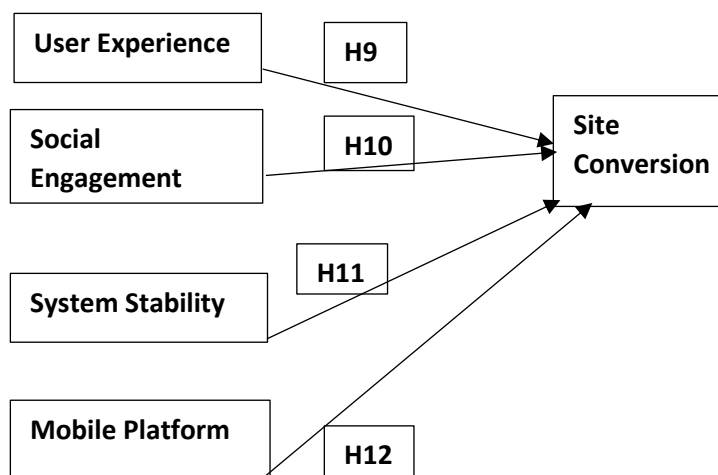


Fig 4.4 Site Conversion Model

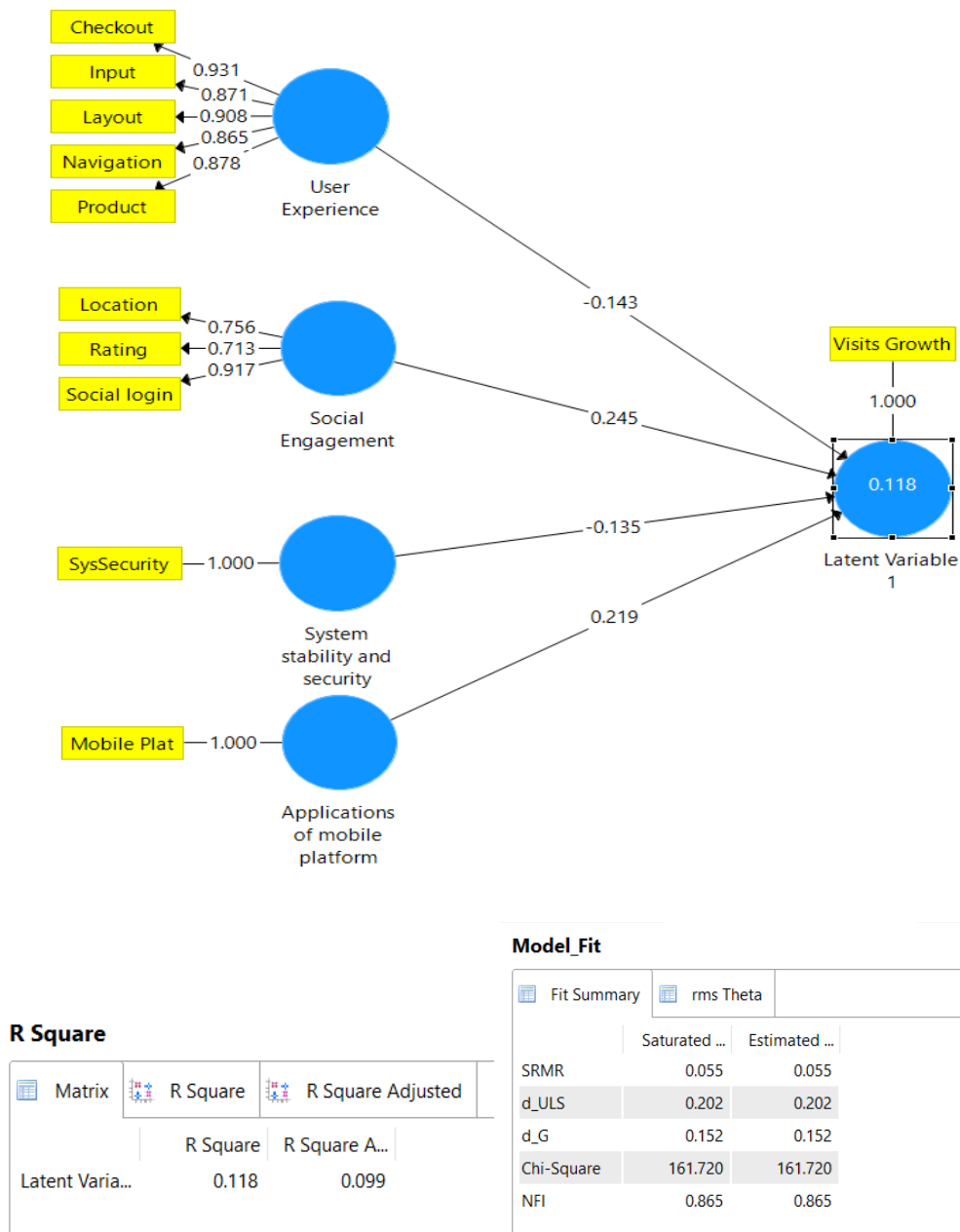


As PLS-SEM works particularly well with relatively smaller sample sizes and complex models (Hair et al., 2012, Henseler et al., 2014). Smart PLS 3 (Ringle et al., 2014) was deployed to run three structural equation modelling to tests Hypothesis 1 -12 based on the data collected from the 183 sample companies. The Cronbach's Alpha score at previous section 4.3 indicated that groups of the 5 "User experience" factors and the 3 "Social engagement" factors were statistically consistent, "User experience" and "Social engagement" factors were deployed as separate independent factors in the model grouping their 5 and 3 respective sub-factors. System stability and Applications of Mobile ecommerce platform were also used as separate independent variables. The objective was to find out the statistical validity of these combinations of factors both "atmospheric" or "non-atmospheric" and their impact on the three key performance metrics. Learnings from these statistical findings would be triangulated with discussions from the expert interview as well as other academic literature in the next chapter.

#### **4.5 Smart PLS 3 model analysis**

Below were the results of the three PLS-SEM models for Visits Growth, Sales Growth and Conversions based on the 183 data with bootstrap testing at Fig 4.5 to Fig 4.10.

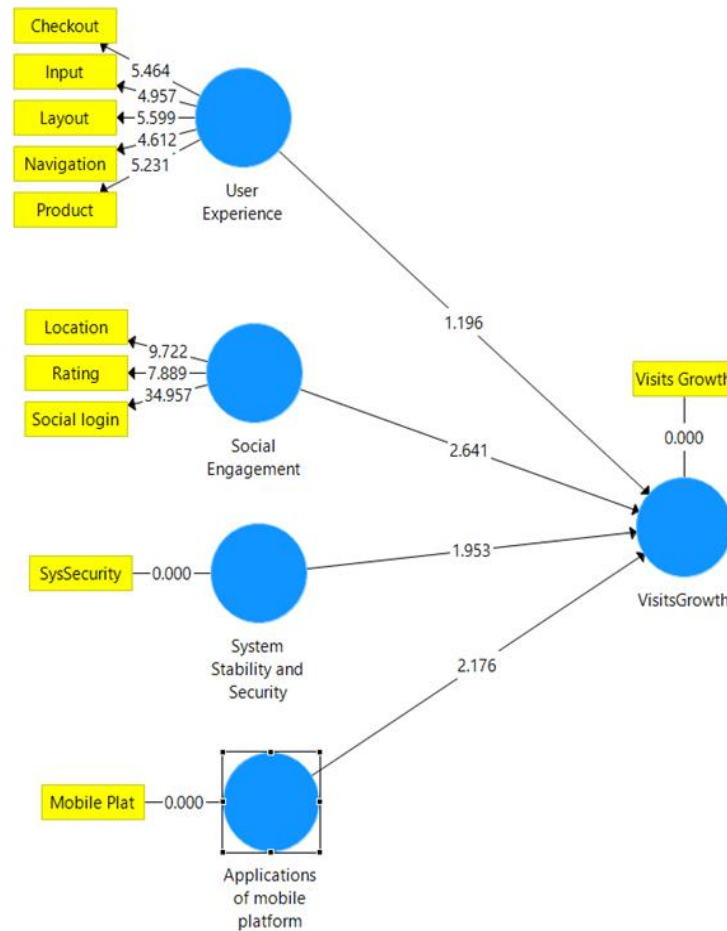
Fig 4.5 PLS-SEM Path model on Visits Growth






**Collinearity Statistics (VIF)**

Outer VIF Values		Inner VIF Values			
	Application...	Latent Varia...	Social Enga...	System stab...	User Experi...
Application...		1.300			
Latent Varia...					
Social Enga...		2.833			
System stab...		1.188			
User Experi...		2.413			

## Bootstrapped analysis on PLS-SEM regression model



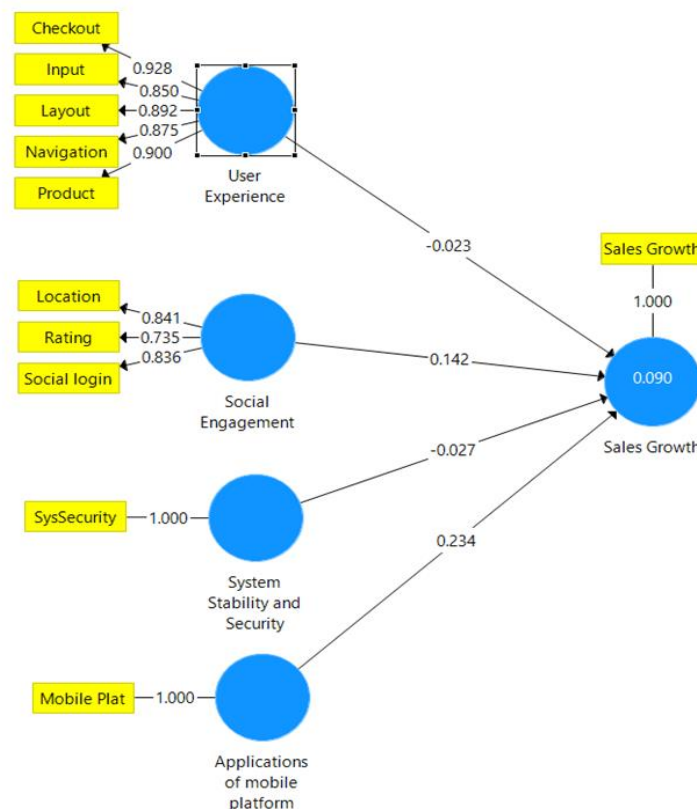
### Path Coefficients

 Mean, STDEV, T-Values, P-Values	 Confidence Intervals	 Confidence Intervals Bias Corrected			
	Original Sa...	Sample Me...	Standard D...	T Statistics (...)	P Values
Application...	0.219	0.230	0.100	2.193	0.029
Social Enga...	0.245	0.208	0.092	2.653	0.008
System stab...	-0.135	-0.137	0.067	2.007	0.045
User Experi...	-0.143	-0.094	0.118	1.213	0.226

In Figures 4.5 above, this PLM-SEM model on Visits Growth indicated positive results modelling independent factors of User Experience, Social Engagement, System stability & Security and Applications of mobile platform technology with the dependent factor of Growth in site visits. Model fit parameter SRMR was 0.055, lower than 0.08 which indicated the overall model fitness. Henseler et al., (2014) introduced the SRMR as a goodness of fit measure for PLS-SEM that could be used to avoid model misspecification. A value of less

than 0.08 (Hu and Bentler, 1999) are considered a good fit. The R-square was 11.8 but the adjusted R-square was 10 which meant 10% of the variance can be explained by the 4 factors. Besides, no collinearity issues could be identified with both internal and external VIF measures under 3. (Diamantopoulos and Siguaw, 2006). In terms of coefficient path measurement, the variable of social engagement indicated the strongest impact at 2.641, the other three were relatively weaker at 2.176 (Mobile Platform); 1.953 (System stability & Security) and 1.196 (User Experience). In terms of statistical significance, the bootstrapped assessment on the PLS model and indicated overall significance level of 95% could be established on the factors of Social Engagement, System Stability & Security and Applications of mobile platform technology with T-statistics above 1.96 and P-Value < 0.05. As for the variable of User Experience, path T-statistics of 21.213 and P-value of 0.226 exceeded measurement threshold. Hence, H1 was not supported.

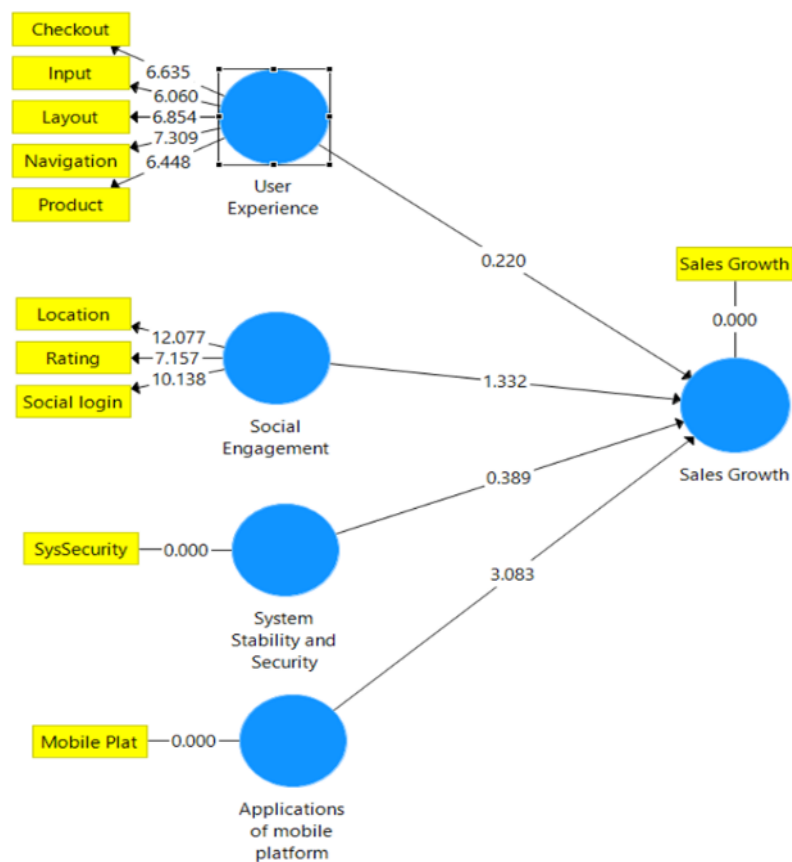
Fig 4.6 PLS-SEM Path model on Sales Growth



R Square				Model_Fit		
Matrix	R Square	R Square Adjusted		Fit Summary	rms Theta	
Sales Growth	R Square	R Square A...			Saturated ...	Estimated ...
				SRMR	0.055	0.055
				d_uls	0.202	0.202
				d_G	0.161	0.161
				Chi-Square	167.900	167.900
				NFI	0.860	0.860

Collinearity Statistics (VIF)					
Outer VIF Values	Inner VIF Values				
	Application...	Sales Growth	Social Enga...	System Sta...	User Experi...
Application...		1.248			
Sales Growth					
Social Enga...		2.887			
System Stab...		1.186			
User Experi...		2.534			

Bootstrapped analysis on PLS-SEM regression model on Sales Growth



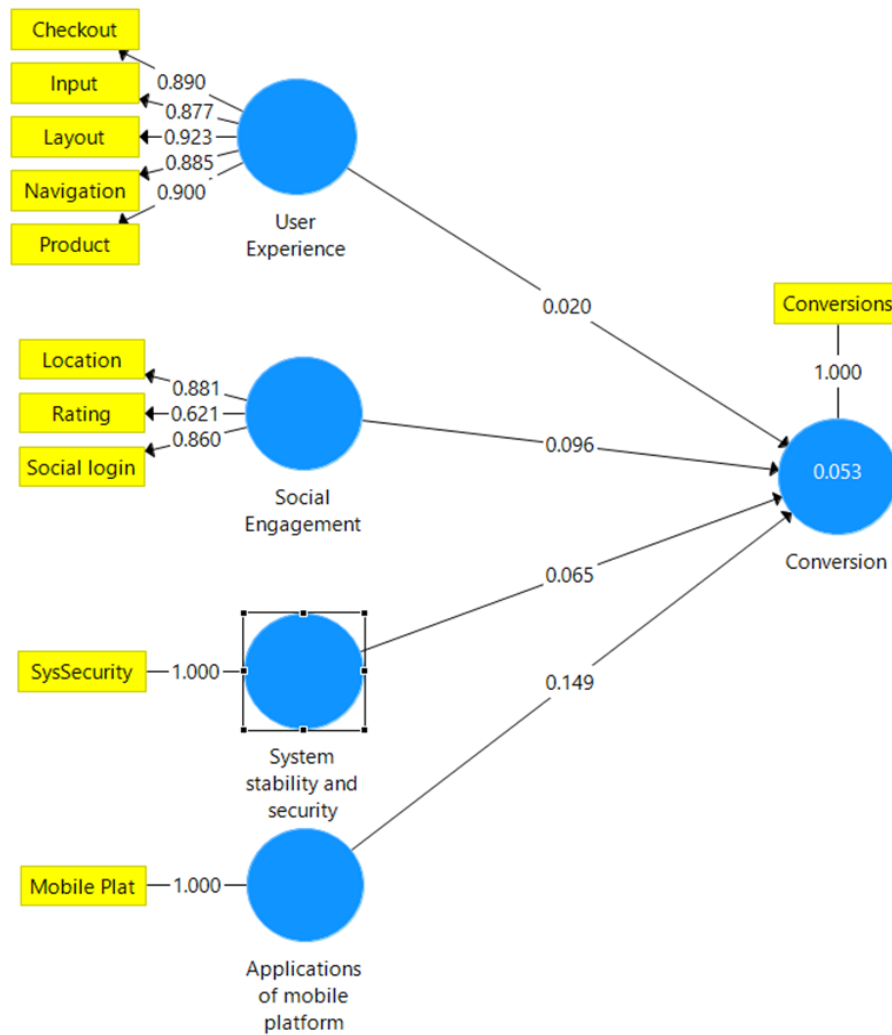
### Path Coefficients

Mean, STDEV, T-Values, P-Values		Confidence Intervals		Confidence Intervals Bias Corre	
	Original Sa...	Sample Me...	Standard D...	T Statistics (...)	P Values
Application...	0.234	0.229	0.076	3.083	0.002
Social Enga...	0.142	0.143	0.107	1.332	0.183
System Stab...	-0.027	-0.027	0.071	0.389	0.697
User Experi...	-0.023	-0.004	0.104	0.220	0.826

In figures 4.6 above, this PLM-SEM model on Sales Growth indicated positive results modelling independent factors of User Experience, Social Engagement, System stability & Security and Applications of mobile platform technology with the dependent factor of Growth in site Sales. Model fit parameter SRMR was 0.055, lower than 0.08 which indicated the overall model fitness. Henseler et al., (2014) introduced the SRMR as a goodness of fit measure for PLS-SEM that could be used to avoid model misspecification. A value of less than 0.08 (Hu and Bentler, 1999) would be considered a good fit. The R-square was 9.00 but the adjusted R-square was 6.90 which meant 6.9% of the variance can be explained by the 4 factors. Besides, no collinearity issues could be identified with both internal and external VIF measures under 3 (Diamantopoulos and Siguaw, 2006). In terms of coefficient path measurement, the variable of Mobile Platform indicated the strongest impact at 0.234, the other three were relatively weaker at 0.142 (Social Engagement); -0.027 (System stability & Security) and -0.023 (User Experience). In terms of statistical significance, the bootstrapped assessment on the PLS model and indicated overall significance level of 95% could only be established with the factor Applications of mobile platform technology, the other three factors of Social Engagement, System Stability & Security and User Experience generated T-statistics below 1.96 and P-Value > 0.05. As for the variable of Application of Mobile platform technology, path T-statistics indicated 3.083 and P-value of 0.002 which were all within the measurement threshold. Hence, H5, H6 and H7 were not supported.



Fig 4.7 PLS-SEM Path model on Conversion



#### Model Fit

#### R Square

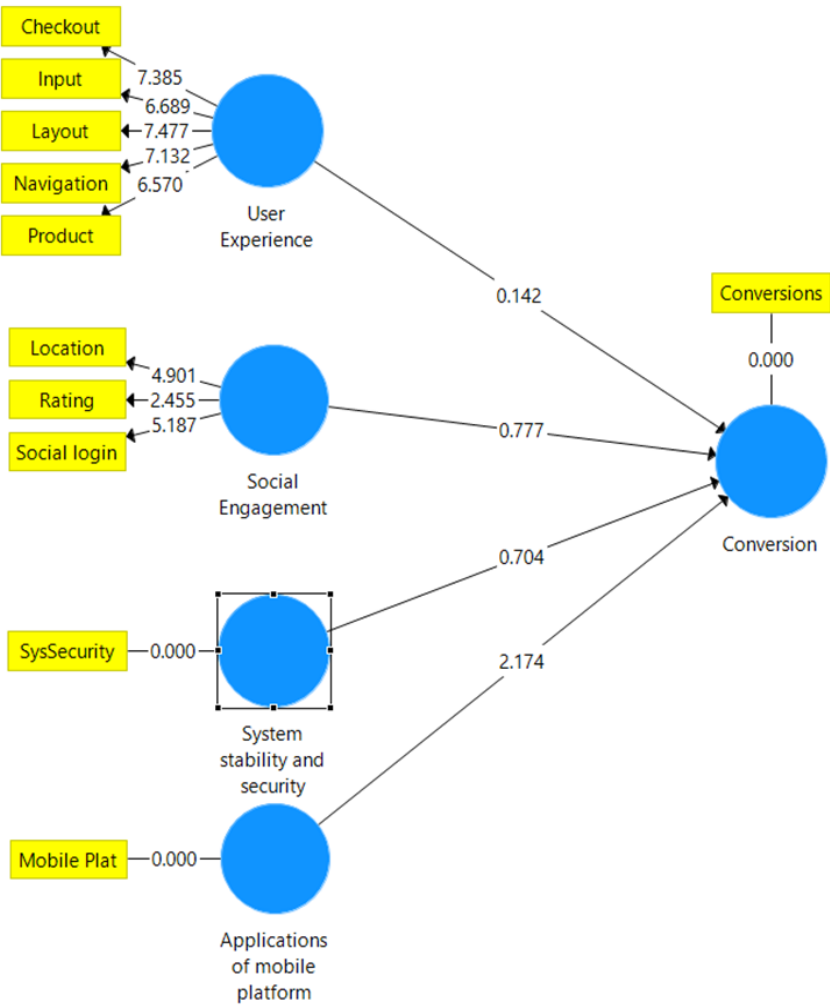
Matrix	R Square	R Square Adjusted
Conversion	0.053	0.032

Fit Summary	rms Theta	
	Saturated ...	Estimated ...
SRMR	0.055	0.055
d_ULS	0.200	0.200
d_G	0.157	0.157
Chi-Square	166.782	166.782
NFI	0.860	0.860

#### Collinearity Statistics (VIF)

Outer VIF Values		Inner VIF Values		
	Application...	Conversion	Social Enga...	S
Application...		1.270		
Conversion				
Social Enga...		2.750		
System stab...		1.175		
User Experi...		2.389		

Bootstrapped analysis on PLS-SEM regression model on Conversion



Path Coefficients

	Mean, STDEV, T-Values, P-Values	Confidence Intervals	Confidence Intervals Bias Corrected		
	Original Sa...	Sample Me...	Standard D...	T Statistics (...)	P Values
Application...	0.149	0.138	0.069	2.174	0.030
Social Enga...	0.096	0.108	0.124	0.777	0.437
System stab...	0.065	0.056	0.092	0.704	0.481
User Experi...	0.020	0.028	0.142	0.142	0.887

In figures 4.7 above, this PLM-SEM model on Conversion indicated positive results modelling independent factors of User Experience, Social Engagement, System stability & Security and Applications of mobile platform technology with a dependent factor of

Conversion. Model fit parameter SRMR was 0.055, lower than 0.08 which indicated the overall model fitness. Henseler et al., (2014) introduced the SRMR as a goodness of fit measure for PLS-SEM that could be used to avoid model misspecification. A value of less than 0.08 (Hu and Bentler, 1999) would be considered a good fit. The R-square was 5.3 but the adjusted R-square was 3.2 which meant 3.2% of the variance can be explained by the 4 factors. Besides, no collinearity issues could be identified with both internal and external VIF measures under 3. (Diamantopoulos and Siguaw, 2006). In terms of coefficient path measurement, the variable of Mobile Platform indicated the strongest impact at 0.149, the other three were relatively weaker at 0.096 (Social Engagement); 0.065 (System stability & Security) and 0.020 (User Experience). In terms of statistical significance, the bootstrapped assessment on the PLS model and indicated overall significance level of 95% could only be established with the factor Applications of mobile platform technology, the other three factors of Social Engagement, System Stability & Security and User Experience generated T-statistics below 1.96 and P-Value > 0.05. As for the variable of Application of Mobile platform technology, path T-statistics indicated 2.174 and P-value of 0.030 which were all within the measurement threshold. Hence, only H12 could be accepted while H9, H10 and H11 were not supported.

The results of the PLS-SEM constructs were summarised below and out of the 12 hypotheses, H2, H3, H4, H8 and H12 were accepted at 95% interval with the rest of H1, H5, H6, H7, H9, H10 and H11 were not supported as they could not meet the 1.96 T-statistics thresholds. It was interesting to see the factor of User Experience could not be quantitatively verified to have a direct impact on performance metrics on Visits, Sales and Conversion. On the contrary, applications of mobile platform technology were found to be a significant factor in impacting Visits, Sales and Conversion. In the next chapter, these findings were further analysed together with the insights from the qualitative analysis.

Table 4.11 Summary of Regression results

	<b>Hypothesis</b>	<b>Construct R</b>	<b>Construct Adjusted R-Square</b>	<b>T-Statistics</b>	<b>Comment</b>
H1	User Exp impact Growth in Site Visit	0.118	0.099	1.213	Not Supported
H2	Social Engagement impact Growth in Site Visits	0.118	0.099	2.653	Accepted Sig 95%
H3	System stability impact Growth in Site Visits	0.118	0.099	2.007	Accepted Sig 95%
H4	Mobile Capability impact Growth in Site Visits	0.118	0.099	2.193	Accepted Sig 95%
H5	User Exp impact Growth in Site Sales	0.090	0.069	0.220	Not Supported
H6	Social Engagement impact Growth in Site Sales	0.090	0.069	1.332	Not Supported
H7	System stability impact Growth in Site Sales	0.090	0.069	0.389	Not Supported
H8	Mobile Capability impact Growth in Site Sales	0.090	0.069	3.083	Accepted Sig 95%
H9	User Exp impact Site Conversion	0.053	0.032	0.887	Not Supported
H10	Social Engagement impact Site Conversion	0.053	0.032	0.437	Not Supported
H11	System stability impact Site Conversion	0.053	0.032	0.481	Not Supported
H12	Mobile Capability impact Site Conversion	0.053	0.032	0.030	Accepted Sig 95%

## CHAPTER 5 FINDINGS AND DISCUSSIONS

### 5.1 Consolidated Findings from Qualitative and Quantitative Analysis

In Table 5.1 below, the findings from both Qualitative and Quantitative Analysis were listed for comparison:

Table 5.1 Comparison of findings from Qualitative and Quantitative Analysis

Expert Interviews (Section 4.2)	PLS-SEM (Section 4.3-4.5)
<p>M-commerce and e-commerce shared the same key metrics in visits, sales and conversions albeit distinctive challenges in m-commerce due to screen size, mobility nature and lack of input tools such as keyboard &amp; mouse</p> <p>User Experience was one of the two pillars to ensure performance in m-commerce. User Experience is the “fundamentals”, “levers”, hygiene factors” that will shape user satisfaction and preference to the site. Key important “atmospheric components” included:</p> <ul style="list-style-type: none"><li>-Site and page layout</li><li>-Input efficiency and ease in editing</li><li>-Product and content descriptions</li><li>-Site Navigation and ease</li><li>-Checkout Experience</li></ul>	<p>NA</p> <p>Based on the current data set, User Experience as an independent variable in H1, H5 and H9 could not pass T-tests at 95% statistical significance.</p>

<p>Social engagement was one of the two pillars to ensure performance in m-commerce. As one of the atmospheric factors, social engagement was the growth drivers for site traffic and revenue. Key important components included:</p> <ol style="list-style-type: none"> <li>1. Usage of ratings and reviews</li> <li>2. Usage of social login and linkages to external social media network</li> <li>3. Utilization of location-based activities and other customer engagement through social network</li> </ol> <p>System stability and security was a critical information technology factor and was fundamental to the existence of successful m-commerce. This factor would directly control the level of user experience in daily operations. For example, site speed directly had shown in many research to be impacting site sales revenue.</p> <p>Extensive and flexible applications of mobile platform technology would enable m-commerce to maximize customer touchpoints and offer the best range of personalised service that would facilitate growth in customers and revenue.</p>	<p>Based on the current data set, Social Engagement as an independent factor was found to be statistically significant at the 95% level and contributed to impacting growth in site visits H2. However, for H6 and H10, both hypotheses were not supported, and Social Engagement could not be validated as impacting Growth in Sales and Conversions.</p> <p>System stability and security as an independent factor in H3 were found to be statistically significant in impacting Growth in Site visits. However, for Growth in sales and Conversions, as in H7 and H11, both hypotheses were not supported.</p> <p>Applications in mobile platform technology were the only independent factor that was found statistically significant in all three constructs as in H4, H8 and H12 and were seen to impact on Growth in Visits, Sales and Conversions.</p>
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In terms of the quantitative analysis from sections 4.3 to 4.5, all the three different constructs as in Fig4.5, Fig 4.6 and Fig 4.7 that hypothesized on Growth in Visits, Growth in Sales and Conversions respectively did not generate high figures in the coefficient of determination as represented by their adjusted R Square numbers. For Fig 4.5 in Visit Growth, adjusted R square was 0.099, Fig 4.6 in Sales Growth, adjusted R square was 0.069 and finally Fig 4.7 in Conversions, adjusted R square was 0.032. R square measures were meant to indicate the proportion of variance in the outcome variable which was explained by the set of predictor variables in the sample, hence in the case of Fig 4.5, the 4 independent

factors could explain 10% of the variations in the outcome of the tested data set in the growth of visits. There were different views on what constituted a significant R square/adjusted R square value by different scholars, Falk and Miller (1992) recommended that R square value should be equal to or greater than 0.10 to be considered; Cohen (1988) indicated that R<sup>2</sup> value of 0.02 could be considered weak, 0.13 would be moderate and 0.26 was substantial. Hair et al., (2011) would put anything lower than 0.25 as weak. Despite all these “rules of thumbs”, the R square or adjusted R square as generated by the models were all skewed towards the lower end. The highest scenario was still site visits as in Fig. 4.5. The impact on conversion and sales revenue appeared to be much more insignificant. Besides, despite the other parameters such as “model fit” and “collinearity” measures were fine in the three models, all three constructs involved individual factors that could not pass through significance tests and T-statistics thresholds; Fig 4.5: User Experience P-Value = 0.226 Fig 8: Social Engagement P-Value = 0.183, System Stability P-Value = 0.697, User Experience P-Value = 0.826. Fig 4.10 Social Engagement P-Value = 0.437, System Stability P-Value = 0.481, User Experience P-Value = 0.887. This led to questions if there could be some other possible moderating factors or optimization in the construct that could be further explored in the next two sections.

