Article

Assessing the Impact of Mobile Technology on Exhibition Attendees' Unplanned Booth Visit Behaviour

Namho Chung [1], Chulmo Koo [1],*, and Kyungmin Lee [2]

[1] College of Hotel & Tourism Management, Kyung Hee University, 26 Kyunghee-daro, Dongdaemun-gu, Seoul 02447, Korea; nhchung@khu.ac.kr
[2] Department of Convention & Exhibition Management, Graduate School, Kyung Hee University, 26 Kyunghee-daro, Dongdaemun-gu, Seoul 02447, Korea; kahwea@khu.ac.kr
* Correspondence: helmetgu@khu.ac.kr

Abstract: This study examines the effect of the booth Recommender system (BRS) embedded in a mobile device on the goals of exhibition attendees, based on two main theories that are unplanned behaviour and goal frame theories. Previous studies have overlooked the importance of the unplanned behavioural effectiveness of IT devices for understanding motivation and delivering unexpected outcomes at exhibitions. The BRS offers customized, personalized, and advanced information to attendees; experiences with the BRS lead to unplanned behaviour. In this paper, we distinguish several goal frames, including hedonic, gain, and normative goals, which contribute to the relationship between continued BRS use and unplanned booth visits. Continued BRS use directly influences revisit intentions to an exhibition and contributes to unplanned booth visits. We analysed data from 508 attendees at a franchise exhibition using structural equation modelling (SEM) method. Our research empirically determined that goal framing theory and unplanned behaviour via continued BRS use embedded in a mobile device are connected. Continued BRS use in an exhibition can contribute to attendees' impulsive behaviour and can induce them to return to an exhibition. The results and implications are discussed.

1. Introduction

Recommender systems can provide more specific, detailed, and personalised service than at any other time in history through web-based and smart devices. Recommendation mechanisms are becoming increasingly critical in supporting customised and personalised service for consumers' and end users' decision-making processes by providing expertise to select appropriate and optimal options [1]. Due to this strength of Recommender systems, they might support the growth and sustainability in each industry to which these these recommendation mechanisms have been applied. Various types of Recommender systems exist from book and music recommendations from Amazon to, recently, Alexa or Google Home, which are Artificial Intelligence platforms for big data analysis of individuals' behaviour.

Recommender mechanisms are designed to assist individuals in choosing between alternatives, and they have spread to various sectors of industry. In spite of Recommender mechanisms being spread to numerous branches of an individuals' life, their effectiveness should be investigated through assorted approaches, due to the fact that people may be inclined to avoid Recommender systems in

favour of freedom of choice. For example, Americans are less likely to trust automated systems [2], or people may avoid salespersons who attempt to persuade them to adopt certain items [3]. The two contrasting points that we address in this paper can be explained by goal framing theory [4], which explains the framing of attitudinal, personal, and contextual aspects of behaviour and unplanned impulse behaviour [5,6], which refers to the degree to which an individual is likely to make unintended, immediate, and unreflective purchases.

Goal framing theory, as explained by Mandl et al. [7] (p.16), suggests that 'the information which is framed is the goal of an action or behaviour. A decision made by a goal frame is influenced by positive versus negative information, which results in acceptance or rejection. Based on this theoretical perspective, Lindenberg and Steg [4] identified three types of goals; hedonic goals (i.e., to feel better immediately), gain goals (i.e., to guard and improve one's resources), and normative goals (i.e., to act appropriately) [8]. When these goals are planned and activated, people's attitudes, feelings, and actions are formulated or affected by the goals. According to Taylor and Todd [9], in the theory of reasoned action, Information Technology (IT) usage is determined by a user's attitudes towards interactions, subjective norms, and perceived behavioural control with a complex IT system [9,10]. Furthermore, in the marketing literature, Pollay [6] attempted to compare customers' planned and impulse purchases, which are influenced by circumstances at a specific moment [6]. Pollay stated that people's cognitive processes focus on the products and brands they plan to purchase. A recent study by Huerta et al. [2] found that automated decision-aid systems had different influences on the decision-making processes of American and Mexican consumers [1]. Surprisingly, people seem to find rejected choices more attractive when accepting one of several suggested options [3]. Thus, people may be more likely or less likely to rely on the use of automated decision-aid systems depending on their level of experience [11]. However, few studies have examined these systems' usage for unplanned behaviour embedded in a mobile device. Hostler et al. [12] noted that very few studies have investigated how end users' impulses are influenced by the suggestions provided by Recommender systems in the context of shopping behaviour. These authors examined the effect of online impulse purchase decisions facilitated by an online Recommender agent.

The exhibition industry has grown rapidly in the last decade and has begun to use IT devices to explain items to booth attendees. Exhibitions are market events at specific times that can draw various companies and consumers. Previous studies have not provided a theoretical foundation to identify the IT factors involved in attendees' behaviour at specific exhibitions. The attendees are confronted with one of: unplanned purchases; suggestion impulse buying, meaning a promotion induces a customer to purchase [13]; or a location-based Recommender system (i.e. Quick Response (QR) code, Near Field Communication (NFC)), which functions as a trigger of unplanned behaviour. In particular, exhibitions have unique environment characteristics in that they are not open space; that is, attendees might easily encounter unplanned behaviour without any added expenses, even facing serendipity by chance. Unplanned behaviour may occur when attendees find new information that booth Recommender systems (BRS) offer to attendees. Our study investigates the complementary theories of goal framing and unplanned behaviour that are facilitated by BRS embedded in a mobile device at exhibitions. This study emphasises the role of BRS in the decision-making processes involved in goal framing and examines how BRS embedded in a mobile device affects attendees' behaviour at an exhibition because the goal framing theory is a suitable theoretical frame for analysing the effect of constructs on environmentally-friendly behaviour [14]. In addition, we draw upon a study of unplanned attraction site visits by travellers based on impulsive decisions [15] to select applications of unplanned behaviour theory [16].

IT devices and the theory of planned behaviour have been well tested [9]. Pollay's [6] study provided insight into the effects of consumers' unplanned impulse behaviour compared with well-planned behaviour. Our study examines how goal framing (hedonic, gain, and normative) affects BRS embedded in a mobile device and generates unexpected outcomes such as unplanned booth visits. This study reviews the 'unplanned decision theory' in diverse disciplines [17], employs

goal framing theory [4], and measures the effects of BRS embedded in a mobile device on unplanned booth visits. The role of IT (i.e., BRS) in this paper involves the management of the relationship between goals and intention for unplanned booth visits to explain revisit intentions at exhibitions.

