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Article

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Effects of post-adoption beliefs on customers' online product recommendation continuous usage: An extended expectation-confirmation model

Muhammad Ashraf¹, Jamil Ahmad^{1*}, Asad Afzal Hamyon¹, Muhammad Ramzan Sheikh² and Wareesa Sharif³

Abstract: This study aims to extend expectation-confirmation model (ECM) of IS continuance based on effort-accuracy model (EAM) for predicting and explaining continuous usage of online product recommendation (OPR) that has been ignored in prior literature. The proposed OPR continuance model, incorporating the post-adoption beliefs of perceived usefulness, perceived decision quality and perceived decision effort, was empirically validated with data collected from an online survey of 626 existing users of the OPR. Results indicated a good explanatory power of the OPR continuance model ($R^2 = 62.1\%$ of OPR continuance intention, $R^2 = 53\%$ of satisfaction, $R^2 = 50.5\%$ of perceived usefulness, and $R^2 = 9\%$ of perceived decision effort, and $R^2 = 72.3\%$ of perceived decision quality), with all major paths supported except one. We also analysed the data on the original ECM that reveals lower variances explained compared to the OPR continuance model (D6% in OPR continuance intention, D5.1% in customer satisfaction, and D3.2% in perceived

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PUBLIC INTEREST STATEMENT

Many studies have been done on initial usage of online product recommendation (OPR), it is premature to consider OPR adoption as success until its post-adoption usage is confirmed. If users' enthusiasm diminishes after the initial usage of the OPR, then its usage may be reduced or discontinued subsequently. Due to the significance of OPR continued use, it is essential to identify the factors that have impact on users' post-adoption behaviour. However, this study integrated expectation-confirmation model (ECM) and effort-accuracy model for predicting users' continuous usage behaviour. Results—based on data collected from an online survey of 626 existing users of the OPR—indicated that the proposed OPR continuance model has a good explanatory power, even compared to the original ECM. At a practical level, this study presents deeper insights into how to address users' satisfaction and OPR continued patronage.

usefulness). The salient effect of perceived decision quality signifies that the nature of the IS can be an important boundary condition in understanding the continuance behaviour. At a practical level, this study presents deeper insights into how to address users' satisfaction and continued patronage.

Subjects: Production, Operations & Information Management; Management of Technology & Innovation; Corporate Social Responsibility & Business Ethics

Keywords: online product recommendation; decision effort; decision quality; usefulness; satisfaction; OPR continuance intention

1. Introduction

The discovery of factors leading to individuals' usage of information system (IS) or IS-enabled services (i.e., online product recommendation [OPR]) is a perennial research issue in IS literature which continues to receive much attention (Ashraf, Jaafar, & Sulaiman, 2016; Lee, 2010; Thong, Hong, & Tam, 2006). Although initial usage is an important, actual success of IS needs continuous usage (Lee, 2010). However, it is premature to consider an IS adoption as success until its post-adoption usage is confirmed (Thong et al., 2006). If users' enthusiasm diminishes after the initial usage of an IS, then its usage may be reduced or discontinued subsequently. When it happens, companies that have developed the IS services would need to write-off their investment (Thong et al., 2006). Due to the significance of IS continued use, it is essential to study the factors that have impact on users' post adoption behaviour. However, this study extends the expectation-confirmation model (ECM) for predicting users' continuous usage behaviour. Although ECM is a robust model, it employs only three factors to predict behavioural intention, namely usefulness, confirmation, and satisfaction (Bhattacharjee, 2001). Additionally, past studies (Oghuma, Libaque-Saenz, Wong, & Chang, 2015; Zhao, Deng, & Zhou, 2015) suggested that a user's continued IS use may also be affected by other factors derived from different stream of literature. Therefore, this study incorporated two additional user beliefs—decision effort and decision quality—into the IS continuance model. These additional factors are part of the effort-accuracy model and have been found to play a salient role in users' acceptance of recommender systems (Xu, Benbasat, & Cenfetelli, 2014). The extended ECM model would enable us to broaden the scope of users' continued IS behaviour, and at the same time to expand the applicability of the IS continuance model in different context of IS usage such as OPR.

OPR generated by product recommender system investigated in this study, is a new type of IS innovation in the field of e-commerce which is gradually becoming important in online buying decision process. In this study, OPR refer to system generated recommendation which also consist of consumer reviews. The consumer reviews are integrated in OPR, perhaps with the purpose of providing more related information in order to improve buying decision or to enhance the effectiveness of the recommendation (Ashraf, Jaafar, & Sulaiman, 2019; Baum & Spann, 2014; Lin, 2014). For example, Baum and Spann (2014) investigated the impact of interplay between system recommendation and consumer reviews on consumers' intention to follow OPR. They demonstrated that providing consumers' positive opinion in OPR increases effectiveness of the recommender system. Additionally, absence of product evaluation, immense choices, complexity and enormous amount of information also challenge customers' limited information processing capabilities (Ashraf et al., 2019; Sheng, Li, & Zolfagharian, 2014). Consequently, identifying a product which fit their need is not an easy task (Xiao & Benbasat, 2007). Additionally, there is also customers' dilemma of wanting to have more information on the one hand and being overloaded with too much information on the other hand (Sheng et al., 2014). In order to help the customers to deal with this dilemma, e-retailers (e.g., Amazon) are increasingly equipping e-commerce websites with distinct recommender systems to provide highly personalized recommendations and assistance in searching, comparing, and evaluating products (Ashraf, Jaafar, & Sulaiman, 2017a; Sheng et al., 2014). Consequently, OPR enables customers to reduce cognitive efforts in decision-making processes, enhance product

inspection, and improve decision quality (Ashraf et al., 2019; Häubl & Murray, 2006). However, the actualisation of these benefits depends on whether and to what extent customers embrace and fully utilise OPR. Nevertheless, no matter how useful OPR is, a critical issue is whether consumers continue to use the OPR (Sheng et al., 2014).