## **5.2 Exploration of Moderating factors in the PLS-SEM construct**

Given the above findings, one dimension that remained to be explored was if out of the 183 samples used to compute the model, would there be any factors external to these constructs that could have impacted the outcome of the regression results. From the reviewed literature discussed in section 2.4.2 as well as insights from industry experts in section 4.2.6, moderators such as culture: Davis et al., (2008), demographics: Steenkamp et al., (2006)

gender: Tsichla et al., (2014) could have an impact on the performance of mobile commerce. However, as this research focused on company-level data based on the top 200 mobile commerce businesses during 2015-16, such data on the potential moderators were not available. The only two possible dimensions that could be further explored based on available data of these 183 companies would be company size or their vertical industries. As outlined in section 3.3, the 183 companies came from a diverse spread of 16 vertical industries which implied for some verticals there might only be less than 10 sample companies. Therefore, it would be very difficult to examine how the model would perform differently with variations in industry verticals given the available small sample size. On the other hand, within the data set, 2 years of m-commerce sales figures were collected for each of the samples. If m-commerce sales figures could be used a proxy to represent the size or magnitude of the companies, it would become possible to subdivide the 183 data set into different test groups to compare whether different company size would have any impact on the regression results.

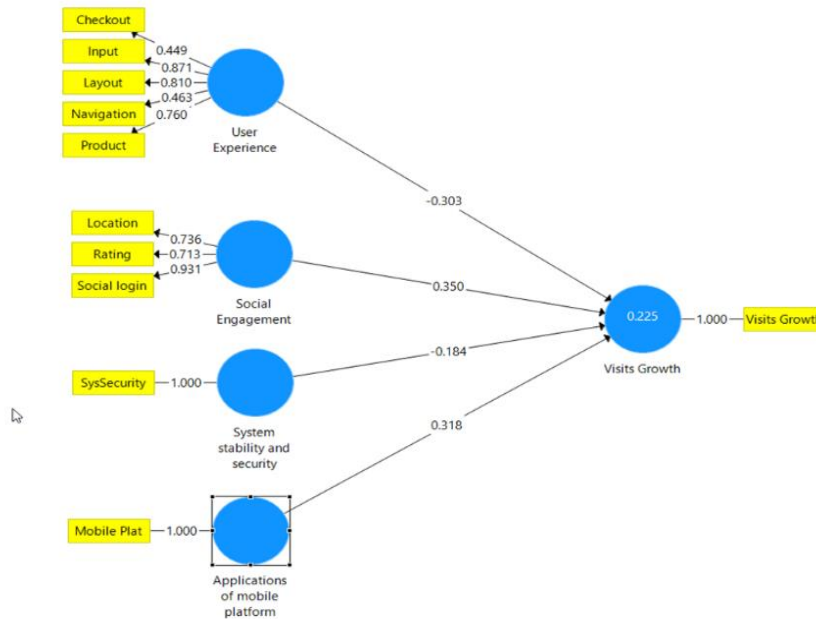
In analysing the mobile commerce sales volume of the 183 samples, the composition was quite polarized; 52 sample companies were in the range of above US\$100m while 69 sample companies were in the range of lower than US\$10m, 62 sample companies fell in the middle between US\$10m to \$100m. Given the diversity, the mean position would not be a useful indication. The median of the sample group was around US\$30m. Based on inputs from industry experts and the reference of this median position, it was deemed reasonable to use US\$50m as a cutting point to divide the population into two groups; Lower sales group of below US\$50m with 115 in the sample and higher sales group from \$50m onwards with 68 in the sample. The original 183 could be used as a control group while similar regression analysis could be run on both the higher sales group and lower sales group to see if there would be any differences in results and conclusions. Below are the results as generated from



the two samples in Fig. 5.1(a-f) for the H Sales Group (US\$50M+) and Fig. 5.2(a-f) below for the L Sales Group (Under US\$50M)

Fig. 5.1 PLS-SEM Regression on H Sales Group (US\$50M+)

a. Visits Growth-H Sales Group



**R Square**

Matrix	R Square	R Square Adjusted
Visits Growth	0.225	0.176

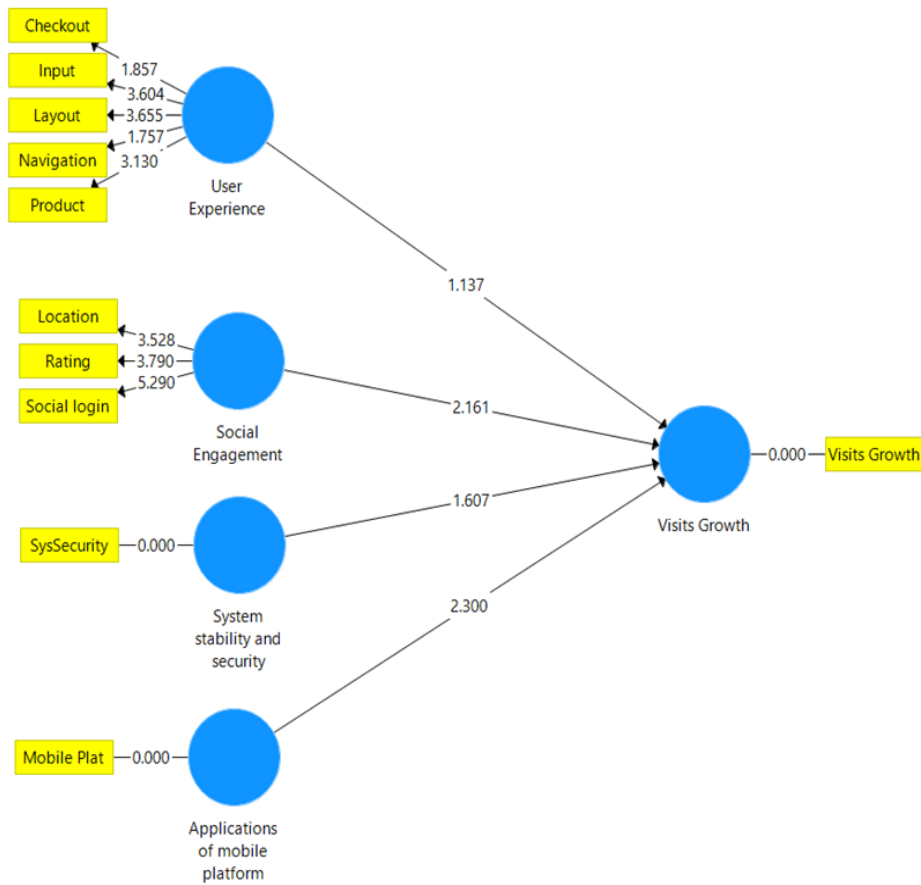
**Model\_Fit**

Fit Summary	rms Theta
SRMR	0.198
d_ULS	2.598
d_G	0.536
Chi-Square	149.039
NFI	0.670

**Collinearity Statistics (VIF)**

Outer VIF Values	Inner VIF Values
Application...	1.341
Social Enga...	1.272
System stab...	1.322
User Experi...	1.314
Visits Growth	

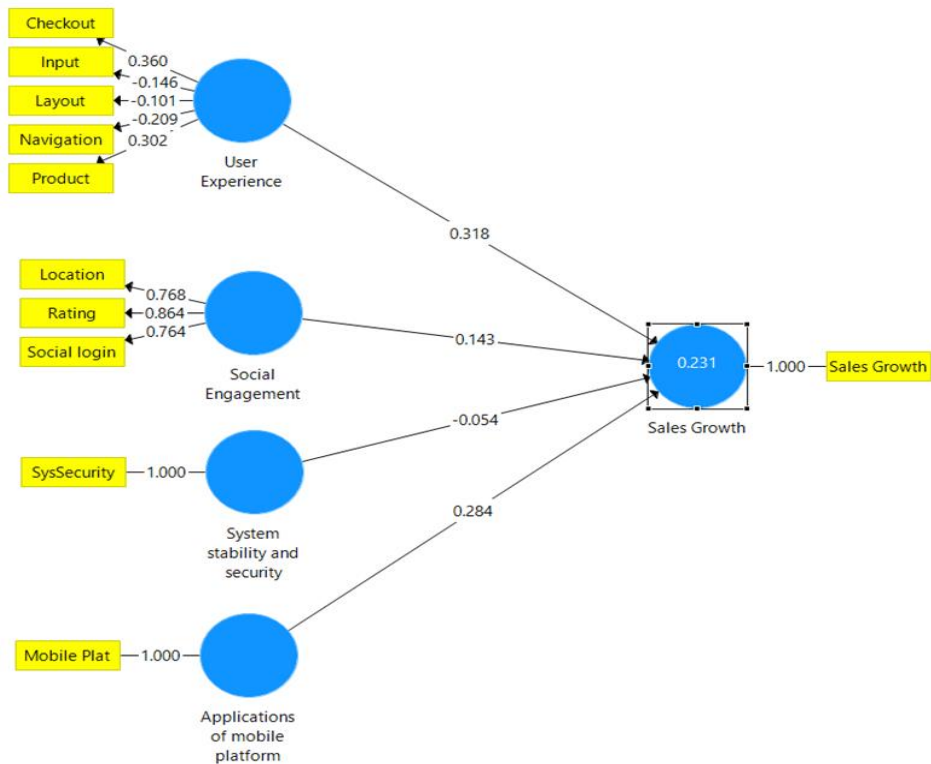
## b. Bootstrapped analysis on Visit Growth construct-H Sales Group



### Path Coefficients

	Mean, STDEV, T-Values, P-Values	Confidence Intervals	Confidence Intervals Bias Corrected		
	Original Sa...	Sample Me...	Standard D...	T Statistics (...)	P Values
Application...	0.318	0.325	0.138	2.300	0.022
Social Enga...	0.350	0.327	0.162	2.161	0.031
System stab...	-0.184	-0.201	0.114	1.607	0.108
User Experi...	-0.303	-0.190	0.267	1.137	0.256

## c.Sales Growth-H Sales Group



### R Square

Matrix	R Square	R Square Adjusted
Sales Growth	0.231	0.182

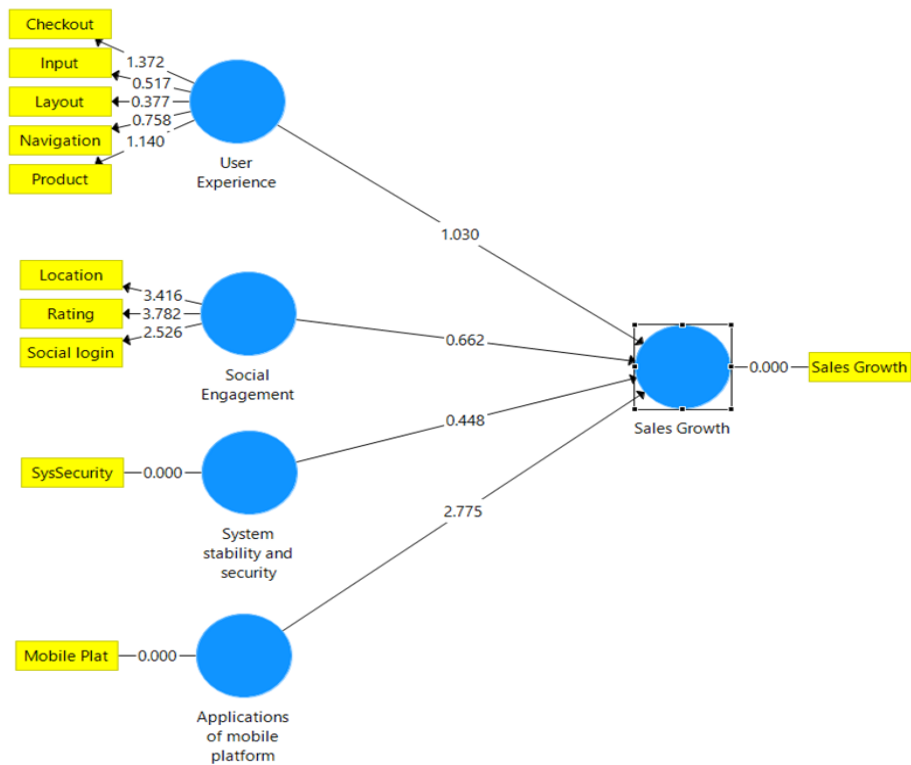
### Model\_Fit

Fit Summary	rms Theta
SRMR	0.386
d_ULS	9.843
d_G	1.379
Chi-Square	405.651
NFI	0.106

### Collinearity Statistics (VIF)

Outer VIF Values	Inner VIF Values
Application...	1.340
Sales Growth	1.033
Social Enga...	1.325
System stab...	1.076

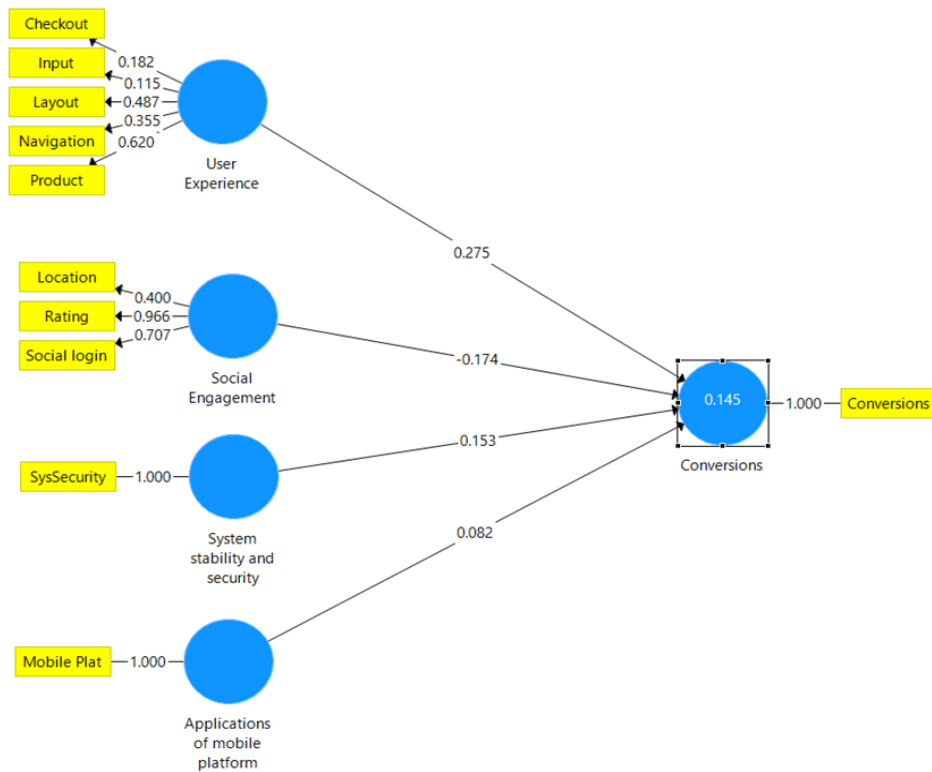
#### d. Bootstrapped analysis on Sales Growth construct-H Sales Group



#### Path Coefficients

	Mean, STDEV, T-Values, P-Values	Confidence Intervals	Confidence Intervals Bias Corrected		
	Original Sa...	Sample Me...	Standard D...	T Statistics (...)	P Values
Application...	0.284	0.312	0.102	2.775	0.006
Social Enga...	0.143	0.283	0.216	0.662	0.508
System stab...	-0.054	-0.088	0.120	0.448	0.654
User Experi...	0.318	-0.126	0.308	1.030	0.303

## e.Conversion – H Sales group



### R Square

Matrix	R Square	R Square Adjusted
Conversions	0.145	0.091

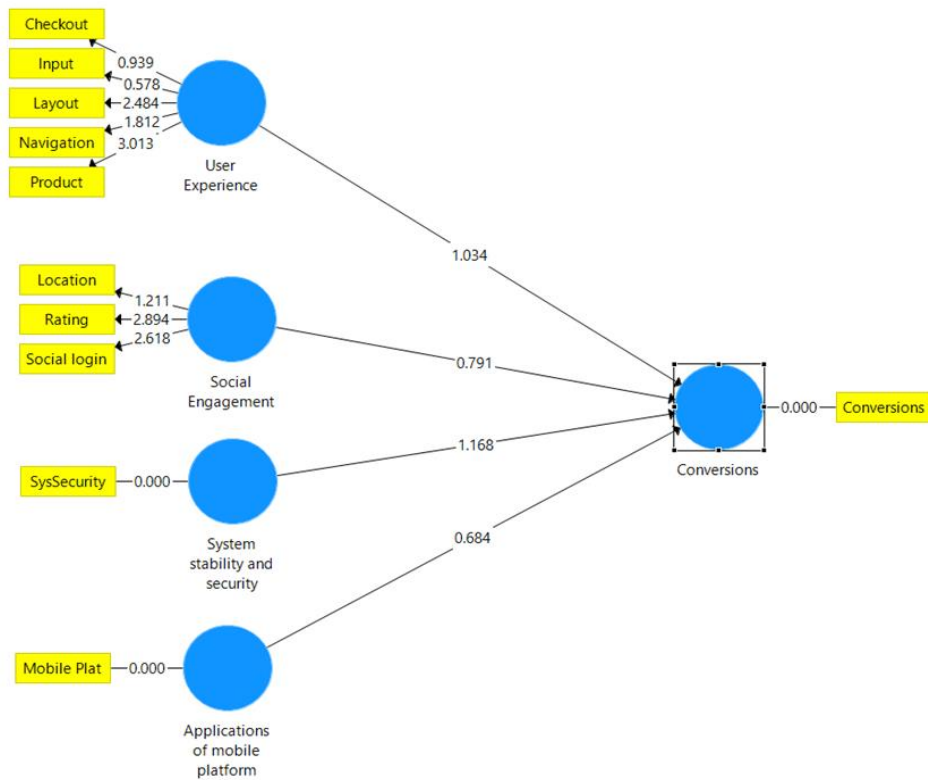
### Model\_Fit

Fit Summary	rms Theta
	Saturated ... Estimated ...
SRMR	0.339 0.339
d_ULS	7.601 7.601
d_G	1.134 1.134
Chi-Square	304.968 304.968
NFI	0.314 0.314

### Collinearity Statistics (VIF)

Outer VIF Values	Inner VIF Values
	Application... Conversions Social Enga...
Application...	1.293
Conversions	1.056
Social Enga...	1.310
System stab...	1.082
User Experi...	

## f. Bootstrapped analysis on Conversion construct-H Sales Group

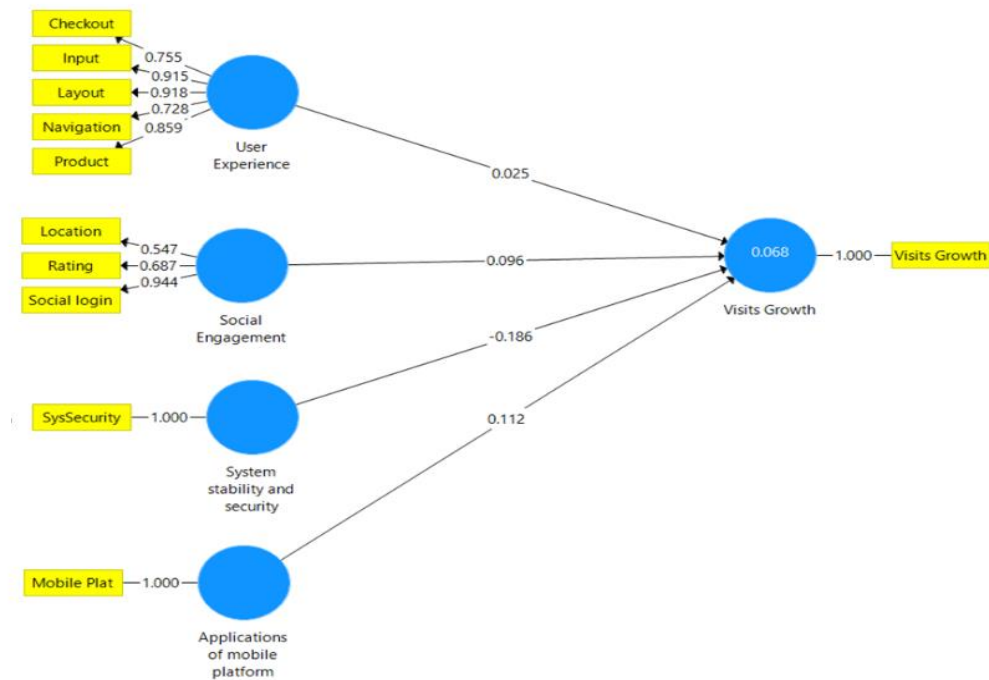


### Path Coefficients

	Mean, STDEV, T-Values, P-Values	Confidence Intervals	Confidence Intervals Bias Corrected		
	Original Sa...	Sample Me...	Standard D...	T Statistics (...)	P Values
Application...	0.082	0.092	0.120	0.684	0.494
Social Enga...	-0.174	-0.134	0.220	0.791	0.429
System stab...	0.153	0.182	0.131	1.168	0.243
User Experi...	0.275	0.081	0.266	1.034	0.302

Fig. 5.2 PLS-SEM Regression on L Sales Group (Below US\$50M)

### a.L Sales Group – Visits Growth



#### R Square

Matrix	R Square	R Square Adjusted
Visits Growth	0.068	0.034

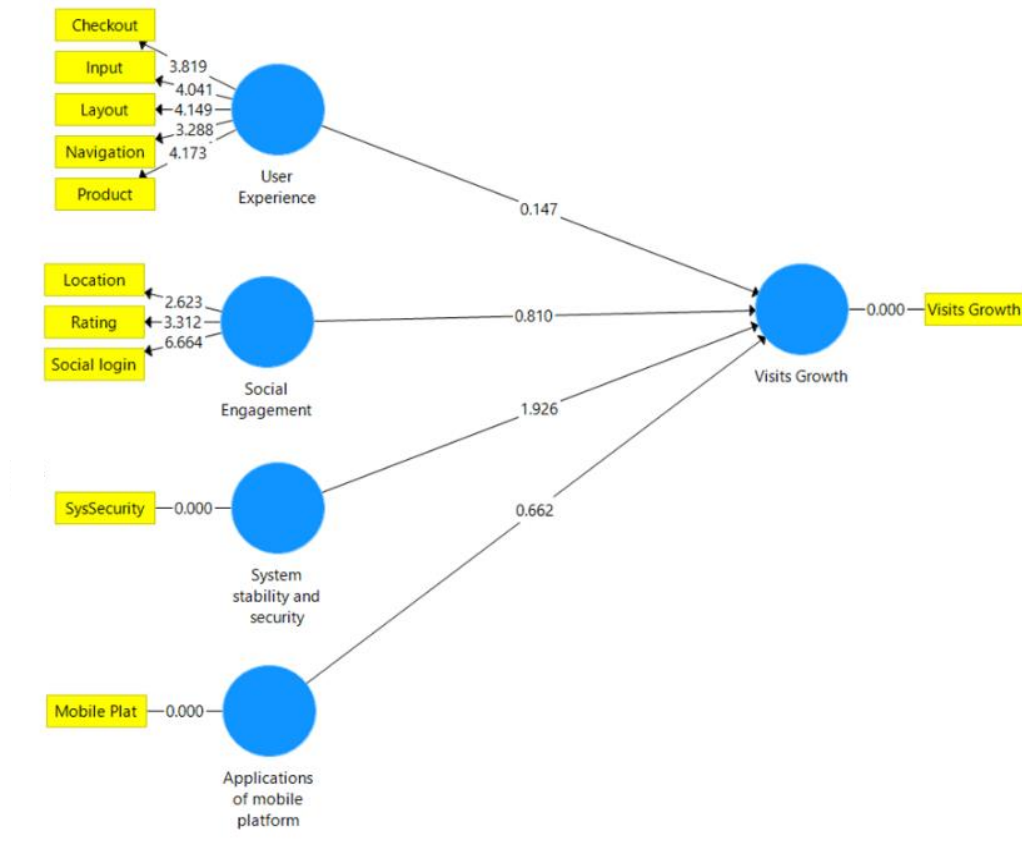
#### Model Fit

Fit Summary	rms Theta
SRMR	0.094
d_ULS	0.584
d_G	0.301
Chi-Square	163.918
NFI	0.775

#### Collinearity Statistics (VIF)

Outer VIF Values	Inner VIF Values
Application...	1.188
Social Enga...	2.233
System stab...	1.312
User Experi...	1.944
Visits Growth	

## b. Bootstrapped analysis on Visit Growth construct – L Sales Group

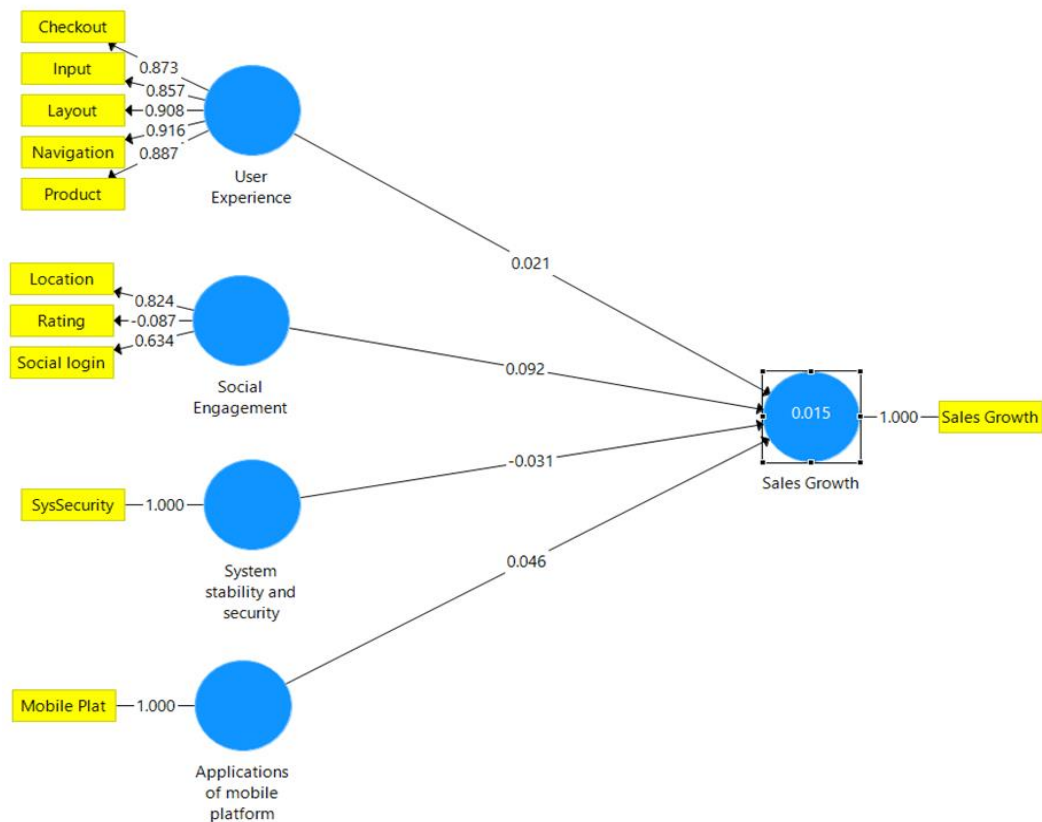


### Path Coefficients

Mean, STDEV, T-Values, P-Values		Confidence Intervals		Confidence Intervals Bias	
	Original Sa...	Sample Me...	Standard D...	T Statistics (...)	P Values
Application...	0.112	0.111	0.170	0.662	0.508
Social Enga...	0.096	0.176	0.119	0.810	0.418
System stab...	-0.186	-0.159	0.096	1.926	0.054
User Experi...	0.025	-0.064	0.167	0.147	0.883



