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Antecedents of Space Traveler Behavioral Intention

Abstract

This study extends the current knowledge of behavioral intention of space travelers based on motivation and risk antecedents of undertaking a space trip. Using cumulative prospect theory, we develop and test research models to investigate sufficient motivation and risk antecedents on behavioral intention, to explore complex combinations of above antecedents (i.e., causal recipes) leading to both high and low scores of behavioral intention, and to identify necessary motivation and risk antecedents to achieve desired behavioral outcome. The results revealed that although motivations appeared as sufficient and necessary antecedents, but risk antecedents play a dominant role such that risks can diminish the effects of motivations in shaping desired behavioral intention of space travelers. Theoretical and practical implications are discussed.

Keywords: space tourism; cumulative prospect theory; risk; motivation; causal recipes; space traveler.

Introduction

Space tourism has been moving beyond fiction and film as five industries of hospitality, transportation, exploration, energy, and construction start working in new commerce opportunities on other planets. While travelers from 37 countries experienced space trips, the space-based hospitability industry is predicted to worth $37 billion by 2027 (London and Schneider 2017). Space tourism becomes a flourishing industry that attract the attention of governments, businesses, and tourists as it anticipated 18-26% annual growth during 2020 to 2030 (Reddy, Nica, and Wilkes 2012).

The commercial space market, with half-century history, expects more than $250 billion investment per year. NASA expects US$700 million revenue from sub-orbital space travels of 15,000 passengers and US$300 million from orbital travels of 60 passengers annually by 2021 (Futron Corporation 2002). Pioneering nations like the US have already established Space Force as one of the armed force branch to manage military operations and traffic in space (Harrison 2018). Recently, as NASA confirmed presence of widespread water on the moon, the Vice President of the US stated that "it is not a question of if, it is just a question of when" while discussing future human space travel and exploration (NASA August 2018). An online survey advised that Japan, Great Britain, Russia, Germany, and China have greatest public demand for space travel (DePasquale, Charania, and Olds 2006).

While commercial enterprises initiate space stocks to make space tourism a reality by serious investment and a growing technological development, still there is a paucity of empirical research modeled behavioral intention of the space travelers (Crouch et al. 2009; Laing and Crouch 2004; Reddy et al. 2012). For example, cost, safety, and product design elements of space travel were reported as significant predictors of potential client's intention to undertake space travel (Crouch and Laing 2004). New adventure and unique experience, such as sense of weightlessness and the earth seeing from the space, derive demand for space travel (Reddy et al. 2012). Nonetheless, we have little knowledge about various sets of risks and motivations involved in space travel such that Reddy et al. (2012) and Chang (2017) called for identification of motivations and concerns of space travelers. This empirical study aims to fill this research gap by applying cumulative prospect theory to support conceptual models involved motivations and risk as antecedents of the space traveler behavioral intention.

This study tries to investigate the triggers and concerns of behavioral intention of potential space travelers. This is important to identify the risks and motivations and investigate how their interactions formulate behavioral intention of the space travelers. According to cumulative prospect theory, individuals overrate losses more than gains. Technically, the failure of traveling to the moon in 1968 has had unfavorable influence on both public image and NASA staff such that causes a four-decade delay on next attempt of this mission (Speed 2018). Koebler (2014) reported there is still a huge amount of uncertainty that blocks dangerous missions such that NASA has long since lost its edge and sense of adventure. As Identification of the risks and motivations involved in space travel helps agents and operators to develop a travel package that reduce their perceived risks and satisfy expected motives for space travel. Crouch et al. (2009, 451) also believed that "understanding what customers desire will, therefore, be a key ingredient to success" in space tourism development.

This study contributes to the current knowledge of space travel by applying cumulative prospect theory to explicate interactions of risks and motivations of space travel in predicting space traveler's behavioral intention. This empirical study proposes and tests conceptual models that includes different types of risk (psychological, financial, and safety risks) and motivation (adventure, gratification, information acquisition, service experience, and social motivation) to stimulate space traveler's behavioral intention. This study assesses two key principles of cumulative prospect theory with models testing results to evaluate the functionality of this theory in explaining behavioral intention of space travelers.

To examine objectives of the study, distinct effects of risk and motivation antecedents are investigated using regression analysis. This study uses fuzzy-set Qualitative Comparative Analysis (fsQCA) to explore the complex combinations of motivation and risk antecedents

leading to both high and low scores of space traveler behavioral intention. Apart from distinct and combinations of motivation and risk antecedents, this study applies necessary condition analysis to identify necessary motivation and risk antecedents to achieve desired behavioral intention of space travelers. Findings from regression, fsQCA, and NCA provide a deeper understanding of this under-explored area of space travel marketing through investigating sufficient and necessary risks and motivations antecedents to undertake a space travel.

Theoretical background

Space tourism

The European Space Agency (ESA 2008, 19) defined space tourism as an "activity that will encompass the execution of sub-orbital flights by privately-funded and/or privately-operated vehicles and the associated technology development driven by the space tourism market." Space tourism provides a potential market that attracts tourists who are interested in doing something unique and uncommon from the adventure tourism sphere. Space tourist is defined as "someone who tours or travels into, to, or through space or to a classical body for pleasure and/or recreation" (Harrington 2017, 118).

Space tourism includes orbital and sub-orbital markets. Orbital space tourism is the most advanced version which is more expensive and time consuming travel. Total annual payloads on all launch vehicles operated by public and commercial institutions varies from 60 to 80 lunches. Sub-orbital space tourism is the simplest type of space travel that advances the possibility of commercialization of this service with much more number of travelers who will all be able to savor the same experience of America's first man in space, Alan Shepard, who in May 1961 declared: *What a beautiful view*! The cost of sub-orbital space travel ranged from US $100,000

and $250,000 which targeted in a lower price of $50,000 within 10 years (space-tourism.eu). Le Goff and Moreau (2013) by conducting a demand analysis of sub-orbital space tourism found that it is sizeable market starting with 600 customers that could reach 128,500 clients by 2030. While the magnitude of demand depends on the costs of travel, Americans and Chinese are most excited about space tourism followed by Japanese Australians, Germans, English, French, Italian, and Spanish potential clients.

Due to lack of awareness on the types of space tourism, spacecraft, service operations, safety, and legal issues, travelers might perceive various types of risks such as safety, psychological, and financial risks. Nevertheless, space tourism seems to attract individuals who are risk-takers and novelty seekers. Increase of general public awareness is essential for advancement of space tourism to not only influence the funding support of the governments and public organizations but also increase interest of people to invest in in space-related stocks to advance technology of space tourism (Reddy et al. 2012).

