

THE STATE OF RESEARCH ON INFORMATION SYSTEM SATISFACTION

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ABSTRACT

Satisfaction with information systems (IS) has been and remains to be of great interest to both scholars and practitioners. The conceptualization of the construct, the theories employed to explain/predict it and the contexts of the empirical studies have changed considerably over time. Early research investigated system characteristics affecting end-user satisfaction, relying mostly on the IS success model. More recent research, on the other hand, studied satisfaction formation in the context of web-based products and services, using the disconfirmation theory originally developed in marketing. In this paper, we describe the evolution of IS satisfaction research and discuss the applicability of the marketing theories to IS contexts. We also explain the importance of further development and suggest future research directions.

INTRODUCTION

Satisfaction has been on the IS research agenda for decades. It appeals to both scholars and practitioners with its theoretical and practical significance. Early IS researchers, e.g., Ives, Olson and Baroudi (1983); and Bailey and Pearson (1983), examined user satisfaction as a function of system characteristics. Satisfaction was frequently used as a surrogate for IS success as it is linked to the success construct in a number of conceptual and empirical aspects (Bailey and

Pearson, 1983). It also enjoys a higher degree of face and convergent validity than other common success proxies such as usage and perceived usefulness. Usage is not an appropriate measure when it is mandatory. Perceived usefulness, on the other hand, fails to capture the affect of the users (Ein-Dor and Segev, 1978). The IS success model (DeLone and McLean, 1992) has served for a long time as the main framework for studying satisfaction. Some studies were conducted in the end-user computing environment and modeled system quality and information

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quality as the key determinants of satisfaction (Doll and Torkzadeh, 1988; Seddon, 1997; McHaney et al., 2002). Others examined service quality as another important determinant of satisfaction (Pitt et al., 1995; DeLone and McLean, 2002). With the emergence of electronic commerce, the distinction between end-users and customers blurred igniting a renewed interest in satisfaction with the focus shifting to online customer satisfaction. The importance of the online customer satisfaction topic to practitioners is mainly due to the strong relationship between satisfaction and retention (Rust and Zahorik, 1993; Rust, Zahorik and Keiningham, 1995; Hallowell, 1996). Customer retention is much cheaper than acquiring new customers (Crockett, 2000). The proliferation of Internet businesses presents even greater challenges to customer retention, as the costs of switching vendors are becoming lower.

Since the end-user of e-commerce applications is also a customer, recent IS studies applied behavioral theories originally developed in the marketing literature to explain end-user/customer satisfaction (McKinney, Yoon and Zahedi, 2002; Bhattacharjee, 2001). One such theory is the disconfirmation theory (Churchill and Suprenant, 1982). The disconfirmation theory stipulates that satisfaction is determined by a comparison between the perception of performance and a cognitive standard (Oliver and DeSarbo, 1988). Numerous marketing studies drew upon this theory to explain or predict satisfaction in the contexts of traditional products and services. Results are mixed, however, regarding the appropriate standard to adopt. Some of the initial studies relied on expectations as the benchmark (Churchill and Suprenant, 1982), while others proposed the use of experience-based norms (Woodruff, Cadotte and Jenkins, 1983). To enhance the logical consistency of the disconfirmation model, several subsequent studies replaced these standards with desires (Suh, Kim and Lee, 1994).

More recently, satisfaction was modeled as a simultaneous outcome of expectation and desire disconfirmation (Spreng, MacKenzie and Olshavsky, 1996; Chin and Lee, 2000; Khalifa and Liu, 2002a

CONTRIBUTION

Our study presents a critical review of the literature on IS satisfaction. We explain the theoretical and practical significance of the IS satisfaction construct and trace the main research developments from the early days of user satisfaction to the latest publications on online customer satisfaction. This historical account provides researchers who are new to this topic with a comprehensive review of the theoretical and methodological evolution of IS satisfaction research. The paper also synthesizes the most recent studies, highlighting their strengths and weaknesses. Opportunities for additional theoretical development are identified and future research directions are suggested accordingly.

&c). It is yet not clear which standard is more prominent in explaining and predicting satisfaction. Little has been done to resolve this issue. Recently, however, Khalifa and Liu (2002b) further developed the disconfirmation theory to enhance its applicability to the IS context. They conducted a longitudinal research to explain the variability of the significance and magnitude of the effects of desires and expectations over satisfaction at different adoption stages.