Building upon these theories, three research questions are addressed. First, how do perceived enjoyment (hedonic goal), perceived usefulness (gain goal), and threats to freedom of choice (normative goal) influence continued BRS use and unplanned booth visits? Second, is there a relationship between continued BRS use embedded in a mobile device and unplanned booth visits that suggests intentions for unplanned booth visits? Third, how do continued BRS use and unplanned booth visits influence revisit intentions at exhibitions? The purpose of this study is to investigate the role of goal framing in continued BRS use and unplanned booth visits and its effect on revisit intentions at exhibitions.

The remainder of this paper proceeds as follows. The next section discusses unplanned behaviour and goal framing theory. We then present the research model and develop the hypotheses. The research method section describes our data collection and statistical techniques. A further discussion of the main research findings is provided, followed by the limitations and research implications.

2. Theoretical Background

2.1. Goal Framing Theory

Psychology and sociology suggest that all people have different ways of understanding any given context. The notion of goal orientation was introduced in the educational literature to explain individual differences in students' learning [18]. Two goals have been articulated in the context of learning; learning versus performance. Individuals with learning goals and individuals with performance goals pursue these goals differently. Attributes and goal framing have been examined in the relationship between behaviours and goal attainment in health decisions [19]. In IT, a study examined the utilitarian and hedonic value frames [20] of mobile data services to attract new customers to large IT investments and considered consumers' adoption of these services [21]. Thus, decisions about goals depend on the specific situation [4].

A frame is 'the way in which people process information and act on it' [8] (p.118). Therefore, when people change their goals, they behave differently in line with the new goals. A goal frame considers a specific goal in terms of how its framing effects (i.e., selective attention) are affected by cognitive processes. Therefore, the goal determines which frame people consider, which attitudes are most cognitively accessible, how people evaluate various aspects of the situation, and what alternatives are considered [8]. Three types of goals have been identified in an environmental context; hedonic goals (i.e., to feel better immediately), gain goals (i.e., to guard and improve one's resources), and normative goals (i.e., to act appropriately) [4]. More specifically, (1) a hedonic goal signifies the desire to improve the way individual feels right now and is associated to one's need fulfilment; (2) a gain goal indicates the desire to improve an individual's resources; (3) a normative goal reveals the desire to act appropriately in a collective organization [4]. According to Lindenberg and Steg [4], when one of these three goals is pertaining to a focus, it apprehends the cognitive and motivational processes; that is, it truly 'frames' the environment [22]. Thus, when these goals are activated, they influence people's attitudes, feelings, and actions [8].

A hedonic goal frame activates one or more subgoals that involve the way a person feels in a particular situation (e.g., avoiding negative thoughts and events, seeking direct pleasure). People who have hedonic goals are generally sensitive to what increases or decreases their pleasure. Thus, individuals with hedonic goals might engage in environmentally-friendly behaviour because it is enjoyable and pleasurable [14]; that is, individuals who framed by hedonic goals seem to perceive enjoyment. Moreover, perceived enjoyment in hedonic information systems is a stronger determinant of intention to use than perceived usefulness [23].

A gain goal frame makes people very sensitive to change in their personal resources. For example, if a particular spray that is environmentally harmful is cheaper than an environmentally sound spray,

a person with a gain goal frame will choose the former because it is cheaper. Technology Acceptance Model (TAM)-based studies are related to work and focus on utilitarian uses (i.e. goal-directed use) and task-oriented perspectives. Utilitarian value is closely related to the effectiveness and efficiency that result from the use of IT or 'perceived usefulness' [24]. Thus, individuals who are framed by gain goals particularly focus on how they could achieve perceived usefulness of the resources.

The subgoals related to a normative frame involve a cognitive background. A normative goal frame activates all subgoals related to appropriateness and makes people sensitive to what they think they should do. Taylor and Todd [9] introduced the concept of subjective norms, which reflects people's perceptions that significant referents want them to perform specific behaviours [9]. An individual's normative belief involves a particular referent weighted by the motivation to meet with that referent. Thus, a normative goal is related to the concepts of rights, duties, and equality [25]. More generally, normative thought interferes with individual liberties because an individual's actions affect other people's possibilities. In the context of consumer behaviour, interpersonal relationships threaten a person's freedom to choose products and services [3]. For example, a person who wants to choose B may choose A because other people prefer A due to the normative view (i.e., equality of power) [25]. This forces people to give up freedom of certain behaviours and freedom of attitudes and decreases their freedom of choice (i.e., anti-normative). Thus, individuals who are framed by normative goals could be involved in treats to freedom of choice, and freedom of choice is influenced by an individual's observations of other people. As aforementioned the notion of each goals, to determine how they work in an individual's attitude and behaviour, we assigned perceived enjoyment as a hedonic goal's construct, perceived usefulness as a gain goal's construct, and threat to freedom as a normative goal's construct and investigated these goals' effect via Recommender systems in this research.

2.2. Unplanned Behaviour Theory

Impulsive behaviour may be affected by several factors [6]. Pollay [6] stated that purchases that are not normally planned can be seen as unplanned impulse behaviours. The concept of 'unplanned' behaviour is another dimension of the relationship between intentions and actual behaviour that has been examined in marketing. Consumer behaviour reacts to attempts to control that behaviour, and consumers enjoy freedom of choice under given circumstances [3]. For example, people may behave according to others' opinions or they may act differently from the opinions they receive. Therefore, people may be interested in free behaviours or attitudes.

Unplanned behaviour (i.e., impulse buying) has been considered important [12]. Impulse buying tendencies are defined as 'the degree to which an individual is likely to make unintended, immediate, and unreflective purchases' [5] (p. 57). Impulse buying is associated with the state between concluded and planned purchases. Unplanned behaviour is a goal-interpreted rather than a goal-directed phenomenon that allows people to describe what they want to do rather than what they plan to do [26,27]. We introduce a classification of consumer behaviour into the planned behaviour of consumer behaviour theory and the unplanned behaviour of impulse purchasing. Exhibitions provide conditions that are more likely to increase unplanned behaviour via a BRS, which helps attendees to browse freely, to unexpectedly find items, and to generate ideas from unexpected booth visits.

The use of BRS may be positive when multiple items are available within a limited time. Unplanned behaviour in the tourism industry is defined as travellers' willingness to choose secondary destinations, attractive sites, or restaurants using locally available information [16]. Travellers who visit attractive destinations that were not previously planned are likely to unexpectedly find new information and to choose alternative options when they are disappointed by their expectations of their initial choices or when unexpected constraints occur [16]. Immediate and spontaneous behaviour is likely to occur in response to on-site stimuli.