Antecedents of behavioral intention of space travelers

A review of the space tourism literature shows that several factors formulate behavioral intention of individual to undertake a space travel. Reddy et al. (2012) conducted a survey to assess factors influencing decision-making process of British residents about space tourism. They found safety, training requirements, the operating company reputation, duration of travel, design of the spacecraft and process of lunch, accommodations facilities in the space destinations, and insurance costs are most important indicators that tourists consider to undertake space travel. In the case of Australians clients, Crouch et al. (2009) reported price is one the most important determinant of potential customer in choosing types of space tourism followed by nationality of

service operator, the physical requirements placed on travelers, crowdedness of travel, and the duration of preparation for space travel.

Motivational and risk factors influencing the travelers' behavioral intention for earth-based destinations well studied in tourism literature (Arnold and Reynolds 2003; George and Mawby 2015; Kim et al. 2013; Olya and Al-ansi 2018; Olya et al. 2019; Reisinger and Mavondo 2006; Simpson and Siguaw 2008). As Crouch (2001) stated, due to lack of large population of experienced space travelers, it is not straightforward to evaluate customer motivations, perceived risks, attitudes, and behaviors. Evaluation of potential space travelers is significant as Griffin (2008, 4), the administrator of NASA, acknowledged "space exploration today is primarily a government activity, but that will not always be so. In fact, we should work to see that it is not. We should reach out to those individuals and companies who share our interest in space exploration and are willing to take risks to spur its development."

With regards to traveler motivation, Swarbrooke et al. (2003) named potential clients of space travel as 'new-tourists' who like enjoyment, need a self- fulfilment, and prefer to escape from everyday routine. Reddy et al. (2012, 1095) stated that "early predictions indicate that space tourism would attract tourists who are interested in doing something new and unusual from the adventure tourism sphere as well as the established space-related interests such as viewing Earth from the space (rather than for scientific purposes)." Chang (2017) conducted a survey in the context of Taiwan to assess effects of four motivational factors, namely, social, functional, hedonic and cognitive, and perceived novelty on attitude of space travelers. Chang (2017) concluded that motivation is a multi-facets and complex predictor of space travelers' attitude and recommended assessment of risk perceptions along with motivation factors in indicating behaviors of space travelers.

Risk takers are more likely to undertake space travel (Crouch et al. 2009). Specifically, people perceive space travel as a risky journey (Futron 2002). From demand side, Robert Zubrin, president of the Mars Society stated that "it's fear holding NASA back. These are risky missions. If you want to be safe, stay on the ground" (Koebler 2014). Nevertheless, wealthy people who are excited in extreme sports (e.g. climbing mountain and bungee jumping) can be targeted as potential segment in space tourism marketing plan (NSS 2009). Reddy et al. (2012) indicated that even extreme sports participants perceive various types of risk involved in space tourism (e.g., safety and insurance cost).

As many studies reported, cost is the most important determinant in decision-making process of the space travelers, financial risk may play a negative role in shaping their desired behavioral intention (Crouch et al. 2012; Crouch and Laing 2004; von der Dunk 2013). Potential customers may perceive psychological risk due to lack of awareness of the about process and product design of space travel. Though, Leybovich (2009, 25) indicated that "risk is critical to the experience of adventure activities, to make them worth the participant's time, resources, energy, and possibly even health and life".

Risks and motivations antecedents

Risk and motivations are multidimensional factors that act as important factors for tourists to consider when deciding whether or not to visit a specific destination (Richards 2002; Olya et al. 2019). The main motivations derive pleasure traveler decisions to visit a destination/attraction include socio-psychological motivations (e.g., escape from an ordinary lifestyle, exploration and adventure, gratification, prestige, social motivation), and cultural motivations (e.g., education, novelty) (Crompton 1979). Similarly, Pearce and Lee (2005) believed that main motivations for

tourists to travel are escape, gratification, relationships enhancement, and self-development. Knowledge seeking, relaxation, and family togetherness are also reported as motivations affecting the behavioral intention of travelers (Jang and Wu 2006).

Drawing from prospect theory, Antón, Camarero and Laguna-García (2017) identified internal (e.g., travelling with family/friends to boost relations, seeking new experiences, relaxing, getting away from the tensions of everyday life) and external (e.g., enjoying the city's cuisine, sightseeing) as motivations significantly influencing visitor intention to recommend a UNESCO World Heritage Site in Spain. Fuchs and Reichel (2011) investigated relationships of motivations (e.g., leisure, sightseeing, visiting family and friend) and risks (e.g., financial, socio-psychological risk, food safety and weather risk) with visit intentions of the first time and repeat visitors to a highly volatile destination.

In the context of social networking, Currás-Pérez et al. (2013) examined the effects of risk factors (e.g., psychological, privacy, social, and time-loss risks) and motivations (i.e., entertainment, social and fashion gratifications) as triggers of satisfaction and loyalty of online users of social networking sites. They found that loyalty of customers positively influenced by motivation factors, whereas it was not affected by their risks perception. In the tourism context, Olya and Al-ansi (2018) examined risk perceptions of halal consumers about purchase of halal items and services. They found complex interactions of risk factors, such as psychological, health, social, environmental, quality, financial, and time-loss risks, influence behavioral intentions of intentional Muslim travelers to recommend and to continue using halal products and services.

In the area of the sharing economy, different types of risk perceived by Airbnb hosts were used to predict their behavioral intentions in terms of continuance intention to use and intention

to recommend this business to others (Malazizi et al. 2018). They found heterogeneous effects of risk factors on the outcomes of proposed model. Continuance intention to use Airbnb is negatively influenced by financial, political, and safety and security risks, whereas it is positively affected by psychological risks due to the benefit of social interactions between host and guest. Intention to recommend Airbnb as peer-to-peer business to the others is decreased by hosts perception of political risk and is increased by psychological risk. Similarly, So, Oh and Min (2018) reported heterogonous impacts of motivation (e.g., enjoyment and social interaction) and constraints (e.g., perceived risk) factors on behavioral intention of Airbnb guests.

Cumulative prospect theory

Proposes theory was proposed by Tversky and Kahneman (1986) to address drawbacks of expected utility theory by elucidating two key elements. First, individuals make decisions under risky conditions, while they consider value functions involving losses and gains. Second, the behavior of people who perceived risk follows a nonlinear transformation of the probability scale, while they underweight moderate and high probabilities and overweight small probabilities. Tversky and Kahneman (1992) advanced prospect theory through improving value and weighting functions and named it cumulative prospect theory. This theory posits that customers consider the perceived values of gains and losses and acts based on decision weights rather than probabilities of outcome. In other words, although customers are aware of potential risks, their decision is derived by the consequent of gains and losses rather than final outcomes.