With the new shift towards the marketing approach in IS satisfaction research, the disconfirmation theory emerged as the main candidate for explaining IS satisfaction formation. The applicability of this theory, which was originally developed in marketing, to the IS context is, however, questionable. In this paper, we address this important issue in light of a comprehensive review of the state of research on satisfaction in the IS literature. Specifically, we study the evolution of the conceptualization and operationalization of the satisfaction construct. We also critically discuss the latest theoretical developments and suggest future directions of research.

In the following section, we describe the conceptualization and operationalization of satisfaction in early IS studies that focused on the end-user computing context. Next, we discuss the role of satisfaction in the IS

success model. We then describe the marketing theories of satisfaction formation and their application in contemporary IS studies. This is followed by an account of the latest theoretical developments in IS satisfaction research. Finally, we discuss the necessity of further developing the newly proposed theories to enhance their applicability to the IS context and suggest future directions of research.

USER/END-USER SATISFACTION

User satisfaction has been on top of the IS research agenda for almost 20 years (Haga and Zviran, 1994). Early studies examined satisfaction of primary users, such as managers or supervisors who deal with the information products generated by the systems (Davis and Olson, 1985). For example, McKinsey and Company (1968) evaluated the satisfaction of chief executives with organizational MIS efforts. DeSanctis and Gallupe (1987) measured manager satisfaction with a group decision support system (GDSS). User satisfaction is broadly defined as the “multidimensional attitude towards various aspects of MIS such as output quality, man-machine interface, EDP staff and services, and various user constructs such as feelings of participation and understanding” (Raymond, 1985). The subsequent proliferation of personal computing gave rise to growing research interests in end-user satisfaction. End-user satisfaction refers to the “affective attitude towards a specific computer application” (Doll and Torkzadeh, 1988) of “individuals who interact with the information system directly” (Martin, 1982; McLean, 1979; Rockart and Flannery, 1983).

End-user satisfaction was initially measured using survey instruments consisting of single-item measures only (Barrett, Thornton and Cabe, 1968; Lucas, 1976). As this approach provides little insight into the specific factors that drive satisfaction, multi-attribute measures were developed (Jenkins and Ricketts, 1979). Some examples of attributes proposed in these early instruments include system acceptance (Igersheim, 1976) and output quality (Lucas, 1978). One of the most frequently adopted measurement instruments for end-user satisfaction was developed by Doll and Torkzadeh (1988).

They defined the initial pool of items based on the instruments designed for the traditional computing environment (Bailey and Pearson, 1983; Ives, Olson and Baroudi, 1983). They introduced several factors to account for the direct interaction between end-users and specific computing applications (Sprague, 1980). The initial instrument consisted of 40 items using Likert scales. Structured interviews, exploratory factor analyses and pilot tests were conducted to verify the reliability and validity of the instrument. This resulted in a final instrument with five factors and 12 items. The five factors are content, accuracy, format, ease of use and timeliness. The instrument was further refined by a confirmatory factor analysis to test the robustness of the factor structures (Bollen, 1989, Joreskog and Sorbom, 1989). Subsequently, a multi-group invariance analysis was performed, verifying the robustness of the five factors across different population subgroups with some variation in the factor weights (Doll et al., 2000).

While some studies focused on system attributes (Ditsa and MacGregor, 1995), others included the quality of the information products generated from the system (DeLone and McLean, 1992) and the level of support provided (Miller and Doyle, 1987; Raymond, 1987).

Recently, Mahmood et al. (2000) proposed an integrative theoretical framework for the instrument development of end-user satisfaction. They compiled studies conducted in 1986 to 1998 and reconciled their differences in conceptualization, methodology, analysis techniques and sample characteristics. Results of a meta-analysis indicated that end-user satisfaction is mainly affected by perceived benefits, user background and organizational support. Perceived benefits are measured by user expectations, ease of use and perceived usefulness. User background is determined by user experience, user skills and user involvement in the system development process. Organizational support, on the other hand, is driven by user attitude towards IS, organizational encouragement and perceived attitude of top management. Zviran and Erlich (2003) provided a comprehensive list of literature on satisfaction measurement.