According to previous studies, to be effective, unplanned behaviour in tourism [16] or other related businesses such as conventions must be structured to provide unique value through reactions to stimuli based on instant information from a BRS. Online Recommender services via devices are

a common form of personalisation and a persuasive communication tool for users to achieve their goals [28]. During consumer decision-making, Recommender services assist individuals in finding information on products or services. There is a perceived gap between consumers' expectations and the disconfirmation of these expectations, which may provide an unpredictable or positive situation with the use of a BRS. Unplanned behaviour theory can be applied to exhibition contexts in which a BRS is used to manage the relationship between motivation and outcomes rather than the intentions of planned behaviour, as shown in Figure 1. The recommendation of a BRS functions as a trigger to unplanned booth visit behaviour in exhibitions when attendees' planned visiting is not fulfilling their expectation during their visit phase. Due to attendees tending to use the purchase environment as a directory from which they access the necessary information at the moment of purchase [15,29], attendees seem to be influenced by the recommendation of a BRS at the moment of visiting.
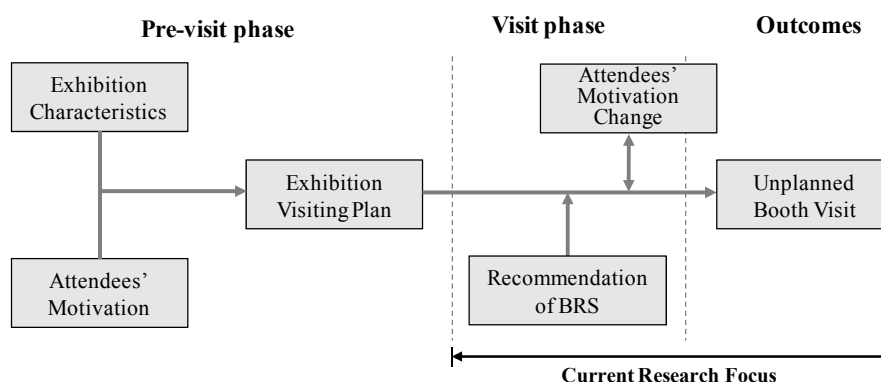

Figure 1. Exhibition Attendees' Visiting Behaviour.

3. Research Model and Hypotheses

Based on the integrated theoretical background of unplanned behaviour and goal frame theory for Recommender mechanisms, we applied a BRS for personalisation services to the context of booth exhibitions. The proposed research model is shown in Figure 2.
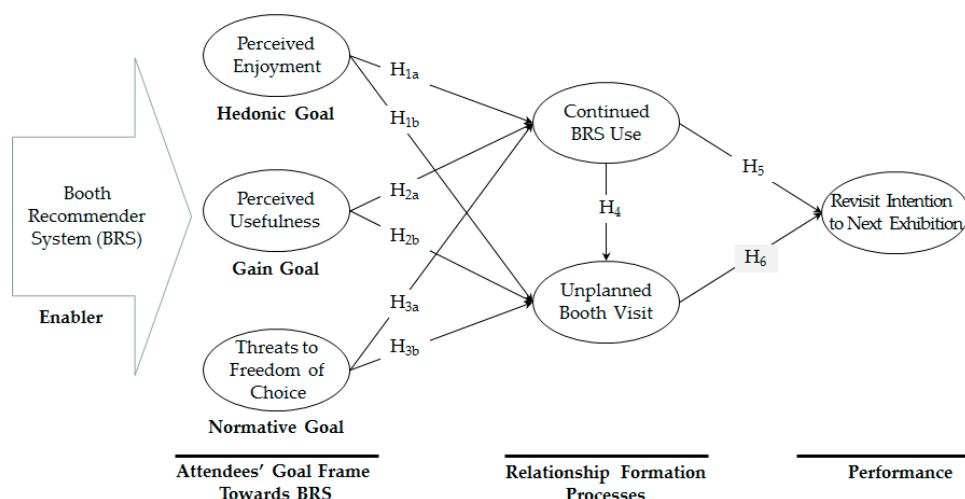

Figure 2. Research Model.

3.1. Perceived Enjoyment

Hedonic goals help people to experience positive or pleasurable thoughts and events in particular situations. People who have hedonic goals are generally sensitive to their level of pleasure. One goal frame is perceived enjoyment, such as the extent to which the activity of using a computer is

perceived to be enjoyable [30] (p. 1113). A pleasure-oriented system can provide fulfilment and connection to home and leisure activities. Heijden [23] found that the hedonic nature of an information system is an important boundary condition for the TAM. Perceived enjoyment strongly influences web use for entertainment purposes. Many hedonic aspects of household technology are closely related to perceived enjoyment. Hedonic systems are related to the home environment, whereas perceived usefulness is related to the workplace [23] Recently, Sun and Zhang [20] argued that intrinsic motivations such as perceived enjoyment can increase perceptions of behavioural intentions in utilitarian systems.

Impulse buying is defined as unplanned purchasing [17]. The psychological literature suggests that when people are in good moods, they are more likely to engage in approach behaviour. Thus, impulse buying is strongly influenced by the positive effect of good moods, including amusement, delight, enthusiasm, and joy. Beatty and Ferrell [17] found that impulse buying influenced shopping enjoyment. Thus, we propose that hedonic goals are positively involved in continued BRS use and unplanned booth visits in the context of exhibitions. Thus, we hypothesise the following:

Hypothesis 1a. *Hedonic goal: perceived enjoyment from using a BRS has a positive impact on continued BRS use.*

Hypothesis 1b. *Hedonic goal: perceived enjoyment from using a BRS has a positive impact on unplanned booth visits.*

3.2. Perceived Usefulness

Gain goals make people sensitive to changes in their personal resources. TAM-based studies are related to the utilitarian use of work environments (i.e. goal-directed use) and the task-oriented perspective. Utilitarian value is related to the effectiveness and efficiency that result from the use of IT or 'perceived usefulness' [24]. Recent studies have shown that utilitarian value is positively related to adoption intentions [20,21]. Utilitarian motivation is related to critical missions, rationality, effective decisions, and goal orientation.

A goal-oriented consumer generates purchase intentions. Although a consumer may not purchase a particular item, he or she may obtain ideas and prices for potential purchases. Utilitarian value may result in necessary unplanned behaviour. Therefore, consumers who emphasise utilitarian value may not focus on relevant items to situationally explain efficiency but may be happy to browse in shopping places. Parboteeah et al. [31] demonstrated that impulsive purchasing is related to product descriptions and navigation aids. Thus, we propose that perceived usefulness as a gain goal may be positively related to unplanned booth visits. Thus, we hypothesise the following:

Hypothesis 2a. *Gain goal: the perceived usefulness of using a BRS has a positive impact on continued BRS use.*

Hypothesis 2b. *Gain goal: the perceived usefulness of using a BRS has a positive impact on unplanned booth visits.*

3.3. Threats to Freedom of Choice

Normative goals are related to concepts of rights, duties, and equality [25]. More generally, normative goals affect individual liberties, and one individual's action may severely affect another individual's possibilities. Paradoxically, normative goals may enable individuals to move in the opposite direction from the influence by producing a negative effect or a 'boomerang effect' [3]. If there are limited options, a person is not likely to choose one. Individuals may find Recommenders restrictive or may feel pressured to accept them, and they may consider Recommenders barriers to free choice or behaviour. In such cases, individuals react by negatively evaluating the Recommender, refusing to accept it in an attempt to restore their freedom to choose, or even choosing the opposite of the Recommender.