Two features of cumulative prospect theory are 'diminishing sensitivity' and 'loss aversion,' which were invoked to describe decisions of individuals about risks and uncertainties. Diminishing sensitivity means that "subjects are risk averse with respect to gains and risk

seeking with regard to losses," and loss aversion means that when it comes to take a decision under both risk and uncertainty "losses loom larger than gains" (Kairies-Schwarz et al. 2017, 379). A simple example of diminishing sensitivity is that individuals are more sensitive to loss of $100 rather the gain of $100. An example for loss aversion involving uncertainty is that an individual goes with sure gain of $300 rather than a 50% chance of gaining $700 nor nothing. Furthermore, individual prefers 50% probability of either losing $700 or nothing against 100% chance of losing $300. This means that, when people need to make a decision, they intend to avoid risks and uncertainties which might outweigh the gains. In the case of space tourism, travelers might overweight risks (i.e., losses) of space travel comparing the motivations (i.e., gains).

Summerfield and Tsetsos (2015, 28) stated that "because human behavior is at systematic odds with rational axioms, psychologists used non-normative framework [i.e., cumulative prospect theory] to describe human behavior." Cumulative prospect theory is used in explaining individual's behaviors in economic studies specifically in the areas of casino gambling and stocks sectors (Imas 2016). Kairies-Schwarz et al. (2017) applied cumulative prospect theory in the health insurance context. They found that the decision quality of consumers to choose insurance contracts is derived by risk preferences, which is matched with cumulative prospect theory rather than expected utility theory.

In marketing research, List (2004) conducted an experiment to examine functionality of neoclassical theory against prospect theory in explaining purchasing behavior of customers. List (2004) found that prospect theory adequately describes inexperienced consumer's behaviors, whereas behavior of consumers with intense market experience is explained by neoclassical

theory. In the field of travel and tourism, Antón et al. (2017) used prospect theory to explain the effects of heritage visitor's motivations on the linkage of their satisfaction and loyalty.

We believe cumulative prospect theory well justifies behavioral intention of the space travelers for several reasons. First, the proposed model involves motivation and risks antecedents which space travelers may evaluate motivations as gains and risks as losses. Second, cumulative prospect theory is used to explain choice under both risks and uncertainties, and is matched with the proposed conceptual models that includes various types of risks (e.g., psychological and safety) and motivations (e.g., gratification and service experience). In fact, it is not certain that expectations of potential space travelers about their motivations will be confirmed. In other words, due to lack of actual experience, potential travelers may value motivations in shaping their behavioral intention under uncertainties.

The third reason for justifying the application of cumulative prospect theory as the theoretical underpinning of the proposed research model is that it is recommended to explain non-linear interactions of indictors in predicting social phenomena (Antón et al. 2017; Kairies-Schwarz et al. 2017; Tversky and Kahneman 1992). We assume non-linear interactions of risk and motivation factors in predicting the behavioral intention of the space travelers. Furthermore, two principles of cumulative prospect theory, namely, diminishing sensitivity and risk aversion, are assessed based on the results of model testing to check that cumulative prospect theory accommodated the research findings.

Research model

Based on a review of the travel and tourism literature, this study assumed that behavioral intention of space travelers may influenced by three types of risks, of safety, psychological, and

financial risks and five motivations including information acquisition, adventure, gratification, service experience, and social motivations. Risks and motivations affecting behavioral intention of space travelers are defined as follows:

- Safety risk: possibility of occurrences of failure during the space travel that might lead to dangerous accidents and fatal incidents.
- Financial risks: probability of losing money due to paying extra and unexpected expenses for an expensive space travel.
- Psychological risk: the risk of anxiety and psychological stress stemming from being a space traveler.
- Adventure: a motive makes space travelers excited and stimulated as they feel they are adventuring in a new universe.
- Gratification: a motive makes travelers feel happy due to relieving stress by undertaking a space trip.
- Social motivation: an opportunity to be with family and friends and socialize with people with same interests.
- Service experience: a reason to experience space travel as a new type of service.
- Information acquisition: a reason be informed and updated about space and space tourism.

Drawing on cumulative prospect theory, space travelers may consider several gains (e.g., gratification) and various types of risk (e.g. safety) of space travel and make a decision based on the evaluation of these losses and gains using certain heuristics. In other words, behavioral intention of the potential clients are influenced by their assessment from weights of different gains and losses of space travel.

Figure 1 illustrates two conceptual models. Figure 1a is designed to investigate distinct effect of motivations and risks antecedents on behavior intention, and Figure 1b, which is a configurational model, is developed to calculate causal recipes from two configurations of motivation and risk. Configurational model includes two configurations of motivation and risk. Motivation configuration consists of adventure, gratification, social motivation, service experience, and information acquisition. The complex configuration from motivations to predict behavioral intention is indicated by arrow 'a' in Figure 1b. Risk configuration is composed of psychological, financial, and safety risks, and causal recipes from this configuration is represented by arrow 'b' in Figure 1b. The causal recipes from combination of risk and motivation configurations is also investigated that indicated by arrow 'c' in Figure 1b. The configurational model is tested to explore patterns (e.g., combination of antecedents) of motivations and risks lead to high and low scores of behavioral intention of space travelers.

Figure 1 about here

Method

Measurements

The scale items of behavioral intention, risks, and motivations were extracted from validated scales used in tourism studies (Arnold and Reynolds 2003; George and Mawby 2015; Kim et al. 2013; Knutson et al. 1993; Meng and Han 2016; Reisinger and Mavondo 2006; Simpson and Siguaw 2008). Behavioral intention were measured using three items adapted from Meng and Han (2016). Three items from Arnold and Reynolds (2003) were used to gauge adventure of potential space travelers.

Gratification is measured using three items from Arnold and Reynolds (2003) and Kim et al. (2013). Using three items from Kim et al. (2013), social motivation was measured. Service experience is measured using three items from Knutson et al. (1993). Three items from Kim et al. (2013) are used to measure information acquisition. Safety risk is measured using three items from George and Mawby (2015). Three items for psychological risk and three items for financial risk were extracted from Reisinger and Mavondo (2006) and Simpson and Siguaw (2008).

All items, except social motivation, were measured using the seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7). Likert-type scale response anchor for social motivation was ranged from 'not at all important' (1) 'extremely important' (7). A different scale response is recommended as a procedural remedy for controlling common method variance (CMV). One item of safety risk (i.e., space travel is just as safe as any other travel) is reversed coded, which is another suggested remedy to reduce potential threat of CMV (Podsakoff et al. 2003).