Past studies reported the usage of various types of IS innovations from simple and limited functions [e.g., word processor (Davis, 1989)] to complex functions [e.g., mobile Internet services (Thong et al., 2006), e-learning (Lee, 2010), online recommendation system (Helmert, Krishnan, & Patnam, 2019)]. Users' interaction with OPR is far different and varied to support diversified expectations and needs. However, this study also attempts to contribute to the IS post-adoption literature about the role of technological nature as a boundary condition in predicting and explaining customers' OPR continuance intention. Therefore, understanding the factors affecting customers' intention to continue OPR use will not only assist developers in designing effective online recommendation system, but also help e-retailers to design strategies that are more likely to increase the use of OPR.

In summary, this study has two research objectives: (i) to develop an extended IS continuance model which is applicable to different kind of innovation that has consumer appeal (ii) to provide empirical validation for the utility of the extended IS continuance model and the factors influencing OPR continuance. To achieve these objectives, we integrated the ECM and EAM to extend IS continuance model. Since each model has distinct roots and is based on a different set of antecedent variables, we contend that they independently provide a partial understanding of customers' cognitive processes related to OPR usage. It is therefore possible that, combining these two theoretical models may collectively provide a more comprehensive and an improved understanding of the cognitive processes and behaviour related to OPR continuous usage than when each model considered alone. However, the primary contribution of this study is its examination of the integration of ECM and EAM in predicting and explaining OPR continuous usage intention and an empirical evaluation of which factors are critical to affecting this intention.

2. ECM of IS continuance

Bhattacharjee (2001) developed ECM of IS continuance by integrating expectation-confirmation theory (ECT) and technology acceptance model (TAM) based on the congruence between individuals' IS continuance decisions and consumers' re-purchase decisions. ECT has been used in the context of consumer behaviour to examine customers' satisfaction and re-purchase decision (Churchill & Surprenant, 1982; Oliver, 1993). ECT hypothesizes that a consumer's level of satisfaction with a product determines re-purchase intention. The satisfaction level is then determined by his/her pre-purchase expectations about the product performance, and discrepancies between expectations and product performance (i.e., disconfirmation). The expectation-confirmation is attained when the product performs as much as expected: positively confirmed when the product performs better than expected; and negatively confirmed when the product performs worse than expected (Churchill & Surprenant, 1982). The ECM posits that an individual's intention to continue IS use is dependent on following three variables: (i) the user's level of satisfaction with the IS, (ii) the extent of user's confirmation of expectations, and (iii) post-adoption expectations in the form of perceived usefulness.

The ECM has unique features, first it highlights the importance of post-adoption expectations rather than pre-adoption expectations. An individual keep updating expectations towards using an IS as he/she gains more experiences. After assimilation of these experiences, an individual's expectations toward using the IS could be different from the initial expectations before using it (Bhattacharjee, 2001; Edwards, Edwards, Westerman, & Spence, 2019). Therefore, Bhattacharjee (2001) argued that the post-adoption expectations are the relevant factors of an individual's level of satisfaction with the IS. Second, perceived usefulness is used as a surrogate measure of post-adoption expectation which is a salient cognitive belief, and it is consistent with the definition of expectation in the ECT as individual belief (B) or sum of beliefs (ΣB_i) (Davis, 1989). Third, the ECM did not adopt the performance variable, as it presumes that the effect of performance is already

captured within confirmation and satisfaction variables (Bhattacharjee, 2001). Fourth, it provides an adequate explanation of IS acceptance-discontinuance anomaly by explaining causality relationship of expectation disconfirmation-dissatisfaction which subsequently causes IS discontinuance (Bhattacharjee, 2001; Nam, Baker, Ahmad, & Goo, 2018). However, users' satisfaction determines IS continuance intention.

Owing to the similarity between re-purchasing and continue IS use, the ECM posits an equivalent relationship in the context of IS continued use. Furthermore, satisfaction is influenced by two cognitive beliefs of the individuals: confirmation of expectations and perceived usefulness. Users' expectation provides the baseline for the confirmation which subsequently determine their level of satisfaction (Ashraf et al., 2017a). Individuals' confirmation of expectations suggests that the individual obtained expected benefits by experiencing with the IS that leads to a positive impact on their satisfaction with the IS usage (Islam, Mäntymäki, & Bhattacharjee, 2017). However, individuals' confirmation of expectations is positively related to their perception of usefulness. Additionally, perceived usefulness is a central motivator of IS usage over both stages of pre- and post-adoption that substantively effect individuals' continued IS use (Bhattacharjee, 2001). Several subsequent studies applied ECM and validated its robustness in various contexts such as mobile Internet service (Thong et al., 2006), e-learning (Lee, 2010), online social network (Sun, Liu, Peng, Dong, & Barnes, 2014), mobile apps (Tam, Santos, & Oliveira, 2018). Without arguing further, we derived following hypotheses in our study context of OPR:

H1: Satisfaction with OPR has positive impact on customers' intention to continue OPR use.