### c.Sales growth – L Sales Group



#### R Square

Matrix	R Square	R Square Adjusted
Sales Growth	0.015	-0.021

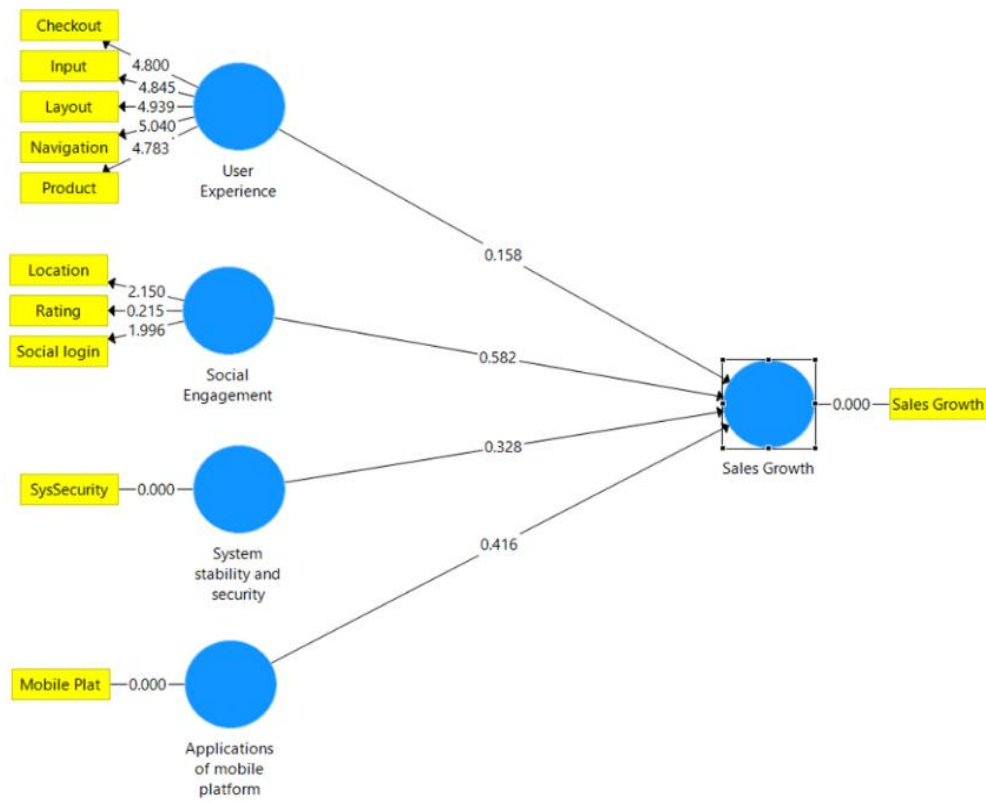
#### Model\_Fit

Fit Summary	rms Theta	
SRMR	Saturated ...	Estimated ...
	0.179	0.179
d_ULS	2.103	2.103
d_G	0.348	0.348
Chi-Square	191.417	191.417
NFI	0.734	0.734

#### Collinearity Statistics (VIF)

Outer VIF Values		Inner VIF Values			
	Application...	Sales Growth	Social Enga...	System stab...	User Experi...
Application...		1.053			
Sales Growth					
Social Enga...		1.341			
System stab...		1.052			
User Experi...		1.343			

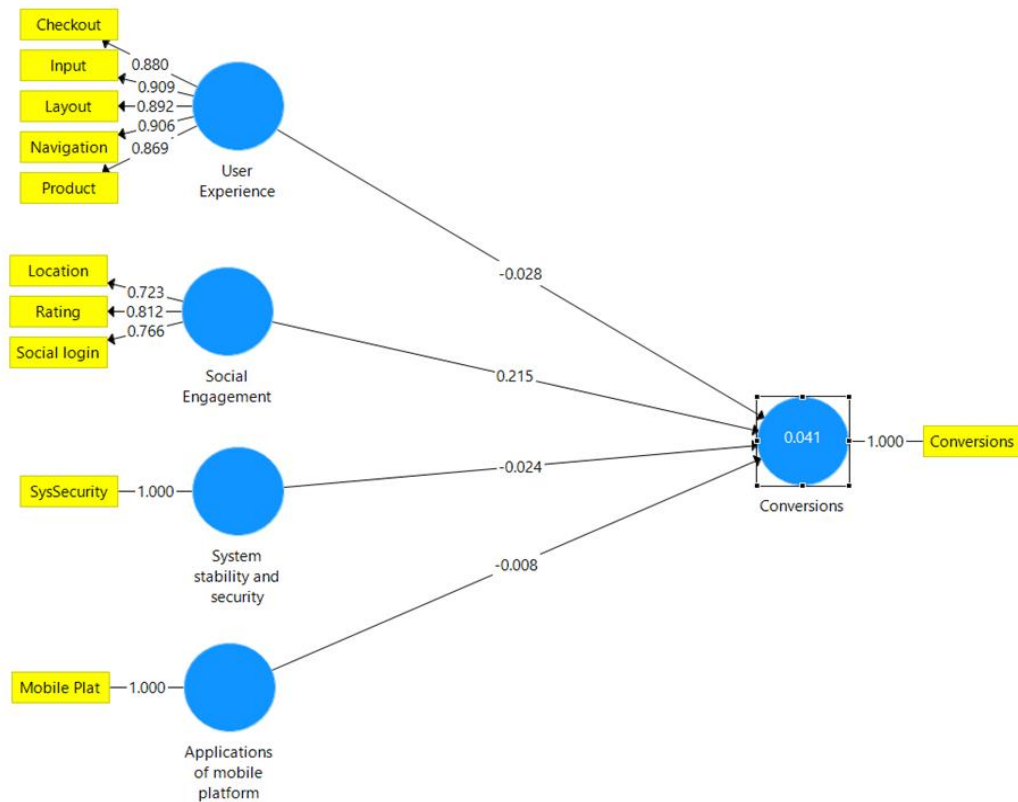
#### d. Bootstrapped Sales growth construct – L Sales Group



#### Path Coefficients

	Mean, STDEV, T-Values, P-Values	Confidence Intervals	Confidence Intervals Bias Corrected		
	Original Sa...	Sample Me...	Standard D...	T Statistics (...)	P Values
Application...	0.046	0.067	0.111	0.416	0.677
Social Enga...	0.092	-0.029	0.157	0.582	0.561
System stab...	-0.031	-0.060	0.096	0.328	0.743
User Experi...	0.021	0.088	0.132	0.158	0.875

## e.Conversion – L Sales Group



### R Square

Matrix	R Square	R Square Adjusted
Conversions	0.041	0.007

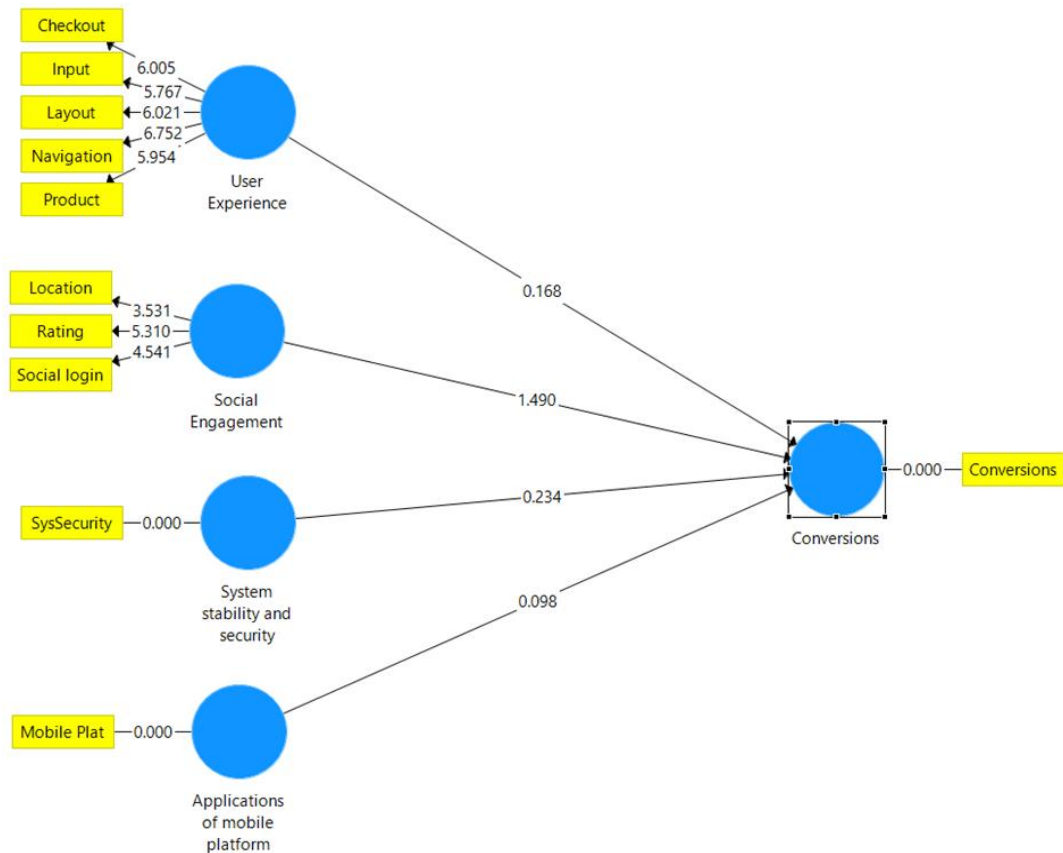
### Model\_Fit

Fit Summary	rms Theta
SRMR	0.075
d_ULS	0.374
d_G	0.202
Chi-Square	133.319
NFI	0.816

### Collinearity Statistics (VIF)

Outer VIF Values	Inner VIF Values
Application...	1.131
Conversions	2.602
Social Enga...	1.400
System stab...	2.306

## f. Bootstrapped analysis on conversion construct – L Sales Group



### Path Coefficients

	Mean, STDEV, T-Values, P-Values	Confidence Intervals	Confidence Intervals Bias Corrected		
	Original Sa...	Sample Me...	Standard D...	T Statistics (...)	P Values
Application...	-0.008	-0.009	0.084	0.098	0.922
Social Enga...	0.215	0.216	0.144	1.490	0.137
System stab...	-0.024	-0.025	0.102	0.234	0.815
User Experi...	-0.028	-0.006	0.169	0.168	0.867

Table 5.2 Comparison of Regression results between Control Group (H1-C to H12-C) and Tests Groups: High Sales Group (H1-H to H12-H) & Low Sales Group (H1-L to H12-L)

	Hypothesis	Construct R	Construct Adjusted R-Square	T-Statistics	Comment
H1-C	User Exp impact Growth in Site Visit	0.118	0.099	1.213	Not Supported
H1-H		0.225	0.176	1.137	Not Supported
H1-L		0.068	0.034	0.147	Not Supported
H2-C	Social Engagement impact Growth in Site Visit	0.118	0.099	2.653	Accepted Sig. 95%
H2-H		0.225	0.176	2.161	Accepted Sig. 95%
H2-L		0.068	0.034	0.810	Not Supported
H3-C	System stability & security impact Growth in Site Visit	0.118	0.099	2.007	Accepted Sig. 95%
H3-H		0.225	0.176	1.607	Not Supported
H3-L		0.068	0.034	1.926	Not Supported
H4-C	Applications of Mobile platform impact Growth in Site Visit	0.118	0.099	2.193	Accepted Sig. 95%
H4-H		0.225	0.176	2.300	Accepted Sig. 95%
H4-L		0.068	0.034	0.662	Not Supported
H5-C	User Exp impact Growth in Site Sales	0.090	0.069	0.220	Not Supported
H5-H		0.231	0.182	1.030	Not Supported
H5-L		0.015	-0.021	0.158	Not Supported
H6-C	Social Engagement impact Growth in Site Sales	0.090	0.069	1.332	Not Supported
H6-H		0.231	0.182	0.662	Not Supported
H6-L		0.015	-0.021	0.582	Not Supported
H7-C	System Stability & Security impact Growth in Site Sales	0.090	0.069	0.389	Not Supported
H7-H		0.231	0.182	0.448	Not Supported
H7-L		0.015	-0.021	0.328	Not Supported
H8-C	Applications of Mobile platform impact Growth in Site Sales	0.090	0.069	3.083	Accepted Sig. 95%
H8-H		0.231	0.182	2.775	Accepted Sig. 95%
H8-L		0.015	-0.021	0.416	Not Supported
H9-C	User Exp impact Site Conversion	0.053	0.032	0.887	Not Supported
H9-H		0.145	0.091	1.034	Not Supported
H9-L		0.041	0.007	0.168	Not Supported
H10-C	Social Engagement impact Conversion	0.053	0.032	0.437	Not Supported
H10-H		0.145	0.091	0.791	Not Supported
H10-L		0.041	0.007	1.490	Not Supported
H11-C	System stability & security impact Conversion	0.053	0.032	0.481	Not Supported
H11-H		0.145	0.091	1.168	Not Supported
H11-L		0.041	0.007	0.234	Not Supported
H12-C	Applications of Mobile platform impact Conversion	0.053	0.032	0.030	Not Supported
H12-H		0.145	0.091	0.684	Not Supported
H12-L		0.041	0.007	0.098	Not Supported

Based on the above comparison results in Table 5.2 of the regression analysis performed on the three population groups: H1-C to H12-C: Control group (183 samples), H1-H to H12-H: High sales group (65 samples) and H1-L to H12-L: Low sales group (115 samples); the validity of the hypothesis were similar with the exception that in the Lower Sales group, none of the hypothesis could pass statistical significance threshold unlike results in the High Sales Group which exhibited the same pattern with the Control Group in Hypothesis H2, H4 and H8. For H3, regression on H Sales Group data only showed T-Statistics of 1.6 and could not reach 95% statistical significance.

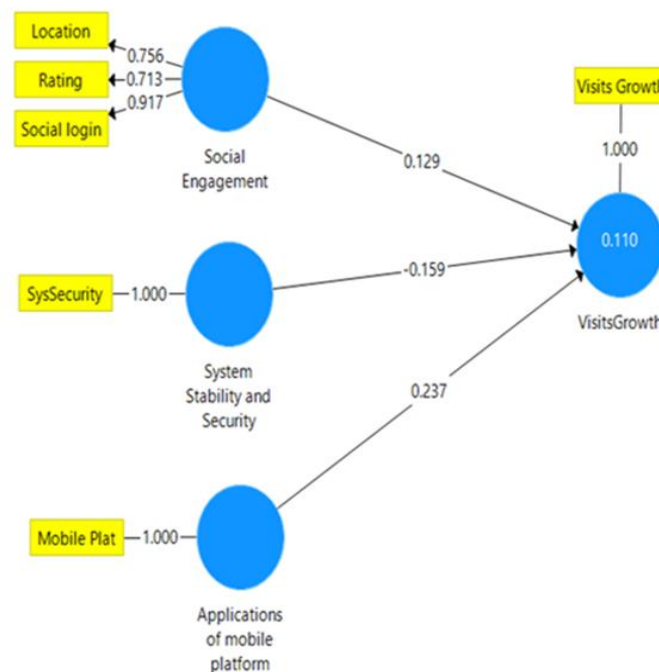
Although the results of the H Sales Group and the Control Group did indicate a similar pattern in the hypothesis validity, the adjusted R-Square of the H Sales Group for the first model on Growth in Site Visits was higher at 0.176. The implication was based on the data of the H Sales Group, the model on the 4 tested independent variables could explain 17.6% of the variance as compared to 0.99 or 9.9% in the case of the Control Group. This might seem to imply that the 4 tested independent variables model could better explain the behaviour for the larger companies with higher sales. However, under the H Sales Group data, both H1-H (user experience) and H3-H (system stability) were not supported, hence, a 4-factor model was still not valid under the H Sales Group.

It was evident from the test performed above that the division of data into Higher Sales and Lower Sales Group did not generate significantly different results as compared with the Control Group. As such, based on existing data set, it would not be possible to hypothesize that company size as reflected by their sales volume could have a significant moderating effect on the regression analysis for this research.

### **5.3 Exploration of alternative PLS-SEM model**

Based on the original findings from section 4.5, the 4 independent factors were found to yield stronger adjusted R square scores in visits growth model Fig. 4.5 then the others in sales Fig. 4.7 or conversion Fig.4.9. At the same time, even with this model, the factor of User Experience could not pass the significance test at 95% which meant this factor did not carry any explanatory power in the model at all. Therefore, will taking away the factor of User Experience improves the robustness of the construct? Based on this rationale, a revised construct with only 3 factors; Social Engagement, System stability and Mobile Platform was presented and was found to yield much more solid statistical results.

Figure 5.3 PLS-SEM Model for Visits Growth based on 3 Factors



R Square		
Matrix	R Square	R Square Adjusted
	R Square	R Square A...
VisitsGrowth	0.110	0.095

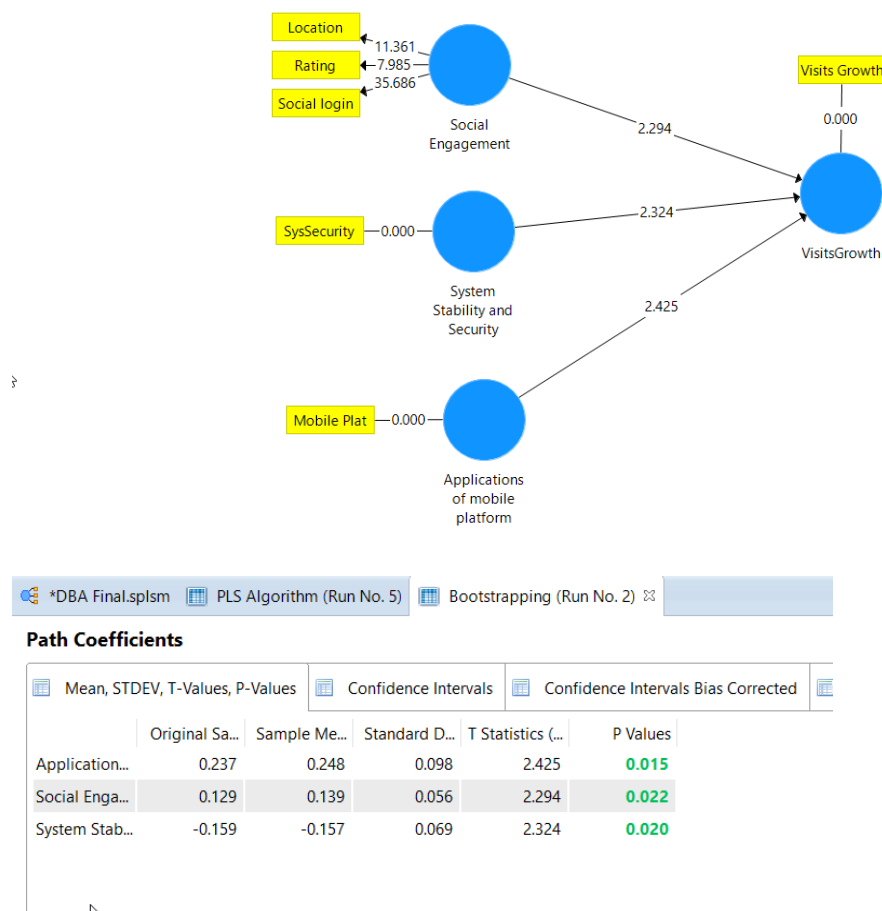
  

Model_Fit		
Fit Summary	rms Theta	
	Saturated ...	Estimated ...
SRMR	0.070	0.070
d_ULS	0.104	0.104
d_G	0.035	0.035
Chi-Square	39.147	39.147
NFI	0.802	0.802

Collinearity Statistics (VIF)				
Outer VIF Values	Inner VIF Values			
	Application...	Social Enga...	System Sta...	VisitsGrowth
Application...				1.264
Social Enga...				1.230
System Stab...				1.119
VisitsGrowth				

Bootstrapped analysis on PLS-SEM 3 Factor regression model on Visits Growth





In figures 5.3 above, this PLM-SEM model on Visits Growth indicated positive results for modelling the independent factors of Social Engagement, System stability & Security and Applications of mobile platform technology with the dependent factor of Growth in site visits. Model fit parameter SRMR was 0.070, lower than 0.08 which indicated the overall model fitness. Henseler et al., (2014) introduced the SRMR as a goodness of fit measure for PLS-SEM that can be used to avoid model misspecification. A value of less than 0.08 (Hu and Bentler, 1999) would be considered a good fit. The R-square was 0.11 but the adjusted R-square was 0.095 which meant 9.5% of the variance can be explained by the 3 factors. Besides, no collinearity issues could be identified with both internal and external VIF measures under 3. (Diamantopoulos and Siguaw, 2006). In terms of coefficient path measurement, the variable of social engagement reached 0.129, the other two reached 0.237 (Mobile Platform); and -0.159 (System stability & Security). In terms of statistical significance, Fig. 5.3 showed the bootstrapped assessment on the PLS model and indicated overall significance level of 95% could be established by all the 3 factors of Social Engagement, System Stability & Security and Applications of mobile platform technology with T-statistics above 1.96 and P-Value < 0.05. This construct implied that Social Engagement, System stability & Security and Applications of mobile platform technology could be validated as three impactful independent factors that could explain 9.5% of the variance in Growth in Visits.

## 5.4 Discussion

In this section, the original research questions are re-examined considering the findings from the complete mixed-method research process. The two research questions are:

1. What is the impact and role of “atmospheric factors” on m-commerce performance as measured by metrics such as site visits, conversion and sales?
2. Can the above research question be validated with company-level performance data?

To answer these questions, it will be necessary to re-examine the total picture of what has been uncovered as factors that might impact m-commerce performance in the process of this research and what findings of the research are pointing to particularly for the role of “atmospheric factors”.

Figure 5.4 Factors impacting the performance of m-commerce

Note: Circled part denotes focus from the industry as reflected from expert interviews

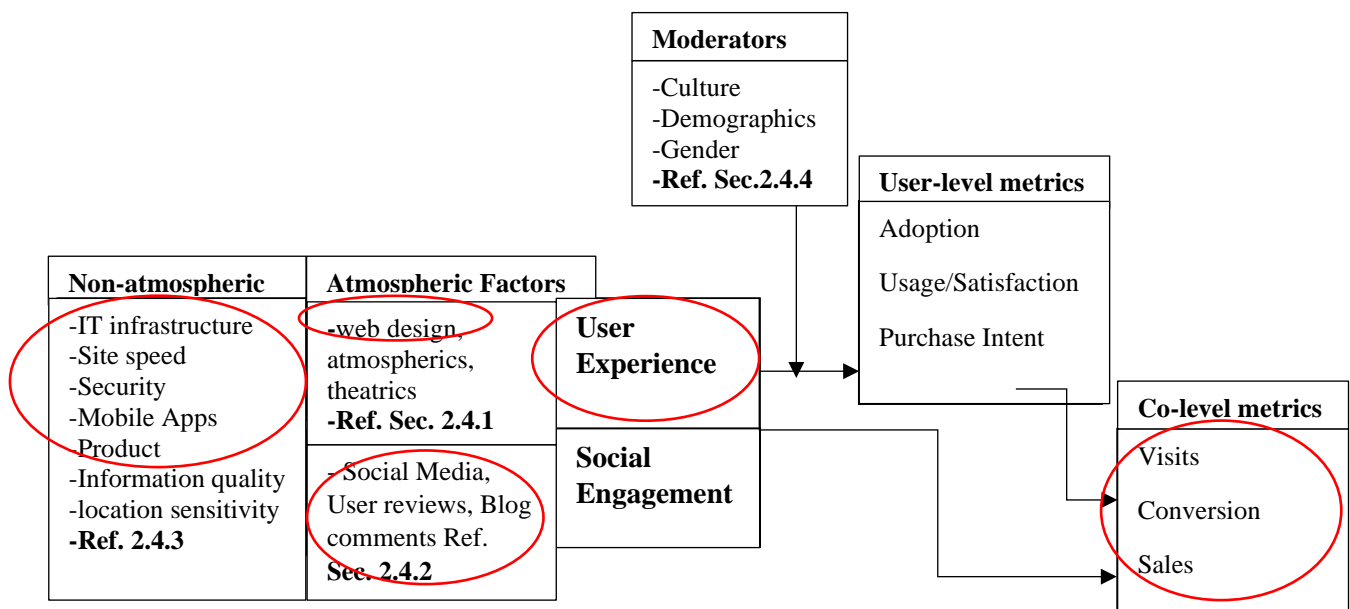


Figure 5.4 above might be similar to the framework described earlier in Chapter 2, the objective of Fig. 5.4 is to accurately describe the factors as well as the difference in focus in both “atmospheric” and “non-atmospheric” orientation that were found in reviewed literature and expert interviews to have impacted on the performance of m-commerce. In addition, the “indirect” factors such as “culture”, “demographics” and “country characteristics” were also captured and recognized as important moderators to the impact on m-commerce performance. It appeared from the research process, discussion of “atmospheric factors” had been in the mainstream role in both the reviewed literature and expert interviews.

As indicated in Table 2.1 to 2.3, 27 out of the 107 studies were focused on (1) Layout/Design, (2) Virtual atmospherics, (3) Virtual Theatrics. 7 studies were focused on Social Factors (Table 2.8). Discussions of these two “atmospheric factors” (User experience and Social engagement) added together represented 32% of the reviewed articles. Furthermore, the above picture was only reflecting the 56 studies directly using “atmospherics and or SOR” approach from Appendix I. Within the 51 “non-atmospherics and or SOR” studies in Appendix II, there were also 22 studies (Table 2.7) that covered factors such as layout, site design, navigation and flow concepts as an important part of their explanatory framework. The subject of “social factor” was also a distinctive focus as 12 studies in the “non-atmospherics and or SOR” listed in Appendix II did explore the impact of the social factor on e-commerce or m-commerce. (Table 2.8) Hence, it could be seen that despite the different approach of studies, “atmospheric factors” had been in a mainstream role in impacting e-commerce or m-commerce.

Similarly, from the expert interviews, 10 out of 10 experts voiced strong opinions on the importance of focusing on “User Experience” and “Social engagement” as the top two drivers to achieve a targeted performance level of m-commerce. The following quotes could illustrate:

Expert B: “usability and user experience are the most important factor in determining the performance of mobile commerce.”

Expert D: “Navigation flow, site design, use of colour and fonts will directly impact the level of user experience and therefore user satisfaction”.

Expert D: “If user experience is one pillar, social engagement is the other”.

Expert J: “To me, this (social engagement) is the second most important for mobile commerce performance”.

The mainstream role from both reviewed literature and the industry experts on “atmospheric” factors might have resulted from the long history of applying “physical retailing atmospherics concepts” to the virtual and mobile world as discussed in sections 2.2 and 2.3. However, factors other than “atmospheric” could not be ignored. There were 13 studies (Table 2.9) that touched on factors such as IT infrastructure, Site speed, Security, Mobile Apps, Product and content, Information quality and location sensitivity. In fact, within this group of “non-atmospheric” factor analysis, there were factors that could be very situational and time-dependent for example handset design or bandwidth. Over time, the impact of these factors would change substantially. For example, during the early days of m-commerce in 2000, the lack of standardized smartphone design and operating systems such as iOS/Android or the limited mobile data speed in 2.5G or 3G did hamper successful delivery of m-commerce service. With regards to these “non-atmospheric” factors, in both the literature reviewed and expert interviews, a strong articulation had been made that pointed to the impact of IT infrastructure, site speed, and network security being major factors that were affecting the performance of m-commerce. In additions, the literature reviewed showed a much larger diversity of factors other than infrastructure, such as user attitude, Gao (2013)

user's trust on information Choi et al., (2008) and quality of content Liu & Arnett (2000) while the experts were very focused on-site system infrastructure, site speed and security as an important determinant of m-commerce performance. The following quotes could illustrate:

Expert E: "First, IT infrastructure impact performance of mobile by way of impacting site speed. Speed does matter."

Expert H: "Security and IT infrastructure would impact the performance of mobile commerce as they would shape the level of user experience for the site."

Expert G: "Nowadays most large e-commerce business will be well equipped with all three; the main site, a dedicated mobile site and two sets of apps each for IOS and Android devices. With this preparation..... maximise their touchpoints with target customers."

For the last cluster of factors that impact m-commerce performance, there appeared to be a greater difference in focus from reviewed literature and industry experts. The indirect factors such as culture, demographics, or gender etc., did not obtain much mindshare from the experts. For example, Expert C, E & F remarked that culture and demographics factors could be considered as underlying context but difficult to conclude that they would determine the performance of m-commerce. Most of them would like Expert I, even take these as "givens" or "issues" to manage around. On the contrary, there were 13 studies (section 2.4.2) that addressed all these moderators for example; Culture: Fink et al., (2000), Hu et al., (2004), demographic background: Steenkamp et al., (2006), gender: Tsuchiya et al., (2014).