The questionnaire was composed of four sections. In the first section, five filter questions (I. Are you seeking for a unique and unusual experience? II. Are you considering yourself as a luxury traveler? III. Have you had a luxury travel experience (i.e., total expenditure is greater than USD$ 7,000) within the last one year? IV. Are you a novelty seeker? and V. Are you a heavy spender during travel?) were used to target qualified respondents. Novelty and adventure seeking, economic power of individuals, willingness to spend for travel and leisure are main features of the space travelers (Swarbrooke et al. 2003). We designed filter questions based on the above features to select respondents who have more similar characteristics with potential space travelers.

Confidentiality of the participants' information and their responses were acknowledged. Basic information of survey (e.g., timing) is provided in the first section. The second section presents instruction about space tourism and types of space travel. This instruction helped respondents to have sufficient information to rate the items related motivations and risks of undertaking a space travel (Crouch et al. 2009). Questions for measuring the study variables are presented in sections three. In the fourth section, demographic characteristics of the participants are measured.

Data and procedure

The survey instruments were checked by three academicians who are experts in tourist behavior. Filter questions to recruit qualified respondent and instruction section were slightly modified based on the comments of experts. A pilot study with 17 potential respondents was conducted to check ease of clarity of scale items, format of survey instrument, comprehensibility of the instruction, and suitability of survey length and completion time. Respondents who participated in the pilot study found all scale items understandable and clear. Two participants suggested enriching opening instruction of the survey, so we improved it by providing more information about space tourism and types of space travel.

Data was collected using a web-based survey conducted by an online panel company in the United States in August 2017. The company committed that all panel partners employ continuous monitoring and quality control checks to guarantee respondents are carefully taking the survey. We believe that the web-based panel survey is an effective approach to obtain views of potential space travelers for several reasons. First, the online panel survey allowed us to target a broader range of qualified sample compared to a field survey methodology as a total of twenty

million panelists were registered in the service provider company. Second, respondents were randomly invited from different geographical locations across the US. Technically collecting views of such data using filed administration is not a straightforward project. Third, the company assess the qualifications of the respondents based on the designed filter questions through cross-checking the previous records of the respondents. Importantly, the company ensures best practices in handling methodological, ethical, and regulatory issues, and the legalities regarding technology in research. While we acknowledge the samples obtained from the web-based panel survey did not completely represent the entire population of our research interest, this method is recognized and used as an effective approach to reach a wider range of interested samples comparing a field administration survey (e.g., Han 2015; Untaru et al. 2016).

A total of 957 participants who passed the qualification stage attempted to fill the questionnaires. After scanning and screening the data, cases with missing values were deleted. Tabachnick et al. (2013) recommended a 5% cut-off for using the replacement technique for missing values. As all cases with missing values exceeds recommended cut-off for incomplete data, no statistical technique used to replace missing values. After dropping cases with incomplete data, a total of 370 valid and completed questionnaires were obtained. To check non-response bias, a means comparison test was conducted to check whether the two sample groups extracted from origin sample are different statistically. The results of chi-square test showed no significant difference which mean study measures did not influence by non-response bias.

The sample includes 50.5% male and 49.5% female respondents. In terms of age, 15.4% of respondents were aged between 18-27 years old, 21.6% were 28-37 years old, 20.8% were 38-47 years old, 20% were 48-57 years old, and 22.2% were older than 57 years. Regarding educational background, 5.4% of respondents have a high-school diploma, 36.2% gained some

college degree, 41.9% hold master, and 16.5% respondents had a PhD. The sample consisted of 28.1% single and 71.9% married/coupled respondents. Income level of 4% of respondents was under US$ 90,000, 13.8% ranged from $90,001 to $120,000, 20% $120,001 - $150,000, 18.1% was $150,001 - $180,000, and 44.1% were over $180,001.

Analytical approaches

The reliability of study variables was checked using Cronbach's alpha (α) and composite reliability (CR). Construct validity of the measures and fitness of the measurement model were tested using confirmatory factor analysis (CFA). Logarithmic regression, which is a non-linear regression test, was performed to investigate net effect of motivation and risk factors on behavioral intention of potential space travelers. The reason for using non-linear regression is that result of Shapiro-wilk showed that observed residuals are not normally distributed (residual statistic= .963, $p<.001$). The detailed results are provided in the Appendix A. We assume the predictors have logarithmic accusations with dependent factor. The literature also advises logarithmic equation to predict individual's behavior under risky conditions. Specifically, Tversky and Kahneman (1992) used a nonlinear procedure (i.e., logarithmic regression) to check the corroboration of the cumulative prospect theory. Thus, we investigated net effects of the antecedents on the behavioral intention of space travelers using logarithmic regression.

Causal recipes (i.e., sufficient combination of the motivation and risk factors) were explored using fsQCA. fsQCA is a set-theoretic analytical approach that explores a causal combination of the antecedents (i.e., motivation and risk factors) to stimulate the desired outcomes (i.e., behavioral intention). fsQCA involves three main steps. The first is calibration, which is transformation of crisp-set data to fuzzy set value. The seven-point Likert scales were

calibrated so that non-full membership was assigned to 2, 4 was assigned to cross-point, and full membership was assigned to 6 (Olya and Akhshik 2019; Olya and Gavylian 2017; Pappas et al. 2016). The second step is truth tabulation, which refers to calculation of all possible conditions results in a given outcome. fsQCA used Boolean algebra to calculate sufficient and consistent conditions leading to the model outcome. Sufficiency and consistency of the conditions were ensured using two probabilistic measures of coverage and consistency which are analogous to determination coefficient and correlation in symmetrical method, respectively. The third step is counterfactual analysis in which truth tables need to be refined based on existing knowledge or expert judgment (Ragin 2008).

While regression analysis reveals a sufficient factor and fsQCA shows a sufficient combination of the antecedents (i.e. causal recipe) to predict a given outcome, still a further analysis is needed to introduce necessary antecedents. In another words, a predictor (i.e., single factor/causal recipe) can be sufficient but not necessary to achieve a given outcome. In contrast, a factor can be insufficient but necessary to attain the outcome (Olya, Bagheri, and Tümer 2019). For example, a risk factor might emerge as a sufficient, but not necessary, antecedent to contribute in behavioral outcome of the space travelers. As such, analysis of necessary conditions was conducted to identify necessary motivation and risk antecedents leading to the expected behavioral intention of space travelers (Dul 2016; Han et al. 2019; Olya and Al-ansi 2018).