H2: Perceived usefulness of OPR has positive effect on customers' intention to continue OPR use.

H3: Perceived usefulness of OPR has positive impact on customer's satisfaction with OPR use.

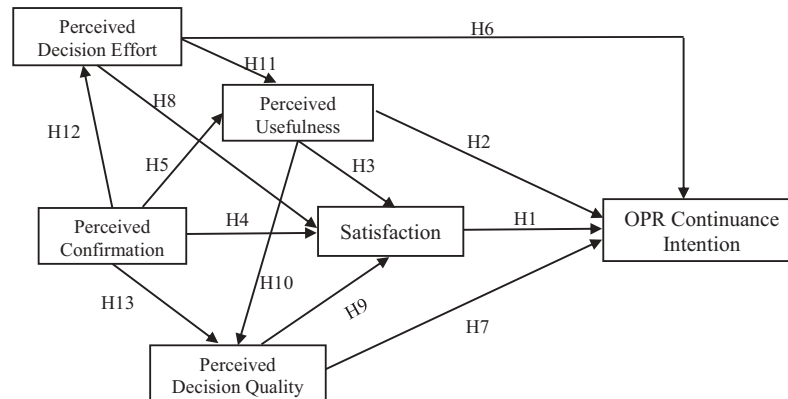
H4: Confirmation of expectations is positively related to customer's satisfaction with OPR use.

H5: Confirmation of expectations is positively related to customers' perceived usefulness of OPR use.

3. Extended ECM of OPR continuance

Bhattacharjee (2001) stated that a further extension of the ECM would better explain the continued IS usage behaviour. Such extensions can be found in the past IS literature (e.g., Edwards et al., 2019; Islam et al., 2017; Thong et al., 2006) by incorporating variables from different theoretical frameworks (i.e. Flow theory, Usability theory). Further, Zhang (2007) argued based on the concept of motivational affordance that individuals would like to use and continue to use an IS in order to fulfil their different social-psychological, instrumental, and decision-related needs. Accordingly, this study extends ECM by incorporating two additional post-adoption beliefs: perceived decision effort and perceived decision quality. These two additional constructs are incorporated based on effort-accuracy model (Payne, Bettman, & Johnson, 1993). This study proposes that these additional post-adoption constructs together with the two original constructs of ECM can help us to better understand the customers' intention to continue OPR use. Past studies (Xiao & Benbasat, 2007; Xu et al., 2014) have also applied the effort-accuracy model to examine the influence of online recommendation as decision aids on cognitive effort and decision quality. They argued that it is not feasible for human to evaluate all available alternative products before making final choice due to their limited cognitive capacity. Therefore, a customer seeks a substantial and comprehensive source of information for selecting better quality product while exerting lower decision effort. Further, it is reported that the customers would most likely to continue OPR use, if the OPR as a decision aid helps the customers in reducing their decision effort and improve buying decision quality (Wang & Benbasat, 2009; Xu et al., 2014). The proposed research model and hypotheses are illustrated in Figure 1.

Figure 1. Proposed extended expectation-confirmation model of OPR continuance.



Consistent with the effort-accuracy model, if customers perceive that OPR as a decision strategy assists them in reducing their buying decision effort and also helps in improving their buying decision quality, then they would most likely to continue OPR use for future buying (Wang & Benbasat, 2009; Xu et al., 2014). In contrast, if customers perceive that the OPR does not facilitate in increasing decision quality, then they would more likely to discontinue using the OPR for future buying (Ashraf, Jaafar, & Sulaiman, 2017b; Xu et al., 2014). Moreover, if the customers perceive that using OPR also requires extra effort for searching and screening alternate products in order to make a final choice, all other things being equal, then they would prefer to rely on their own capabilities rather than relying on the OPR to make a final choice. Hence, we arrived at following hypotheses:

H6: Perceived decision effort has negative impact on customers' intention to continue OPR use.

H7: Perceived decision quality has positive impact on customers' intention to continue OPR use.

Parikh and Fazlollahi (2002) demonstrated that there is strong correlation between decision factors and satisfaction. Xu et al. (2014) reported that increased decision quality and reduced decision effort during OPR usage may contribute to users' positive perceptions of the OPR. These studies have shown that decision quality and decision effort are important cognitive beliefs in determining satisfaction with the OPR usage. The customers would most likely to continue OPR use, if they are satisfied with their expectation-confirmation for reducing the decision effort exerted and improving the buying decision quality (Ashraf et al., 2017b; Hostler, Yoon, & Guimaraes, 2005; Wang & Benbasat, 2009; Xu et al., 2014). Thus, we proposed following hypotheses:

H8: Perceived decision effort has negative influence on customers satisfaction with the OPR use.

H9: Perceived decision quality has positive impact on customers satisfaction with the OPR use.