In Figure 5.4, the difference in focus from the reviewed literature and expert interviews was shown. The industry experts were much more interested in exploring comprehensive factors that impact m-commerce whether they were labelled as “atmospheric” or not. The industry experts were particularly focused on how these factors were impacting m-commerce actual performance metrics at company level i.e. The metrics they were concerned with were site traffic/visits, conversion and sales revenue. Hence, the industry was very focused on driving “User Experience” and “Social engagement” as the most important priorities. In this regard, these two areas were also corresponding to the “atmospheric” line of research that could be identified from reviewed literature. For example, Chen et al., (2018) proposed the concept of “Flow” or “User Experience”, Thakur (2018) illustrated that ‘customer engagement’ impacted a user’s intention in the online review. However, it was necessary to point out, the unit of analysis in most of the reviewed literature was “user behaviour level” i.e. user adoption, usage and intent to purchase. In the reviewed literature, the objective was to identify the correlations between “atmospheric” or other factors and their impact on human behaviour and based on the effect on users, their impact on direct company level metrics: visits, conversion and sales were often implied with only a few exceptions such as browsing pattern impacting sales, Lee et al., (2015) or online reviews impacting sales Chong et al., (2016)

Figure 5.5 Holistic view on the factors impacting the performance of m-commerce

Source: Author

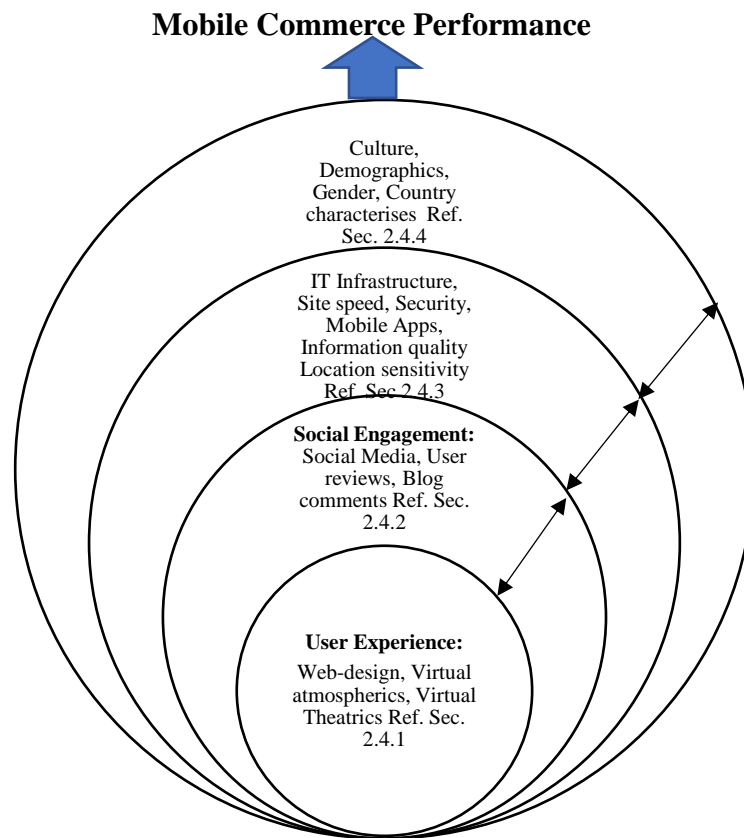


Figure 5.5 above projected a comprehensive picture on factors impacting m-commerce performance as a 4 layered concentric circle. Starting from the core is the drive on web-design related efforts on User Experience, extending to the outer layer of Social engagement through initiatives on social media and blogs. Further beyond is the layer that dealt with IT infrastructure, site speed, mobile platform applications etc. The most outer layer captures factors such as culture, demographics and country characteristics. This concentric circle pictured how these factors can be analysed from a more micro perspective in the core such as web-design/user experience extending layer by layer to the more macro perspective on culture and demographics. In additions, these different layers of factors are not static and will

have interactions between themselves and this is represented by the double arrows between the layers.

By using this concentric circle analysis, two important questions can be discussed: (1) What is considered to be “atmospheric factor” vs “non-atmospheric factor”? (2) Where is the operational boundary of the m-commerce business? When Kotler (1973), defined “atmospherics” in sensory terms such as ‘sight’, ‘sound’, ‘scent’ and ‘touch’, the obvious object he had in mind was a physical retail store. He would advocate shop owners to create the “right atmospheres” to proactively manage customers’ shopping behaviour. When the same concept is applied to a virtual shop in a mobile network, it is difficult to assume the “atmosphere” for m-commerce remains the same. For example, in a world of mobile network, IT infrastructure, network security and network speed are relevant and important “atmospherics” for the m-commerce business. Given this perspective, the meaning of “atmospherics” factors can also be viewed differently. Correspondingly, the operational boundary should also be re-defined for m-commerce business. Before the advent of social networks 10 years ago, the retail websites were operating more on a standalone basis. With the importance of social networks growing and how m-commerce would become part of many social networks to draw on every possible source of incoming traffic, the boundary of the m-commerce as a company would also need to be extended. With this holistic view about the interplay between these layers of factors affecting m-commerce, it is more important to see how different layers of factors will interact and create impact at the user behaviour and company level instead of focusing on a single notion of “atmospheric factor” or “framework of atmospheric factors”.

To conclude this discussion, the findings from the qualitative research indicated that “atmospheric” factors grouped under the dimensions of “User Experience” and “Social Engagement” did create an impact on the performance of m-commerce and had played a



mainstream and significant role in the analysis of the subject matter. The reference metrics might have been more focused on user-level measures such as purchase intent or perception in the past, but company-level metrics such as visits and sales were also used in more recent studies Lee et al., (2015) or Chong et al., (2016) as well as this particular research. With the rapid development of m-commerce and the complexities in mobile technologies and environment, “non-atmospherics” factors such as “system stability & security” and “mobile applications and platform” became important and had complemented the “atmospherics” factor in our analysis. In particular, as discussed in the paragraph above, what constituted environment or “atmospherics” to a virtual mobile business might also be changing from time to time, hence, the new technology factors such as systems and mobile applications could also be interpreted as the new “atmospherics” to the m-commerce business.

The second research question is: Can the impact and role of atmospheric factors on m-commerce be validated with company-level performance data? The quantitative research or validation process for research question two could be recapped as follows:

**Section 3.3.2:** A data set of 183 companies comprised of performance metrics and financial data in 2015-16 was obtained from Internet Retailer. The corresponding operation assessment based on inputs from 3 independent assessors was put together on a unified testing instrument/scorecard based on factors formulated from insights based on the literature review and expert interviews (Table 3.8 & 3.9)

**Sections 4.2 and 4.3:** A proposed model set of 4-factor (User Experience, Social Engagement, System stability and mobile platform applications) was formulated after consolidating insights from qualitative research in literature review and expert interview. This model set of 4-factor was tested with exploratory factor analysis using SPSS 25 (Table 4.10).

To further validate the model, a confirmatory factor analysis using Smart PLS 3 was performed (Figure 4.1) both EFA and CFA results indicated the factors model was viable.

**Sections 4.4:** The 4-factor model set was formulated into 3 regression constructs to be examined with 3 major performance metrics: Site visits growth, Fig. 4.2, Site sales growth, Fig. 4.3 and Conversion Fig.4.4. According to this 4 x 3 correlation set, 12 hypotheses were proposed to be verified.

**Sections 4.5:** The 3 regression constructs were tested using PLS-SEM software Smart PL3 3. Results indicated that only the model on Site visit growth Fig. 4.5 could yield an adjusted R square of 0.099 or 10% explanatory power. In additions, all three models carried 1 to 3 factors that could not pass the significance tests at 95%. Out of the 12 hypotheses, H2, H3, H4, H8 and H12 were accepted at 95% interval with the rest of H1, H5, H6, H7, H9, H10 and H11 rejected as they could not meet the 1.96 T-statistics thresholds. It was interesting to see the factor of User Experience could not be quantitatively verified to have a direct impact on performance metrics on Visits, Sales and Conversion. On the contrary, the factor Applications of mobile platform technology was found to be significant in impacting Visits, Sales and Conversion (Table 4.11)

**Section 5.2:** Explored the dimension of whether there might be any factors external to these constructs or important moderators that could have impacted the outcome of the regression results. Based on available data on the sales figures of the 183 sample companies and using these figures as a proxy as company sizes, the data set was divided into two groups with one over US\$50M and the other above the US \$50M. Regression tests on the same constructs were applied on these two groups and compared with the original 183 samples as Control group. Despite some minor differences in the higher sales group, results were similar to the Control set. Based on existing data set, it would not be possible to hypothesize that company

size as reflected by their sales volume could have a significant moderating effect on their performance (Figure 5.1 a-f, Figure 5.2 a-f, Table 5.2)

**Sections 5.3:** Taken away the factor of User Experience and tested with a model set of 3 factors (Social Engagement, System stability and Mobile platform applications) on the Site visits growth yield adjusted R-square of 0.095 with all the factors fulfilled 1.96 T-statistics thresholds which meant The 3 factors of Social Engagement, System stability and Mobile platform applications were verified by the adjusted R-square to be able to explain 9.5% of the variations in site visits growth of the sampled 183 companies.

The results that came out of the mixed-method research was clear but the question that needed to be addressed became; How could researchers or practitioners interpret this 9.5%? Would this R-Square be meaningful and significant in explaining its impact on m-commerce performance? In reverse, if these three factors could only explain 9.5% what could be the other factors accountable for the other percentages that this research might not have included?

As pointed out in earlier section 5.1, there are different views on what a significant R square/adjusted R square value by different scholars, Falk and Miller (1992) recommended that R square value should be equal to or greater than 0.10 to be considered; Cohen (1988) indicated that R<sup>2</sup> value of 0.02 could be considered weak, 0.13 would be moderate and 0.26 was substantial. Hair et al., (2011) would put anything lower than 0.25 as weak. Accordingly, by all measures, 9.5% here would still be in the “weak” area. It was also recognized that the research discipline might also have a large effect on the type of R-square outcome. In areas of marketing and particularly dealing with a multi-factors and complex subject of what impacted the growth of site visits for m-commerce companies, the findings of 3 factors that could have contributed 9.5% of the variations could also be regarded as meaningful.

One important remark that should be made on this discussion is that there might still be other factors outside of this research design that could have a major impact on the outcome of m-commerce performance. Although in section 5.2 above, company size as based on the current research samples was found to have no significant impact on m-commerce performance, one factor remained unexplored was the great variation between different vertical industries. In this research group of all 183 m-commerce business, these companies came from very different industries, the operation performance metrics of different verticals, for example, FMCG (Fast-moving consumer goods) would be significantly different from jewellery and accessories or consumer electronics retail. Hence, the difference in the verticals or product lines could be accountable for a very large percentage of difference in the research outcome and this would be further discussed in section 6.4

Having explored what potentially this research result did not cover and explain, it would be very important to follow through on the original 4-factor construct which this quantitative research was based on. In particular, could the statistics result add any new insights into the 4 identified factors? The very first factor that needs to be addressed was “User Experience”. From the literature review, “User Experience” was the mainstream atmospheric driver that accounted for 40% of the discussion. From expert interviews, this was regarded as the number one concern and a key driver in impacting the performance of m-commerce. However, from the quantitative analysis in section 5.1 and 5.2, the final model optimized out this factor of “User Experience” What could be the reasoning behind this?

In the 107 articles reviewed in Chapter 2, there were only a few studies such as Lee et al., (2015), Chong et al., (2016) Lohse et al., (2017) that can directly measure independent factors such as online reviews or browsing pattern and the impact on dependent factors such as website sales based on available big data over a long period. However, as compared to this study, the results from these “big data” studies tend to be focusing on a single company or a

marketplace platform such as eBay or Facebook. The timing these studies covered would normally be several months as it would be rather difficult to gather and consolidate a huge database for several years. As such, it would be difficult for practitioners to apply the insights to different business scenario. The advantage of this study, however, would be a more comprehensive coverage and applications to different vertical industries and the data used could cover for several years to capture a better longitudinal view. The value and limitations of this study would be further addressed in section 6.2.

The majority of all other studies reviewed focused on the impact of independent factors (atmospheric or otherwise) on dependent factors such as consumer attitudes, satisfaction, intention to purchase, consumer pleasure and arousal, perceived value etc. All these are “indirect” success metrics rather than “direct” success metrics such as sales, visits or conversion. Most of these indirect attributes such as the intention to purchase or satisfaction could only be positive reasons that would induce subsequent success in the direct metrics of visit, conversion and sales. This research, on the contrary, had directly pointed out the 3 factors that would impact the performance of m-commerce in their key operation metrics which were important findings and carried actionable managerial implications. Details would be addressed in section 6.3.

In Lo et al., (2016), the authors advocated a “two-theory approach” that distinguished “hygiene factors” from “motivational factors” in consumer impulse online purchase. Lo et al., (2016) also argued that “atmospheric” factors such as site design and layout were mere “hygiene factors” that would provide a healthy environment for consumer to buy but “motivation factors” such as site promotions, blogger’s recommendations would be needed to trigger consumers to come to visit the site and make the final conversion. Referencing the two points raised in Lo et al., (2016) “User Experience” or most atmospheric factors should be classified as “hygiene factors” that would be conducive to success in metrics such as

visits, conversion and sales. Therefore, it would be probable that a high rating on “User Experience” could not necessarily translate into higher numbers of visits, conversion and sales. Furthermore, there would also be a “time-lag dimension” that should be considered. It would be very probable that improvements for example in site design, image presentation for products, ease in search content would take time for consumers to experience, appreciate and affect their behaviour pattern and finally effected the actual outcome in the operation after a certain period.

From the expert interviews, more insights could be extracted in relations to the nature of user experience. As expert C pointed out: *“Atmospheric factors such as colour, navigation flow, fonts, site content are what I would call “hygiene factors” in shaping the overall user experience.”* He also warned that: *“getting the atmospheric factors right alone could not ensure good performance of mobile commerce.”* In light of this comment, despite what could be seen about the hype on “User Experience” from the industry, it should be recognized that the drive for “User Experience” would be a continuous exercise. M-commerce business would certainly improve along the way on the practice of delivery of better and better user experience and these practices would also be shared and publicised. Therefore, more and more m-commerce would also be improving along the way. Following this logic, it appeared the drive towards “User Experience” would become a “catch-up” exercise instead of an exclusive “secret weapon” that could distinguish one m-commerce business from the other.

The second element that needs to be addressed is why the factor Applications of mobile platform technology seems to be so strong statistically in its impact on sales, conversion and sales. The prevalence of mobile platform technology is a relatively recent phenomenon. There were not many pieces of literature that had covered this subject. Nilashi et al., (2015) discussed how security, design and content factors in the mobile application and technology

platform had impacted customer trust in m-commerce. McLean et al., (2018) addressed factors on ease of use, customization and convenience would direct customer experience by impacting the level of enjoyment and timeliness in app usage.

As pointed out in the expert interview and also the statistical finding, a well-implemented mobile platform technology had become the most immediate factor that m-commerce could create a positive impact on key success metrics such as sales, conversion and sales. Referring to what Expert F indicated, with 86% consumers time being spent in using mobile applications to access information and transact commercially, they would almost immediately be impacted by these mobile apps or dedicated mobile site if m-commerce business could deploy these technologies as their priority. Hence, it would not be a surprise to see this factor to show strong statistical relevancy in its impact on key success metrics. Besides, as Expert G also stated: “Nowadays most large ecommerce business will be well equipped with all three; the main site, a dedicated mobile site and two sets of apps each for IOS and Android devices.” Most of the large m-commerce entities which might have stronger performance metrics also had better implementation and adoption of mobile platform technology. Hence, from a statistical standpoint, there should be a stronger correlation between the two dimensions.

The next important factor to examine is “Social engagement” which was an integral part of the dual atmospheric factor as documented in the literature review. The importance of “Social engagement” was also attested by the 10-panel experts as the key drivers of m-commerce performance. As Expert D remarked: *“social engagement will be most important in growing mobile commerce site in terms of traffic and revenue. Social engagement and promotional events are extremely important to any mobile commerce business to build connections with the social communities relevant to their users”*. From the revised regression analysis in section 5.1 and 5.2, “Social engagement” remained a solid factor in the

3-factor model that could explain 9.5% of the variations in visit growth. Hence, the impact this factor could carry would be different from the pure drive of “User Experience”. From both reviewed literature and expert description, the “social engagement factor” was used as a catalyst of growth in both traffic and revenue as any improvement in this dimension should very directly lead to additional users and potential customers. Therefore, it is not surprising to see how this factor could make a direct contribution to the growth of site traffic.

Last but not least, for the factor of “System stability and security”, appeared to have received much more attention and focus from the industry then reflected in the discussions in the review literature. Although the study of m-commerce had been multi-disciplinary, quite a number of reviewed studies approached the subject of m-commerce from a user behaviour and psychological perspective, site system stability, security and site speed issues were taken as given. These exceptions were in those “IT and technology” discussion (Table 2.9), the issue of IT infrastructure or system stability and quality would be described as one of the “Non-atmospheric/SOR” study list. The perspectives from the industry on this factor were much stronger as Expert E pointed out: *“IT infrastructure impact performance of mobile by way of impacting site speed. Speed does matter”*. As Expert H also commented that *“there are more and more statistics available that indicated that quality of the network and site speed will very often determine whether the user will use and continue to use the m-commerce network”*. Looking at this perspective it would become quite possible that m-commerce performance might respond to network quality and speed issues much more immediately than a site design “atmospheric” issue as no matter how good the site design could be if the user would not have the patience to wait for the great design to be updated and uploaded, the better user experience would not even have a chance to create any impact.



To sum up, the final 3-factor model: social engagement, mobile platform apps and system stability and security appeared to be logical and reasonable in impacting site visits growth as users of m-commerce would naturally touch on these three factors even before the others.

## CHAPTER 6 CONCLUSION

### **6.1. Concluding Statements**

This study was launched with a “Mixed-Methods” research approach to address the research questions and gap with detailed discussions in section 5.4. This section aims to provide concluding statements.

As the first part of the research process, the researcher initiated the qualitative research and engaged a 10-industry expert panel to solicit their views. The content and points from these semi-structured interviews were further consolidated into a comprehensive 10-factor m-commerce performance scorecard. The researcher initiated the quantitative research and invited 3 industry experts to use this scorecard to rate site performance of the Top 200 m-commerce business in 2015-2016 according to Internet Retailer. Using these scores and corresponding financial and operational metrics such as visits, sales and conversion available in the Internet Retailer database, the researcher further ran SPSS factor analysis and structured equation modelling SMART PLS analysis.

A 4-factor (User Experience, Social Engagement, System stability and mobile platform applications) model set was formulated into 3 regression constructs to be examined with 3 major performance metrics: Site visits growth, Fig. 4.2, Site sales growth, Fig. 4.3 and Conversion Fig.4.4. According to this 4 x 3 correlation set, 12 hypotheses were proposed to be verified. The 3 regression constructs were tested using PLS-SEM software Smart PL3 3. Results indicated that only the model on Site visit growth Fig. 4.5 could yield an adjusted R square of 0.099 or 10% explanatory power. In additions, all three models carried 1 to 3 factors that could not pass the significance tests at 95%. Out of the 12 hypotheses, H2-Social Engagement impact Growth in Site Sales - H3- System stability impact Growth in Site Visit,

H4- Mobile Capability impact Growth in Site Visits, H8- Mobile Capability impact Growth in Site Sales and H12- Mobile Capability impact Site Conversion were accepted at 95% interval with the rest H1, H5, H6, H7, H9, H10 and H11 were rejected as they could not meet the 1.96 T-statistics threshold.

Due to the above findings, the factor of User Experience was deleted to become a revised model set of 3 factors (Social Engagement, System stability and Mobile platform applications) on the Site visits growth (Fig. 5.3) that yielded adjusted R-square of 0.095 with all the factors fulfilled 1.96 T-statistics threshold. Hence, the 3 factors of Social Engagement, System stability and Mobile platform applications were verified by the adjusted R-square to be able to explain 9.5% of the variations in site visits growth of the sampled 183 companies and was the only viable construct against others in Site sales growth or conversion model to be the outcome of this research.

Based on available data, exploration was also performed on testing whether company size as represented by company sales might be a potential moderator that could impact the regression results. Regression tests on the same constructs were applied on these two groups (one above US\$50M and the other one below) sub-divided from the original data group and compared with the original 183 samples as a control group. The test group did not show any major differences with the control group. Therefore, it would not be possible to hypothesize that company size as reflected by their sales volume could have a significant moderating effect on their performance (Figure 5.1 a-f, Figure 5.2 a-f, Table 5.2)

## **6.2. Value contributions and limitations of this study**

This study had contributed in the following three ways to current research efforts and understanding of the subject matter. First, this study utilised an uncommon approach of “Mixed-Method Research” which was one of the few studies that could provide

“triangulation” of findings from the literature review, industry expert interviews as well as statistical modelling. The ability to compare and contrast findings from different phases of the investigations as well as using the previous investigations to educate and enrich the next one was particularly beneficial. The starting point of this study was a literature review and findings were used in the interview questions for the expert panel. The findings from the expert panels were also used to formulate the scorecard for assessing the company performance that would become an integral part of the quantitative study. Finally, the outcome of this study would become inputs to research literature that would ultimately be challenged and refined to form the new knowledge base of the subject. This process assured the logical flow and integrity of the findings in each stage and had facilitated the progress of knowledge particularly on a practical and non-abstract subject such as e-commerce/m-commerce.

Second, this study had helped to fill the gap in company-level data analysis. The focus of the literature reviewed was found to have been limited to the unit level of the psychological state of arousal and avoidance of user behaviour which rendered it difficult for the industry to leverage the findings. This study represented an attempt out of the few to validate literature and industry findings with financial and operational data from a horizontal layer of top 200 m-commercial business. Such an approach and findings would facilitate analysis that could be more generalized and applicable instead of limited to specific companies.

Third, this study had generated unique findings and a different perspective in factors impacting the performance of m-commerce. Contrary to common perception, “User Experience” could not be regarded as the key driver for performance of m-commerce, the regression constructs instead pointed out that Social Engagement, System Stability and Mobile Platform applications were shown as the key drivers and at least accountable for 9.5%

of the data variability. While the significance of this 9.5% might still be debatable, this interesting finding did point to the importance of social initiatives, system speed and the focus in various mobile platform applications as much more immediate and direct measures for m-commerce business to impact their site visits in the near term. Another different perspective this study had offered was about the view on the definition of “atmospheric” and “non-atmospheric” factors. It appeared that in the world of the mobile network as compared with the age of “brick and mortar” retail, technology had become a bigger part of the “atmosphere” to “virtual retailing” to the extent that network speed or capability of the platform directly impacted how m-commerce business would or would not operate. Hence, the boundary of what constituted an “atmospheric factor” needed to be redefined or “virtual retailing” had become too complex to simply just looking at “atmospheric factors”. This also answered the question on the changing “role” of “atmospherics studies” by exploring the impact of “atmospherics studies” and how these studies had changed over time through the traces of the literature as well as the perspectives from the industry experts. Further managerial implication of this study would be addressed in section 6.3 below.

In terms of the limitations of this study, first, it was evident that the dataset used in this study was still rather small. Despite targeting at top 200 m-commerce companies, only 183 from the sampled data were usable. Although Smart PLS would facilitate analysis on a smaller sample size of under 200 cases, it would still be a stretch to generalize too extensively from a data set of 183 companies. In addition, one of the major difficulties that needed to be considered was this dataset comprised of companies with very distinctive sizes and resources availability. Some of the sampled companies were top-notch supergiants such as Amazon and Apple, the scale and behaviour of these giant players would be quite different from average-sized m-commerce player. Another limiting factor was the study samples belonged to very diverse industry segments; the 183 companies were made up of companies

from various industries such as fast-moving consumer retail (FMCG), information technology, apparel, jewellery and accessories etc. The operation metrics performance of different companies in different verticals were known to be rather different for example, conversion ratio would normally be higher with FMCG and apparel as compared to jewellery. As such it would be difficult to generalize over so many different verticals. Last, but not least, due to resource limitation, this study could only analyse one or two years of data, as pointed out in section 5.4, it might take time for user experience factors to create the intended impact so when this study could only track one or years of data, the analysis might not fully illuminate the real pictures entirely, hence, a longitudinal scan over 3 years would be more desirable.

### **6.3. Managerial implications of the study**

The results from the qualitative analysis and the quantitative analysis of this mixed research pointed to several important issues that have profound managerial implications for operators of m-commerce. From the qualitative analysis, two key drivers of m-commerce performance were identified: “User Experience and Social Engagement”. Besides, two more factors such as “System Stability & Security” and “Mobile Platform Applications” were named as the top of mind items. From the quantitative analysis, however, the “User Experience” factor was found to be statistically insignificant in affecting site visits and sales growth or even conversion. The only statistically valid construct impacting site visits growth appears to be a 3-factor group of Social engagement, system stability/security and applications of the mobile platform.

The first implication for managers of m-commerce will be, is “User Experience” no longer important? As discussed in section 5.4, “User Experience” can be viewed as the “hygiene factors” Lo et al., (2016) that will always be necessary but insufficient to deliver the

results. In most situations, investment and initiatives in “User Experience” will take time to affect changes in actual operation metrics. As quoted in Internet Retailer User Experience Guide (2019), Greg Schuller, Head of User Experience, Gap Inc. remarked that he thinks “there is no end-date” to user experience improvement. In the same Internet Retailer User Experience Guide (2019), from the result of an online survey of 80 online retailers organised by Internet Retailer, 45% of the group responded that “User Experience” is their Number 1 priority for the year. Hence, the managers of m-commerce should still focus on User Experience as a continuous improvement effort to stay competitive so that performance of their operations would not deteriorate but only be improved.

Second, “Social Engagement” will always be the power train in growing traffic as indicated in the statistical results. In this regard, the findings from the literature, expert interviews and statistical analysis were consistent. As such, managers should have no hesitation in focusing on this growth factor.

Third, when it comes to system stability and site speed issue, the implications might not be as evident. However, it should be noted that the importance of this factor was fully supported by expert views in the panel as well as from that the regression results. It was one of the 3 factors identified to impact site visits growth. More often than not, marketing managers of m-commerce will tend to focus on paid search, content, display ads to increase traffic but lose sight of the fundamental importance of site speed in impacting sales and conversion. For example, as quoted in an industry specialist blog article ([www.hotingmanual.net/3-seconds-how-website-speed-impacts-visitors-sales](http://www.hotingmanual.net/3-seconds-how-website-speed-impacts-visitors-sales)) 1. Amazon loses 1% sales for every 100ms load time 2. Walmart increase 2% conversion per 1 second load time improvement. Hence, it is apparent that managers should pay attention to this.

Fourth, on the factor of mobile platform applications, the impact of having a comprehensive deployment of mobile platform including dedicated mobile site and mobile apps are essential to maximize touchpoints with customers and directly impact traffic growth and subsequently conversion and sales. The statistical analysis indicated this insights and implications very clearly as this factor was the only factor that could pass the significance test at 95% level in the regression results.

Last but not least, this study does not only point to the importance of the above factors but the fact that the statistical results indicated that the 3 factors could only explain 9.5% of the variability. This will mean that there are a lot of other factors that influence growth in site visits. As pointed out in Fig. 5.4, the factors are all interacting with each other and there may be other specific factors about the product category and/or the specific marketing channel that have a significant impact on performance metrics of m-commerce. A manager of m-commerce should be alert and cognizant of specific factors that are important to their field and prepare to have a holistic view of how each factor interact and understand that timely decision and execution are extremely important for ensuring their success.

#### **6.4. Directions for Further Research**

Based on the discussion on the limitations in this study, the researcher would recommend the following directions for further research:

1. It is evident that the “Mixed-Method” approach in covering multiple angles from established academic research, inputs from industry experts and vigorous statistical verification, appears to be a more fruitful and valuable approach as compared with using single track study that will only focus on user behaviour arousal and avoidance to project user acceptance and purchase intent. Therefore, one direction for future



research is to continue with this present study but with enhancement to address the weakness identified. As pointed in section 6.2 above, the next level of study could focus on finding out the potential difference of moderating factors such as vertical industries, company sizes, geographical or cultural setting.

In terms of performance behaviour in vertical industries, there could be major differences between mass marketplaces that sell all kinds of products versus specific industry shops such as garments or other fast-moving foods and services. Future research can focus on particular verticals to find out key atmospheric factors that are particularly relevant to that verticals. The “Mixed-Method” approach could bring in substantial benefit if inputs from industry experts from particular verticals could be combined with industry data. The next step of the research could invoke cross-comparison from top 10 industry verticals and come up with an industry-wide benchmark matrix which could become a very effective tool for the m-commerce industry.

Another dimension to deepen the research focus of this “Mixed-Methods” approach is longitudinal research. The next research could still focus a building a general analytical construct but should be tested by a series of data in 3-5 years. A longitudinal analysis could add tremendous value in tracking how atmospheric or non-atmospheric factors impact the performance of m-commerce business over a specific time. This will be of particular value as changes in factors such as user experience will need time to create changes and impact. The longitudinal analysis will be ideal to illustrate clearly whether and how the impact is created.

2. Future research could consider breaking out from the confinement of “atmospheric and non-atmospheric” factor concepts. In particular, the nature of e-commerce and m-commerce are evolving daily hence, what constitutes “atmospheric” today might not be the case tomorrow. For example, User Experience is a hot topic today for any e-commerce or m-commerce business, but due to the quick accumulation of knowledge and experience in site design, layout and content presentation, all these implementations could become standard templates easily accessible for any m-commerce players. There is quite a lot of commercial website development platforms or agencies nowadays that can offer abundant implementation options in enhancing User Experience. On the other hand, how to ensure the top mobile site speed or optimize the workflow between online to offline stores, will become the new “atmospheric” considerations in the new mobile network era.