Results and Discussion

Reliability and validity

The results of psychometric properties of measures were provided in Table 1. The magnitude of α and CR values for nine study variables were larger than .7, which is the recommended level for internal consistency of the scale items (Bagozzi and Yi 1988; Cortina 1993). These results confirm the reliability of the study measures. Exploratory factor analysis (EFA) is conducted to check scale composition of the items (Pappas et al. 2016). The results of CFA show that all items are sufficiently and significantly loaded under the assigned construct (standardized factor loading >.5, p<.001). Based on the EFA and CFA results, no item was dropped to satisfy the validity of the measures (Anderson and Gerbing 1988). Findings from EFA are in line with CFA results as items were adequately loaded under respected factor (λ>.5- no cross-loading), and the magnitude of eigenvalue for all emerged factors was above 1.

A sample of absolute (RMSEA: root mean square error of approximation), relative (CFI: comparative fit index and IFI: incremental fit index), and parsimonious (PGFI: parsimonious goodness of fit) statistics were calculated to check the fitness of the measurement model. As shown in Table 1, fit measures (CFI= .902, IFI= .903, PGFI= .704, RMSEA= .089) showed a moderate fit with the empirical data. The results of average variance extracted (AVE) provide evidence of convergent validity as AVE for all constructs was greater than .5 and not larger than CR for the correspondence construct. Value of AVE for all constructs was greater than the corresponding maximum shared squared variance (MSV) and the average shared square variance (ASV) confirming the discriminate validity of the study scales (Anderson and Gerbing 1988; Fornell and Larcker 1981).

Table 1 about here

Sufficient risk and motivation antecedents

The results of regression analysis for investigating the effects of motivation and risk antecedents on behavioral intention of the space travelers are demonstrated in Figure 2. Adventure has a significant and positive effect on behavioral intention (β= .590, p<.001). Crompton (1979) also indicated that exploration and adventure serves as a tourist's motivation to travel or visit a destination. According to the results, gratification boosts behavioral intention (β= .711, p<.001). These results are in line with So's (2018) study that found enjoyment significantly improved overall attitude and behavioral intention of Airbnb guests. Currás-Pérez et al. (2013) also found gratification increases customer's satisfaction and loyalty. According to regression results, social motivation plays a significant role in formulating behavioral intention of space travelers (β= .560, p<.001). Jang and Wu (2006) and Fuchs and Reichel (2011) believed tourist travel to spend time with family and friends and also to familiarize themselves with people sharing the same interests. In the marketing area, Kim et al. (2013) found that social and hedonic motivations increased satisfaction and engagement intention of mobile users.

As illustrated in Figure 2, service experience improves behavioral intention of space travelers (β= .586, p<.001). This means potential space travelers are keen to experience a new and unique service during space trip. This result is in accordance with Nejati and Mohamed (2014) who found the decision of international travelers was influenced by 'uniqueness', 'quality', and 'distance and value'. Antón et al. (2017) also identified seeking new experience enhanced heritage visitor's recommendation intention. Information acquisition has a significant and positive effect on the behavioral intention of space travelers (β= .461, p<.001). This result suggests that people more likely undertake space travel to keep informed and educated about space and space trips. One of the reasons for this may be that having more knowledge enhances

travelers' awareness about less-known aspects of space travel, which might motivate them to undertake this trip. This finding is in accordance with Crompton (1979) and Jang and Wu (2006) who believed knowledge seeking and education motivate individuals to travel.

The results of regression test revealed that psychological risk decreases the behavioral intention of space travelers (β= - .139, p<.01). Similar results were found by Yüksel and Yüksel (2007) who indicated that desired tourist's shopping behavior influenced by psychological risk negatively. Currás-Pérez et al. (2013) also reported a negative impact of perceived risk including psychological risk) on satisfaction and loyalty of customers. Financial risk was not deemed as a negative contributor of behavioral intention of space travelers. This is in line with Malazizi et al. (2018) who reported finical risk did not decrease intention of Airbnb hosts to recommend the business to others. Similarly, So et al. (2018) found that behavioral intention of Airbnb guests is not affected by their risk perception.

Safety risk has significant and negative effect on the behavioral intention of space travelers (β= - .186, p<.001). In the field of the sharing economy, Malazizi et al. (2018) reported a negative impact of safety and security on user's behavioral intention. Relating the results of this study with finings of space tourism, significant effects of finical and safety risks on behavioral intention are in line with Crouch and Laing (2004), who similarly reported that cost and safety as two concerns of Australian space travelers. In terms of motivational factors, findings of the present study are in accordance with Laing and Crouch (2005, 214) that sated several motivations—namely, "intellectual curiosity, childhood influences, challenge/goal-setting, self-actualization/prestige, fun/novelty, learning, cultural influences, fantasy, educating others, risk/escape, and spirituality/environment/adventure"—may derive from the behavioral

intentions of frontier tourists. Similarly, Chang (2017) indicated that perceived novelty, hedonic, and social motivations improved Taiwanese's attitude toward space travel.

Insert Figure 2 about here

Sufficient recipes from risk and motivation antecedents

The results of fsQCA for testing the motivation configuration in predicting low and high scores of behavioral intention are provided in Table 2. Two sufficient causal models describe combination of motivational antecedents where the expected behavioral intention of space travelers is obtained (coverage: .962, consistency: .840). Model 1 indicates that combination of high adventure, service experience, and information acquisition derive behavioral intention of the potential travelers to undertake space tourism. Alternatively, Model 2 offers that high adventure, gratification, social motivation, and service experience results in high score of behavioral intention.

According to the fsQCA results, five causal recipes emerged for predicting low score of behavioral intention (arrow A in Figure 1b) (coverage: .629, consistency: .845). The first model advises that high adventure, and information acquisition and low gratification and social motivation leading to low score of behavioral intention. Based on the second model, a low score of behavioral intention is caused by low gratification and social motivation and high service experience and information acquisition. Alternatively, a combination of high adventure, service experience, information acquisition and low social motivation explicate condition of undesired behavioral intention (Model 3). A low score of adventure, gratification, social motivation, service experience, and information acquisition lead to undesired behavioral intention (Model 4).

Model five indicates that high adventure, gratification, social motivation, service experience, and low information acquisition results in low behavioral intention of space traveler (Table 2).

Insert Table 2 about here

The causal recipes from risk configuration for indicating high and low scores of behavioral intention of space travelers (arrow B in Figure 1b) are provided in Table 3. fsQCA results showed that expected behavioral intention are attained based on two causal recipes from risk configuration (coverage: .575, consistency: .889). The first model suggests that low psychological and safety risks improve the behavioral intention of space travelers. According to the second model, low financial risk and high safety risk contribute to desired behavioral intention. As shown in Table 3, unexpected behavioral intention of space travelers results from high psychological risk and low safety risk (coverage: .494, consistency: .779).