Consistent with the two stage decision process of human information processing theory (Simon, 1955), OPR enables the customers to have a manageable set of alternatives which subsequently easy to evaluate the reduced set of recommended products in depth for choosing a product. This usefulness of OPR may overcome customers' perception of uncertainty about the product quality which subsequently would improve decision quality (Ashraf et al., 2019; Xiao & Benbasat, 2007). Moreover, Seo, Lee, and Lee (2013) demonstrated that perceived usefulness of a decision aid positively influence users' decision quality. Hence, perceived usefulness of OPR is expected to have positive impact on customers perceived decision quality.

H10: Perceived usefulness of OPR has positive impact on customers' perceived decision quality of OPR.

Thong et al. (2006) reported that any system which is perceived easy to use will facilitate its continuous usage. Since perceived decision effort is similar to perceived ease of use in terms of cognitive effort exerted by the OPR users (Huang, Tan, Ke, & Wei, 2013), it is expected that perceived decision effort leads to influence perceived usefulness of OPR. An OPR requires less cognitive effort in making buying decision would be perceived more useful in terms of better task performance than the OPR requires greater cognitive effort. It is also expected that the level of confirmation would be negatively related to the perceived decision effort and positively related to perceived decision quality. That is, as customers gain confirmation experience with the OPR use, the customers' perception of decision effort and decision quality will be updated and become more concrete in determining the OPR continued use. Thus, we proposed following hypotheses:

H11: Perceived decision effort has negative impact on customers' perceived usefulness of OPR.

H12: Confirmation of expectations has negative effect on customers' perceived decision effort of OPR.

H13: Confirmation of expectations has positive influence on customers' perceived decision quality of OPR.

4. Research method

4.1. Construct measurement

All the items measuring the research variables were adapted from prior studies (Bhattacharjee, 2001b; Xu et al., 2014; Benlian, Titah, & Hess, 2012) and slightly modified to suit the study context of OPR (For detail, see Table A1). Most of the items have used a 5-point Likert scale with endpoints for "strongly disagree" and "strongly agree", except for the satisfaction items which were measured on 5-point semantic differential scales and OPR continuance intention used scale ranging from "very unlikely" to "very likely". Two screening questions were also included to determine whether the respondents have used OPR and bought at least one product over the last six months. Only responses from existing users of OPR were included in the data analysis. In order to improve the validity and reliability of the survey instrument, the construct measurements were validated by an expert panel (consisting of 2 academicians, 1 e-retailer, and 2 online customers), pre-testing (9 academicians), and pilot testing (50 Amazon customers). The pilot test showed that constructs have good internal consistency (all alpha values were greater than 0.80), thus no further modifications were made in the survey questionnaire.

4.2. Data Collection

This study focused on real users of OPR, because most of the past studies have neglected the "real-world" users environment in favour of controlled and overly structured laboratory experiments, and were thus unable to explore how decision makers actually obtain information and use in buying decision making process (Zha, Li, & Yan, 2013). However, Amazon customers were considered as target population due to following four major reasons: first, Amazon is recognized as one of the leading e-commerce retailers and is a positive example for other online shopping stores in terms of the way it supports the provision of OPR (Archak, Ghose, & Ipeiritis, 2011; Benlian et al., 2012). Second, the Amazon customers are likely to present strong online buying power. Third, they have exposure of OPR while buying online (Ashraf et al., 2019). Fourth, a verified list of Amazon customers is available on the Amazon website that was used for administering online survey.

An online survey was designed on surveymonkey platform sent to Amazon customers and subsequently 626 valid responses were received. In total 626, 329 (52.6%) respondents were males and 156 (24.9%) and 171 (27.3%) respondents were in age groups of 36–45 years and

more than 55 years, respectively. Regarding geographical location of the respondents, they belong to 15 different countries, but majority of respondents were from USA (45%) and UK (14.1%), followed by Germany (7.2%), France (6.1%), Italy (5.6%), Canada (4.8%). Moreover, five point Likert scale was used to measure respondents' familiarity with Amazon and OPR, mean value shows that respondents have higher familiarity with Amazon (mean = 4.81, SD = 0.593) and OPR (mean = 4.62, SD = 0.838), and they regularly visit Amazon (mean = 4.32, SD = 0.81). With respect to respondents' experience of online buying and OPR usage, 78.9% of the respondents have been buying product online for more than 5 years, whereas 58.6% have been using OPR for more than 5 years. Over the last 6 months, 350 (55.9%) respondents purchased more than 20 products. The demographic summary of survey respondents is presented in Table 1.

Table 1. Demographic summary of survey respondents (N = 626)