Web users may perceive web Recommenders as restricting their free will, even when the Recommenders are relevant, accurate, and timely. When this occurs, consumers enter a motivational state in which they form negative attitudes towards the proposed Recommenders. Therefore, we posit that perceptions of threats to freedom generated by normative goal Recommenders are negatively related to intentions to use the Recommender service [28]. By contrast, if people are interested in the options but feel threatened by their choices, then the proposed options will tend to be more attractive or more sought after before alternatives are eliminated [3]. Therefore, we hypothesise the following:

Hypothesis 3a. *Normative goal: threats to freedom of choice while using a BRS have a negative impact on continued BRS use.*

Hypothesis 3b. *Normative goal: threats to freedom of choice while using a BRS have a positive impact on unplanned booth visits.*

3.4. Continued BRS Use, Unplanned Booth Visits, and Revisit Intentions at Exhibitions

TAM can apply to the internet for either utilitarian or hedonic purposes. People surf the internet for entertainment purposes and seek information for work-related purposes [23]. Bressolles et al. [32] found a strong relationship between website quality and unplanned purchases. Hostler et al. [12] explored the use of Recommender agents on online shopping behaviour and found that the use of a Recommender agent significantly influences product search effectiveness, which leads to unplanned purchases. Many TAM studies have shown that information system continued intentions are strongly related to satisfaction with prior use of IT [33,34]. Satisfied consumers tend to return to the same store.

Due to impulse buying behaviour having voluntary, spontaneous, unanticipated, and unplanned characteristics, it is difficult to predict why consumers return to purchase new products [35]. Furthermore, unplanned behaviour can lead to negative outcomes such as unnecessary spending or post-purchase regret [36–38], the use of a BRS can directly influence unplanned booth visits and impulse purchasing behaviour, and a BRS may arouse hedonic desires and stimulate desires for fun and excitement related to unplanned booth visits [26]. These desires may be increased and nurtured by unplanned experiences, which produce revisit intentions at exhibitions in customers for whom an unplanned impulse purchase conveys a favourable evaluation of their behaviour [38–40]. We suggest that unplanned booth visits at exhibitions may generate fun and excitement, which can motivate individuals' revisit intentions at exhibitions. Thus, we suggest that continued BRS use influences unplanned booth visits and revisit intentions at exhibitions. In turn, unplanned booth visits facilitated by a BRS are positively connected to revisit intentions at exhibitions. Moreover, this research investigates how the BRS supports the sustainability of the exhibition industry though examining the effect on revisit intentions at an exhibition. Therefore, we hypothesise the following:

Hypothesis 4. *Continued BRS use has a positive impact on unplanned booth visits.*

Hypothesis 5. *Continued BRS use has a positive impact on revisit intentions at exhibitions.*

Hypothesis 6. *Unplanned booth visits have a positive impact on revisit intentions at exhibitions.*

4. Research Methodology

4.1. Instrument Development

In this study, measurements were derived from the previous literature pertaining to the six constructs of perceived enjoyment, perceived usefulness, threats to freedom of choice, intention to use BRS, unplanned booth visits, and revisit intentions at exhibitions (see Table 1). Four perceived enjoyment items were adopted from Hong and Tam [41], three perceived usefulness items were adopted from Lee and Lee [28], and three threats to freedom of choice items and intention to use BRS items were drawn from Lee and Lee [28]. Furthermore, four unplanned booth visit items were

self-developed based on Hostler et al. [12] and Hwang and Fesenmaier [15] for the present study. Finally, four revisit intentions for exhibition items were adapted from Severt et al. [42]. All of these items were measured on a seven-point Likert scale, ranging from strongly disagree (1) to strongly agree (7). Then, we pre-tested all the items from twenty college students to make sure the meaning and understanding were clear and did reliability test to ensure that all items are statistically satisfied.

Table 1. Results of Convergent Validity Testing [a].

	Constructs and Variables	Loadings	CR [b]	AVE [c]	α
Perceived Enjoyment	1. I had fun using the booth Recommender service.	0.894	0.927	0.761	0.926
	2. The booth Recommender service was entertaining for me.	0.901			
	3. I enjoyed the booth Recommender service.	0.888			
	4. The booth Recommender service was not boring.	0.802			
Perceived Usefulness	1. Using the booth Recommender service enables me to find a desired booth more quickly.	0.926	0.905	0.762	0.901
	2. Using the booth Recommender service enables me to find a desired booth more easily.	0.898			
	3. Using the booth Recommender service is helpful for the show experience.	0.788			
Threats to Freedom of Choice	1. The booth Recommender service limits me in finding an exhibition booth.	0.780	0.903	0.758	0.901
	2. The booth Recommender service makes it inconvenient for me to find an exhibition booth.	0.943			
	3. The booth Recommender service bothers me in finding the exhibition booth.	0.881			
Continued BRS Use	1. I continuously used the booth Recommender service.	0.872	0.911	0.773	0.909
	2. The booth Recommender service continuously helped me to find booths easily.	0.920			
	3. The booth Recommender service continuously fulfilled my expectations.	0.844			
Unplanned Booth Visits	1. I visited an unplanned booth through the booth Recommender service.	0.679	0.878	0.645	0.874
	2. I spontaneously visited a booth through the booth Recommender service.	0.867			
	3. I visited a booth without thinking through the booth Recommender service.	0.853			
	4. I visited a booth on the spur of the moment due to the booth Recommender service.	0.799			
Revisit Intention to Exhibition	1. I will attend the franchise exhibition again.	0.908	0.945	0.811	0.944
	2. I am planning to visit the franchise exhibition frequently in the future.	0.922			
	3. I will continue to visit the franchise exhibition in the future.	0.930			
	4. I would recommend the franchise exhibition to others.	0.840			

[a] χ^2 = 303.736, d.f. = 174 (χ^2/d.f. = 1.746), *p* = 0.000, GFI = 0.945, AGFI = 0.927, NFI = 0.966, CFI = 0.985, RMSEA = 0.038; [b] Composite Reliability; [c] Average Variance Extracted.