Insert Table 3 about here

The results from fsQCA for combination of motivation and risk configurations (arrow C in Figure 1b) are presented in Table 4. Five models explained sufficient combination of motivation and risk antecedents results in high behavioral intention (coverage: .870, consistency: .902). Model 1 advises that high adventure, gratification, social motivation, service experience, information acquisition and low physiological risk lead to high behavioral intention. According to the second model, high behavioral intention caused by high adventure, gratification, social motivation, service motivation, information acquisition, and financial risk. Alternatively, high adventure, social motivation, service motivation, information acquisition, psychological risk, and safety risk lead to high behavioral intention of space travelers (Model 3). As shown in Table 4, high behavioral intention results from high adventure, social motivation, service motivation, information acquisition, financial risk, and safety risk (Model 4). According to Model 5, high

adventure, service experience, information acquisition, psychological risk, financial risk, and safety risk and low gratification lead to desired behavioral intention of the space travelers (Table 4).

As shown in Table 4, a low level of behavioral intention results from low adventure, gratification, social motivation, service motivations, information acquisition, psychological risk, financial risk, and high safety risk (Model 1). The second model suggests that low gratification, and financial risk and high adventure, social motivation, service experience, information acquisition, psychological risk, and high safety risk lead to low score of behavioral motivation. Model 3 advises that undesired behavioral intention caused by low gratification and psychological risk and high adventure, social motivation, service experience, information acquisition, financial, and safety risks. According to Model 4, low gratification and social motivation and high adventure, service experience, information acquisition, financial, and safety risks lead to low score of behavioral intention. Model 5 suggests that low safety risk and high gratification, social motivation, service experience, information acquisition, psychological and financial risks results in low score of behavioral intention (Table 4).

Insert Table 4 about here

Necessary risk and motivation antecedents

The results of necessary conditions analysis for achieving expected behavioral intention of the potential space travelers are provided in Table 5. The antecedent with magnitude of consistency larger than .9 is subject to necessary condition of the given outcome (Dul 2016; Olya and Al-ansi 2018). The results showed that necessary motivational antecedents of behavioral intention are adventure, gratification, social motivation, service experience, and information acquisition

(consistency > .9). These results are similar to Olya et al. (2019), who identified new experience, novelty and exploration as necessary motives of visitor intention to recommend a heritage site. As shown in Table 5, risk antecedents are not necessary for attaining desired behavioral intention of space travelers.

Insert Table 5 about here

Conclusion and Implications

Theoretical significances

This empirical study used cumulative prospect theory to explain associations of motivation and risk antecedents with behavioral intention of potential travelers to undertake a space trip. This study attempted to address research a gap in past research on how behavioral intention of potential travelers are influenced by motivation and risk factors. This study concluded that motivational factors (i.e., gratification, adventure, gratification, experience of new service, acquisition of information, and social motivation) significantly contributes to achieving behavioral intention. Nevertheless, assessment of study findings with key principles of cumulative prospect theory showed that risk antecedents (psychological, financial, and safety risks) can enfeeble the effects of motivations in attaining desired behavioral intention of space travelers. This outcome is very important as development of space travel requires public attention and investment. It helps to develop a marketing plan for targeting a wide range of clients through advising on what and how risks and motivations formulate behavioral intention of the potential space travelers.

This study contributed the current knowledge of space tourism in several ways. First this study deepened our understanding of space tourism marketing by applying cumulative prospect

theory to describe behavioral intention of space travelers based on their motivations and risk perceptions. Cumulative prospect theory integrates psychological considerations into theories of decision-making under risk conditions in which space travelers counter-balance the values of losses (risks) and gains (motivations) of a decision leading to an outcome. It accommodates behavioral intention of the space travelers who evaluate risks and motivations involved in a space trip in a holistic way and come up with a decision based on the descriptive assessment.

The results of model testing confirmed two key principles of cumulative prospect theory. i) Diminishing sensitivity: Comparing five models emerged from combination of risk and motivations for predicting desired behavioral intention (Table 4) showed that coverage value (number of cases with high level of behavioral intention that are represented by a given model) is decreasing from Model 1 to Model 5 as space travelers may overweight risks (losses) and underweight motivations (gains). Specifically, in the first model (M1: ad*gr*so*ser*inf*~pys), 34 space travelers who expressed desired behavioral intention considered five motivations and perceived low level of psychological risk in their decision to undertake a space travel. Whereas, in fifth model (M5: ad*~gr*ser*inf*pys*fin*saf) the number of space travelers with desired behavioral intention decreased to eight as they perceived three types of risk and believed space travel would not be a gratifying trip. These results confirmed that results of model testing are in accordance with diminishing sensitivity feature of cumulative prospect theory.

ii) With regards to 'risk aversion' principle of cumulative prospect theory, results from fsQCA showed that individuals overweight risk factors while underweight motivational factors in their intention to not undertake a space travel. As shown in Table 4, in the first model for low score of desired behavioral intention (M1: ~ad*~gr*~so*~ser*~inf*~pys*~fin*saf), space travelers perceived a high level of safety risk, although they perceived low levels of

psychological and financial risks, which might influence their evaluation from motivational factors such that they avoid to undertake a space travel. The fifth model is another evidence for support of risk aversion principle as space travelers who perceived psychological and financial risks expressed low intention to undertake a space travel. As appeared in Model 5 (ad*gr*so*ser*inf*pys*fin*~saf), space travelers perceived low level of safety risk and high levels of five motivation factors, but they overweight psychological and financial risks and underwrites possible gains (motivations). Recalling the results of necessary condition (Table 5), motivation antecedents emerged as necessary condition, but space travelers underweight such gains due to perceived risks which is in accordance with risk aversion principle of cumulative prospect theory (i.e. losses loom larger than gains).

The second contribution of this study refers to investigation of the distinct effects of motivation and risk factors that significantly contribute in behavioral intention of the space travelers. This empirical study found that adventure significantly and positively affects behavioral intention of travelers. Similarly, gratification servers as an impactful motivation for traveler to undertake this tripe. Service experience serves as a motivation antecedent that sufficiently increases traveler intention of undertaking a space travel. According to the results, information acquisition has a negative and significant effect on behavioral intention. Psychological risk acts as a sufficient antecedent that significantly decreases the desired behavioral intention of space travelers. While past studies highlighted the role of safety and financial risks, the results of this empirical research revealed these two risk antecedents have not significant effects on behavioral intention of the space travelers. Such results indicated the importance of configurational modeling of the traveler's behavioral intention in which role of each antecedent is evaluated along with features of other antecedents.