Variables	Frequency (%)	Variables	Frequency (%)
Gender		Marital Status	
Male	329 (52.6)	Single	137 (15.3)
Female	289 (46.2)	Married	382 (61.0)
Missing Values	8 (1.3)	Living with partner	13 (2.1)
		Divorced	57 (9.1)
		Widowed	22 (3.5)
		Other	2 (0.4)
		Missing Values	13 (2.1)
Age group		Purchases over six months	
Less than 20 years	6 (1.0)	1–5	131 (20.9)
20–25 years	37 (5.9)	6–10	69 (6.7)
26–35 years	110 (17.6)	11–15	42 (2.1)
36–45 years	156 (24.9)	15–20	13 (0.4)
46–55 years	141 (22.5)	16–20	21 (11.0)
More than 55 years	171 (27.3)	More than 20	350 (55.9)
Missing Values	5 (0.8)		
Online buying experience		Geographical Location	
Less than 1 year	6 (1.0)	Australia	26 (4.2)
1–2 years	7 (1.1)	Brazil	9 (1.4)
2–3 years	32 (5.1)	Canada	30 (4.8)
3–4 years	45 (7.2)	China	4 (0.6)
4–5 years	42 (6.7)	France	38 (6.1)
More than 5 years	494 (78.9)	Germany	45 (7.2)
		India	21 (3.4)
OPR usage experience		Ireland	1 (0.2)
Less than 1 year	22 (3.5)	Italy	35 (5.6)
1–2 years	43 (6.9)	Japan	8 (1.3)
2–3 years	52 (8.3)	Mexico	8 (1.8)
3–4 years	78 (12.5)	Netherlands	3 (0.5)
4–5 years	64 (10.2)	Spain	11 (1.8)
More than 5 years	367 (58.6)	UK	88 (14.1)
		USA	282 (45)
		Other	3 (0.5)
		Missing Values	14 (2.2)

5. Results

For data analysis, we followed the two-step procedure recommended by Anderson and Gerbing (1988) and subsequently followed by several past studies (e.g., Ashraf et al., 2017b). First, we examined the measurement model to measure reliability and validity. In addition to that, goodness fit of the measurement and structural models were also examined by conducting confirmatory factor analysis using AMOS21. Second, we then examined the structural model via structural equation modelling (SEM) using SmartPLS (version 2 M3). Compared to covariance-based SEM (CB-SEM), PLS-SEM is more robust to multicollinearity and distributional variance in item properties, flexibly supports a variety of research variable types (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014).

5.1. Analysis of measurement and structural models

The reliability and validity of the research variables are presented in Tables 3 and 4. All the composite reliability (CR) estimates and Cronbach's alpha values are 0.767 or higher, indicating that each construct exhibited strong internal reliability (Hair et al., 2014). The average variances extracted (AVE) are 0.695 or greater, exceeding the rule-of-thumb of 0.50, indicating that at least 69.5% of the variances observed in the items are accounted for by their hypothesized variables reliability. Moreover, confirmatory factor analysis (CFA) is another indicator of convergent validity. We performed CFA using PLS-SEM in order to examine the inter-factor and cross-factor loadings. The convergent validity is realized if the items of each construct load exceed 0.70 on their respective construct than the other constructs (Hair et al., 2014). As shown in Table 2, loadings for all items of the reflective construct is reported to have values greater than 0.876, and AVE values for all constructs are above than cut point of 0.50. Consequently, the convergent validity is achieved among all constructs. In addition, the squared multiple correlations of each item (ranging from 0.707 to 0.969) exceeded the 0.40 limit for convergent validity (Hair et al., 2014).

There are two ways to assess the discriminant validity (Hair, Black, Babin, & Anderson, 2010). First, factor loading of each item must be greater than the cross loadings of items of other constructs. Second, the level of correlation between the construct and other constructs. For the first type of discriminant analysis, the CFA analysis was performed and the results showed that the measurements of the constructs were more strongly loaded on their respective constructs than other constructs. For second type of discriminant validity analysis, we compared the squared correlations between constructs with the AVEs for individual constructs. Table 3 shows that all AVEs are greater than the squared correlations, providing evidence of discriminant validity.

To determine the fitness of the measurement model, we also conducted a confirmatory factor analysis (CFA) using AMOS 21. Various indices are used to evaluate the model fit (see Table 4). The goodness-of-fit (GFI) and adjusted goodness-of-fit (AGFI) are 0.93 and 0.903, respectively. The values of the comparative fit index (CFI) and normalized fit index (NFI) are 0.987 and 0.98 respectively, also indicating good model fit. The observed value for root mean square error of approximation (RMSEA) is 0.054, which is within the recommended cut-off values of 0.08 for RMSEA. Generally, fit statistics greater than or equal to 0.9 for GFI, NFI, and CFI, but the values of AGFI and PCFI should be greater than or equal to 0.8 indicate a good model fit (Anderson & Gerbing, 1988). Hence, the results of fit indices met the criteria, indicating good model fit. As results shown in Table 4, the structural model also has an adequate fit (Hooper, Coughlan, & Mullen, 2008).

5.2. Hypotheses Testing

As shown in Figure 2, all hypothesized paths (except one paths H6) are strongly significant at $p < 0.001$ and $p < 0.01$. The effect of the newly added post-adoption perceived decision quality is salient in the extended ECM of OPR continuance. The results show that perceived decision quality has strongest effect on customer satisfaction and intention to continue OPR use, conversely perceived decision effort has significant effect on satisfaction, but not on intention to continue OPR use. In terms of variance explained, the extended ECM of OPR continuance accounted for