One example of breaking out of the “atmospheric” or “non-atmospheric” can be found in approaching the question from the angle of a “Consumer decision making” process as can be found in Lo et al., (2016) that heightened how “hygiene” and “motivation” factors impact each stage of consumer decision making that finally lead to sales. The benefit of a “Two-Factor Theory” of Hygiene-Motivation factor is this will be a practical way to look at how various factors are playing their role in driving consumer decision at each phase of the decision-making process. The approach as used in Lo et al., (2016) was more “micro” in researching consumer behaviour through typical questionnaire research on a group of random consumers and generalized the results over the 6 stages of consumer decision making to establish insights on consumer impulse buying. Future research could deploy this “Consumer decision making” framework, extend beyond impulse buying and focus on specific company or group of companies in the same vertical. By narrowing down the focus

and investigating into company-level data, the insights from the research can become much more relevant and valuable to the company or the vertical industry of the company. When similar research could be carried out in different vertical industries, more generalised construct could be built to enable a bigger-picture analysis.

3. Last, but not least, as pointed out in the discussion at section 2.3 and Table 2.6, the following 4 studies: Lee et al., (2015), Chong et al., (2016), Wang et al., (2018), Kim & Kim (2018), had started deploying massive clickstream data and ‘big data’ analytical tools such as neural networks in studying user buying pattern and m-commerce performance. These innovative methods have contributed new dimensions for linking consumer purchase with on-site behaviour as well as social engagement.

Click-stream data analysis will be most useful in investigating performance factors impacting site visits, conversion and sales particularly for marketplace platforms such as Amazon, eBay or Facebook. Two possible approaches can be deployed to leverage click-stream data analysis on measuring site performance; one is for a new shop or a group of new shops to be implemented under a specific design of user experience, social engagement and atmospherics test model. Consumer click-stream data of these sites over a period can be collected to provide holistic analysis on how these specific implementations have impacted site visit, conversion and actual sales. The second approach is to track incremental changes or implementations on existing sites and use their click-stream data to analyse what is the specific impact of these incremental changes on performance metrics on visits, conversion and sales. A very strong example was Lee et al., (2015) that tracked browsing pattern and check out cart usage to predict site sales which claimed to have over 80% accuracy.

The biggest challenge in using this approach is the accessibility of these tools and data and how these tools can be applied to other smaller m-commerce business. When adequate resources and data are available, this new approach would be ideal in generating new insights into how different factors would impact m-commerce performance.

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## **APPENDIX I**

### **Summary of 56 E-Commerce and M-Commerce studies 2000-2018 (Atmospheric/SOR)**

<b>Studies based on Atmospherics/SOR Perspective</b>		
<b>No.</b>	<b>Year &amp; Authors</b>	<b>Key Findings and Analysis</b>
A1	Stevenson et al., (2000)	Simpler backgrounds elements indicated more positive impacts on attitude toward the brand, purchase intention and attitude toward the website.
A2	Coyle & Thorson (2001)	Perceptions of telepresence grew stronger as a level of interactivity and levels of vividness in web sites increase. Participants who saw sites high in vividness developed stronger attitudes toward those sites than did those who saw sites of moderate or low vividness. The hypothesis that high levels of vividness help created more enduring attitudes was supported.
A3	Eroglu et al., (2001)	Posit a Stimulus-Organism-Response (SOR) framework that atmospheric cues of online store impacting shopper's internal affective and cognitive states and led to response outcome in terms of approach/avoidance behaviours. Involvement and atmospheric responsiveness were identified as moderators between atmospheric cues and shopper's affective and cognitive reactions.
A4	Dailey (2002)	Restrictive navigational cues resulted in increased attractiveness for navigational control, increased frustration lower web site attitudes and increased intention to avoid the website. Consumers expected to have navigational control and this control was threatened by restrictive navigation cues. Psychological reaction occurred resulting in an increased desire for navigational control that also led to negative emotions, negative web site attitudes and site avoidance intentions.
A5	Liang & Lai (2002)	Consumers responded positively to well-designed web sites rather than media richness
A6	Menon & Kahn (2002)	The characteristics of products and websites that were encountered earlier in online browsing by shoppers could significantly influence the level of arousal and pleasure that consumers experience. This experience could influence their subsequent shopping behaviour. Two experiments showed that if the initial experiences encountered in a simulated internet shopping trip were higher in pleasure, then there was a positive impact on approach behaviours and subjects engaged in more arousing activities.
A7	Eroglu et al., (2003)	Empirical testing confirmed the effect of site atmospherics on shopper attitudes, satisfaction, and various approach/avoidance behaviours as a result of the emotions experienced during the shopping episode. Involvement and atmospheric responsiveness were also found to be key moderators.
A8	Huang (2003)	Information and emotion played significant roles in users' virtual shopping decisions. When the information load of a virtual environment was maintained at a level that elicited pleasure, users would tend to explore and shop. Alternatively, a virtual environment full of surprises and changing activities that excited users would tend to solicit on-line transactions



A9	Lee & Benbasat (2003)	<p>1. Higher visual fidelity images on a web interface led to greater user attention to the product examined than lower visual fidelity images</p> <p>2. Motion on a dynamic web interface demanded greater user attention than a static web interface.</p> <p>3 An interface with higher fidelity and motion led to greater attention span in comparison.</p>
A10	Gorn et al., (2004)	Colours that induced more relaxed feeling states led to higher perceived quickness
A11	McKinney (2004)	Identified the atmospheric variables that contributed to satisfaction for internet consumers with different orientations toward shopping. Atmospheric categories that were proposed for studying internet environments included external and internal variables, layout and design, point-of-purchase and customer services. There were several types of shopping orientations: positive, convenience, apprehensive, pathetic, highly involved. Results showed that some atmospheric variables influenced satisfaction for all consumers, regardless of shopping orientation but some were contributors to satisfaction for specific shopping segments.
A12	Heijden & Verhagen (2004)	Identified 7 store image components through focus groups and pilot study. Four of these components linked positively to online purchase intention with statistical significance, 3 did not (Store familiarity, Store style, Store ease of use)
A13	Vrechopoulos et al., (2004)	Grid layout was identified as being more effective but hybrid format such as Grid/Freeform should be further explored and tested
A14	Richard (2005)	Atmospherics cues were classified as central (structure, organization, informativeness, effectiveness and navigational characteristics) and peripheral (entertainment). All atmospherics cues were impacting the other constructs with the central cues mostly affecting site involvement and exploratory behaviour while entertainment affected site involvement and site attitudes.
A15	Ballantine (2005)	Level of interactivity and amount of information had a significant effect on consumer satisfaction
A16	Biers & Richards (2005)	Evaluated the effects of Web site background colour on consumers attitudes toward selected product attributes and consumers likelihood of purchase using a mixed design factorial experiment. Seven levels of colour, including neutral white, and three levels of the product were used in the experiment. Results indicated a trend for two of the three products to receive more positive attribute scores when featured on a blue or purple background.
A17	Fiore et al., (2005)	The path-analysis model revealed significant paths between hedonic value and resulting emotional pleasure and arousal variables. A pattern of significant paths was also found between the three variables and global attitude willingness to purchase and willingness to patronize the online store.

A18	Griffith (2005)	A tree web site structure was perceived to be easier to use and facilitates greater elaboration and response than a tunnel structure. Although all other hypotheses regarding tree vs tunnel structures were confirmed, the mediating roles of ease of use and elaboration on consumer response received only partial support.
A19	Martin et al., (2005)	Medium web-site complexities found to be favourable in impacting consumer brand attitudes, webs site attitudes and purchase intentions
A20	Mazursky & Vinitzky, (2005)	Consumer search processes were affected by different on-line interfaces (2D Vs 3D) with different advantages to each, depending on the search situation. The central hypotheses regarding process variables such as shopping duration number of examined brands and the sequence of the search were confirmed.
A21	Mummalaneni (2005)	Online store design and ambience had a positive effect on consumer's pleasure and arousal thereby impacting satisfaction and intended loyalty.
A22	Chan & Kim (2006)	Results showed inverted U-shaped relationships between the level of animation and both recognition rates and attitude towards the ads. Under high-animation conditions, subjects were highly aroused as indicated by the increased level of emotional intensity thus inhibited the subject's ad recognition performance.
A23	De Wulf et al., (2006)	Website evaluations (of content, organization, and technology) were posited as affecting the success (involving satisfaction, commitment, and trust) Pleasure was introduced as a key variable mediating the relationship between web site evaluation and web site success
A24	Tractinsky et al., (2006)	Aesthetics impression of a web site was formed after a very brief exposure to the site and that such impressions were not transient. While average ratings of web-page attractiveness were highly consistent, there was considerable variance in individual evaluations.
A25	Zviran et al., (2006)	Web sites adhering to user-based design principles led to greater satisfaction and success
A26 (Mobile)	Cyr et al., (2006)	Visual design aesthetics did significantly impact perceived usefulness, ease of use and enjoyment, all of which ultimately influenced user's loyalty intentions towards a mobile service
A27	Wang et al., (2007)	Social cues in websites led to positive arousal and pleasure and therefore contributed to user patronage.
A28	Davis et al., (2008)	Behavioural and emotional responses to online store atmospherics varied across collectivist and individualist cultural value systems.
A29	Bisson et al., (2009)	Captured insights from a website designer perspective on the social dimension of design concerning e-atmospherics, which included factors such as social aesthetic in the design of space, the influence of social viral cues, the interpretation of shopping as a social activity and meaning of appropriate interactivity.

A30	Celine et al., (2009)	Background music contributed to sales of a florist shop
A31	Cheng et al., (2009)	Both background music and colour were elements of the environment that provided for an effective method of influencing online shopper's mood states.
A32	Kim et al., (2009)	Product presentation (model vs flat) had a significant effect on consumer's emotional responses, and there were positive relationships among consumer's emotional cognitive and conative responses. Music was found to have no impact on the consumer's emotional response
A33	Manganari et al., (2009)	Proposed the Online Store Environment Framework (OSEF)
A34 (Mobile)	Manganari et al., (2010)	Proposed the Mobile Online Store Environment Framework (MOSEF)
A35	Wang et al., (2010)	Aesthetic formality and aesthetic appeal had different effects on the online consumer's cognitive and affective responses. Regardless of the consumer's task orientation, the effect of aesthetic formality was significant on perceived online service quality, while the effect of aesthetic appeal was also significant on satisfaction during an online service encounter.
A36	Hunter & Mukerji (2011)	The importance of tailoring "website atmospherics" according to the characteristics of the target market and also suggested incorporating consumer preferences.
A37	Manganari et al. (2011)	Focused on testing virtual layout and design on user pleasure, trust and usage based on data from the online travel industry.
A38	Albert & Hersinta (2012)	Case studies to illustrate how Social networking sites such as Facebook contributed to on-line purchases.
A39	Wang (2013)	Site design aesthetics affected purchase intention. Identified the Cultural difference between Brazil and Taiwan and highlighted the importance of cultural context. Validated the importance of product reviews in web-purchasing intent.
A40	Chung et al., (2015)	Confirmed the relationships between the trustworthiness of internet shopping vendor and customer trust towards online shopping; website atmosphere and image; customer trust and stickiness; website image and stickiness. Both high trustworthiness and website atmosphere had increased internet shoppers' stickiness.
A41	Liu et al., (2015)	Flow experience significantly impacted repurchase attention. Interactive speed, skill, challenge, perceived control, telepresence, perceived usefulness, and perceived ease of use were positively related to flow experience. Loyalty was a mediator between flow experience and repurchase attention.
A42 (Mobile)	Pelet & Taieb (2016)	Research indicated significant effects of mobile website's colour contrast on behavioural intentions. Perceived dominance and trust towards the website had positive effects on behavioural intentions, whereas mood had non-significant effects on behavioural intentions.

A43 (Mobile)	Sohn (2016)	Research results demonstrated increased perceived website complexity negatively influenced user satisfaction with mobile online shops
A44 (Mobile)	Um (2016)	Confirmed the relations between perceived interactivity, enjoyment, and usage intention based on the pleasure-arousal-dominance emotional state model.
A45	Ching et al., (2016)	Developed and verified a model stating 3 major aspects (atmosphere, image, and trust) of online storefronts influencing customers' patronage and purchase intention.
A46	Hasan (2016)	Validated the negative impact of visual, navigational and informational website design characteristics on user-perceived irritation in online shopping.
A47	Ju & An (2016)	Based on the SOR framework to examine the effect of social presence and ambient factors from the impulse purchasing perspective in a social commerce context. 3 Findings: 1. social presence in a social commerce site replicated the presence of consumers in the retail environment and made consumers felt like shopping together, which led to higher impulse purchasing behaviour. 2. identified music tempo as an important ambient factor for a social commerce site. 3. the scarcity of a deal could have a negative effect as a moderator between music tempo and pleasure. A pleasant and entertaining experience was necessary, and a social aspect would need to be incorporated for better performance in social commerce sites.
A48	Kang & Lee (2016)	Websites designed to provide a greater sense of control and social presence resulted in greater pleasure and arousal among users, more positive evaluations of e-service quality, and stronger revisit intentions for the e-service platform. A well-designed website interface with an appropriate social presence and customizable interface appeared to create an optimal online environment for offering desirable service experiences and thereby retaining customers.
A49	Kim & Kim (2016)	Confirmed Positive brand-related UGC had a significant effect on the consumer's emotional and cognitive responses. The emotional response would drive behaviour response in impulse buying or future purchase intention
A50	Lo et al., (2016)	Visual complexity and background colour contrast of website had partially significant effects on consumers' emotional responses. A well-designed website with adequate visual complexity and figure-background colour contrast could create the desired environment to attract and retain consumers.
A51	Kim & Shin (2016)	Posited the interactions between visual and olfactory cues in e-commerce and then to determine whether surrounding features were appropriate for a web-based environment. Environmental cues contributed to better emotional states and led to satisfaction toward e-commerce.

A52 (Mobile)	Pelet &Taieb (2016)	Confirmed the significant effects of the mobile website's colour contrast on behavioural intentions to buy, revisit and recommend. Besides colour contrast, Perceived dominance and trust towards the website also had positive effects on behavioural intention.
A53	Ramonienė et al., (2016)	Confirmed that atmospheric factors such as colour, graphics and layout had a significant impact on the state of pleasure and arousal which in turn impacted intention to purchase. The test was performed in the context of a Lithuania apparel online website
A54	Islam & Rahman (2017)	Results based on survey data confirmed under the SOR framework, information quality, system quality, virtual interactions and rewards did have a positive impact on customer engagement and brand loyalty under a brand community context. However, the moderating effect of gender could be validated.
A55	Wang et al., (2017)	Background music on a website's homepage would generate positive affective responses of arousal and pleasure within users and enhanced users' perceived usefulness and perceived enjoyment as well. The findings revealed the effects of respondent' affective responses to the music moderated by gender. Website music produced more significant cognitive responses in high web skill users than low web skills users who might need more cognitive measures to navigate the sites.
A56 (Mobile)	Huang et al., (2018)	Confirmed the impact of self-efficacy, attributes conflicts and interpersonal conflicts as factors in consumer's state of mind to create a state of emotional ambivalence which led to hesitation and finally abandoning their mobile shopping cart

## **APPENDIX II**

### **Summary of 51 E-Commerce and M-Commerce studies 2000-2018 (Non-atmospheric/SOR)**

<b>Studies based on Non-Atmospherics/SOR Perspective</b>		
<b>No.</b>	<b>Year &amp; Authors</b>	<b>Key Findings and Analysis</b>
B1	Fink & Laupase (2000)	Impact of predominant culture could not be generalised to another culture. Research showed some variables in web site design/effectiveness impacted by predominant culture, but some other variables did not show the same. Therefore, the research did not yield conclusive results.
B2	Liu & Arnett (2000)	4 website predictive success factors were identified: information and service quality, system use, playfulness and system design quality
B3	Szymanski & Hise (2000)	Convenience, site design, financial security was identified as key e-satisfaction factors
B4	Childers et al., (2001)	Posited an attitudinal model with test-integrating constructs from TAM research and constructs derived from models of web behaviour. Results of hedonic and utilitarian dimensions were supported in this model. Navigation, convenience and the substitutability of the online shopping environment to personally examining products were found to be important predictors of online shopping attitudes. Therefore, the creation of online shopping web-atmosphere through more effective design of interactive retail shopping environments was found to be important.
B5	Hopkins & Alford (2001)	A multi-dimensional scale to measure e-tailer image was developed. Results of two empirical tests confirmed the dimensionality, reliability and validity of the e-tailer image scale.
B6	Burke (2002)	Technologies could enhance the shopping experience, but applications had to be tailored to the unique requirements of consumer segments and product categories.
B7	Kim et al., (2003)	Identified 13 generic dimensions of secondary emotions that people usually felt when viewing diverse homepages. Identified key design factors that professional designers would frequently use to develop emotionally evocative homepages Explained quantitative relationships between key design factors and the 13 emotional dimensions
B8	Hu et al., (2004)	Most design factors triggered the same impressions in Japanese, Chinese and UK respondents. Some design factors had special culture-dependent characteristics which need to be localized
B9	Steenkamp et al., (2006)	Relationship between perceived web site value and its drivers was systematically and predictably moderated by the institutional context in which consumers live.
B10 (Mobile)	Xu (2006)	Top 12 critical success factors of m-commerce were identified as a convenience, ease of use, trust, ubiquity, security, improvement of bandwidth, crystal-clear spacing, more powerful devices, personalization battery life, handset look/design, location-sensitive

B11 (Mobile)	Choi et al., (2008)	Content reliability, availability and perceived price level of using m-internet transaction were the most significant factors for m-satisfaction and m-loyalty
B12 (Mobile)	Ko et al., (2009)	Usefulness, enjoyment, ease of use was positively related to the perceived value which had an important mediating effect on consumer's intention to adopt mobile fashion shopping
B13	Chung & Cheol (2009)	Proposed The C(Culture) V(Value) A(Attitude) B(Behaviour) Model
B14 (Mobile)	Tan & Wu (2010)	Perceived ease of use impact Perceived usefulness and consumer attitude, trust and social influence affected customer intention to use m-commerce
B15 (Mobile)	Li et al., (2011)	Convenience, media richness, subjective norms, self-efficacy impacted emotion and subsequently consumption experience in mobile commerce
B16	Kailani & Kumar (2011)	Culture as the main moderator to perceived risk and acceptance of the on-line website
B17	Punj (2011)	Identified the moderating effect of consumer demographics, consumption values and demographics characteristics on on-line purchase behaviour
B18	Shen (2012)	Illustrated the importance of social aspect to be distinguished from information and transactional aspects using a Technology Acceptance Model
B19 (Mobile)	Shen et al., (2012)	Wireless networks, mobile devices and applications affected system quality and system usefulness. Localization, immediacy and customisation of mobile word-of-mouth determined information quality that impacted information usefulness
B20 (Mobile)	Hung et al., (2012)	Posited an empirical validation of Expectation-Confirmation Model for m-shopping continuance by incorporating trust
B21	Baksi (2013)	Identified the strong moderating effect of CRM in web-site purchases
B22 (Mobile)	Jaradat & Al Rababaa (2013)	Illustrated Social influence as one of the most significant determinants on m-commerce behavioural outcomes.
B23	Gao (2013)	A 6-factor model was tested, 5 factors were supported: web site quality, information quality, navigation, response time, visual appeal, interactivity all contributed to user satisfaction which ultimately impacted user intention to buy.
B24 (Mobile)	Chong (2013)	Age and educational level had significant relationships with m-commerce usage activities, but these relationships varied between content delivery, transactions, location-based services, and entertainment activities.
B25 (Mobile)	Chong (2013)	Satisfaction, perceived usefulness, perceived ease of use, perceived enjoyment, perceived cost and trust all had a strong impact on consumer's m-commerce continuance intentions
B26 (Mobile)	Mishra (2014)	Attitude and perceived behavioural control had a significant impact on m-commerce usage & adoption in India

B27 (Mobile)	Mirusmonov et al., (2014)	Personalization, self-efficacy, intimacy, simplicity, mobility & connectivity had a major influence on m-shopping value differently on m-commerce utilitarian & hedonic value
B28 (Mobile)	Lu (2014)	User personal innovativeness remained as strong determinants of m-commerce continuance intention. Social influence changed the pattern of influence on continuance intention.
B29	Tsichla et al., (2014)	Gender was identified as the moderator. In the absence of low task-relevant cues, males developed less favourable attitudes toward the site and the brand, while females' attitude remained consistent across both experimental conditions
B30	Uzunoğlu et al., (2014)	Illustrated the role of bloggers in brand communications, through a two-step flow theory. Bloggers built communities and influence their followers, they also helped the brands in building trust and confidence.
B31	Setenay & Ali (2015)	Results indicated that social capital and trust positively influenced online word-of-mouth engagement behaviour of college students on Facebook. The strength of the influence of trust and social capital increased through the opinion-seeking and-giving path. When the users trusted their contacts on Facebook, their willingness to rely on the product information from their "friends" would increase.
B32	Lee et al., (2015)	24% of consumers in a general-purpose marketplace (like eBay) discovered items from external sources (e.g., price comparison sites), while most (>95%) of consumers in special-purpose shopping sites directly accessed items from the sites themselves. The study revealed that item browsing patterns and cart usage patterns were the important predictors of the actual purchases. The proposed model achieved over 80% accuracy in predicting consumers' purchases across the four online shopping sites.
B33	Xun (2015)	Shopper visitation was a result of the conscious decision-making process in a 2-Step model divided into Exploration and Purchase decision phases.
B34 (Mobile)	Dehghani & Tumer (2015)	Facebook ads enhanced brand image and equity. Both factors contributed to positive purchase intention. Reliability of technology, growth of m-commerce organization, profitability, user education and legal support identified as success factors of m-commerce system
B35 (Mobile)	Fong & Wong (2015)	4 Factors identified as influencing user's intention to use m-commerce system: users' attitude; the intensity of social & peer pressure, perceived use and level of localization.
B36 (Mobile)	Nilashi & Ibrahim (2015)	Security, design and content factors impacted customer trust in mobile commerce.
B37 (Mobile)	Kim & Sundar (2015)	Results indicated that large screen size and video mode promoted heuristic processing while small screen size and text mode encouraged systematic processing. Heuristic processing led to greater effectiveness and behavioural trust while systematic processing was associated with cognitive trust. The phantom model analysis revealed the effects of large screen size and video mode on purchase intentions.



B38	Bhattacharya et al., (2015)	Proposed an integrative Cyber Atmospherics – Contentment – Reliance - Adhesion model by synthesizing on factors from the literature review.
B39	Chong et al., (2016)	Online reviews, online promotional strategies and online sentiments could all predict product sales, some variables were more important predictors than others. The interplay effects of these variables became more important variables than the individual variables themselves e.g. online volume interactions with sentiments and discounts were more important than the individual predictors of discounts, sentiments or online volume.
B40	Elwalda & Lu (2016)	Reviewed the main dimensions of Online Customer Reviews and how they affected customers' purchase intentions. It also addressed the issues of credibility's, roles, antecedents, helpfulness, measures and consequences of OCRs. A case study was also used to highlight OCRs the relationship between OCRs and consumer's purchase intentions.
B41	Liu et al., (2016)	Confirmed the propositions of Aesthetic formality impacting perceived ease of use, pleasure and satisfaction.
B42	Lo et al., (2016)	Based on a Consumer Decision Making Model framework and referencing the Two Factor Theory, user experience and site design were identified as mostly the hygiene factor and sales promotion as the motivation factors in contributing to impulse purchase in the various stages of the consumer decision-making process.
B43	Park & Gretzel (2016)	A unified framework of commonly used web site success factors emerged from the analysis and included a total of nine factors:(1) information quality; (2) ease of use; (3) responsiveness; (4) security/privacy; (5) visual appearance; (6) trust; (7) interactivity; (8) personalization; and (9) fulfilment.
B44	Thach et al., (2016)	Confirmed 87% of the respondents found social media impacted their sales achievement.
B45	Lohse et al., (2017)	Positive OCRs led to lower return rates, higher sales after returns, and better conversion rates. The research identified a weaker impact of OCRs in mobile than a desktop sales channel. The influence of positive OCRs was also moderated by higher involvement products than vice versa.
B46 (Mobile)	McLean et al., (2018)	Proposed a Mobile Applications Customer Experience Model with utilitarian factors: ease of use, customisation, convenience driving customer experience by impacting the level of enjoyment and timeliness in app usage. This research also illustrated that gender and smartphone screen-size had played a moderating role in the customer experience.
B47	Wang & Wattal (2018)	Confirmed the impact of introducing a store on social media fan pages was not welcomed by social media users and had reduced customer engagement with the fan pages as well as decreasing sales.

B48	Chen et al., (2018)	Confirmed that perceived usefulness and perceived ease to use were significantly related to Flow. The flow was the mediator between perceived usefulness and attitude. Flow also impacted the attitude and purchase intention.
B49 (Mobile)	Faulds et al., (2018)	Posited a new 4-pillars conceptual model for mobile shopping: Consumer decision process being driven by Customer-retailer interconnectedness, Consumer empowerment, Proximity-based consumer engagement, Web-based consumer engagement
B50	Kim & Kim (2018)	Customer's voluntary sharing of deal information via social networks constituted an important business model in social commerce. Confirmed that the effect of Facebook “Likes”, and Twitter “tweets” were statistically significant with deal sales.
B51	Thakur (2018)	Confirmed the mediating role of customer engagement in satisfaction and online review intention. The study also showed the moderating role of trust and satisfaction levels in customer engagement.

## **APPENDIX III**

### **Transcribed interview records for 10 Expert Panel**

#### **Expert A**

##### **1. How do you define success in a mobile commerce business?**

(EXAR1) The first factor to look at is the business objective of this mobile e-commerce business/operations. The definition of e-commerce is very board and so this business could be built for helping brands to reach out to a new target market or simply to reinforce the company's brand image in the digital space. Other mobile e-commerce businesses were built as transactions platform through mobile devices and network. In both cases, the measurement criteria would be very different. In the former case, I would probably look at how successful the mobile commerce entity could help the company to grow new customer base and the level of customer engagement with the business. In the latter case, as a transaction platform, the level success will be shown in the sales transaction revenue generated which will be driven by customer visits as well as the extent of conversion to the transaction from the visits.

##### **2. Can you give me some examples of successful/unsuccessful mobile commerce business based on your criteria mentioned?**

(EXAR2) For examples IT tunes is one of the very early successful examples of mobile e-commerce business, the platform not only created a whole new category of services of mobile juke-box but also firmly established Apple's brand image in the new category as music. There are many cases of not so successful implementations in mobile e-commerce that it will be difficult to particularly name them. However, the usually unsuccessful mobile commerce business often displayed an insufficient understanding of the mobile users and tried to push their existing offline or even online business models directly to mobile. As a result, users cannot have a smooth, satisfactory and or trusting experience from engaging with the mobile platform. To illustrate, I have seen companies just put their web interface without even considering using some level of responsive-design; the result is users find it very difficult to navigate around and perform any functions they are supposed to do.

##### **3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business?**

(EXAR3) The ideal place that I would start is the business objective and how this mobile commerce platform is going to fulfil the business mission. Given a full picture of the business objective, it is extremely important to define the operating metrics such as target customers, visits, product or services to be carried, level of conversion and engagement that can support the business objectives. Based on these metrics, the next important step is to design the type of user experience that will deliver these operation metrics.

**4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?**

**-If yes, why do you think it is the case?**

**-If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples on the unique set of success factors for mobile commerce**

(EXAR4) No, a successful desktop web-based e-commerce business does not guarantee similar success in mobile commerce. As discussed above, I have seen companies that might have a good original desktop web-based business, but they just applied the same system and web-based interface into mobile. As a result, users who might be using smartphones or tablet design suffered from significant degradation of user experience. For example, users find it difficult to search for information, navigate around and even checking out and make payment.

In terms of similarities, web-based e-commerce and mobile commerce both need to provide good user experience and an engagement process to their customers and achieve business objectives mainly through a virtual network instead of physical interactions with customers. However, mobile commerce will post several unique considerations: users will need to interact with the business through a much smaller screen thereby creating constraints in the information display. Users of mobile commerce can only interface with the business with a simple swipe and tap moves instead of having the luxury of a full keyboard. Users of mobile commerce will tend to have a very limited time in attention as they are on the move. At the same time, they will also post tremendous opportunities in location-based services due to their inherent mobility.

**5. I like to understand your perspective on the following factors and how each of them creates an impact on the performance of mobile e-commerce:**

**-What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?**

(EXAR5.1) Atmospheric factors such as colour, navigation flow, fonts, site content are important drivers that will shape the overall user experience and level of satisfaction the user will have on his interaction with the mobile commerce entity. As I pointed out earlier the success of a mobile commerce business is determined by whether its users are satisfied with their site and the kind of experience they have when they interact with the site.

**-What's your view on usability and user experience on the performance of mobile e-commerce?**

(EXAR5.2) I will see usability and user experience as one of the most if not the most important factor in affecting the performance of mobile commerce. Indeed, I have yet to come across any successful mobile commerce business that offers lousy user experience. Even if the business has unique and product offerings that make users coming back to the site

despite their unpleasant experience, this situation will not be sustained as user dissatisfaction will build up and prompt them to look for alternatives.