This is first empirical study that conducted configurational modeling using an asymmetric approach (i.e., fsQCA) to explore complex combinations of the motivation and risk antecedents explaining conditions of high and low scores of behavioral intention of space travelers. The results from fsQCA revealed that a combination of motivation and risk antecedents (i.e., more than one antecedent) need to be employed in causal models to predict both high and low behavioral intention. The fsQCA results also showed that behavioral intention of potential space travelers can be explained by more than one causal models that inform how motivation and risk antecedent can be matched alternatively to predict expected behavioral intention. The fsQCA results showed that causal models of low behavioral intention are unique and different than opposite mirror of causal models of low behavioral intention of space travelers (c.f. Tables 2, 3 and 4).

Finally, this is among a few tourism studies that identify a necessary condition to reach the desired behavioral intention of traveler. This study showed that adventure, gratification, social motivation, service experience, and information acquisition are necessary motivation to intend undertaking a space travel. Interestingly, risk factors do not contribute as necessary conditions of behavioral intention of space travelers. This study showed that while some of the antecedents (e.g., psychological risk) are sufficient, they are not necessary to achieve behavioral intention. Contrary, some of the antecedents (e.g., information accusation) are necessary, but insufficient in modeling of behavioral intention of space travelers. This study highlights the necessity of application of a set of pragmatic analytical approaches (e.g. symmetric and asymmetric methods) as each technique provides useful insights into the current knowledge of tourist's behavior.

Implications

The outcomes of this study offer an action plan for marketers and investors of space tourism to target potential clients based on their motivations and risks involved in a space travel. Managers can follow the causal recipes extracted from motivation and risk configurational modeling that recommend how to attune motivation and risk antecedents such that lead to expected behavioral intention of space travelers. Policy makers need to know that, although risk factors like psychological and safety risks, along with other antecedents influence behavioral intention of space travelers, they might act as sufficient, not necessary, antecedents of desired outcome.

Risk perception of the space travelers can consistently and sufficiently underweight the motivations, although appeared as sufficient and necessary antecedents, in formulating their behavioral intention. This means marketers must be vigilant in management of risk perception of the potential clients through developing innovative ideas that minimize the risks of space travel while offering the identified motivations. For example, a Japanese company is ambitious of building an elevator, rather than a rocket, to transfer travelers to the space by 2050. While travelling to space using an elevator is not risk-free, it might work as a contingency plan of a spacecraft, which brings higher levels of psychological, financial, and safety risks due to uncertainties of incidents and accidents during lunching and landing a rocket.

One of the effective approach in risk management is training. We recommend managers to include professional training as one of the key elements of the marketing plan. Training programs must provide informative instruction about tackling safety, psychological, and financial risks of space travelers. Operators can reduce the risk perception of the potential clients by collaborating with third parties (e.g., insurance companies) to offer insurance packages for safety and financial losses. We also recommend international cooperation among companies and

agencies to plan for a safer travel to the space. Pioneer institutions can advance this industry if they work closely and share their knowledge and competences in terms of risk management of this human dream. Having said that, marketers can design an initiative to target potential space travelers with risk-takers personality. They can benefit from established psychological measures to identify such characters.

This empirical study found that adventure, gratification, social motivation, experience of new service, and acquisition of information about space and space travel motivate travelers to undertake a space trip. Marketing plans and campaigns should satisfy these needs by producing and delivering messages and slogans that highlight such motivations for potential client. Producing and posting videos in social media can act as an influential tool to illustrate adventurous, novelty, and gratifying aspects of a space travel as NASA is doing so well. This strategy also helps with identification, assessment, and communication the risks and policies related to space travel as such platforms provide an opportunity for both service providers and clients to communicate and share their concerns and thoughts.

One of the limitations of this study is inclusion of a single outcome (i.e., behavioral intention of undertaking space travel) in the proposed conceptual models. It is recommended including various outcomes such as trust and attitude toward space travel and investment intention into the model in further research. This study is a cross-sectional study which may be a limitation for generalization of the outcome for future practices as perceptions of the people about space tourism could be changed due to technological and structural development of space travel. A longitudinal data from motivation and risk antecedents of behavioral intention will provide a more accurate insight of decision-making process of space travelers.

Another limitation of the study refers to differentiating types of space travel at a construct level, future studies can collect views of potential clients concerning motivations and risks attached in various types of space travels such as orbital and sub-orbital trips. Further research can include cultural and trip/destination related factors (e.g., length of stay, travel party size, time and typology of the accommodation) in the conceptual model to predict attitude and behaviors of space travelers. We also advise researchers to investigate the change of behavioral intentions of the space travelers based on their socio-demographics factors using means compassion tests.

We acknowledge that this study is limited to panel data that represents views of potential space travelers. So few individuals have travelled to space as tourists that we did not have access to obtain their perspectives about perceived risks and motivations. It is worthwhile to approach these individuals to conduct an in-depth interview about their actual experience, motivations and risk perceptions, and behaviors toward space travel. Alternatively, we suggest establishing an initiative—which is sponsored by NASA or other institutions that can benefit from the outcome of the research—to register travelers who are well-qualified to undertake a space trip. Then, views of the people need to be studied using a mix method approach that would lead researcher to propose more pragmatic strategies and implications.

Insert Appendix A. about here

References

Anderson, J. C., and D. W. Gerbing. 1988. "Structural equation modeling in practice: A review and recommended two-step approach." *Psychological Bulletin 103*(3): 411-423.

Antón, C., Camarero, C., and M. Laguna-García. 2017. "Towards a new approach of destination loyalty drivers: Satisfaction, visit intensity and tourist motivations." *Current Issues in Tourism 20*(3): 238-260.

Arnold, M. J., and K. E. Reynolds. 2003. "Hedonic shopping motivations." *Journal of retailing 79*(2): 77-95.

Bagozzi, R. P., and Y. Yi. 1988. "On the evaluation of structural equation models." *Journal of the Academy of Marketing Science 16*(1): 74-94.

Camerer, C. 2005. "Three cheers—psychological, theoretical, empirical—for loss aversion." *Journal of marketing research 42*(2): 129-133.

Chang, Y. W. 2017. "A preliminary examination of the relationship between consumer attitude towards space travel and the development of innovative space tourism technology." *Current Issues in Tourism 20*(14): 1431-1453.

Cortina, J. M. 1993. "What is coefficient alpha? An examination of theory and applications." *Journal of Applied Psychology 78*(1): 98-104.

Crompton, J. L. 1979. "Motivations for Pleasure Vacation." *Annals of Tourism Research 6*(4): 408-424.

Crouch, G. I. 2001. "The market for space tourism: early indications." *Journal of Travel Research 40*(2): 213-219.

Crouch, G. I., Devinney, T. M., Louviere, J. J., and T. Islam. 2009. "Modelling consumer choice behaviour in space tourism." *Tourism Management 30*(3): 441-454.