Table 2. Descriptive statistics and convergent validity

Variables	N	Mean	SD	Factor Loadings	Squared Multiple Correlations	Alpha Value	CR	AVE
OPR Continuance Intention						0.982	0.987	0.950
CUI1	626	4.185	0.955	0.974	0.925			
CUI2	626	4.139	0.946	0.971	0.921			
CUI3	626	4.172	0.946	0.984	0.969			
CUI4	626	4.177	0.957	0.970	0.919			
Customer Satisfaction						0.949	0.963	0.867
CS1	626	3.762	1.024	0.907	0.738			
CS2	626	3.616	1.060	0.950	0.881			
CS3	626	3.525	1.061	0.936	0.850			
CS4	626	3.470	1.041	0.930	0.839			
Decision Effort						0.946	0.961	0.861
DE1	626	2.496	0.885	0.877	0.707			
DE2	626	2.453	0.878	0.941	0.815			
DE3	626	2.471	0.896	0.951	0.941			
DE4	626	2.518	0.912	0.939	0.898			
Decision Quality						0.942	0.956	0.813
DQ1	626	3.665	0.924	0.895	0.763			
DQ2	626	3.572	0.941	0.914	0.795			
DQ3	626	3.474	0.963	0.911	0.785			
DQ4	626	3.717	1.021	0.875	0.704			
DQ5	626	3.669	1.000	0.913	0.790			

(Continued)

Table 2. (Continued)

Variables	N	Mean	SD	Factor Loadings	Squared Multiple Correlations	Alpha Value	CR	AVE
Perceived Confirmation						0.767	0.868	0.695
PC1	626	3.473	0.914	0.928	0.843			
PC2	626	3.396	0.905	0.932	0.836			
PC3	626	3.345	1.041	0.695	0.773			
Perceived Usefulness						0.963	0.972	0.872
PU1	626	3.712	1.112	0.934	0.855			
PU2	626	3.806	1.096	0.951	0.885			
PU3	626	3.837	1.149	0.923	0.806			
PU4	626	3.832	1.050	0.915	0.788			
PU5	626	3.710	1.121	0.946	0.873			

Table 3. Discriminant validity

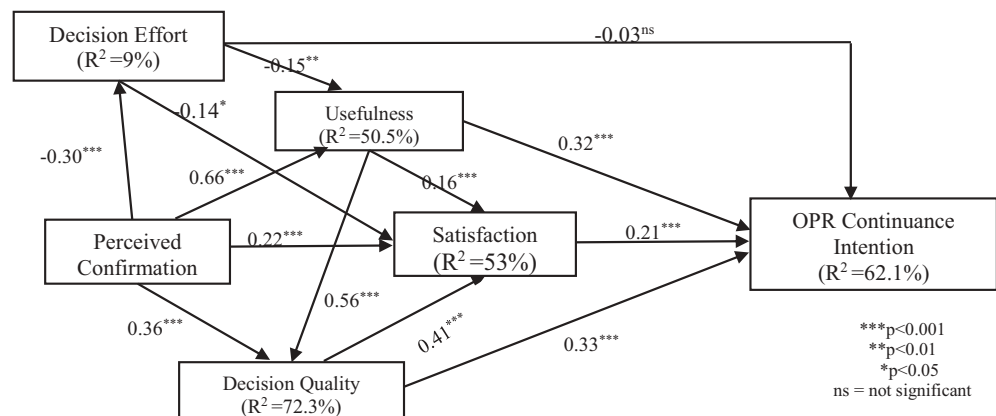
Constructs	CUI	CS	DE	DQ	PC	PU
OPR Continuance Intention (CUI)	0.95					
Customer Satisfaction (CS)	0.42	0.87				
Perceived Decision Effort (DE)	0.10	0.09	0.86			
Perceived Decision Quality (DQ)	0.55	0.47	0.12	0.81		
Perceived Confirmation (PC)	0.36	0.41	0.09	0.42	0.70	
Perceived Usefulness (PU)	0.53	0.42	0.11	0.50	0.47	0.87

Note: Diagonal values are AVE and remaining are squared correlations

Table 4. Assessment of model fit

Fit Indices	Recommended Value	Measurement Model	Structural Model
CMIN	≤5.00	2.794	3.695
GFI	≥0.90	0.930	0.904
AGFI	≥0.80	0.903	0.878
CFI	≥0.90	0.987	0.981
NFI	≥0.90	0.980	0.974
PCFI	≥0.80	0.829	0.841
RMSEA	≤0.08	0.054	0.066
Chi-square (df, p)		542.076 (194, p < 0.01)	731.590 (198, p < 0.01)

Figure 2. Results of the extended ECM of OPR continuance.



62.1% of the variance in customers' intention to continue OPR use, 53% of the variance in customer satisfaction, 50.5% of the variance in perceived usefulness, 9% of the variance in perceived decision effort, and 72.3% of the variance in perceived decision quality. Hence, the highest variance is explained in perceived decision quality, indicating its significance in the extended ECM of OPR continuance. We also analysed the data on the original ECM. All paths are supported and accounted for 58.1% of variance in customers' intention to continue OPR use, 47.9% of the variance in satisfaction, and 47.3% of the variance in perceived usefulness. The higher variances explained for the extended ECM of OPR continuance (D6% in OPR continuance intention, D5.1% in satisfaction, D3.2% in perceived usefulness). Additionally, the results also show that confirmation in relation to perceived decision quality explained highest variance ($R^2 = 72.3\%$)

compared to other post-adoption expectations (see Figure 2), provide further empirical support for extending the post-adoption expectations.

In addition to direct effects of predictors on criterion variables, this study also conducted a decomposition effect using regression process analysis (Hayes, 2017). As shown in Table 5, perceived usefulness ($b = 0.29, p < 0.001$), perceived decision effort ($b = -0.29, p < 0.001$), and perceived decision quality ($b = 0.24, p < 0.001$) also have a significant indirect effect on customers' intention to continue OPR use through satisfaction. Similarly, they also have indirect impact on customer satisfaction.