SATISFACTION AS A SURROGATE OF IS SUCCESS

User satisfaction is one of the key constructs in the IS success model developed in the early 1990s (Seddon, 1997; DeLone and McLean, 1992). This model conceptualized IS success at three different levels: the technical, semantic and influence/effectiveness levels. The technical level is captured by system quality, representing various system characteristics such as system reliability, online response time, system accuracy, system flexibility, ease of use etc. (Hamilton and Chervany, 1981; Swanson, 1974; Emery, 1971). The semantic level refers to the quality of the output of the information system in terms of information accuracy, timeliness, relevance, format, informativeness, usefulness, sufficiency, understandability, reliability, comparability, quantifiability, freedom from bias, currency, clarity and uniqueness (Bailey and Pearson, 1983; King and Epstein, 1983; Ahituv, 1980; Gallagher, 1974; Swanson, 1974). The technical and semantic levels are antecedents to the influence/effectiveness level, which includes usage and user satisfaction. These effectiveness variables are, however, not independent. They interact with each other, as increased usage is likely to enhance satisfaction and vice versa. IS success depends on the extent to which these three levels are translated into positive impacts on individuals and the organization.

The IS success model was subsequently further developed to include service quality as an additional antecedent to user satisfaction. The decentralization of IT led to the evolution of the role of information systems from a purely product-provider (supplying information products) to a mixed capacity that delivers both products and services (Oliver, 1998; Lloyd-Walker and Cheung, 1998; Pitt, Watson and Kavan, 1995; Kettinger and Lee, 1995). While the primary functions of an IS department used to be system development and operation, the scope of IS services has expanded to include responsibilities such as running technical help desks and information call centers (Pitt, Watson and Kavan, 1995). It is therefore not sufficient to explain user satisfaction based on system quality and information quality alone. The shift of the IS role from mere system building to service

provision has made the satisfaction of IS service recipients more customer-driven (Loh and Venkatraman, 1992; Cash, McFarlan and McKenny, 1992; Boynton and Zmud, 1988), highlighting the need to borrow service marketing concepts to better understand user satisfaction (Kettinger and Lee, 1995). Hence, Pitt et al. (1995) proposed to add service quality as another antecedent to user satisfaction in the IS success model.

Five distinct dimensions of service quality have been identified, namely, tangibles, reliability, responsiveness, assurance and empathy (Parasuraman, Zeithaml and Berry, 1988). Tangibles represent the physical facilities, equipment and appearance of personnel. Reliability refers to the ability to perform the promised service accurately and credibly. Responsiveness is the willingness to help promptly. Assurance denotes the knowledge and courtesy of IS employees and their ability to inspire trust and confidence. Empathy is defined as caring and individualized attention. Pitt, Watson and Kavan (1995) recommended the use of the SERVQUAL instrument to measure service quality. The instrument was originally developed in the marketing context (Parasuraman, Zeithaml and Berry, 1988) and subsequently validated in the IS domain (Kettinger and Lee, 1994, Kettinger, Lee and Lee, 1995).

In addition of being a key construct in the IS success model, satisfaction is also often used as a proxy for IS success (Zviran and Erlich, 2003; Ives, Olson and Baroudi, 1983; Olson and Ives, 1981) compared to usage or other variables in the success model. It enjoys a higher face validity than usage, which may not be a valid indicator of success in the case of mandatory usage. Individual and organizational impacts, on the other hand, are hard to quantify (Turner, 1982). Many IS benefits, such as reduced inventories and fastened decision-making processes, cannot be readily converted into monetary terms (Thong and Yap, 1996). It is also difficult to isolate the effect of IS implementation on organizational performance. Furthermore, the measurements for satisfaction are relatively better developed. (Gelderman, 1998; Ives, Olson and Baroudi, 1983; Olson and Ives, 1981; Swanson, 1974).

With the proliferation of electronic commerce, the distinction between end-users and online customers is becoming difficult if not impossible, stressing the need to integrate the IS and marketing satisfaction theories. The IS models that mainly focused on system/information characteristics are no longer sufficient to explain satisfaction in the online context, which is characterized by an interaction of both product/service and technological attributes (Palmer and Griffith, 1998). The focus of marketing models, on the other hand, is restricted to product/service attributes without capturing the system and information quality factors (emphasized in the IS models). Hence marketing models also cannot fully explain the notion of customer/end-user satisfaction.

SATISFACTION FORMATION – THE MARKETING THEORIES

The disconfirmation model is one of the primary theories for explaining satisfaction in the marketing literature (Yi, 1990). The theory stipulates that satisfaction is determined by the intensity and direction of the gap between perceived performance and a cognitive standard. Disconfirmation occurs in three forms: 1) positive disconfirmation; 2) confirmation; and 3) negative disconfirmation. Confirmation or positive (negative) disconfirmation occurs when perceived performance meets or exceeds (falls below) the cognitive standard. Positive (negative) disconfirmation is likely to result in satisfaction (dissatisfaction) (Oliver, 1981). Regarding the consequence of confirmation, mixed findings were reported. While some researchers argued that mere confirmation should lead to satisfaction (Miller, 1977; Swan and Combs, 1976), others suggested that it would result in indifference, as there were no “pleasant surprises” (Erevelles and Leavitt, 1992; Kennedy and Thirkell, 1988).