4.2. Data Collection

The major purpose of this study was to examine attendees' perceptions of BRS for exhibitions. The BRS has been developed for mobile communication technology and uses a QR code and wireless Internet standard to connect devices. The BRS reads contextual information (QR code-based booth information) to assist exhibition attendees by providing information that includes schedules, topics, products, companies, and presentation locations. The BRS has accuracy functions when the operating bounds are extremely short, as in Figures 3 and 4. Figure 3 shows how BRS works in exhibition.

① Visit Exhibition
② Application download
③ User registration

④ Booth QR code tagging
⑤ Check recommended information
⑥ Visit recommended booth

Figure 3. Snapshot of booth Recommender system (BRS) Usage.

$\chi^2 = 321.213$, d.f = 177, $p = 0.000$, GFI = 0.943, AGFI = 0.925, NFI = 0.964, CFI = 0.983, RMSEA = 0.040
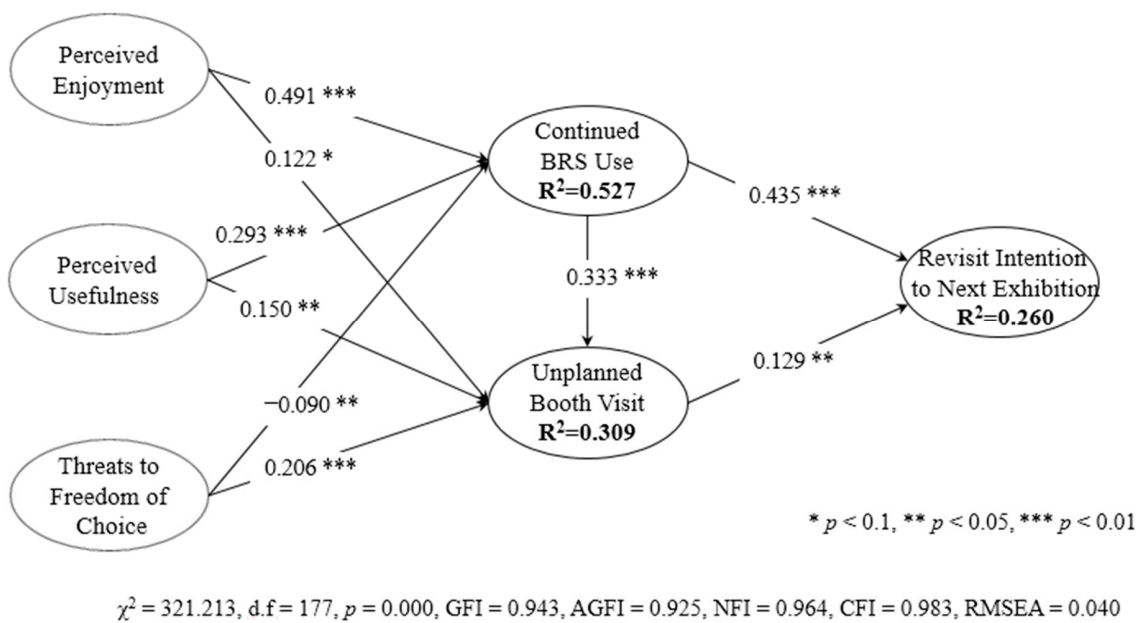
Figure 4. Results of the Structural Equation Modeling Analysis.

To this end, this study developed a system to test the BRS of the 2012 franchise exhibition in Seoul because this exhibition adopted a QR code that is a kind of booth Recommender system and promoted this test with the event 'Interesting Booth QR Click Event'. In this event, gifts were given to attendees who visited any of 300 booths, each of which had a specific QR code. People who scanned the code with their smart phones were considered visitors. The purpose of this event was to identify the locations of attendees who scanned QR codes on a real-time basis and analyse their QR code information to understand the preference for booth Recommenders in real time. From 17 March to 19 March 2012 (two nights and three days), a large number of attendees participated in this exhibition. Of these attendees, 520 attendees utilised the BRS. As an incentive to complete tasks for the study, each participant who completed the survey was provided with a gift certificate worth $5. A total of 508 valid responses were collected from the survey and coded for analysis. The majority of the respondents in the present study were male (322, 63.4%). The largest proportion of respondents (261, 51.3%) was under the age of 30, followed by respondents aged 30 to 39 (122, 24.0%). Most respondents were students (197, 38.8%) and office workers (95, 18.7%). The average annual total income was less than 29 million won (286, 56.4%), followed by 30–39 million won (88, 17.3%).

5. Data Analysis and Results

This study employed a structural equation modelling (SEM) approach to test the hypotheses proposed in Figure 1. SEM is designed to evaluate how well a proposed model or hypothetical construct explains the collected data [43]. The SEM used a two-step hybrid method by specifying a measurement model in the confirmatory factor analysis (CFA) and testing a latent structural model developed from the measurement model [44].

5.1. Confirmatory Factor Analysis

We assessed the constructs for convergent validity and discriminant validity via CFA using AMOS 18. In CFA, the measurement model is revised by dropping items that share a high degree of residual variance with other items. The χ^2 fit statistic was 303.763 with 174 degrees of freedom (χ^2/d.f. = 1.746) ($p < 0.001$). The goodness-of-fit index (GFI) was 0.945, the adjusted goodness-of-fit index (AGFI) was 0.927, the normed fit index (NFI) was 0.966, the comparative fit index (CFI) was 0.985, and the root mean square error of approximation (RMSEA) was 0.038. All statistics supported the overall measurement quality given the number of indicators [45].

Convergent validity was checked using three criteria. First, the standardised path loading of each item must be statistically significant and greater than 0.7 [46]. Second, the composite reliability (CR) and the Cronbach's α for each construct must be larger than 0.7. Third, the average variance extracted (AVE) for each construct must exceed 0.5 [47]. As shown in Table 1, the standardised path loadings were all significant and greater than 0.7. Furthermore, the CR and the Cronbach's α exceeded 0.7 for all constructs. The AVE was greater than 0.5 for each construct. Therefore, convergent validity for the constructs was supported [33] (p. 815).

The discriminant validity of the measurement model is checked by comparing the square root of the AVE for each construct with the correlations between that construct and other constructs. If the square root of the AVE is greater than the correlations between that construct and other constructs, this indicates discriminant validity [47]. As shown in Table 2, the square root of the AVE for each construct exceeded the correlations between that construct and the other constructs. Therefore, discriminant validity was established.

Table 2. Correlations and Descriptive Statistics.