6. Discussion

6.1. General support for the extended ECM of OPR continuance

The result strongly supports the extended ECM of OPR continuance with all hypothesized paths were being significant except one (H6). Both satisfaction and post-adoption beliefs such as perceived usefulness and perceived decision quality were significant determinants of customers' intention to continue OPR use. It further supported the contention in ECM that having satisfied users is the important determinant of users' continuance intention. Our results also showed that customers' extent of confirmation and perceived usefulness, decision effort, and decision quality of OPR were key predictors of their level of satisfaction. Combining the current findings with the past findings (Ashraf et al., 2016; Islam et al., 2017), it confirms the saliency of the expectation-confirmation paradigm in understanding OPR continuous usage. Results implied that Amazon customers place more emphasis on confirmation of expectations (usefulness and decision quality of OPR) rather than expectations only in forming their levels of satisfaction and OPR continuance, supporting our argument that customers' various post-adoption expectations are affected by their levels of confirmation.

6.2. Impact of post-adoption beliefs on OPR continuance intention

This study extended the list of post-adoption expectations to include perceived decision effort and perceived decision quality based on effort-accuracy model. Customers forms intentions to continue OPR use if they have perceived of usefulness and decision quality of OPR. An interesting finding is that, among the three post-adoption beliefs, the impact of perceived decision quality on customers' intention to continue OPR use is the strongest; even stronger than the impact of perceived usefulness and satisfaction. In contrast to prior findings (Benlian et al., 2012; Chang & Huang, 2015; Lee, 2010; Thong et al., 2006), the saliency of perceived decision quality is much stronger than all the other post-adoption beliefs and thus an antidote against OPR discontinuance. It is may be due to different nature of OPR that facilitates the users in order to accomplish the task product buying. Since recommender system performs the resource-intensive information processing job of screening, narrowing, and sorting the available alternatives, customers can free up some of the processing capacity in order to evaluate them and choose products that fit their needs. In contrast, if the customers perceive that products recommended by OPR does not best match their needs or no longer effective in improving buying decision, then all other things being equal, they would prefer to rely on their own capabilities rather than relying on the OPR to make a final choice.

The current results also showed that perceived decision effort has no significant direct impact on continuance intention which further support Bhattacharjee (2001) argument that users' cognitive effort exerted becomes insignificant over extended period of IS usage. Conversely, perceived decision effort has significant indirect effect on customers' intention to continue OPR use via perceived usefulness of OPR (see Table 5). The decomposition effect revealed that user's cognitive effort exerted should be considered while designing technology. The technology undergoing continuous change due to new products and services being introduced regularly, users have to constantly update their perception of cognitive effort in using it. In addition, as the usability concern is linked to perceptions of cognitive effort required using the OPR (Huang et al., 2013;

Table 5. Direct, indirect and total effects—estimates

Predictors	Criterion Variables					
	Customer Satisfaction			OPR Continuance Intention		
	Direct	Indirect	Total	Direct	Indirect	Total
Perceived usefulness	0.26***	0.32***	0.58***	0.34***	0.29***	0.63***
Perceived decision effort	−0.12**	−0.23***	−0.35***	−0.06 ^{ns}	−0.29***	−0.35***
Perceived decision quality	0.74***	–	0.74***	0.48***	0.24***	0.72***
Perceived confirmation	0.27***	0.50***	0.77***	–	–	–
Customer Satisfaction	–	–	–	0.62***	–	0.62***

Note: *** $p < 0.001$, ** $p < 0.01$, ns = not significant

Xu et al., 2014), it is plausible that decision effort could have significant indirect impact on IS continuance. However, it is implied that product selection task that a customer went through is frustrating, complex, and required extra effort; similarly, if the technology of interest inherently requires its users to undergo a long and continuous learning process, then perceived cognitive effort may have significant direct effect. The past IS adoption literature implicitly assumes that the technology of interest does not change or evolve over time in terms of its features and usage contexts (Thong et al., 2006). Many technologies do keep evolving and changing, and users of such technologies (e.g., mobile applications) need to adapt their expectations by interacting them. Hence, depending on the nature of a technology, users may have to go through a continuous learning process to use the technology; and thus, cognitive effort can exert influence on users' behaviour for an extended period of time.

Further, our findings also indicated that satisfaction is the third strongest determinant of customers' OPR continuance intention. The satisfaction-intention link has previously been validated in different contexts [e.g., consumer behaviour research over a wide range of product and service contexts (Bhattacharjee, 2001b; Lin, Wu, & Tsai, 2005), mobile Internet services (Thong et al., 2006), e-learning (Lee, 2010)] and its revalidation in the context of OPR further confirm the robustness of this affect-intention relationship.