The disconfirmation model is grounded in the adaptation level theory, which postulates that perception of stimuli, i.e., perceived performance, is linked to an adapted standard, i.e., the cognitive standard (Bearden and Teel, 1983; Helson, 1964). This standard represents an adaptation level formed based on the perception of the stimulus, the context and the

organism. It is employed as a benchmark in subsequent evaluation processes, i.e., satisfaction judgment. Expectations are frequently adopted as the cognitive standard in the marketing literature. According to the expectancy theory (Tolman, 1932), expectations are shaped by personal experience and understanding of environmental factors, taking into account practical feasibility. They are therefore sometimes referred to as “predictive expectations” or “expected expectations” (Miller, 1977). Oliver (1980) argued that the conceptualization of expectations as anticipated occurrence of events best fits the adaptation level theory. The definition of expectations in the disconfirmation domain is therefore distinguished from that of normative expectations or ideal expectations. These categories of expectations are founded upon the equity theory (Adams, 1963) and the value-percept disparity theory respectively (Westbrook and Reilly, 1983), representing the degree of fairness and personal values. The expectation disconfirmation model has been verified in many empirical studies (Yelkur, 2000; Chiou, 1999; Spreng, MacKenzie and Olshavsky, 1996; Churchill and Suprenant, 1982; LaTour and Peat, 1979).

Experienced-based norms are alternative standards for disconfirmation. They denote certain beliefs about similar kinds of product/service formed based on past personal usage experience, word-of-mouth evidence and marketing efforts for those products/services (Woodruff, Cadotte and Jenkins, 1983). The proponents of norm-based disconfirmation argued that the conceptualization of norms is similar yet superior to expectations by accounting for past experience with *similar* subjects of evaluation. However, norms are constrained by the individual’s *actual* experience, and hence may not be applicable for new products/services (Cadotte, Woodruff and Jenkins, 1987).

Early disconfirmation studies assumed that the effect of perceived performance is fully mediated through disconfirmation. Exceptions, however, may occur when usage is mandatory or when the individual has no or little prior experience with the subject of evaluation. In these cases, the individual may either not bother or is unable to form concrete

expectations. His/her satisfaction may hence be primarily and independently driven by perceived performance. Tse and Wilton (1988) therefore added a direct link between perceived performance and satisfaction.

The expectation disconfirmation theory, however, suffers from logical inconsistencies and inadequacies in the case of extremely high/low expectations. Intuitively, an individual may nevertheless be satisfied (dissatisfied) if his/her high (low) expectations are slightly negatively (positively) disconfirmed, though the expectation disconfirmation theory predicts the opposite outcome. To address this void, Suh, Kim and Lee (1994) proposed the use of desires instead of expectations as the cognitive standard in the disconfirmation process. Unlike expectations, which are formed mainly based on prior experience and existing knowledge (Zeithaml, Parasuraman and Berry, 1990), desires represent inner emotional needs and wants that are not necessarily limited to rational cognitive understanding of environmental circumstances. According to the means-end theory (Gutman, 1982), desires are generally more present-oriented and are likely to stay stable over time. An individual may develop desires that are different from his/her expectations towards the same subject of evaluation. For instance, he/she may desire for a high level of online security with a university website (inner wants). He/she does not expect so, however, having considered the limited resources available to universities (environmental circumstances). Hence, perceived performance exceeding expectations does not lead to satisfaction if it falls below desires. Suh, Kim and Lee (1994) tested the desire disconfirmation model in the context of end-user computing using surveys involving 150 department heads of Korean firms. They adopted direct measures of the disconfirmation construct using a 5-point Likert scale. For expectation disconfirmation, the scale ranged from "better than I expected" to "a little poorer than I expected". The mid point was labeled as "just as I expected". Similarly, the scale of desire disconfirmation ranged from "better than I wanted" to "a little poorer than I wanted", using "just as I wanted" as the mid-point. A number of studies supported the argument that the desire disconfirmation

theory provides a better explanation of satisfaction formation (Spreng and Olshavsky, 1992; Olshavsky and Spreng, 1989).