**-What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?**

(EXAR5.3) Perhaps this is the second most important driver for mobile commerce performance. In the early days of ecommerce, the desktop web interface interaction with users was a very much standalone experience. The impacts of other social media or blogs even if they existed were an external reference to the users. Nowadays, depending on which vertical you are referring to a very high percentage of users will not purchase until they have seen some sort of user comments from blogs or they will not come to the site unless this is referred by their friends from Facebook or Instagram. From findings in various industries, promotion events and activities have been the most effective ways to build up site traffic in terms of visits and time users engaging with the site content.

**-What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?**

(EXAR5.4) Using an analogy of train services, security and IT infrastructure could be compared to the rail and signal system. In other words, the whole ecommerce system predicates on a sound and secure IT infrastructure just as a train service will need a railroad network and a signal system for the trains to keep the service. It is obvious if the country has very low speed and insecure mobile data network, mobile commerce will not even be possible. However, with the prevalence of 3.5G and increasing strong mobile security technology on both system and devices, this factor has become more “necessary” but “insufficient” to determine success in mobile commerce.

**-What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?**

(EXAR5.5) In general, the age group 20-45 seems to be more active in ecommerce and but the age group that even in mobile commerce is even lower. This is probably related to smartphone usage and which user age group fall under the more active user of the smartphone. There is also a perception that mobile commerce is adopted more and effectively used by a tech-savvy young male who would have stronger prior knowledge or trust in tech-stuff. Therefore, factors such as demographics, culture and prior knowledge seem to be more related to technology adoption rather than driving the performance of mobile commerce. Recently, in China or countries like Indonesia, we have seen mobile commerce leap-frogging the phase of web commerce as the mobile network is much more advanced and pervasive. We have seen successful usage of mobile commerce that goes beyond the average perceived boundaries in demographics, culture and prior knowledge found in other countries.

**-What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?**

(EXAR5.6) These are certainly important aspects that impact the performance of mobile commerce as users are interacting with the content and the product/services as displayed to them in through the mobile commerce platform. The environment prevalent under mobile commerce will be even more stringent as compared to desktop commerce as users are only looking at a much smaller screen and very often, they are on the move, hence they will not be able to have the normal patience or period to look carefully on what is being shown on the small screen they are holding in their hands. UX designers must have such mobile perception in mind when they design the workflow for users to navigate, search, and interact with the content presented in the platform. I would say it is not product or content that necessarily affects the performance of mobile commerce but rather how the product or content is being displayed and leveraged as part of the overall user experience that is crucial.

**-What's your view on the mobile app and its impact on the performance of mobile e-commerce?**

(EXAR5.7) It is often argued that if the company has a nice design responsive site that can cater to users holding screens of various sizes, that will be good enough. However, in the Greater China area, this is certainly not true. Mobile apps have become an extremely important vehicle and form a unique eco-system that arguably mobile commerce must participate and excel in. In the US, the argument is users are not as willing to download many mobile apps and use them consistently to perform their transactions in mobile commerce. Hence, ecommerce consultants in the US often advocate that apps are more for long-term customer service and engagement while mobile sites are more for high volume mobile commerce transactions. On the contrary, in China, for example, the success of Taobao, JD.com clearly illustrated the prevalence of mobile apps.

**-Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?**

(EXAR5.8) The specific country environment does affect the adoption and performance of mobile commerce. In Hong Kong for instance, given the short travel distance and an efficient public transportation system with residential areas clustering around shopping malls and transportation hubs, everything can be purchased very conveniently. I believe this factor has hindered the growth of mobile commerce and will continue to impose challenges to the performance of mobile commerce.

**-What's your view on the user's background and IT knowledge level impacts the performance of mobile commerce?**

(EXAR5.9) Looking at a micro-perspective, I believe the performance of mobile commerce will be benefitted given the users have a stronger IT knowledge as well as an open and trusting attitude in the usage of mobile devices. However, I have also seen cases where if the mobile commerce business can deliver simple and pleasing user experience, performance could still be great for a user group that is not as typical.

**6. Open-ended question: expert informants given a list of 14 design features that are key for the success for mobile e-commerce, can you list your top 5?**

(EXAR6)

Simplicity

Speed

Mobile context-specific inputs

Easy sharing

Multiple payment methods

## **Expert B**

### **1. How do you define success in a mobile e-commerce business?**

(EXBR1) I would look at the performance of the mobile commerce business key operational metrics to determine whether this business is successful or not. The key operations metrics that I will look at are No. of Visits, Sales volume from the business, growth of customer base and conversion rate of the customer visits to successful transactions.

### **2. Can you give me some examples of successful/unsuccessful mobile e-commerce business based on your criteria mentioned?**

(EXBR2) I will quote the example of Taobao in China as one of the most successful mobile commerce business. It is estimated that over 70% of their traffic is from mobile users and they have designed their interface to be extremely user friendly. For example, despite they have a lot of products, their users can easily find out what they want to buy in a small mobile phone screen, browse through the product content, easily complete the transaction through Alipay their built-in payment system and obtain post-sales service with customer service through the Aliwangwang interface.

On the contrary, I have seen some of the not so successful mobile commerce implementations particularly from those who might have a strong brick-and-mortar retail background. One example in Hong Kong is Top electronics and appliances retailer which is a Bestbuy. Their ecommerce business was never integrated into the mainstream retail unit. As a result, both the website and mobile app can only sell a very limited proportion of their goods. Their website design and layout are more like a traditional product directory. Users find it difficult to navigate around. The mobile app interface was especially a disaster with very functionalities, users even found it difficult to check out and make payment.

### **3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business?**

(EXBR3) I would start from the business objective, who are the target customers, why customers should buy from you and how this mobile commerce platform can deliver a unique user experience to help the business to achieve business objectives. Very often, mobile commerce is only part of the total ecommerce platform and ecommerce might only be one distribution branch of the whole company's distribution network. Therefore, it is extremely important to have a clear picture of what are the expectations of e-commerce or mobile commerce branches regarding the whole company's business. With a clear perspective on how the mobile commerce should work, it will be much easier to design around the user experience within the site environment as well as out the site environment which includes customer services, shipment and logistics.



**4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?**

**-If yes, why do you think it is the case?**

**-If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples of the unique set of success factors for mobile e-commerce?**

(EXBR4) No, mobile commerce is quite different from desktop web-based commerce as users in mobile commerce can only look at a much smaller screen size and mobile users are constantly on the move. Hence, the usage pattern, span of attention, the operating environment will impose different challenges and opportunities in operating mobile commerce.

I have seen companies just totally ignored the unique operating requirements of mobile commerce. At best these companies will just outsource some APP programmers to write a simple mobile that will wrap around existing web interface and launch it as a mobile commerce. Users get poor interfacing experience as although it is the same company selling the same products, the purchase experience will be very different as not only will the app reacting slowing to the users, but the fonts, buttons, product pictures are not in the right positions as the design is not mobile optimised.

**5. I like to understand your perspective on the following factors and how each of them creates an impact on the performance of mobile e-commerce:**

**-What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?**

(EXBR5.1) Atmospheric factors such as site design, colour, navigation flow, fonts, site content are fundamental ingredients within the confine of the ecommerce site that will determine the overall user experience and level of satisfaction the users will have on the site. However, there are also other factors such as customer service, logistics, IT infrastructure that will also affect the performance of mobile commerce.

**-What's your view on usability and user experience on the performance of mobile e-commerce?**

(EXBR5.2) From my experience, usability and user experience are the most important factor in determining the performance of mobile commerce. User's bad experience in using the mobile commerce site will directly turn them away from the business to other competing business that could offer a better experience. The first step that mobile commerce operator will need to do is to create a pleasant mobile site design and flow so that users can be attracted to the site and continued in using the site. This is particularly important in mobile apps as it is shown in the recent research that if the users are not satisfied with the app in the first few days, they will discontinue using the app and uninstall the app from the phone completely.

**-What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?**

(EXBR5.3) I think social engagement is equally important as user experience as the most important driver for mobile commerce performance. Users will need to be reminded of the site and promotional events and engagement with the users are crucial in continuing to maintain a loyal user group. It is even more important nowadays as the impacts of social media or blogs is so pervasive and viral. Therefore, mobile commerce needs to have a strong presence and connectivity to social media network to maintain its health.

**-What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?**

(EXBR5.4) I would say security and IT infrastructure are the necessities for both web commerce or mobile commerce. Particularly for mobile commerce, the user will not have the luxury to be seating still and have the time to go through vigorous steps and multi-layers authentications to complete the transactions. At the same time, mobile users tend to be more cautious as they have a higher chance to lose their devices as compared to a desktop machine, hence a user-friendly but secured way to facilitate the transaction over a stable and efficient IT infrastructure will certainly impact the performance of mobile commerce.

**-What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?**

(EXBR5.5) From my experience, it is difficult to say factors such as user demographics, culture or prior technical knowledge are determining the performance of mobile commerce. For example, it is generally believed that tech-savvy young male will use mobile commerce more frequently as they have prior knowledge, interests and fit right in the demographics of mobile commerce users. However, in the Greater China area, young female office workers are a very large and important segment that are actively using mobile commerce app such as VIPShop.com. It is estimated that over 60% of their total revenue came from mobile commerce and over 80% of users were young female.

In terms of culture, it is extremely difficult to assess. In general, it is perceived that mobile commerce is more supported by the Asian culture as people are very used to carrying and looking at their smartphone all the time while for Western Europe, the cultural norm in using smartphone tends to be less extensive and pervasive. However, these observations are certainly inclusive, and the results could be different from time to time.

**-What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?**

(EXBR5.6) Product and service content is one of the important factors that will affect customer user experience and their purchase decisions. No matter how user friendly and how pleasing the web site design is, the whole purpose is to guide users to interact with product and service content to complete the transactions in the mobile platform. It is extremely

important therefore to decide what product and content are to be presented and how the graphics, text, as well as video, could be placed in the right positions and seamlessly shown the customers' eyes. The presentation could only happen within the confine of a small screen and we could also expect a few seconds of customer attention assuming the content will not be cut short by an unstable mobile network or wifi.

**-What's your view on the mobile app and its impact on the performance of mobile e-commerce?**

(EXBR5.7) In Asia, Mobile apps demonstrated their supreme importance as it is the most dominant platform of mobile commerce against the usage of a mobile website. Asian users are very comfortable with downloading apps and consistently using these apps to complete their mobile commerce applications. Given the dominance, having a good mobile app directly impact the performance of mobile commerce of the company. In other words, it will be more difficult to gain and engage with customers if mobile commerce is not tapping into the IOS or Android community.

**-Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?**

(EXBR5.8) One factor that worth to mention is in China or perhaps some other SE Asian countries like Indonesia, the advancement of mobile infrastructure is one of the key factors affecting the performance of mobile commerce. Development of mobile infrastructure surpassed landline, the advancement of mobile infrastructure has helped to spur the development of mobile commerce by creating a high bandwidth pervasive mobile environment that facilitates secured and smooth ecommerce transactions.

**-What's your view on the user's background and IT knowledge level impacts the performance of mobile commerce?**

(EXBR5.9) I tend to believe with the industry's focus on user experience and continuous improvement in IOS and Android, it is becoming easier and easier for the user to run e-commerce transactions through a mobile environment. Such advancement can also be seen in mobile devices and tablets to the extent that users will not need a lot of knowledge and background in IT to enjoy the fun and benefits in using mobile commerce.

**6. Open-ended question: expert informants given a list of 14 design features that are key for the success for mobile e-commerce, can you list your top 5?**

(EXBR6)

Simplicity

Speed

Mobile context-specific inputs

Prepopulated forms

Click and collect

## **Expert C**

### **1. How do you define success in a mobile e-commerce business?**

(EXCR1) I will look at the key metrics which may also be applied to desktop web ecommerce. For example, the number of visits, sales revenue generated, the level of engagement with customers, level of user satisfaction, how the mobile commerce business connects with a social media network.

### **2. Can you give me some examples of successful/unsuccessful mobile e-commerce business based on your criteria mentioned?**

(EXCR2) I will quote Taobao as one of the most successful examples of mobile commerce as they are the largest ecommerce marketplace that captured over 60% of market share in China. They have over half of their users using a mobile device and Taobao mobile app to engage and buy things all over China. The app is well designed to fit Chinese style and user friendly with customer service pop up Aliwangwang to assist customers in the purchase process. Users could also access comments from other users as well as easily sharing their post-sales comments. The app is also well integrated with Alipay the payment module that is linked to the user's credit card making payment and settlement extremely easy.

On the less successful side, there are many examples. Most foreign e-tailers now trying to enter the China market are found to be rather unprepared. First, they use their foreign language website and translated it to Chinese. The flow, design and language of the website are very different from Chinese style. These foreign e-tailers do not bother to invest time and money for a mobile app, they will just rely on the responsive site design and launch their mobile commerce. Most of these e-tailers failed to attract Chinese users as they find it difficult to navigate not to mention able to make payment for their transactions as these foreign sites would not accept local credit cards and on some of these sites, users could not fill in their shipping address in local Chinese languages as these foreign sites could not even handle double-byte. Making matter worse, a lot of these foreign sites are very slow in loading content and probably their sites are located abroad and not optimised for Chinese mobile network.

### **3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business?**

(EXCR3) One should start from the target customers and how the company's product offer or services will fit into the segment. Then we should look at what kind of user experience and engagement that the mobile commerce platform can offer to target customer segment and how that will differentiate from competitors. Having that in mind, the mobile commerce platform should design around how to build a sustainable business platform that can attract and maintain users.

**4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?**

**-If yes, why do you think it is the case?**

**-If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples of the unique set of success factors for mobile e-commerce?**

(EXCR4) No, mobile commerce is much more difficult to operate as there are lot more challenges in terms of limitations in screen size, mobile users are constantly on the move. Sometimes, it is also extremely difficult for some products to be sold successfully on mobile devices. For examples, very high-end antiques, diamond, jewellery, watches etc; the average prices of these products might well be over US\$10000. Today, not a lot of users are willing to do a transaction of that amount over the phone and particularly by referring to the limited product content and pictures. Therefore, for some of these verticals, even if they will have success in desktop web-based ecommerce, which enabled them to do a better selling job, it might not be possible for them to have equal success in mobile commerce unless the e-tailer has made necessary adjustments.

In terms of similarities, web-based e-commerce and mobile commerce both need to provide good user experience and an engagement process to their customers that can positively impact their business. However, despite the known challenges of mobile commerce, there is a unique opportunity that mobile commerce could bring and that is location-based setting services. Smartphone has a unique advantage to enable users to conduct e-commerce transactions in any locations with live connections with a social media network. This is already a very popular application for consumers to see something online, check their prices and find nearby stores to take a final look before purchase. Because of GPS built into the smartphone, stores can push extra coupons or discount to users before their purchase hence further cementing the sell. After the user has bought the items, it is also possible for her to share her pleasant shopping experience through her connected social media network. This sharing will further bring in more sales from other potential customers when they receive the content and know the locations.

**5. I like to understand your perspective on the following factors and how each of them creates an impact on the performance of mobile e-commerce:**

**-What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?**

(EXCR5.1) Atmospheric factors such as colour, navigation flow, fonts, site content are what I would call “hygiene factors” in shaping the overall user experience. These atmospheric factors will facilitate or deter the users to form a pleasant impression and interaction journey in each time when he uses the mobile platform. However, getting the atmospheric factors right alone could not ensure good performance of mobile commerce as the end game of these elements is to generate a favourable user experience so that they will be attracted to come to the site and continue to buy the product and services.

**-What's your view on usability and user experience on the performance of mobile e-commerce?**

(EXCR5.2) To me, this is the most important factor that will determine the performance of mobile commerce as user traffic is the first variable that will drive the sales revenue of the mobile site. It is a time-proven rule in our industry that positive user experience will lead to user satisfaction and hence increased and sustained user traffic.

**-What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?**

(EXCR5.3) To create an impact on the performance of mobile commerce, the first step is to generate a good user experience. Then, the second step is to promote the engagement of users with the site by promotional events and social engagement activities through social media connected to the site. In China as an example, it is quite common to find a company using games or context to encourage site users to initiate activities such as blogging about the purchase experience, upload pictures of the product or services to join lucky draws etc. From our experience, the more engaged the users are with the site, the more likely they will be loyal customers of the business.

**-What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?**

(EXCR5.4) I would think a strong and healthy IT infrastructure is fundamental to the existence of a successful mobile e-commerce business. Perhaps more important is the security which is especially crucial for mobile commerce. Although mobile devices are very flexible and convenient, and users can access internet and mobile commerce platform anywhere anytime. The challenge is mobile device and network is much easier to be hacked and abused. Cases and incidents as such have been reported quite frequently that led to customers distrust.

**-What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?**

(EXCR5.5) These factors might have some indirect impacts but from a day to day operations perspective, I would consider demographics and cultural factors to be secondary. First, demographics change from location to location and second, culture is sometimes too abstract to be measured. Hence, it will be difficult to trace the impact of demographics or culture on the performance of mobile commerce. As for the third factor, arguably having prior knowledge should be beneficial for the user to perform better in using the mobile platform but that alone does not ensure the success or otherwise of the mobile commerce business.

**-What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?**

(EXCR5.6) To deliver a good user experience is to ensure users can have a smooth and pleasant encounter and interaction with the right product and service content that will facilitate their understanding of what they are looking at and make a purchase decision. Hence, product and service content can be regarded as the subject matter or a core part of user experience which in turn determine mobile commerce success.

**-What's your view on the mobile app and its impact on the performance of mobile e-commerce?**

(EXCR5.7) In China, mobile apps are the dominant ecosystem for mobile commerce. To be successful in mobile commerce, it is almost a must for the business to have mobile apps in both IOS and Android. Android will give the mobile commerce access to the mass market but IOS is equally important to capture the high-spending segment in the market. Therefore, the mobile commerce business in China must be prepared to compete in the mobile apps market to gain users and maintain mind share and a high-level of user engagement to be successful.

**-Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?**

(EXCR5.8) in China, Government policy does affect the performance of mobile commerce. In the last 5 years, the Chinese Government has encouraged the growth of ecommerce as a means of improving the livelihood of people, particularly in the less developed inner cities. At the same time, a lot of these inner cities do not have extensive IT infrastructure, so the mobile network is perhaps the only option. As a result, the mobile network and mobile commerce are becoming more and more pervasive. Mobile commerce players can easily enjoy

the scale of business as Government has been encouraging and pushing so much so if anyone who can come up with creative product and service offering, the mobile commerce player will be welcomed.

**-What's your view on the user's background and IT knowledge level impacts the performance of mobile commerce?**

(EXCR5.9) Personal propensity and previous IT knowledge normally will be positive factors inducing the adoption and usage of mobile commerce. However, these factors are again very distanced and indirect. In most time, the presence of these factors might or might not have a direct impact on the actual performance of mobile commerce. For instance, as nowadays user design focused on ease of use which means users are not supposed to have prior knowledge or a computer science degree to operate in mobile commerce. In those situations, user background or prior IT knowledge has very little impact on mobile commerce performance.



**6. Open ended question: expert informants given a list of 14 design features that are key for the success for mobile e-commerce, can you list your top 5?**

(EXCR6)

Speed

Easy sharing

Mobile context-specific inputs

Multiple payment methods

Click & collect

## **Expert D**

### **1. How do you define success in a mobile e-commerce business?**

(EXDR1) I would look at the number of active users as well as the sales revenue generated (if applicable) for this mobile commerce platform to determine their level of success. In additions, I would also compare their conversion rates (mobile vs desktop) to see how good this mobile commerce platform is doing in terms of their ability to turn visits into actions or sales transactions that this platform is designed for.

### **2. Can you give me some examples of successful/unsuccessful mobile e-commerce business based on your criteria mentioned?**

(EXDR2) Amazon is a successful pioneer in expanding from a desktop web-based e-commerce platform to mobile by fully investing in various responsive and adaptive site technology as well as apps in both Android and IOS. From typical metrics such as visits and revenue, Amazon has always been on the top and this is also true when we look at their ability to convert. There are however many not so successful examples, I would not refer to specific names here but usually, I will find such examples from traditional Brick-and-Mortar based retailers now finding their new directions in ecommerce. These players tend to ignore the intricate differences web-based ecommerce and mobile commerce. As a result, their mobile sites tend to be very clunky and most of their users could not have a satisfactory experience. At most, these mobile sites serve as a source of information for customers to check prices before they purchase from retail shops.

### **3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business?**

(EXDR3) Start from the user and look at how the mobile commerce platform can meet the users' need in the most effective way. In additions, it is also important to plan how the mobile commerce will fit into the business's bigger ecommerce strategy to ensure a smooth integration.

### **4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?**

**-If yes, why do you think it is the case?**

**-If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples of the unique set of success factors for mobile e-commerce?**

(EXDR4) No, desktop web commerce is quite different from mobile commerce. While most e-commerce sites are optimised for desktop. The mobile site is very often not the case. User experience relies upon not only the performance of the site but also connectivity. For mobile devices, the challenge is to accommodate devices with much slower and far less reliable

connections. This presents a problem because images can take a lot longer to load, increasing the chances that a user will bounce.

**5. I like to understand your perspective on the following factors and how each of them creates an impact on the performance of mobile e-commerce:**

**-What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?**

(EXDR5.1) Atmospheric factors are the fundamental levers that would impact the performance of mobile commerce. Navigation flow, site design, use of colour and fonts will directly impact the level of user experience and therefore user satisfaction. With more happy customers on the site, this will lead to repeated usage and repeat customers, the success of the site will be built overtime and other metrics such as site revenue will also be increased.

**-What's your view on usability and user experience on the performance of mobile e-commerce?**

(EXDR5.2) User experience is the key to mobile commerce performance. As discussed earlier, without a good user experience, mobile commerce will not be able to attract new customers and retained them to sustain the business.

**-What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?**

(EXDR5.3) If user experience is one leg, social engagement is the other. Good user experience is essential to keep the audience in the site and at least growing at an organic rate. However, social engagement will be most important to growing mobile commerce site in terms of traffic and revenue. Social engagement and promotional events are extremely important to any mobile commerce business to be connected to the social communities relevant to their users. By strengthening user social engagements and running promotional events such as lucky draws, games and content sharing, more and more users will be attracted to the site.

**-What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?**

(EXDR5.4) IT infrastructure is what I would call the air and water for the survival of mobile commerce. Very often, it is assumed to be there but not perceived as a competitive advantage. In fact, given the global pervasive 3.5/4G network as well as the widely deployed cloud-based network, mobile commerce business nowadays in most countries can always count on strong reliable support. Security, on the other hand, is always the wild-factor that no business dares to assume there will be no issue. The stronger the security the mobile commerce has, the better peace of mind the user will have in using the network. Hence, you may say IT infrastructure and security also reinforce user experience and in turn impact performance of mobile commerce.

**-What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?**

(EXDR5.5) My view is demographics and cultural factor might have a bigger initial impact particularly in the stage of adoption of the platform rather than affecting the continued performance of the mobile commerce platform. For example, as we have been exposed to some survey results, a male who is more technology savvy might have a high tendency to use mobile banking, mobile ticketing services and age group under 25 might be less concerned about security in completing transactions online with their mobile devices. However, when we are talking about daily operations and performance of the mobile commerce platform, demographics and cultural factors are less likely to create impact. On the other hand, the user's prior knowledge in computer and information technology might be relevant to how they can use and obtain better user experience and appreciate the offer from the mobile commerce platform.

**-What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?**

(EXDR5.6) Being a key component of the atmospheric factor suite, product and service content (as well as how they are presented and structured) is the flesh of the mobile commerce offer and user experience. When users are engaging with the mobile commerce site, after they come in, they will be interacting heavily with the product and service content to do what they want to find out or buy so I would say this is the key part of the user experience offer that mobile commerce has to ensure they are doing their best job to ensure their success.

**-What's your view on the mobile app and its impact on the performance of mobile e-commerce?**

(EXDR5.7) From our research and experience, loyal customers today expect an app from their favourite brands and if you don't have one, your most loyal and lucrative demographic base will think something is missing. Loyalty generation from mobile apps is one of the most important factors affecting the performance of mobile commerce. Through mobile apps, the mobile commerce business can offer gift cards and points programs that will provide its users with a solid incentive to download and continue to engage with the business.

Another dimension that would be relevant is through the mobile app, a business can offer more personalised services and location-based on-line to off-line capabilities that will open up more business opportunities for mobile users.

Finally, the buyer's journey today is more fragmented than ever, and modern consumers will have more and more touchpoints that they like to leverage and engage with the mobile business. Hence, mobile apps is an important factor that would affect the performance of mobile commerce.

**-Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?**

(EXDR5.8) From the country where I came from India, we have a leap-frog from traditional land-line telecommunications infrastructure to a very vibrant and pervasive mobile network. This has helped to boost up consumer's interests in the use of mobile devices and mobile technology. Mobile commerce as part of this revolution did benefit from this favourable environment factor.

**-What's your view on the user's background and IT knowledge level impacts the performance of mobile commerce?**

(EXDR5.9) I like to offer may be an opposite view that if the performance of the mobile commerce platform must rely on the users' background and IT knowledge, then this mobile commerce platform is facing failure rather than success. The whole idea about what I would call successful mobile commerce platform is the ease of use and if you need to be a very technically savvy person who might have extensive previous knowledge in IT to feel comfortable using the mobile platform, this is more a sign to indicate that there would be a lot of room to simplify and minimise. As user experience is so crucial to the success of mobile commerce, the platform to be successful should be designed to have the widest appeal and ease of use for the widest possible market segment which would include consumers who might not know about technology.

**6. Open ended question: expert informants given a list of 14 design features that are key for the success for mobile e-commerce, can you list your top 5?**

(EXDR6)

- Speed
- Easy sharing
- Mobile context-specific inputs
- Autofill
- GPS enabled store finder

## **Expert E**

### **1. How do you define success in a mobile e-commerce business?**

(EXER1) From our profession, mobile commerce is successful if it can attract users to use it and delighted the users with a great user experience which will lead to good business results that the mobile commerce business is targeted to do.

### **2. Can you give me some examples of successful/unsuccessful mobile e-commerce business based on your criteria mentioned?**

(EXER2) Most graphic designers would probably like Apple's minimalist design and the Apple Shop that one can access through mobile site or app is surely one of the very successful mobile commerce that we can refer to. Apple is doing a fantastic job in designing the site that can highlight their great products and offer users a fantastic journey in discovering their products, comparing different versions and finally making the purchases. Both fonts, contents and size of images are optimised so users will not need to enlarge their screen size to read and navigate around. A true user-centric design that helps to win customers. As a contrast, I can see the Dell Computer mobile site present itself very differently. The site is not optimised towards mobile devices. The fonts are extremely small and not readable. Perhaps due to the level of customisation Dell wants to drive, it is rather difficult to navigate around and choose between options. It is not to say that Dell is unsuccessful in mobile commerce but the implementation of on the mobile commerce channel does not support a successful e-channel of distribution even though Dell is almost ahead of Apple as a computer manufacturer.

### **3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business?**

(EXER3) Not sure it is a bias from our profession, I would suggest always start with the users. One common mistake that ecommerce business commit is failing to put user experience at the forefront of development. As a result, the mobile commerce business is only offering subpar site performance and poor user experience. Frustrated users are prone to abandoning carts and bouncing out to another site to look for similar items of interests with more seamless user experience. Hence, mobile commerce business must always have the users' need in mind and drive the whole site design and experience journey exactly to the profile and needs of the target users. Only with this principle upheld, could thereby chance the business could have any success in growing and maintaining its user base.

**4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?**

**-If yes, why do you think it is the case?**

**-If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples of the unique set of success factors for mobile e-commerce?**

(EXER4) It is a definite no as the success of desktop web-based commerce does not necessarily translate to similar success in mobile commerce. Despite both shared quite a few basic similarities in terms of drivers of success such as user experience, ability to build and sustain traffic and finally ability to convert traffic into revenue, there are quite a lot of differences about mobile commerce that would determine performance level:

- e. Mobile commerce platform will need to deal with smaller screens in physical size as well as fewer pixels. A smaller display means that the user can see a lot less information. A small display will push more of page content below the fold and require users to scroll through the page to read. Therefore, for the site to work well, important information will need to near the top of the page and this information should be display in an easy-to-read font. The whole page layout needs to be usable and it needs to look good in a small browser window as well which all point to the need of a much simpler page layout design than a regular website.
- f. Mobile commerce platform will need to cater for the use of devices with slower processors. In general, mobile devices have much less processing power than desktop computers. This will mean if the site content is JavaScript-intensive, the pages will run very slowly. This requires a lot of optimisation that is easier said than done.
- g. Most mobile devices are touch-based input. The implications for mobile site designers are we must cater for unique such as imprecision in touch navigation finger movements dictated by the small screens. Another similar aspect that needs to be cautious is the usage of on-screen-keyboard which will also affect the user's ability to input and complete the transaction as easily as in a desktop environment.

I could go on the long list but these major differences between a desktop web-based environment with a mobile environment impost tremendous challenges for the operator of mobile commerce in optimising their platform to come up with the best user experience for their customers.

**5. I like to understand your perspective on the following factors and how each of them creates an impact on the performance of mobile e-commerce:**

**-What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?**

(EXER5.1) Atmospheric factors such as colour, navigation flow, fonts, site content are all important ingredients in the overall user experience. As I pointed out earlier the success of a mobile commerce business are determined by how good the mobile site design can cater for

mobile user's need and specific user environment. The higher level of ease of usability users get will determine their satisfaction and loyalty to the site.