6.3. Impact of post-adoption beliefs on satisfaction

An interesting finding is that confirmation has significant influence on all post-adoption expectations (i.e., usefulness, decision effort, and decision quality) and they in turn significantly influence the customers' levels of satisfaction with the OPR use. In other words, in spite of significant direct impact of expectation-confirmation on satisfaction, it also has stronger indirect effect via perceived usefulness, perceived decision quality, and perceived decision effort (see Table 5). Thus, the current findings further revalidate the claim of Bhattacharjee that confirmation of expectations is the salient predictor of satisfaction. Another interesting finding is that among all post-adoption beliefs, perceived decision quality is the strongest predictor of customers' satisfaction with the OPR, indicating its saliency in terms of effect mechanism on OPR continuance. In addition to direct effect of perceived usefulness on satisfaction, it also has significant indirect effect via perceived decision quality. Thus, our results confirmed the need to broaden the scope of post-adoption expectations depending on the nature of the IS examined.

7. Research Implications

This study has both research and practical contributions. In terms of contribution to research, this study proposed theoretical model of OPR continuance by integrating ECM and EAM in order to

predict and explain customers' behavioural intention to continue OPR use. Empirical testing of the model contributes to the development of a more comprehensive explanation of OPR continuance behaviour. In terms of contribution to practices, the saliency of perceived decision quality, perceived usefulness, expectation-confirmation, and satisfaction present e-retailers with potential fruitful areas to affect OPR continuance. As a result, the e-retailers will be able to retain existing customers and hopefully increase their OPR usage. The satisfied customers can provide an effective channel to bring in new customers through word-of-mouth promotion. In view of the findings on OPR, a technology that is consumer-oriented, IS adoption researchers should give careful consideration to the unique characteristics of the IS innovation when investigating users' post-adoption decision-making processes. This study has shed light on a possible development of a richer model of IS continuous usage. Finally, since majority of respondents were from western countries, the implication of our findings can be fruitful to e-retailers in Asia which target or intend to penetrate the global market, in particular Amazon customers.

8. Limitation and Future Research

Before we discuss research contribution, a few study limitations along with future research should be noted. First, the current study uses a cross-sectional design rather than a longitudinal design. If the purpose is to examine whether pre-adoption expectations actually change after confirmation of experiences, then a longitudinal design is recommended that would give a clearer picture of how the users and the relationships among variables change over time. As our objective was to determine the utility of expanding the list of post-adoption expectations, a cross-sectional design was suitable for this study. Second, concerns about common method bias (CMB) could arise due to cross-sectional survey, our Harman's one-factor test and correlation matrix results indicated that CMB was not a problem in this study. This study showed that the post-adoption beliefs and confirmation have significant direct and indirect effects on customers' intention to continue OPR use; future studies may explore what factors impact these variables and how they can be manipulated to improve customers experience with the OPR. Finally, majority of respondents were from non-Asian countries, those have a unique cultural environment different from Asian countries. Consequently, the generalizability of our findings from western culture to Asian culture and other e-commerce environment (other than Amazon) will need to be confirmed with additional studies.

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Appendix

Table A1. Definition and measurements of research variables

Construct	Definition	Measurements	Source
Perceived Usefulness (PU)	Perceived usefulness refers the degree to which a person believes that using OPR would enhance his or her buying decision performance.	Using the online product recommendation (OPR): PU1. Enabled me to evaluate the product. PU2. Assisted me to understand the performance of the product PU3. Allowed me to accomplish more analysis than would otherwise be difficult. PU4. Was helpful in familiarizing me with the product. PU5. Enhanced my effectiveness in assessing the product.	Benlian et al. (2012)
Perceived Confirmation (PC)	Perceived confirmation refers to the customers' perception of congruence between expectation of OPR use and its actual performance.	PC1. My experience with using the OPR was better than what I expected. PC2. The service level provided by the OPR was better than what I expected. PC3. Overall, most of my expectations from using the OPR were confirmed.	Bhattacharjee (2001)
Perceived Decision Effort (DE)	Decision effort refers to the amount of effort exerted by the customers in processing product information, evaluating product alternatives, and arriving at choice decision (Xiao & Benbasat, 2007).	Using the OPR, the product selection task that I went through DE1. Was frustrating. DE2. Was complex. DE3. Required a lot of time. DE4. Required much effort.	Xu et al. (2014)
Perceived Decision Quality (DQ)	Decision quality is defined as the extent to which the customers have decided to purchase products that fit their needs or taste. Decision quality is indicated by decision confidence and effectiveness.	The product recommended by OPRs it DQ1. Suited my preferences. DQ2. Best matched my needs. DQ3. Best choice to buy. DQ4. Helped me to avoid poor choice DQ6. Helped me to make best decision possible.	Xu et al. (2014)

(Continued)

Construct	Definition	Measurements	Source
Customer Satisfaction (CS)	Satisfaction is a psychological or affective state related to and resulting from a cognitive appraisal of the expectation-performance discrepancy (Bhattacharjee, 2001).	How do you feel about your overall experience of OPR use? CS1. Very dissatisfied/Very satisfied. CS2. Very displeased/Very pleased. CS3. Very frustrated/Very contented. CS4. Absolutely terrible/Absolutely delighted.	Bhattacharjee (2001)
OPR Continuance Intention (CUI)	OPRs continued use refers to the customer's behavioural intention to continue using the OPRs whenever he or she needed to buy a product in the future.	If you needed to purchase a similar product in the future, how likely is it that you would CUI1. Intend to continue using the OPR in the future CUI2. Predict your use of the OPR to continue in the future CUI3. Plan to continue using the OPR in the future. CUI4. Continue to pay attention to the OPR.	Benlian et al. (2012)



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