Recently, we have witnessed a growing number of IS studies using the disconfirmation approach in examining satisfaction. Some of them focused on the conceptualization of satisfaction while others relied on the disconfirmation theory for measurement development. Susarla, Barua and Whinston (2003), for example, investigated the respective roles of expectation disconfirmation and norm-based disconfirmation as determinants of satisfaction with application service providers (ASP) using survey data collected from 256 firms. Their results indicated that expectations had significant impact on satisfaction, while the effect of norm-based disconfirmation was much weaker. McKinney, Yoon and Zahedi (2002), on the other hand, developed a measurement tool for online customer satisfaction, integrating the expectation disconfirmation model and the IS success model (DeLone and McLean, 1992). Accordingly, they stipulated information quality and system quality are the two major determinants of satisfaction. They measured expectations, perceived performance and expectation disconfirmation for each of these specific dimensions of quality. They also operationalized satisfaction with the direct approach, using a scale that ranged from "very pleased" to "very displeased". Similarly, Staples et al. (2002) provided support for the expectation disconfirmation theory in examining the relationship between expectations, perceived benefits and user satisfaction. Consistent with prior studies, their results showed that unrealistically high expectations are associated with low satisfaction and perceived benefits. Several studies applied the expectation disconfirmation theory in the context of IS continuance. Bhattacharjee (2001), for example, modeled satisfaction to be one of the determinants of continued adoption of online banking services. In this study, satisfaction is conceptualized and operationalized using the expectation disconfirmation approach.

Compared to the previous IS models, the disconfirmation theory examines not only the system/information attributes affecting satisfaction but also the underlying satisfaction

formation process. In other words, it further addresses *how* and *why* individuals are satisfied/dissatisfied instead of merely investigating *what* leads to satisfaction. This shift of research approach provides greater insights to end-users/online customers' psychology, strengthening the theoretical underpinning for the conceptualization of satisfaction.

Most IS studies, however, applied the expectation disconfirmation theory directly without further development. They overlooked the possibility that some unique IS contextual factors may potentially impair the validity of the theory, which is originally developed and tested in contexts that are very different from the IS environment.

FURTHER DEVELOPMENT TO THE DISCONFIRMATION THEORY

One of the few attempts to further develop the disconfirmation theory was made by Chin and Lee (2000). They argued that expectations and desires may have direct and independent effects over satisfaction and therefore should be included simultaneously in the disconfirmation model. An individual may be dissatisfied after all if perceived performance falls below his/her desires despite that his/her expectations are met or exceeded. On the other hand, one may have minimal desires towards the subject of evaluation (he/she does not want it at all), yet he/she may still be dissatisfied if the expectations developed based on, e.g. advertising claims, are not fulfilled. Chin and Lee (2000) therefore proposed a satisfaction model that captured both expectation disconfirmation and desire disconfirmation. They developed a survey instrument for the proposed model, but did not test it empirically.

Khalifa and Liu (2002a & c) provided further support for the argument of the simultaneous consideration of expectations and desires in explaining satisfaction formation. They examined satisfaction with Internet-based services in the context of an online knowledge community, including both expectation disconfirmation and desire disconfirmation as determinants of satisfaction. Two online surveys were administered to 131 community members,

eliciting their pre-adoption expectations and desires and their post-adoption evaluation of the online offerings. Their empirical results show that both expectation disconfirmation and desire disconfirmation affect satisfaction significantly with similar magnitudes. Khalifa and Liu (2002 a&c) also performed additional analysis using formative measures for expectations and desires and identified a number of critical expectation/desire factors driving satisfaction. These factors include information worthiness, membership perks, reliability of technical systems, user-friendliness, membership service quality, security and page loading speed. These studies, however, were cross-sectional and did not examine the evolution and the dynamic nature of satisfaction. They did not explain whether the magnitude and relative importance of the determinants of satisfaction could change over time. As suggested by Mahmood et al. (2000), technologies and user requirements change so rapidly that satisfaction should be assessed using longitudinal studies to reflect the changing attitude over the usage period.