Construct	Correlation of Constructs						Mean	S.D.
	1	**2**	**3**	**4**	**5**	**6**		
1. Perceived enjoyment	**0.872**						4.921	1.126
2. Perceived usefulness	0.613 **	**0.873**					5.167	1.179
3. Threats to freedom of choice	0.008	−0.090 *	**0.871**				3.504	1.418
4. Continued BRS use	0.405 **	0.385 **	0.139 **	**0.879**			5.053	1.106
5. Unplanned booth visits	0.632 **	0.589 **	−0.090 *	0.439 **	**0.803**		4.745	1.178
6. Revisit intention to exhibition	0.384 **	0.425 **	−0.114 *	0.315 **	0.456 **	**0.901**	5.658	1.094

The diagonal elements in boldface in the 'correlation of constructs' matrix are the square root of the average variance extracted (AVE). For adequate discriminant validity, the diagonal elements should be greater than the corresponding off-diagonal elements.* $p < 0.05$, ** $p < 0.01$.

5.2. Hypothesis Testing

Figure 4 and Table 3 present the maximum-likelihood estimates for the various overall fit parameters. The χ^2 statistic fit was 321.213 with 177 degrees of freedom (χ^2/d.f. = 1.815) ($p < 0.000$). The GFI was 0.943, the AGFI was 0.925, the NFI was 0.964, the CFI was 0.983, and the RMSEA was 0.040. These multiple indicators suggest that the model has good fit, justifying further interpretation.

Table 3. Standardised Structural Estimates and Tests of the Main Hypotheses.

Hypothesis	Path	Estimates (*t*-Value)	Results
Hypothesis 1a	Perceived enjoyment → Continued BRS use	0.491(9.613)	Supported
Hypothesis 1b	Perceived enjoyment → Unplanned booth visit	0.122(1.803)	Supported
Hypothesis 2a	Perceived usefulness → Continued BRS use	0.293(5.767)	Supported
Hypothesis 2b	Perceived usefulness → Unplanned booth visit	0.150(2.407)	Supported
Hypothesis 3a	Threats to freedom of choice → Continued BRS use	−0.090(−2.513)	Supported
Hypothesis 3b	Threats to freedom of choice → Unplanned booth visit	0.206(4.646)	Supported
Hypothesis 4	Continued BRS use → Unplanned booth visit	0.333(4.890)	Supported
Hypothesis 6	Continued BRS use → Revisit intention to exhibition	0.435(8.443)	Supported
Hypothesis 6	Unplanned booth visit → Revisit intention to exhibition	0.129(2.560)	Supported

χ^2 = 321.213, d.f. = 177 (χ^2/d.f. =1.815), p = 0.000, GFI = 0.943, AGFI = 0.925, NFI = 0.964, CFI = 0.983, RMSEA = 0.040.

The squared multiple correlations (SMCs; R^2) for the structural equations for continued BRS use, unplanned booth visits, and revisit intention for the exhibition are high. For continued BRS use, SMC = 0.527, and, for unplanned booth visits, SMC = 0.309. Furthermore, more than one-quarter of the variance (SMC = 0.260) in revisit intention for the exhibition is explained by the direct effects of continued BRS use and unplanned booth visits. Table 3 presents the standardised parameter estimates.

Hypotheses 1a, 2a, and 3a address the structural relationships between perceived enjoyment, perceived usefulness, threats to freedom of choice, and continued BRS use. Perceived enjoyment has a positive effect on continued BRS use (γ_{11} = 0.491, *t*-value = 9.613, $p < 0.01$). Therefore, Hypothesis 1 is supported. Hypothesis 2a is supported by the significant positive impact of perceived usefulness on continued BRS use (γ_{21} = 0.293, *t*-value = 5.767, $p < 0.01$). Hypothesis 3a is supported by the significant negative impact of threats to freedom of choice on continued BRS use (γ_{31} = −0.090, *t*-value = −2.513, $p < 0.05$). Hypotheses 1b, 2b, and 3b address the structural relationships among perceived enjoyment, perceived usefulness, threats to freedom of choice, and unplanned booth visits. Perceived enjoyment has a positive effect on unplanned booth visits (γ_{12} = 0.122, *t*-value = 1.803, $p < 0.1$). Therefore, Hypothesis 2b is supported. Hypothesis 3b is supported by the significant positive impact of perceived usefulness on unplanned booth visits (γ_{22} = 0.150, *t*-value = 2.407, $p < 0.001$). Hypothesis 3b is supported by the significant impact of threats to freedom of choice on unplanned booth visits (γ_{32} = 0.206, *t*-value = 4.646, $p < 0.01$).

Finally, Hypotheses 4 and 5 address the relationships between continued BRS use, unplanned booth visits, and revisit intention for an exhibition. Continued BRS use has a positive effect on unplanned booth visits (β_{21} = 0.333, *t*-value = 4.890) and is statistically significant at the $p < 0.01$

level, supporting Hypothesis 4. Continued BRS use has a positive effect on revisit intentions for an exhibition (β_{31} = 0.435, *t*-value = 8.443) and is statistically significant at the $p < 0.01$ level, supporting Hypothesis 5. Hypothesis 6 is supported by the significant positive impact of unplanned booth visits on revisit intentions for an exhibition (β_{32} = 0.129, *t*-value = 2.560, $p < 0.01$).

6. Discussion and Conclusions

This study focused on whether exhibition attendees' adoption of the BRS embedded in a mobile device leads to their revisit intention to exhibitions. In other words, this study attempted to identify whether the attitudes of exhibition attendees toward BRS influence their behaviours such as exhibition visits. Exhibition attendees' points of view regarding the BRS were segmented into three types based on goal framing theory; perceived enjoyment, perceived usefulness, and threats to freedom of choice (anti-normative), which represent the hedonic goal, the gain goal, and the normative goal, respectively. According to this study, these three goals were found to have a significant influence on both continued BRS use embedded in a mobile device and unplanned booth visits. In addition, continued BRS use had a significant influence on unplanned booth visits and revisit intentions for exhibitions.

The analysis indicated that exhibition attendees are fully aware of the various BRS functions. Moreover, as shown in Hypothesis 3a, the Recommender function of the BRS was a negative influential factor because it discouraged autonomous booth selections by exhibition attendees. However, 'threats to booth choice' was a positive, not a negative, influential factor on unplanned booth visits. This outcome suggests that, even though the BRS's Recommender function negatively affected the exhibition attendees' freedom, the exhibition attendees made unplanned visits to booths for fun or excitement according to the BRS Recommenders. In addition, among the antecedents for intention to revisit, the influence of the BRS obtained the highest level at β_{31} = 0.435. These results indicate that the use of Recommender systems at exhibitions is not confined to device-based options but has an extended influence on users' post-exhibition behaviours. The findings of this study are meaningful because they suggest that, when people use intelligent devices at event venues or exhibitions, the influences of devices do not remain at the level of present adoption but extend to future revisit intentions.