**-What's your view on usability and user experience on the performance of mobile e-commerce?**

(EXER5.2) I have discussed at length about the operating environment of mobile commerce is different from ecommerce as well as how these mobile commerce businesses will need to design, adjust and optimise their site by changing the atmospheric components so that user experience can be enhanced. From my perspectives, usability or user experience is the fundamental factor that drives the performance of mobile commerce.

**-What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?**

(EXER5.3) If user experience is the inner core of makes a mobile commerce business successful, the outer core will be its ability in social engagement. To be a successful mobile commerce business, the site will need to enable users to have smooth connections to other social media channels as no site could just exist as an island, interactions with other social media channels such as Facebook, Instagram, blogging and recommendation sites is essential for users to share their experience, refer to others' comments and interact within a meaningful user community. To grow the user base, the mobile commerce business needs to run promotional events and facilitate active social engagement for its users. All this will directly impact the performance of the mobile commerce business.

**-What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?**

(EXER5.4) First, IT infrastructure impact performance of mobile by way of impacting site speed. Speed does matter. According to research by Aberdeen Group, one second delay will mean 11% fewer page views, a 16% decrease in customer satisfaction and a 7% loss in conversions. Second, site security is even more important, particularly for transactions. Users will only be confident enough to make their first purchase and continue with his patronage.

**-What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?**

(EXER5.5) Demographics and cultural factors are always an important underlying factor that is impacting the performance of mobile commerce particularly in the phase of adoption. However, I do not see these factors as having long term impact once the mobile commerce business passed the stage of adoption. Moreover, when a mobile commerce platform can truly deliver good user experience and value to its users, that should transcend boundaries in culture and demographics.



**-What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?**

(EXER5.6) Product and service content are key ingredients in the user experience journey. I would like to point out some major flaws that ecommerce site might have regarding how their product and service content is presented. We have been spoiled by the idea of high-speed internet as being ubiquitous and universal, so business just throws everything, large images, flashy graphics and transitions and vast amounts of content at the users. In the desktop web-commerce world, this might still be fine but when it turns to mobile, this would result in very bad user experience. Not only that the loading time of these content will be very low, but users will also find it hard to find the information they need. Given the short patience that a mobile commerce user will have, they will burn out quickly and will look somewhere else for what they need.

**-What's your view on the mobile app and its impact on the performance of mobile e-commerce?**

(EXER5.7) I understand that mobile web experience has improved immensely in the past few years and you will find more people doing the things they normally would do from their PC now turning to the smartphones. In such case what is the value of mobile apps? I still find mobile apps is an important factor that will affect mobile commerce performance particularly in the Asia areas where smartphone users are very used to downloading and using all kinds of mobile apps, instead of typing URL and tried to find the mobile site they need to go. Hence, a lot of retailers still find native mobile apps with a positive retail asset to have. Due to its simplicity relative to a full suite mobile site, mobile apps are welcomed by loyal customers. Retailers are found to use mobile apps to enable loyalty initiatives such as gift cards and points programs, giving customers a great reason to download the app and continue engagement with the retailers. In additions, retailers can use the data from the app to know their customers and extend more personalisation services and offer to their customers.

**-Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?**

(EXER5.8) Using Hong Kong for as an example, given the short travel distance and an efficient public transportation system with residential areas clustering around shopping malls and transportation hubs, everything can be purchased within a radius of 10 mins walk or 30 mins subway transport. Ecommerce or mobile commerce are put in a supplementary role but one that would be unique and interesting in terms of how more online-to-offline and location-based services will be further developed. Therefore, if we are purely looking at numbers of visits or sales revenue, HK would not be too impressive but if we are looking at how mobile commerce are influencing the sales cycle of major retailers with an O2O setting, HK would be something quite different.

**-What's your view on the user's background and IT knowledge level impacts the performance of mobile commerce?**

(EXER5.9) Like the demographic and cultural factors, IT knowledge level and user's background on IT might have some impact in the initial stage but once the users are familiar and become more proficient with the features and functions of the platform, background and IT knowledge should no longer be the key considerations. User experience and social engagement should instead of the key factors driving the success of the mobile commerce business.

**6. Open ended question: expert informants given a list of 14 design features that are key for the success for mobile e-commerce, can you list your top 5?**

(EXER6)

Mobile context-specific inputs

Simplicity

Prepopulated forms

Easy sharing

Mirroring an OS

## **Expert F**

### **1. How do you define success in a mobile e-commerce business?**

(EXFR1) I will look at how the business objective of mobile commerce is being met by the platform regarding key metrics such as visits, conversion and sales revenue as generated over time by the site. The elements of growth are also important as well as how these benchmarks are compared to similar business in the same categories.

### **2. Can you give me some examples of successful/unsuccessful mobile e-commerce business based on your criteria mentioned?**

(EXFR2) I would quote Trip Advisor as one the most successful mobile commerce business in the sense that the platform has become one of the most trusted platforms in user-generated content over a wide range of travel-related content. Trip Advisor started as a collection of neutral third-party user blog for travellers to refer to. The model has now developed into a globally successful destination site for travel with great influence on purchase decisions of travellers in the hotel, air-ticket, rental and dining bookings.

There are however a lot of less successful implementations mostly displayed the following traits: 1. Complete disregard of user experience, straight adoption of a full desktop website implementation into mobile without clear thought-out designs based on characteristics of mobile users, poor design in content presentation etc.

### **3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business?**

(EXFR3) The starting place is the target user in mind. I would also add, we would also be practical to see from the perspective of the business. What can the business offer to users in the mobile environment and how the business will like to present its offer to the users in a very distinguishable way? Working from both supply and demand side, we shall be able to design a platform that can effectively present the product services as well as not losing touch with the users.

### **4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?**

**-If yes, why do you think it is the case?**

**-If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples of the unique set of success factors for mobile e-commerce?**

(EXFR4) No, although there are similarities between mobile and desktop web-based ecommerce in key success metrics such as user experience, number of users, ability to

convert and actual sales, there are a few key areas that are very different in how content can be delivered in a mobile commerce environment and drive a good user experience:

- d. No, or limited, multitasking** - many devices still can't multitask, and even those that can, don't offer the power or flexibility of desktop multitasking. This poor multitasking support can affect the way you design your mobile websites. For example, consider including Twitter/Facebook sharing buttons on every page of your site, so that users don't have to copy and paste your page's URL to a different window or app to share the page.
- e. Portrait screens** Most desktop displays have a landscape orientation; however, the opposite is true of mobile devices- most users hold their device in portrait orientation. This is fuelling a trend toward mobile sites that are well-suited to a vertical orientation, resulting in design decisions, such as:
  - Fewer columns of content (a single column is ideal)
  - No overly-wide elements: This includes large multi-column tables, as well as extra-wide images, slideshows, Flash movies, and iframes
  - Navigation along the top rather than down the side
- f. Failing Flash support** - On the desktop, Flash is almost ubiquitous, with over 90% of browsers having the Flash player installed. With the mobile web, however, it's a different story. No iOS devices run Flash. Android devices using version 2.2 or later can run Flash, although many users choose to turn it off since it can cause performance and stability problems. In all, well under half of the world's mobile devices are Flash-capable, and even when a device can run Flash, it's usually not a pleasant experience. Therefore, a website relying on Flash is not going to be popular on mobile devices. Fortunately, there are now ways that you can create a Flash-like experience for both mobile and desktop users without needing to use Flash itself. Modern web standards like HTML5, CSS3 and SVG allow you to create vectors, animations, games, interactive elements, and embedded videos that will run well on all modern mobile devices, Flash-enabled or not.

## **5. I like to understand your perspective on the following factors and how each of them creates an impact on the performance of mobile e-commerce:**

**-What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?**

(EXFR5.1) Atmospheric factors such as colour, navigation flow, fonts, site content are all the building blocks for the whole user experience journey. Each block has its impact on part of the user experience equation. For example, site design using different colour scheme appeals to different target customers, the right size of fonts and pictures describing the products or offer will shape user's impressions and decisions on whether they would buy or not.

**-What's your view on usability and user experience on the performance of mobile e-commerce?**

(EXFR5.2) As a continuation of the last question, the ultimate determining factor on the performance of mobile commerce is user experience. Many different factors are impacting on the user experience outcome. I have seen a survey that listed over 30-40 factors that would potentially impact the user experience. Some of these factors are what we have termed in the past as “Atmospheric Factors”, there are some that seem to be related to technical aspects such as IT infrastructure, security, the usage of mobile apps etc they are external to the site.

**-What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?**

(EXFR5.3) I would see this as the second most important drivers for mobile commerce performance. Obviously, for a mobile commerce site to be successful, users must have a level of satisfaction with their experience using the interface and functionalities. What is becoming more important today is the mobile commerce site does not stand alone on its own. It must belong to a bigger part of a community where users of the site will find it necessary to interact with users within the site as well as other communities that are relevant and important to product and service interests. Therefore, social engagement activities and promotional events are very often key to the success of mobile commerce to sustain and grow their customer base. Access to social media or bloggers/KOL's recommendations will be crucial for users to make their onsite purchase decisions.

**-What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?**

(EXFR5.4) The impact of IT infrastructure on the performance of mobile commerce is substantial. For example, site speed in eCommerce is widely accepted as one of the most important factors in driving revenue. That's because speed has a major impact on conversion rates and site traffic. Take for instance that, according to a case study in the US, 51% of online shoppers in the US claimed if a site is too slow, they will not complete a purchase. During peak traffic times, 75% of consumers are willing to visit competitor sites instead of dealing with a slow loading page. However, it must be noted that site speed is not only determined by IT infrastructure alone, site design and content structure also play a significant part.

In terms of security, like IT infrastructure, has been a very important underlying factor that will impact the performance of mobile commerce. No users will feel comfortable making purchases with a security compromised site. Therefore, the initial trust that the site could build with the users is extremely important.

**-What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?**

(EXFR5.5) As appear in surveys, age group 20-45 is the most active group in mobile commerce. There is also a perception that mobile commerce is adopted more and effectively used by a tech-savvy young male who would have stronger prior knowledge or trust in tech-stuff. However, I would think this is still difficult to conclude to quantify how factors such as demographics or culture are affecting the performance of mobile commerce.

**-What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?**

(EXFR5.6) I think product and service content has substantial impact on the performance of mobile commerce. We all understand patience is a dying virtue amongst online users. Therefore, the “on-the-go mindset” of mobile browsing must be reflected in landing pages. Regardless of whether it’s homepage or product listings, we must do everything we can to eliminate clutter and unnecessary information. The landing page must be perfectly minimalistic while conveying all the proper elements to prompt a conversion. There is a logo, catchy headline, pricing, captivating image, and vibrant Call-To-Action. It only requires a glance to absorb all the information.

Another aspect is “Forms design”. Filling out forms is a tedious task, especially for mobile users. Making the process simple is crucial in gathering the necessary information for conversions. Non-essential fields should be taken away; stick to the one’s imperative for data collection. A zoom feature is also particularly helpful, so customers don’t have to squint while entering information.

The third element that I could see product and content implementation impact performance of mobile commerce is an Optimized Call-to-Action (CTA) on the landing page. CTA is the heart and soul of the landing page. It is what all the other content leads to.

**-What's your view on the mobile app and its impact on the performance of mobile e-commerce?**

(EXFR5.7) I think the mobile app has a great impact on the performance of mobile commerce simply because Websites are not always viewed in browsers! On the desktop, users nearly always surf the web in a browser. However, 86% of online smartphone time is spent on apps and only 14% is spent on web browsers.

This fact can have various subtle consequences for your mobile site designs:

- Often there's no URL bar - This means users can't glean any information or context by looking at your page URL, copy and paste the URL, or type in a new URL.
- Reduced screen real estate - Mobile browser viewports are small at the best of times, but websites viewed in apps are often crammed into even smaller spaces thanks to app toolbars, buttons, and other widgets surrounding the page.

- Limited functionality - Typically, browser features such as bookmarking, opening links in new windows, or printing is not available when viewing web pages within apps.

That's why most companies that have a mobile site would also have a corresponding mobile app, particularly in Asia. The mobile app will increase the touchpoints for the business and enable a high level of customisation towards users and enhance the engagement level with the user community.

**-Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?**

(EXFR5.8) Using Hong Kong as an example, it is extremely easy to buy things anytime anywhere given the small geographical space. Everything is very compacted and condensed. The development of mobile commerce is shaped by how they could offer value in areas such as online to offline, location-based services and how well they could be integrated into the other physical or virtual distribution channels. On the other hand, given such as competitive scenario, it is also very difficult to expect massive and scalable intake of users that could be found in larger markets such as the US or China.

**-What's your view on the user's background and IT knowledge level impacts the performance of mobile commerce?**

(EXFR5.9) I believe the performance of mobile commerce might be better if all their users have a stronger IT knowledge as well as an open and trusting attitude in the usage of mobile devices. However, I would say the design and set up of a successful mobile commerce site should not be predicated on their users should be tech-savvy users. On the contrary, if the site could be designed around simplicity, even children and senior citizen could have an enjoyable user experience, then this mobile commerce site would enjoy a high level of success than others.

**6. Open ended question: expert informants given a list of 14 design features that are key for the success for mobile e-commerce, can you list your top 5?**

(EXFR6)

Simplicity

Mobile context-specific inputs

Autofill

GPS enabled store finder

Click & Collect

## **Expert G**

### **1. How do you define success in a mobile e-commerce business?**

(EXGR1) I will look at the “hard” metrics such as visits, active customers, conversions and sales revenue which might be like desktop web-based ecommerce. In additions, there might be other “soft” metrics such as user satisfaction, customer engagements and customer/third party comments and ranking that can be used as a reference.

### **2. Can you give me some examples of successful/unsuccessful mobile e-commerce business based on your criteria mentioned?**

(EXGR2) I would consider Amazon and Bestbuy as the pioneers and the forefronts in mobile commerce not only because of their history but also because of their magnitude of products they are representing in their mobile channels. The execution has been fine-tuned over the years so that mobile users can enjoy the same level of ease and the one-touch convenience that has been the uphold principles for the company. I am always amazed by the level of optimisation that must be invested in the mobile site on all the aspects of the site and page layout, input and editing, product and content descriptions, navigation flow and easiness in checking out. All these efforts produce the best in class “user experience” that built customer trust and spurred customer growth which finally reflected in financial results.

There are however a lot of other mobile commerce sites from all verticals that might still be struggling with basic issues such as adjusting their site and page layout to the needs of mobile users, very clumsy input and editing for users who will need to interact through a tiny virtual keyboard, how to optimise big image file for products to make better sense for customers to have a clear view, bad navigation flow as constrained by much smaller screen real estates and finally could not give the customer an easy way out by quickly and efficiently capturing their sales orders. I would not name any sites in particular, but all these characteristics could well be found in traditional brick and mortar retailers jumping into the mobile commerce bandwagon.

### **3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business?**

(EXGR3) My priority will be “User Experience” and how to perfect the whole suite of building blocks such as basic atmospheric factors like site layout, customer input efficiency, product and content, navigation and ease, checkout etc. To differentiate from potential competitors and grow site traffic, I will also look at the social engagement dimension as well.



**4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?**

**-If yes, why do you think it is the case?**

**-If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples of the unique set of success factors for mobile e-commerce?**

(EXGR4) I would give a straight NO as desktop web-based ecommerce is very different from mobile commerce and success in one does not guarantee the other.

Mobile commerce presents itself with the following unique environmental challenges, failure in adapting and designing around these potential hurdles and opportunities will lead to poor user experience and overall failure in the operation.

-Much smaller screen properties: therefore, impacting the kind of product images and site design that would be best suited to mobile users.

-Slower processors and less bandwidth: render it very difficult to serve mobile users' things such as slideshows, interactive form or even PDF.

-Limitations in touch input, no mouse to point and click and a small keyboard, make it difficult for users to navigate and make choices as would be in a desktop environment.

-No Flash support: in the desktop environment over 90% of browsers have the flash player installed but in mobile web, it is simply not the case, so it will be necessary to look for other ways to present what would be standard content in the desktop in the mobile environment.

**5. I like to understand your perspective on the following factors and how each of them creates an impact on the performance of mobile e-commerce:**

**-What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?**

(EXGR5.1) The atmospheric factor is a term that I would use to describe the basic elements perhaps more within the site that are building blocks for user experience. I would refer to 5 of these factors: Site and page layout, Ease and efficiency for user input, Product and content, Navigation and lastly checkout.

**-What's your view on usability and user experience on the performance of mobile e-commerce?**

(EXGR5.2) I will see usability and user experience as one of the most if not the most important factor in affecting the performance of mobile commerce. I see one of the biggest mistake mobile commerce platforms often make is the failure to put user experience at the forefront of development. As a result, the mobile commerce site is not designed around mobile users, factors like slow site speed, subpar site performance lead to poor user experience and the site suffer from the volume of transactions. An even worst scenario would

be frustrated users abandon carts and bounce out of the site to look for competitors' site. When such trends sustained, chances are the mobile commerce site will not survive.

**-What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?**

(EXGR5.3) For me, this is the second most important factor affecting mobile commerce performance. Nowadays, most users will not purchase until they have seen some sort of user comments who purchased the products or services or from blogs or third parties who might have specific product knowledge. Hence the importance of ratings and reviews and most site will include this as important information that must be in place. Second, with Facebook, Instagram in the west or Wechat in China becoming the dominant social media, some users will not come to the other new site unless this is referred by their friends or KOL from their preferred social media platform. As a result, mobile commerce site very often needs to set up social login and linkages to these external social media networks so that they can provide access from these influential sources of visitors as well as maintain a tight social engagement between users with these external communities. From findings in various industries, promotion events and activities such as games, online coupons, location-based functionalities are the most effective ways to build up site traffic in terms of visits and time users engaging with the site content.

**-What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?**

(EXGR5.4) In my view, security and IT infrastructure is the backbone of the mobile commerce site, without a solid build-out, a smooth and satisfying user experience, the ability to socially engage users are simply not possible. These factors manifest itself in the form of system stability as measured by downtime, site speed, page loading speed as well as sophistication in site security measures. Very often, people including me would tend to take these factors as granted. These important factors would be taken as necessary but not enough. In a lot of times, a robust IT infrastructure and strong security network are what might end up differentiating one mobile commerce business from the other.

**-What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?**

(EXGR5.5) In general, it is a common perception that age group 20-45 seems to be more active in mobile commerce. Another perception popular among people is mobile commerce is something used by a tech-savvy young male who would have stronger prior knowledge or trust in tech-stuff. I have seen some scattered studies on the subject, but I could not see any convincing and conclusive results yet. Hence, I would say demographics and culture might be at most an underlying factor for the performance of mobile commerce.

**-What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?**

(EXGR5.6) These are certainly important aspects that impact the performance of mobile commerce as users are interacting with the content and the product/services as displayed to them in through the mobile commerce platform. The environment prevalent under mobile commerce will be even more stringent as compared to desktop commerce as users are only looking at a much smaller screen and very often they are on the move, hence they will not be able to have the normal patience or time to look carefully on what is being shown on the small screen they are holding in their hands. UX designers must have such mobile perception in mind when they design the workflow for users to navigate, search, and interact with the content presented in the platform. I would say it is not product or content that necessarily affects the performance of mobile commerce but rather how the product or content is being displayed and leveraged as part of the overall user experience that is crucial.

**-What's your view on the mobile app and its impact on the performance of mobile e-commerce?**

(EXGR5.7) The mobile app is one of the very important front gates for mobile commerce besides a dedicated mobile site or a responsive and adaptive site configuration that can cater for a wide range of screen sizes. Nowadays most large ecommerce business will be well equipped with all three; the main site, a dedicated mobile site and two sets of apps each for IOS and Android devices. With this preparation, large ecommerce business will be able to maximise their touchpoints with target customers. For example, according to surveys, IOS users are normally the high spending segment while Android users are more towards the mass. In additions, the usage of apps can allow a higher level of customisation and engagements with users. Hence, the wider the net mobile commerce could cast their net, the better they will achieve their business objective.

**-Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?**

(EXGR5.8) I do not think there is any factor that is specific to the US, where I am coming from, that would be especially affecting the performance of mobile commerce. I would think that given the US is a large country with a population not as condensed, the benefits of location-based services and the convenience as offered by mobile commerce are obvious.

**-What's your view on the user's background and IT knowledge level impacts the performance of mobile commerce?**

(EXGR5.9) I can see the performance of mobile commerce might be better under the circumstances where users are people with stronger IT knowledge as well as an open and trusting attitude in the usage of mobile devices. On the other hand, this should not be a factor that we should take it as granted because mobile commerce is not designed just for the use of

computer scientists, technology should be used people without much IT knowledge to enhance the lives.

**6. Open ended question: expert informants given a list of 14 design features that are key for the success for mobile e-commerce, can you list your top 5?**

(EXGR6)

Simplicity

Speed

GPS enabled store finder

Easy sharing

Multiple payment methods

## **Expert H**

### **1. How do you define success in a mobile e-commerce business?**

(EXHR1) To me, a mobile commerce site is successful if the operation can excel in key metrics such as site visits, no of active users, conversion and sales revenue. As a CTO, I would also look at metrics such as site downtime, site speed, how various mobile technology is deployed for example whether the site is just merely a responsive site without good optimisation and whether mobile apps are even part of the channels to address the needs of their mobile users.

### **2. Can you give me some examples of successful/unsuccessful mobile e-commerce business based on your criteria mentioned?**

(EXHR2) Amazon is always a good reference benchmark for me. In a lot of metrics measurements, they are top 3 not only in the US but also in quite a lot of other countries. Amazon has tremendous strength in having its own Cloud Service Platform as well as data power that could drive a high level of customisation. Therefore, they are at the top in almost every technical frontier related to ecommerce. There are also a lot of less successful examples that it would be difficult to name them here. They do have common characteristics in that they would not put user experience in the first place and most of these businesses stumbled at poor implementations of their website to be used by mobile users. It is not difficult to see a lot of sites like this that are slow in loading, difficult to read and navigate and almost impossible to finish a transaction on the mobile devices.

### **3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business?**

(EXHR3) Even as a CTO, I would be naturally confined in my mind by the technical priorities such as what kind of system I have, what are the capabilities and how to operate these different front end and back end systems and make sure all units are well integrated into a seamless network that is robust and efficient. However, I would still say we should start with the customer first. Look at who is our target customers and how the business can add value to this group of customers. With these two in place, we can start configuration our technical solution to implement all the business concepts.

### **4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?**

**-If yes, why do you think it is the case?**

**-If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples on the unique set of success factors for mobile e-commerce**

(EXHR4) I will say success in desktop web-based ecommerce cannot imply success with mobile commerce. The simple reason behind is users using desktop web commerce are using their computers in similar ways, but people use mobile devices differently for different types of tasks.

At their computers, users are:

- Sitting at a desk
- Frequently in an office environment
- Often working
- Sometimes randomly surfing the web
- Often creating content
- Focused on the computer, not so much on their environment

On a mobile device, however, users tend to be:

- Sitting on the couch at home
- Walking around, inside or outside
- Queuing for something
- Waiting for a bus, train, or plane, or travelling
- Looking for a specific piece of information
- Mostly consuming content
- Easily distracted by their environment

These differences affect the types of sites that work well on mobile devices. For example, websites and web apps that are designed to help people create content will generally be more popular on desktop computers, while sites that let users consume content easily, or find a specific piece of information while they're on the move, will attract mobile users more.

**5. I like to understand your perspective on the following factors and how each of them creates an impact on the performance of mobile e-commerce:**

**-What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?**

(EXHR5.1) Atmospheric factors such as colour, navigation flow, fonts, site content are what I would call the fundamentals. These factors are part and parcel for users to have a good user experience and the overall user experience and level of satisfaction the user will have on his interaction with the mobile commerce entity will be determined

**-What's your view on usability and user experience on the performance of mobile e-commerce?**

(EXHR5.2) I think this is a similar question to the previous, but it is important to recognise user experience and a high usability score is always be for a mobile site is shooting for. However, it must also be seen that many factors will affect the user experience. From my role as CTO, I can easily point out a few very critical ones such as site speed, security and the applications of other mobile technology platforms such as a dedicated and optimised mobile site or native mobile apps.

**-What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?**

(EXHR5.3) I have seen a lot of industry reports that classified our current young generation who is the key patrons of mobile commerce as SoLoMo segment. The meaning of this is users are now savvy with all three-social media, location-based services and mobile commerce. Social media has a huge influence on mobile commerce. According to a recent study, 40% of global consumers ages 16-24 use social media to research products. Additionally, 30% of the general population use social media to research products before they make purchases. Given this context, promotional events and social engagement activities of the site will affect the performance of the mobile commerce as users are not living in their islands of community, they have a strong urge to interact with other users on the site as well as reaching out to other people who might have already experienced the same product and services. Hence, social engagement is an important dimension for mobile commerce to master to enhance their user base.

**-What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?**

(EXHR5.4) Security and IT infrastructure would impact the performance of mobile commerce as they would shape the level of user experience for the site. The first area is site speed: attention spans and patience are a delicacy in the world of mobile ecommerce. Slow-loading pages will turn customers away in droves. Even an extra second delay can end up costing you precious conversion. A recent survey found that pages with average loading times of around 2.4 seconds had a conversion rate of 1.9% Pages that took **one** extra second to load resulted in a 27% decrease in conversions!

In additions, many mobile commerce sites don't understand how to measure site speed. They just focus on page load while not paying enough attention to what makes for satisfying user experience. The key metric for user experience is time-to-interact, which is the point at which a customer can act on a page; it's not as important to have the whole page load as it is to have parts of the page ready for your customers to interact with – this makes them happier. Providing a satisfying user experience increases the chance of making a sale and gives customers a reason to return often to shop, as well as tell friends and family about your site.

Furthermore, user experience relies upon not only the performance of the site but also connectivity. For mobile devices, the challenge is to accommodate devices with much slower

and far less reliable connections, like 3G or even 4G LTE. This presents a problem because images can take a lot longer to load (and sites tend to have a catalogue of images), increasing the chances that a user will bounce. To get around this, sites need to use other speed optimizations tools such as parallel downloads, CDNs, browser caching and gzip.

Regarding security, according to research conducted by Shopify, over 50% of all ecommerce internet traffic coming from mobile users will be as vulnerable as ever to the possibility of fraud. Fortunately, it is now becoming more standard practice for mobile commerce site to use a mobile-friendly user authentication that involves sending a one-time password (OTP) to a user via a separate means of communication (usually a text message or a voice call) which only the user has access to and this one-time password expires within a short time. For increased security, phone numbers can be combined with device identifiers to ensure that users have access to not only the phone number they use as identifiers but also the mobile devices they have registered for use with the application. In this scenario, push notifications can be used to send verification codes that are automatically consumed by the mobile commerce application to provide a seamless experience for users.

**-What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?**

(EXHR5.5) I acknowledge the fact that demographic and cultural factors would have some bearing on the performance of mobile commerce, but the impact of these factors is rather indirect and difficult to validate. In general, age group 20-45 seems to be more active in mobile commerce and there is also a perception that mobile commerce is adopted more and effectively used by a tech-savvy young male who would have a stronger prior knowledge or trust in tech-stuff. Again, this may become stereotype and untrue in some other Asian countries.

**-What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?**

(EXHR5.6) I see product and service content as a very important part of user experience. It is not only the flesh on the bones but very often the success of the mobile commerce site is highly correlated with how its product and service content could be accessed.

From a technology perspective, the implementation and presentation of such content have become more and more challenging particularly in a mobile commerce environment. For example, quite a lot of mobile commerce sites suffer from putting too many large size pictures or even videos on their site which dragged down site loading time substantially.

Internal product and search capability, as well as the degree of search engine friendliness, is also a big factor to be considered in making product and service to be easily accessible to users. A lot of mobile commerce business make mistakes in having duplicating content, no customisation between title tags and product titles, no inherent place for content on category pages, lack of customisation between text descriptions and meta description tag, and inability to control navigation links separate from page titles. On top of that, the level of mobile readiness is extremely low, which poses a huge problem with today's algorithms.



Another technical aspect that is relevant for product and service content impacting the performance of mobile commerce is the use of Content delivery networks (CDNs). Very often, this aspect is not fully recognised by mobile commerce business and that deny customers to have a consistent experience regardless of where in the world they shop from.

**-What's your view on the mobile app and its impact on the performance of mobile e-commerce?**

(EXHR5.7) Normally, as a gatekeeper of the business's technology, I would not advocate proliferating and over-complicating the site with components that are more than necessary. However, I still see the value of having mobile apps despite the progress we have seen in the mobile web experience. The fact is native apps are still widely used even though it is harder to get people to download apps. Native apps represent a positive retail asset to have as they can enable a high level of customisation in services and functionalities and prove itself to be invaluable as a CRM tool. Most important of all is its ability to have a higher chance to engage with target customers as well as driving an active social engagement process with the user community and other social media.

**-Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?**

(EXHR5.8) I came from the UK and probably we are more traditional in terms of culture and everything, we have a long history in adopting desktop web-based ecommerce and consumers are quite cautious about exposing too much of themselves on the internet even more so for mobile internet. As such, the development of mobile commerce has not been as rapid as we have seen in fast-developing Asian countries.

**-What's your view on the user's background and IT knowledge level impacts the performance of mobile commerce?**

(EXHR5.9) I certainly think user's background and IT knowledge level will support the usage mobile commerce particularly in the adoption stage, but I cannot see user's background and IT knowledge should be the gating factor for the performance of mobile commerce. On the contrary, just as we can see happening in China, India and Indonesia, the mobile commerce has become the catalyst leading to faster adoption of technologies and we can see there is a lot of successful mobile commerce business there.