THE DYNAMIC NATURE OF SATISFACTION IN THE IS CONTEXT

To investigate the evolution of satisfaction, Khalifa and Liu (2002b) followed a longitudinal approach and extended their previous study to examine satisfaction with Internet-based services in different adoption stages. They conceptually differentiated IS satisfaction from satisfaction in the marketing context, arguing for the dynamic nature of IS satisfaction and for the variability of the significance and relative importance of its determinants over time. The rationale being that the novelty elements inherent in IT are likely to cause rapid or constant changes in the nature and the level of cognitive standards, i.e., expectations and desires, used in the disconfirmation process. Consequently, satisfaction is also likely to change over time. In the initial stage of adoption, individuals may not have adequate prior experience or knowledge to form concrete expectations. They may therefore perform their evaluation by relying more heavily on alternative cognitive standards, i.e., desires that are less experience/knowledge-based. Upon

acquisition of increased actual usage experience, the individuals may be able to form more accurate expectations and hence attach more importance to these standards in judging satisfaction. In support of these arguments, some other studies (Bhattacharee, 2001) have also suggested that post hoc standards were likely to change as a result of accumulated experience.

To empirically verify the evolution of satisfaction and the change of significance and relative importance of its determinants over time, Khalifa and Liu (2002b) developed a satisfaction model distinguishing between the adoption and the post-adoption stages. As consistent with their earlier studies (Khalifa and Liu a & c), they included both expectation disconfirmation and desire disconfirmation as determinants of satisfaction. Khalifa and Liu (2002b) empirically validated the research model with 107 members of an online community of practice. Results of the analysis indicated that the relationship between satisfaction at adoption and post-adoption satisfaction is insignificant, providing support for the argument that satisfaction is a dynamic concept. While both desire disconfirmation and expectation disconfirmation have important effects on satisfaction at adoption, the role of desires diminishes in the post-adoption stage. These findings demonstrate the variability of the significance and magnitude of the determinants of satisfaction over different stages of adoption.

An important implication presented by Khalifa and Liu (2002b)'s study is that the traditional disconfirmation model originated from the marketing literature does not suffice for explaining IS satisfaction which, unlike in the regular physical settings (marketing), is more dynamic in nature. It is therefore necessary to develop a contingency theory to more fully explain/predict satisfaction in the IS context.

CONCLUSION AND IMPLICATIONS FOR FUTURE RESEARCH

The theoretical and methodological development of IS satisfaction research has been evolving to keep abreast of the pace of technological advancement. Early studies modeled user/end-user satisfaction with

information systems as a function of system/information attributes. The recent proliferation of electronic commerce has triggered a shift in this approach to focus on the underlying formation process of satisfaction, whereby accounting for the mix of technological and marketing elements that become more salient in the Internet environment. The blurring roles of end-user and online customer has rendered the initial IS models insufficient to explain online satisfaction. Recent IS studies therefore applied sound behavioral theories developed in the marketing literature to provide a better understanding of the phenomenon. One such theory is the expectation disconfirmation theory that stipulates satisfaction as a result of a comparison between perceived performance and expectations.

The application of the disconfirmation theory in studying online satisfaction represents a good step towards the development of an IS satisfaction theory. Previous IS models focused only on specific factors, i.e., *what*, that lead to satisfaction, overlooking the underlying formation process, i.e., *how* and *why*, of satisfaction. The disconfirmation theory enables a better understanding of the psychological state of the online customers/end-users, which is important in explaining the dynamic nature satisfaction and the variability of its determinants over time.

While a number of studies applied the expectation disconfirmation models without much adaptation, some others have indicated the need for further theoretical development. The disconfirmation theory was originally developed and tested in the marketing context, which is significantly different from that of IS. The novelty elements characterized in IT may hinder the formation of accurate expectations and hence impair the explanatory power of the expectation disconfirmation theory. Furthermore, online satisfaction is also likely to be more dynamic in nature with higher variability of its determinants over time. The latest studies therefore adopted a longitudinal approach to investigate this issue and included both expectations and desires as simultaneous determinants of satisfaction, demonstrating the variability of the significance and magnitude of these determinants at different adoption

stages.

In conclusion, the state of IS satisfaction research reveals that there is still ample room for the development of an IS satisfaction theory. Future research should take into consideration of the variability of the determinants of satisfaction and model the appropriate drivers depending upon the stage of adoption. To explain the inconsistent significance of expectations/desires reported in different adoption stages, future research could consider the inclusion of moderating variables to strengthen explanatory power of the expectation disconfirmation theory for IS satisfaction in all adoption stages. Another important research issue is the formation of

expectations and desires. Future research can explore whether an interaction effect exists when they form or whether they converge over time. Future research should also verify whether satisfaction becomes static at a certain point of time at post-adoption. Constant reviews of the adequacy of the satisfaction measurement instrument are also necessary to capture new factors arising from technological advancement.

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