When intelligent systems such as the BRS remain at the level of device-based onsite adoption, they have negligible meanings for exhibition hosts or marketers. Thus, the results of this study can be considered especially meaningful to BRS developers. Exhibition attendees were observed to visit unplanned booths according to unplanned behaviours arising from the use of the BRS. In fact, such behaviours were revealed to be a positive influential factor on revisit intention, suggesting that positive influences can result not only from planned behaviours but also from unplanned behaviours.

This study has both theoretical and practical implications. First, regarding the theoretical implications of this study, exhibition attendees' attitudes for continued BRS use were explained based on the goal frame theory, and an explanation for exhibition visit behaviour was provided by combining the output with unplanned behaviour theory. We found the theoretical perspectives that integrate the goal frame factors, recommended system, and unplanned behavior relationships; built an integral model; and empirically tested the model. Recently, since smart technologies and devices have been implemented and adopted in convention and exhibition sites, technologies and applications could provide diverse services to attendees and assist the attendees in getting contextual information while they move around during exhibitions. Second, the concepts presented in this study explain not only online behaviours but also offline behaviours. As a result, these findings have implications for a combined model that explains both online and offline behaviour. As a practical implication of this study, the use of BRS at exhibitions is not only a means of arousing the interest of attendees; it also alters attendees' behaviours to encourage unplanned booth visits, thereby facilitating revisits to these exhibitions in the future. Thus, we found that unplanned attendees perceived the BRS service as sufficiently helpful and convenient through 'alert' or 'notice' functions in advance. In this regard, this study suggests the need for an advanced BRS, the functions of which are customised according to user levels or types. Additionally, the BRS functions as an abutment to improve sustainability though

customised and personalised service for attendees by providing expertise to choose appropriate alternatives [1].

The present work was an empirical study of the influence of BRS adoption embedded in a mobile device on unplanned booth visits and revisit intentions for exhibitions based on the goal framing theory. This analysis revealed an interesting outcome; the use of BRS at exhibitions has a significant influence not only on the adoption of the system itself but also on the revisit intention to exhibitions. A limitation of this study may be that the unplanned behaviours of exhibition attendees were identified by surveys. In the future, a more refined analysis will be necessary in which unplanned and planned behaviours are identified based on actual visit logs. In addition, further research should incorporate an analysis of how the identified behaviours are influenced by the BRS and how they influence the behaviours regarding future exhibitions. Another limitation of this study is that the data was gathered in 2012. However, there have been few studies of the impacts of the booth Recommender system, while it has been evolved through an intimate linkage of context and environment via developed technology [48]. For example, artbot, a mobile app that provides serendipitous connections to the art scene, has been developed by Desi and Liam [49]. Therefore, in spite of the data being collected five years ago, this study contributes to momentous research, and researchers should attend to Recommender mechanisms. Further, research also should evolve with the real world via the development of technology, especially under the fourth industrial revolution.

Author Contributions: Namho Chung and Chulmo Koo conceived and designed the experiments; Namho Chung performed the experiments and analyzed the data; Namho Chung, Chulmo Koo and Kyungmin Lee wrote the paper. All of authors contributed to read and approved the final manuscript.

Conflicts of Interest: The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

References

1. Kwon, S.J.; Chung, N. The moderating effects of psychological reactance and product involvement on online shopping recommendation mechanisms based on a causal map. *Electron. Commer. Res. Appl.* **2010**, *9*, 522–536. [CrossRef]

2. Huerta, E.; Glandon, T.; Petrides, Y. Framing, decision-aid systems, and culture: Exploring influences on fraud investigations. *Int. J. Account. Inf. Syst.* **2012**, *13*, 316–333. [CrossRef]

3. Clee, M.A.; Wicklund, R.A. Consumer behavior and psychological reactance. *J. Consum. Res.* **1980**, *6*, 389–405. [CrossRef]

4. Lindenberg, S.; Steg, L. Normative, gain and hedonic goal frames guiding environmental behaviour. *J. Soc. Issues* **2007**, *63*, 117–137. [CrossRef]

5. Park, J.; Lennon, S.J. Psychological and environmental antecedents of impulse buying tendency in the multichannel shopping context. *J. Consum. Market.* **2006**, *23*, 56–66. [CrossRef]

6. Pollay, R.W. Customer impulse purchasing behavior: A re-examination. *J. Market. Res.* **1968**, *5*, 323–325. [CrossRef]

7. Mandl, M.; Felfernig, A.; Teppan, E.; Schubert, M. Consumer decision making in knowledge-based recommendation. *J. Intell. Inf. Syst.* **2011**, *3*, 1–22. [CrossRef]

8. Lindenberg, S. Social rationality versus rational egoism. In *Handbook of Sociological Theory*; Turner, J., Ed.; Kluwer Academic/Plenum: New York, NY, USA, 2001; pp. 635–668.

9. Taylor, S.; Todd, P.A. Understanding information technology usage: A test of competing models. *Inf. Syst. Res.* **1995**, *6*, 144–176. [CrossRef]

10. Ajzen, I.; Fishbein, M. *Understanding Attitudes and Predicting Social Behavior*; Prentice-Hall: Englewood Cliffs, NJ, USA, 1980.

11. Hampton, C. Determinants of reliance: An empirical test of the theory of technology dominance. *Int. J. Account. Inf. Syst.* **2005**, *6*, 217–240. [CrossRef]

12. Hostler, E.R.; Yoon, V.Y.; Guo, Z.; Guimaraes, T.; Forgionne, G. Assessing the impact of recommender agents on on-line consumer unplanned purchase behavior. *Inf. Manag.* **2011**, *48*, 336–343. [CrossRef]

13. Kah, J.A.; Lee, S.H. Beyond adoption of travel technology: Its application to unplanned travel behaviors. *J. Travel Tour. Market.* **2014**, *31*, 667–680. [CrossRef]

14. Liobikienė, G.; Juknys, R. The role of values, environmental risk perception, awareness of consequences, and willingness to assume responsibility for environmentally-friendly behaviour: The Lithuanian case. *J. Clean. Prod.* **2016**, *112*, 3413–3422. [CrossRef]

15. Hwang, Y.H.; Fesenmaier, D.R. Unplanned tourist attraction visits by travellers. *Tour. Geogr.* **2011**, *13*, 398–416. [CrossRef]

16. Hwang, Y.H. A theory of unplanned travel decisions: Implications for modeling on-the-go travelers. *Inform. Tech. Tourism.* **2010**, *12*, 283–296. [CrossRef]

17. Beatty, S.E.; Ferrell, M.E. Impulse buying: Modelling its precursors. *J. Retail.* **1998**, *74*, 169–191. [CrossRef]

18. Chen, G.; Mathieu, J.E. Goal orientation dispositions and performance trajectories: The roles of supplementary and complementary situational inducements. *Organ. Behav. Hum. Decis. Process* **2008**, *106*, 21–38. [CrossRef]

19. Krishnamurthy, P.; Carter, P.; Blair, E. Attribute framing and goal framing effects in health decisions. *Organ. Behav. Hum. Decis. Process* **2001**, *85*, 382–399. [CrossRef] [PubMed]

20. Sun, H.; Zhang, P. Causal relationships between perceived enjoyment and perceived ease of use: An alternative approach. *J. Assoc. Inf. Syst.* **2006**, *7*, 618–645.