**6. Open ended question: expert informants given a list of 14 design features that are key for the success for mobile e-commerce, can you list your top 5?**

(EXHR6)

Simplicity

Speed

Mobile context-specific inputs

GPS enabled store finder

Multiple payment methods

## **Expert I**

### **1. How do you define success in a mobile e-commerce business?**

(EXIR1) I will first look at the business objective of this mobile e-commerce operations and then apply different sets of metrics to measure its success. Start from the basic ones such as site visits, number of active users, conversion and lastly sales revenue. The business objective is important as different organisations under different business objectives can also be looked at under different timeframes. For example, in the initial stage, the mobile business may not be focused too much on generating revenue as compared to build a customer base and brand mindshare among target customers groups. In such a case, the metrics of visits and the number of active users might be even more important near-term targets than the exact sales revenue generated.

### **2. Can you give me some examples of successful/unsuccessful mobile e-commerce business based on your criteria mentioned?**

(EXIR2) I always admire how Tmall has been starting from scratch and has now become one of the most significant digital and mobile channels for even luxury brands in China. The business objective of Tmall is interesting as it has been set up to prove that the Ali group is not just capable of selling merchandise with stolen brand identities. Within a short time, major fashion brands make their moves and set up their flagship stores in Tmall and have gained traction in the China market through their presence in Tmall. In the beginning, it is obvious the sales revenue is not up to expectation but focusing on the user experience and social engagement within the Ali community, visits and active users climb up.

The numbers of unsuccessful sites are out-proportion to successful ones. Most of these sites made mistakes in ignoring these key ingredients: User experience fundamentals such as site layout and navigation flow; Social engagement fundamental such as effective use of reviews and ratings, location-based services and connections to other social media/blogs. Finally, IT and network fundamentals such as network stability and security issues as well as the effective use of mobile apps and mobile sites. These mistakes can be seen often made by US or European ecommerce group expanding into Asia. They tend to struggle with finding the right network setup, applying the same design of their “successful” template from their home countries to Asia and fail in understanding how to enable their users to engage socially through the sites.

### **3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business?**

(EXIR3) Start from the business objective and identify the target audience as well as the unique user value of the site to the target customers. With these three basic elements identified, design the site around how to deliver the best user experience journey that would differentiate the site from others. At the same time, prepare a growth plan base on how the site could enable social engagement amongst users as well as with external social media sites and blogs.

**4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?**

**-If yes, why do you think it is the case?**

**-If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples of the unique set of success factors for mobile e-commerce?**

(EXIR4) No, a successful desktop web-based e-commerce business does not guarantee similar success in mobile commerce. As discussed in above, I have outlined a lot of cases where ecommerce companies that might have their success overseas, failed to extend their operation in Asia and China simply because they could not make successful adjustments in user experience, social engagement and they might have not made the proper preparations in their IT infrastructure and security measures.

Despite both web-based e-commerce and mobile commerce need to chase after the same set of operations metrics such as visits, active users, conversions and sales revenue, mobile commerce posts several unique constraints for ecommerce business in delivering good user experience. Users will need to interact with the business through a much smaller screen thereby creating limitations in the information display. Users of mobile commerce can only interface with the business with a simple swipe and tap moves instead of having the luxury of a full keyboard and mouse. Users of mobile commerce will tend to have a very limited time in attention as they are always on the move.

**5. I like to understand your perspective on the following factors and how each of them creates an impact on the performance of mobile e-commerce:**

**-What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?**

(EXIR5.1) I will group the following 5 elements as “atmospheric factors”: site layout, user inputs, product and content, navigation flow and the checkout experience. These are the fundamentals that will shape the overall user experience and level of satisfaction the user will have on his interaction with the mobile commerce entity. As discussed above, due to the special constraints and restrictions imposed by the mobile environment, ecommerce must put user experience in the forefront of site development, “mobile-first” is important in ensuring the whole user experience could be backup and well-executed.

**-What's your view on usability and user experience on the performance of mobile e-commerce?**

(EXIR5.2) As discussed, usability and user experience are one of the most if not the most important factor in affecting the performance of mobile commerce. I have yet to see any successful mobile commerce business that offers lousy user experience. Even if the business has the best and cheapest product offerings, the user will turn to other sites once they find out there are other alternatives.

**-What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?**

(EXIR5.3) Besides offering the best user experience, mobile commerce must rely on pushing promotional events and increasing the level of social engagement activities to grow and sustain customer base. Nowadays, a very high percentage of users will not purchase until they have seen some sort of user comments from blogs or other purchasers. In additions, they may not even come to the site unless this is referred by their friends from Facebook, Instagram and Wechat, hence the importance of social log-in and on-site links to another social media platform. From experience in various industries, promotion events and activities have been the most effective ways to build up site traffic in terms of visits and time users engaging with the site content. Hence, I would say besides user experience, social engagement is the second most important factor affecting the performance of mobile commerce.

**-What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?**

(EXIR5.4) There are two views on this question, the first perspective is with the prevalence of 3.5G migrating to 4G+ mobile network and increasing strong mobile security technology on both system and devices, this factor has become more “necessary” but “insufficient” to determine success in mobile commerce. For the earlier adopters’ countries in ecommerce such as US and UK, IT infrastructure and security has been taken for granted. Whereas in fast developing and late adopters of mobile commerce, this is still something that will make and break. The second perspective is IT infrastructure and security will remain the critical factors that determine the performance of mobile commerce and I support this perspective. Using the example of site stability and site speed, we can never take this as granted. One second of the load time delay will have a significant negative impact on sales revenue. I trust every ecommerce site will closely monitor the stability of their site, any moment of instability will potentially cause millions of dollars particularly during Black-Friday and sales season. The issue of security is even more obvious. I have personally seen sites being penalised in terms of user abandonment over the loss of trust due to transaction security compromised.

**-What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?**

(EXIR5.5) Generally, age group 17- 45, male with a profile in technology inclination is perceived to be more active in mobile commerce. However, we have also seen different scenarios in China and Korea where female users are more dominant. While acknowledging factors such as demographics, culture might be affecting the performance of mobile commerce, there is not much the mobile commerce business can do to change or improve as compared to atmospheric factors or even IT infrastructure which the business can constantly improve.

**-What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?**

(EXIR5.6) Product and service content is one of the core atmospheric suites. The success or otherwise of the mobile commerce platform is in the ability to present in the best way these product and service content even under all sorts of constraints such as smaller screen, users constant on the move, users have no patience or time to look carefully etc. Therefore, UX designers must have such “mobile-first” when they design the workflow for users to navigate, search, and interact with the content presented in the platform. In addition, it is also important for business owners to see they should not try to squeeze everything sellable into a mobile environment. Instead, strategically select and skillfully present a portion of the portfolio to be put on the mobile environment will certainly prove the results.

**-What's your view on the mobile app and its impact on the performance of mobile e-commerce?**

(EXIR5.7) There is an argument that said if the company has a nice design responsive site that can cater for users holding screens of various sizes, that will be enough and why waste money on investing into mobile apps while most people will not like to download and consistently use native apps.

Depends on where you are, you will see survey results that indicated the high proportion of mobile users predominant using apps rather than mobile web-browsers in accessing information. In addition, user habits vary from country to country. For example, in the Greater China area, mobile apps are so dominant and have become an extremely important platform which forms a unique eco-system that arguably mobile commerce must participate and excel in.

Hence, I would advocate that the mobile commerce platform should be flexible in adopting responsive/adaptive site, a dedicated mobile site and mobile apps. The end game is to maximise customer touchpoints and offer the most compelling user experience. Mobile apps can offer a unique advantage in a high level of personalisation and become the greatest CRM tool by offering gift coupons, incentives, loyalty programs as well as a conduit for online to offline operations using location-based-services.

**-Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?**

(EXIR5.8) I guess every country has some specific country environment that affects the adoption and performance of mobile commerce. We have seen that in Korea, China, Hong Kong and SE Asia. Just like demographics and culture, these factors are more external and sometimes given and therefore not much could be changed as a business level. The only thing to do is to fully understand them and try to leverage or deal with them.

**-What's your view on the user's background and IT knowledge level impacts the performance of mobile commerce?**

(EXIR5.9) I believe given the users' group has a stronger IT knowledge as well as an open and trusting attitude in the usage of mobile devices, it would be advantageous to the adoption and performance of mobile commerce. However, this is also one of the given external factors that the site could not effectively change from a business level. In additions, if the mobile commerce platform is successful enough, the user without a strong IT knowledge should also enjoy the same high-level user experience.

**6. Open ended question: expert informants given a list of 14 design features that are key for the success for mobile e-commerce, can you list your top 5?**

(EXIR6)

Simplicity

Speed

Mobile context-specific inputs

Easy sharing

GPS enabled store finder

## **Expert J**

### **1. How do you define success in a mobile e-commerce business?**

(EXJR1) To me, several key metrics are important to define success, they are visits, number of active users, conversion and sales revenue. If applicable, I would also look at the ratio of desktop web-based ecommerce to mobile and examine their growth rate for 3-5 years.

### **2. Can you give me some examples of successful/unsuccessful mobile e-commerce business based on your criteria mentioned?**

(EXJR2) One prominent example is 11st owned by SKPlanet which is part of SK Telecom which is the major telecom group here in Korea. 11st started as an e-commerce retail portal for Koreans and grew rapidly in the last few years. Not only is the site design flavoured by Koreans, but the flow of the whole mobile site design is also so smooth and quick. Koreans are known for their impatience, 11st exceeds Korean standard in site responsiveness and offer a very satisfying user experience. All qualities are reflected in their achievement in key metrics such as visits, user base and sales revenue. In a matter of years, 11st has become the second-largest ecommerce/mobile commerce entity threatening the incumbent Gmarket.

In terms of less successful ones, there are a lot. Most of these are foreign sites trying to use their English site in the US or Europe, supplemented by very non-local translations and launched as a responsive site here in Korea. The challenges for these businesses are that Koreans will find them quite alien to their culture, they cannot even enter their local address in Korean to order the products and there are no local language customer services to ask questions. In additions, they usually did a poor job in mobile implementation. As a result, the mobile interfaces are very clunky, difficult to navigate and slow. Impatient Koreans will drop out in no time.

### **3. From your experience, where and how should one start to plan and build a successful mobile e-commerce business?**

(EXJR3) I would start with the target customers and the country this mobile commerce is going to operate in. From my experience, the mobile commerce platform can have a chance to win if they can respect the customers and the environment, they are operating in.

### **4. Do you think if the company is successful in desktop web-based e-commerce, its mobile e-commerce business will be equally successful?**

**-If yes, why do you think it is the case?**

**-If no, what do you think are the similarities and differences between mobile and desktop web-based e-commerce? can you give me some examples of the unique set of success factors for mobile e-commerce?**

(EXJR4) I would say No. A successful desktop web-based e-commerce business could not necessarily guarantee similar success in mobile commerce.

On the surface, there seemed to be a lot of similarities. At least they are probably targeting at the same set of metrics and aiming at building good user experience and an engagement process to their customers. However, mobile commerce will bring several unique challenges such as smaller screen thereby creating constraints in the information display, users can only interface with the platform with a simple swipe and tap moves instead of having a full keyboard and mouse; users of mobile commerce are on the move so they could only afford very limited timespan. All these will add pressure on how to deliver a good user experience and engagement hence the performance of the mobile commerce will entirely depend on the strength in dealing with these problems.

Based on some of our recent experience, winning in m-commerce requires much more than simply a reformatted website or smartphone application. Although all digital channels might share the same backbone infrastructure, such as order management and logistics, m-commerce requires fundamentally different approaches to identifying, reaching, and satisfying consumers. Indeed, there are important distinctions between mobile-shopping behaviour and online or in-store behaviour even among women.

**5. I like to understand your perspective on the following factors and how each of them creates an impact on the performance of mobile e-commerce:**

**-What's your view on-site atmospheric factors such as colour, navigation flow, fonts, content on the performance of mobile e-commerce?**

(EXJR5.1) Atmospheric factors such as colour, navigation flow, fonts, site content are important drivers that will shape the overall user experience and level of satisfaction the user will have on his interaction with the mobile commerce entity. As I pointed out earlier the success of a mobile commerce business is determined by whether its users are satisfied with their site and the kind of experience they have when they interact with the site.

**-What's your view on usability and user experience on the performance of mobile e-commerce?**

(EXJR5.2) I see usability and user experience the most important factor in affecting the performance of mobile commerce. I have not seen any successful mobile commerce business that offers lousy user experience. Even if this site has the best deals in town, it would be difficult for this business to sustain. Here's the reason why, contrary to the bargain-hunting mentality that pervades online, mobile shoppers place the greatest value on intuitively easy navigation and convenient shopping experiences. From our experience, more than 60% of South Korea's mobile shoppers cited convenience as their top priority, compared with 44% of online shoppers. To connect with mobile buyers, many successful retailers are providing less information on their mobile sites. Quick delivery of products is also essential for many regular mobile shoppers, particularly those who buy groceries and other staples. To satisfy this consumer demand and expedite the delivery of products purchased on the mobile, GS Shop, for example, opened a mobile-dedicated warehouse, and many mobile-commerce



players are now offering next-day delivery for grocery and kid/baby items. GS Shop has opened a mobile-specific call-centre so shoppers can get specialized assistance with a single click, and players are also adopting new payment solutions such as KakaoPay, a social-media-based payment system.

Hence, this is a full illustration of full engineering of user experience which takes cares of every aspect of the purchase journey from on-site to off-site.

**-What's your view on promotional events and social engagement activities on the performance of mobile e-commerce?**

(EXJR5.3) To me, this is the second most important for mobile commerce performance. Looking at the context of Korean mobile commerce users with a high percentage of female housewives, they are instinctively always interested to refer to ratings and reviews of others. At the same time, given the small screen and limited attention span nature of mobile users. In the early days of ecommerce, the desktop web interface interaction with users was a very much standalone experience. The impacts of other social media or blogs even if they existed were an external reference to the users. Nowadays, depending on which vertical you are referring to a very high percentage of users will not purchase until they have seen some sort of user comments from blogs or they will not come to the site unless this is referred by their friends from Facebook or Instagram. From findings in various industries, promotion events and activities have been the most effective ways to build up site traffic in terms of visits and time users engaging with the site content.

**-What's your view on how security and IT infrastructure might impact the performance of mobile e-commerce?**

(EXJR5.4) I will address the aspect of security first as most Korean users are very concerned about this subject. South Korea is a prime target for cyber-attacks due to the country's high network connectedness, advanced use of mobile devices, and significant intellectual property. South Korea recognizes that cyber-security is a matter of national security. Although the country boasts one of the world's fastest and most mobile IT infrastructures, it also has an insecure infrastructure which is vulnerable to cyber-attacks. The country has heightened its security protocols over recent years, following several high-profile hacking cases, including a cyber-attack on a Korea Hydro and Nuclear Power (KHNP) plant in 2014. Hackers have previously targeted government agencies in South Korea, which compromised sensitive information and endangered the welfare of government officials and civilian employees alike. Because of all this background, no users will dare to use any mobile site that has a security issue.

The second aspect of IT infrastructure will affect mobile commerce in areas of mobile system stability and site speed. As pointed out by many engineering experts, site speed is one of the biggest factors that would directly affect sales revenue. A one-second delay in load time means 7% loss in conversions. Imagine, it is not only slow, but site availability become on and off. This is especially disastrous in a mobile environment when the mobile user is expecting to finish off the transaction before the last strain of power!

**-What's your view on how user demographics, culture and prior knowledge might have impacted the performance of mobile e-commerce?**

(EXJR5.5) Mobile-channel buyers have distinct demographics. In South Korea, women account for 60% of transactions. Additionally, most are in their 30s and are likely to have preschool-age kids. They are also, somewhat surprisingly, likely to be full-time housewives. There has been an assumption that m-commerce is dominated by busy working moms; in fact, working moms spend much more time in front of a PC, mostly at their jobs, while housewives or moms with young kids are more likely to use their smartphones to shop. Companies have noticed: social-commerce player Coupang has aggressively targeted mobile-savvy young moms by offering baby gear such as diapers at low prices. Factors such as user demographics and culture do impact performance of mobile commerce, the question is these factors are sometimes not obvious and their magnitude might not be as quantifiable, so the challenge will always be how to leverage these factors at the right timing.

**-What's your view on product and service content and how they might have impacted the performance of mobile e-commerce?**

(EXJR5.6) As one key component in atmospheric factors, product and service content do impact the performance of mobile commerce. To illustrate this point under the context of Korea, as it is harder to compare products and study details on a phone's small screen, mobile shoppers deliberate less when making purchasing decisions. Our experience shows that more than half of mobile consumer decision journeys last just a single day, compared with only 36% online. Besides, mobile shoppers' visit on average fewer than two sites before making a purchase, versus 2.75 for online shoppers. M-commerce consumers are driven much more by impulse than by product features or prices: some 17% of mobile transactions in South Korea are made without prior research, compared with just 6% of online transactions.

For retailers, this has enormous implications. While it has been critical for online retailers to keep a long tail of products to capture whatever consumers are searching for, mobile shoppers want quick satisfaction. Their purchasing decisions are often governed by impulsive or emotional factors (which encompass product categories including apparel, fashion accessories, and shoes) or habit (such as buying groceries and kid/baby items). For its mobile dedicated shopping platform, for example, online market 11th Street has reduced its total number of SKUs to only 7,000 and emphasizes "deals of the day."

This example indicates how product and service content and particularly how these contents are presented do affect the outcome of mobile commerce.

**-What's your view on the mobile app and its impact on the performance of mobile e-commerce?**

(EXJR5.7) It is often argued that if the company has a nice design responsive site that can cater to users holding screens of various sizes, that will be good enough. This is certainly not true for the Korean market. Mobile apps have become an extremely important vehicle and form a unique eco-system that arguably mobile commerce must participate and excel in.

Korea may be an even stronger case with Samsung being the biggest Android smartphone producer and enjoying a dominant local market share.

In the US and Europe, it is said that users are not as willing to download many mobile apps and use them consistently. In Korea, the scenario is very different. Korean consumers are known to buy online from a smaller number of retailers than they use when they shop in brick-and-mortar stores. Similarly, mobile consumers are more likely to go directly to a retailer's site or app than to use a search engine, meaning there is a significant opportunity for retailers to lock in customers. As a result, South Korea's m-commerce players use multiple tactics to drive repeat visits, offering mileage points or coupons to those who interact at least once each day with their mobile apps.

Connecting the mobile-shopping experience to physical stores also goes a long way toward building a true omnichannel experience and locking in customers. The mobile application for retailer Lotte, for example, offers an "in-store mode," where shoppers get real-time mobile notification of promotions and coupons when they step into one of its department stores and pass a specific brand's area. Hypermarket Emart has a virtual-store application that shows products displayed in the same layout as in its physical stores to provide an easy, consistent shopping experience.

Hence, the usage of a wide range of mobile tactics including mobile apps, dedicated mobile site, or even implementation of responsive or adaptive site design is all-important aspects for the mobile commerce to drive their business. Instead of just following one tactic, most larger ecommerce companies will have an implementation of at least 2 to 3 channels to maximise their customer touchpoints.

**-Do you think there is any factor that is specific to your country that might affect the performance of mobile e-commerce?**

(EXJR5.8) I would mention a few factors specific to Korea that has spurred the development of mobile commerce.

Every year since 2010, South Korea's mobile-commerce market has more than doubled in value. Today in 2014, mobile commerce represents nearly one-third of all web-based sales. Using smartphones to buy products and services has become so commonplace that nearly two of every three people have done so at least once, up from fewer than half in 2012. At this point and we know China and India are coming up rapidly, Korea still has the highest smartphone penetration in the world: more than two-thirds of South Koreans own one, compared with 47% of Americans, 57% of Australians, and 52% of Britons.

This special environment has put Korea at the forefront of omnichannel commerce, where physical stores and online shopping are complemented by mobile (m-commerce). As discussed above, most of South Korea's consumers already have experience with m-commerce, and on-the-go shoppers spend about as much on each mobile transaction as they do in stores. Besides, consumers who turn primarily to their phones to shop "mobile-first" consumers—tend to spend more than shoppers in other channels

**-What's your view on the user's background and IT knowledge level impacts the performance of mobile commerce?**

(EXJR5.9) I believe the performance of mobile commerce might be better if most of the users have a stronger IT knowledge as well as an open and trusting attitude in the usage of mobile devices. Having said that, this factor is not usually controllable or manageable and this is also something that the impact might be mitigated over time.

**6. Open ended question: expert informants given a list of 14 design features that are key for the success for mobile e-commerce, can you list your top 5?**

(EXJR6)

Simplicity

Speed

Mobile context-specific inputs

Call to action on the first page

Easy sharing

**APPENDIX IV      List of 183 m-commerce business in the research**

Case No	Company	Vertical
1	Amazon.com	Mass Merchant
2	JD.com	Mass Merchant
3	VIP Shop	Apparel/Accessories
4	Ocado Group PLC	Food/Drug
5	Jumei.com	Health/Beauty
6	Dangdang.com	Mass Merchant
7	Vancl.com	Apparel/Accessories
8	Vente-Privée	Apparel/Accessories
9	Groupon goods	Mass Merchant
10	Maimaibao	Mass Merchant
11	Etsy.com	Mass Merchant
12	Zalando SE	Apparel/Accessories
13	Newegg Inc	Computers/Electronics
14	Wayfair LLC	Housewares/Home furnishing
15	Nova Protocol	Mass Merchant
16	Overstock.com	Mass Merchant
17	Yoox/Net-a-Porter	Apparel/Accessories
18	ASOS Plc Holdings	Apparel/Accessories
19	Media Saturn	Computers/Electronics
20	Dab.com	Computers/Electronics
21	Coastal Contact	Health/Beauty
22	Fanatics Inc	Apparel/Accessories
23	Peapod LLC	Food/Drug
24	Brands4Friends.de	Apparel/Accessories
25	Zooplus AG	Speciality
26	Gilt Groupe Inc.	Apparel/Accessories
27	Netshoes	Apparel/Accessories
28	eMAG	Computers/Electronics
29	Wenkamp	Mass Merchant
30	JustFab Inc.	Apparel/Accessories
31	Bol.com BV	Books/Music/Video
32	FreshDirect LLC	Food/Drug
33	Showroomprive.com	Apparel/Accessories
34	Wildberries.ru	Apparel/Accessories
35	Interflora	Flowers/Gifts
36	RueLaLa.com	Apparel/Accessories
37	Distrelec Group	Computers/Electronics

38	APMEX Inc	Speciality
39	Hayneedle Inc.	Housewares/Home furnishing
40	Amway	Health/Beauty
41	Ozon	Mass Merchant
42	Boohoo.com	Apparel/Accessories
43	Wiggle Ltd.	Sporting Goods
44	eBuyer UK Ltd	Computers/Electronics
45	Tab.com	Speciality
46	Qiro Group	Books/Music/Video
47	The Hut Group	Computers/Electronics
48	Notebooksbilliger.de	Mass Merchant
49	Light-in-the-box	Mass Merchant
50	KupiVIP	Mass Merchant
51	Cheaper Than Dirt	Sporting Goods
52	Shutterfly Inc.	Apparel/Accessories
53	1 Sale A Day LLC	Mass Merchant
54	Blue Nile Inc.	Jewellery
55	MLB Advanced Media	Apparel/Accessories
56	CafePress.com	Mass Merchant
57	Nasty Gal Inc.	Apparel/Accessories
58	Shoebuy	Apparel/Accessories
59	Build.com	Hardware/Home improvement
60	Maquina de Vendas	Computers/Electronics
61	ModCloth Inc.	Apparel/Accessories
62	Migros-Genossenschafts-Bund	Speciality
63	Livingsocial	Mass Merchant
64	JackThreads	Apparel/Accessories
65	Zazzle	Mass Merchant
66	CustomInk	Apparel/Accessories
67	Motorsport Aftermarket Group	Sporting Goods
68	Cymax Stores	Housewares/Home furnishing
69	Ubaldi.com	Mass Merchant
70	eBags Inc.	Apparel/Accessories
71	ThinkGeek	Mass Merchant
72	Jomashop	Jewellery
73	Mason Inc.	Apparel/Accessories
74	Feelunique.com	Health/Beauty
75	Door to Door Organics	Food/Drug
76	Bluefly Inc.	Apparel/Accessories
77	PrivateOutlet SAS/BrandAlley	Apparel/Accessories

78	Wine.com	Food/Drug
79	iHerb.com	Health/Beauty
80	FragranceNet.com	Health/Beauty
81	Threadless.com	Apparel/Accessories
82	Steals.com	Apparel/Accessories
83	Dungarees.net	Apparel/Accessories
84	Spartoo SAS	Apparel/Accessories
85	Sole Society	Apparel/Accessories
86	Sevenly.org	Apparel/Accessories
87	Ice.com Inc.	Jewellery
88	Artbeads.com	Jewellery
89	Whiteflash Inc.	Jewellery
90	OneClick Ventures	Apparel/Accessories
91	Ziamond Inc.	Jewellery
92	New England Patriots	Apparel/Accessories
93	Beadaholique Inc.	Jewellery
94	Due Maternity	Apparel/Accessories
95	WhatSheBuys	Apparel/Accessories
96	Express Design Group	Apparel/Accessories
97	Shabby Apple	Apparel/Accessories
98	ShadeSaver.com	Apparel/Accessories
99	Shoes.com	Apparel/Accessories
100	AdoreMe	Apparel/Accessories
101	Spreadshirt Inc.	Apparel/Accessories
102	Nine Line Apparel	Apparel/Accessories
103	Revolve Clothing	Apparel/Accessories
104	Paul Fredrick	Apparel/Accessories
105	Brian Gavin Diamonds	Jewellery
106	Benefit Cosmetics US	Apparel/Accessories
107	Titanium Buzz.com	Jewellery
108	Choxi.com	Mass Merchant
109	Cheaper Than Direct	Sporting Goods
110	Optics Planet	Sporting Goods
111	Proactiv	Health/Beauty
112	FTD Cos.	Flowers/Gifts
113	Touch of Modern	Housewares/Home furnishing
114	123Stores.com	Mass Merchant
115	Real Truck	Automotive Parts
116	Blue Apron	Food/Drug
117	Diamond Candles	Flowers/Gifts

118	eCampus	Books/Music/Video
119	Art.com	Housewares/Home furnishing
120	Flex Shopper	Computers/Electronics
121	Shop.com	Mass Merchant
122	Tanga.com	Computers/Electronics
123	Alibris.com	Books/Music/Video
124	MyOTCstore.com	Food/Drug
125	BuyAutoParts.com	Automotive Parts
126	Fathead LLC	Speciality
127	ShoppersChoice.com	Mass Merchant
128	Shoplet	Office supplies
129	Cat5Commerce	Sporting Goods
130	eMusic.com	Books/Music/Video
131	Appliance Zone	Hardware/Home improvement
132	SwimOutlet.com	Sporting Goods
133	Tech For Less	Computers/Electronics
134	AutoAccessoriesGarage.com	Automotive Parts
135	SmartPak	Speciality
136	UnbeatableSale.com	Mass Merchant
137	LovelySkin.com	Health/Beauty
138	GameFly	Toys/Hobbies
139	Advance Auto Parts	Automotive Parts
140	pcRush.com	Computers/Electronics
141	Plated.com	Food/Drug
142	ValuePetSupplies	Speciality/Pet Supplies
143	Cyberweld	Hardware/Home improvement
144	TakeALot.com	Mass Merchant
145	RepairClinic.com	Hardware/Home improvement
146	HobbyTron.com	Toys/Hobbies
147	Home Chef	Food/Drug
148	Fat Brain Toys	Toys/Hobbies
149	Mobovida	Computers/Electronics
150	StocknGo	Health/Beauty
151	Austin Bazaar	Books/Music/Video
152	Tiger Fitness	Food/Drug
153	Sweaty Betty	Health/Beauty
154	Side By Side stuff	Automotive Parts
155	eCommerce Outdoors	Sporting Goods
156	SkinCareRx	Health/Beauty
157	Sports Unlimited	Sporting Goods



158	Golfballs.com	Sporting Goods
159	ZZ Performance	Automotive Parts
160	DealYard.com	Mass Merchant
161	Calendar Holdings	Office supplies
162	ScanMyPhotos.com	Computers/Electronics
163	Chain Reaction Cycles	Sporting Goods
164	Poppin	Office supplies
165	Woodcraft Supply	Hardware/Home improvement
166	Shop PBS	Books/Music/Video
167	GoHastings.com	Books/Music/Video
168	Airgun Depot	Sporting Goods
169	Ozone Billiards	Sporting Goods
170	Candy.com	Food/Drug
171	Accessory Geeks	Computers/Electronics
172	OverstockArt.com	Housewares/Home furnishing
173	BedBathStore.com	Housewares/Home furnishing
174	Bourbon & Boots	Mass Merchant
175	Maxwells Attic	Mass Merchant
176	Organize.com	Housewares/Home furnishing
177	GearUpGo.com	Sporting Goods
178	Candyland Store	Food/Drug
179	Office Supplies Lane	Office supplies
180	FindTape.com	Office supplies
181	Our Pampered Home	Mass Merchant
182	TikiMaster.com	Housewares/Home furnishing
183	Ashford.com	Jewellery