21. Kim, B.; Han, I. The role of utilitarian and hedonic values and their antecedents in a mobile data service environment. *Expert Syst. Appl.* **2011**, *38*, 2311–2318. [CrossRef]

22. Foss, N.J.; Lindenberg, S. Microfoundations for strategy: A goal-framing perspective on the drivers of value creation. *Acad. Manag. Perspect.* **2013**, *27*, 85–102. [CrossRef]

23. Heijden, H. User acceptance of hedonic information systems. *MIS Q.* **2004**, *28*, 695–704.

24. Davis, F.D. Perceived usefulness, perceived ease of use, and user acceptanceof information technology. *MIS Q.* **1989**, *13*, 319–342. [CrossRef]

25. Kolm, S.C. Rational normative economics vs. 'social welfare' and 'social choice'. *Eur. Econ. Rev.* **1994**, *38*, 721–730. [CrossRef]

26. Chung, N.; Koo, C.; Kim, J.K. Extrinsic and intrinsic motivation for using a booth recommender system service on exhibition attendees' unplanned visit behavior. *Comput. Hum. Behav.* **2014**, *30*, 59–68. [CrossRef]

27. March, R.; Woodside, A.G. Testing theory of planned versus realized tourism behavior. *Ann. Tour. Res.* **2005**, *32*, 905–924. [CrossRef]

28. Lee, G.; Lee, W.J. Psychological reactance to online recommendation services. *Inf. Manag.* **2009**, *46*, 448–452. [CrossRef]

29. Abratt, R.; Goodey, S.D. Unplanned buying and in-store stimuli in supermarkets. *Manag. Decis. Econ.* **1990**, *11*, 111–121. [CrossRef]

30. Davis, F.; Bagozzi, R.P.; Warshaw, P.R. Extrinsic and intrinsic motivation to use computers in the workplace. *J. Appl. Soc. Psychol.* **1992**, *22*, 1111–1132. [CrossRef]

31. Parboteeah, D.V.; Valacich, J.S.; Wells, J.D. The influence of website characteristics on a consumer's urge to buy impulsively. *Inf. Syst. Res.* **2009**, *20*, 60–78. [CrossRef]

32. Bressolles, G.; Durrieu, F.; Giraud, M. The impact of electronic service quality's dimensions on customer satisfaction and buying impulse. *J. Cust. Behav.* **2007**, *6*, 37–56. [CrossRef]

33. Bhattacherjee, A.; Sanford, C. Influence processes for information technology acceptance: An elaboration likelihood model. *MIS Q.* **2006**, *30*, 805–825.

34. Limayem, M.; Cheung, C.M.K. Understanding information systems continuance: The case of internet-based learning technologies. *Inf. Manag.* **2008**, *45*, 227–232. [CrossRef]

35. Harmancioglu, N.; Finney, R.Z.; Joseph, M. Impulse purchases of new products: An empirical analysis. *J. Prod. Brand Manag.* **2009**, *18*, 27–37. [CrossRef]

36. Chang, C.C.; Tseng, A.H. The post-purchase communication strategies for supporting online impulse buying. *Comput. Hum. Behav.* **2014**, *39*, 393–403. [CrossRef]

37. Pirog, S.F.; Roberts, J.A. Personality and credit card misuse among college students: The mediating role of impulsiveness. *J. Market. Theory Pract.* **2007**, *15*, 65–77. [CrossRef]

38. Rook, D.W.; Fisher, R.J. Normative influences on impulsive buying behavior. *J. Consum. Res.* **1995**, *22*, 305–313. [CrossRef]

39. Dittmar, H.; Beattie, J.; Friese, S. Objects, decision considerations and self-image in men's and women's impulse purchases. *Acta Psychol.* **1996**, *93*, 187–206. [CrossRef]

40. Hausman, A. A multi-method investigation of consumer motivations in impulse buying behavior. *J. Consum. Market.* **2000**, *17*, 403–426. [CrossRef]

41. Hong, S.; Tam, K.Y. Understanding the adoption of multipurpose information appliances: The case of mobile data services. *Inf. Syst. Res.* **2006**, *17*, 162–179. [CrossRef]

42. Severt, D.; Wang, Y.; Chen, P.J.; Breiter, D. Examining the motivation, perceived performance, and behavioral intentions of convention attendees: Evidence from a regional conference. *Tour. Manag.* **2007**, *28*, 399–408. [CrossRef]

43. Hair, J.F., Jr.; Black, W.C.; Babin, B.J.; Anderson, R.E.; Tatham, R.L. *Multivariate Data Analysis*, 6th ed.; Pearson Prentice Hall: Upper Saddle River, NJ, USA, 2006.

44. Kline, R.B. *Principles and Practice of Structural Equation Modeling*; Guilford: New York, NY, USA, 2011.

45. Anderson, J.C.; Gerbing, D.W. Assumptions and comparative strengths of the two-step approach. *Sociol. Methods Res.* **1992**, *23*, 321–333. [CrossRef]

46. Gefen, D.; Straub, D.W.; Boudreau, M. Structural equation modeling and regression: Guidelines for research practice. *Commun. AIS* **2000**, *4*, 2–76.

47. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Market. Res.* **1981**, *18*, 39–50. [CrossRef]

48. Solo. Solo Launcher and Alibaba's Alohar Mobile Build the World's First Contextually Intelligent Launcher. *PR News*, 15 May 2015. Available online: http://www.prnewswire.com/news-releases/solo-launcher-and-alibabas-alohar-mobile-build-the-worlds-first-contextually-intelligent-launcher-300084052.html (accessed on 25 April 2017).

49. O'Neill, K. Artbot Engineers the Discovery of Art. *MIT News*, 13 May 2015. Available online: http://news.mit.edu/2015/artbot-engineers-discovery-art-0513 (accessed on 20 April 2017).