Currás-Pérez, R., Ruiz-Mafé, C., and S. Sanz-Blas. 2013. "Social network loyalty: evaluating the role of attitude, perceived risk and satisfaction." *Online Information Review 37*(1): 61-82.

DePasquale, D., Charania, A. C., and J. R. Olds. 2006. "The Emerging Orbital Space Tourism Industry: New Insight into Demand and Prospects for Success." In *AIAA Space* September *2006 Conference*.

Dul, J. 2016. "Identifying single necessary conditions with NCA and fsQCA." *Journal of Business Research 69*(4): 1516-1523.

ESA (European Space Agency) 2008. "Space tourism." www.esa.int/esapub/bulletin/bulletin135/bul135c_galvez.pdf (accessed December 07, 2017).

Fornell, C., and D. F. Larcker. 1981. "Evaluating structural equation models with unobservable variables and measurement error." *Journal of Marketing Research*: 39-50.

Fuchs, G., and A. Reichel. 2011. "An exploratory inquiry into destination risk perceptions and risk reduction strategies of first time vs. repeat visitors to a highly volatile destination." *Tourism Management 32*(2): 266-276.

Futron Corporation. 2002. "Space tourism market study: Orbital space travel and destinations with suborbital space travel." Bethesda, MD. http://www.spaceportassociates.com/pdf/tourism.pdf (accessed December 07, 2017).

George, R., and R. I. Mawby. 2015. "Security at the 2012 London Olympics: Spectators' perceptions of London as a safe city." *Security Journal 28*(1): 93-104.

Griffin, M. D. 2008. "Risk and rewards in commercial space." National Aeronautics and Space Administration (NASA) Lunar Lander Challenge Recognition Ceremony. 5, December. http://www.nasa.gov/pdf/295733main_Risks-and-Rewards-in- Commercial-Space-5-Dec-08.pdf (accessed December 07, 2017).

Han, H., 2015. "Travelers' pro-environmental behavior in a green lodging context: Converging value-belief-norm theory and the theory of planned behavior." *Tourism Management* 47: 164-177.

Han, H., Al-Ansi, A., Olya, H. G., and W. Kim. 2019. "Exploring halal-friendly destination attributes in South Korea: Perceptions and behaviors of Muslim travelers toward a non-Muslim destination." *Tourism Management* 71: 151-164.

Harrison, T. 2018. "How Does Space Policy Directive 3 Affect Space Traffic Management?" Center for Strategic and International Studies. 19, June https://www.csis.org/analysis/how-does-space-policy-directive-3-affect-space-traffic-management. (accessed July 11, 2018).

Harrington, A. 2017. "US state spaceflight liability and immunity acts in context" in Commercial Uses of Space and Space Tourism: Legal and Policy Aspects by Jan Wouters, Philip De Man, Rik Hansen. Cheltenham: Edward Elgar Publishing.

Kim, Y. H., Kim, D. J., and K. Wachter. 2013. "A study of mobile user engagement (MoEN): Engagement motivations, perceived value, satisfaction, and continued engagement intention." *Decision Support Systems 56:* 361-370.

Knutson, B., Stevens, P., Patton, M., and C. Thompson. 1993. "Consumers' expectations for service quality in economy, mid-price and luxury hotels." *Journal of Hospitality and Leisure Marketing 1*(2): 27-43.

Koebler, J. 2014. "Deep Space; NASA can't arbitrarily change its health standards just because it wants to." MOTHERBOARD. https://motherboard.vice.com/en_us/article/4x3wbd/nasa-cant-ethically-send-astronauts-on-one-way-missions-to-deep-space. (accessed December 07, 2017).

Laing, J. H., and G. I. Crouch. 2004. "Australian public interest in space tourism and a cross-cultural comparison." *Journal of Tourism Studies 15*(2): 26-36.

Laing, J. H., and G. I. Crouch. 2005. "Extraordinary journeys: An exploratory cross-cultural study of tourists on the frontier." *Journal of Vacation Marketing 11*(3): 209-223.

Le Goff, T., and A. Moreau. 2013. "Astrium suborbital spaceplane project: Demand analysis of suborbital space tourism." *Acta Astronautica 92*(2): 144-149.

Leybovich, M. E. 2009. "*A technoregulatory analysis of government regulation and oversight in the United States for the protection of passenger safety in commercial human spaceflight."* PhD diss., Massachusetts Institute of Technology, Massachusetts. https://dspace.mit.edu/bitstream/handle/1721.1/57522/618475269-MIT.pdf?sequence=2 (accessed December 02, 2017).

London, J., and E. Schneider. 2017. "These 5 industries will be first to do business in space." World Economic Forum. https://www.weforum.org/agenda/2017/11/industries-will-make-money-in-space/via. (accessed December 02, 2017).

Meng, B., and H. Han. 2016. "Effect of environmental perceptions on bicycle travelers' decision-making process: developing an extended model of goal-directed behavior." *Asia Pacific Journal of Tourism Research 21*(11): 1184-1197.

NASA (2018). "Vice President Pence Talks Future Human Space Exploration on This Week @NASA." 24, August. https://www.nasa.gov/multimedia/podcasting/twan_index.html (accessed August 27, 2018).

National Space Society-NSS. 2009. "Space tourism: Opening the space economy. National Space Society." Positional Paper on Space Tourism. http://www.nss.org/tourism/position.html (accessed December 07, 2017).

Nejati, M., and B. Mohamed. 2014. "Investigating the key factors influencing the travel decisions of international tourists." *International Journal of Leisure and Tourism Marketing 4*(2): 106-116.

Olya, H. G., and A. Akhshik 2019. "Tackling the Complexity of the Pro-environmental Behavior Intentions of Visitors to Turtle Sites." *Journal of Travel Research 58*(2), 313–332.

Olya, H. G., and A Al-ansi. 2018. "Risk Assessment of Halal Products and Services: Implication for Tourism Industry." *Tourism Management* 65c: 279-291.

Olya, H. G., and Y. Gavylian. 2017. "Causal Complexity of Residents' Support of Tourism Development." *Journal of Travel Research* 56(7): 893–912.

Olya, H. G., Bagheri, P., and M. Tümer. 2019. "Decoding behavioural responses of green hotel guests: A deeper insight into the application of the theory of planned behaviour." *International Journal of Contemporary Hospitality Management* 1-17. Doi: 10.1108/IJCHM-05-2018-0374.

Olya, H. G., Lee, C. K., Lee, Y. K., and Y. Reisinger. 2019. "What are the triggers of Asian visitor satisfaction and loyalty in the Korean heritage site?." *Journal of Retailing and Consumer Services 47*: 195-205.

Pappas, I. O., Kourouthanassis, P. E., Giannakos, M. N., and V. Chrissikopoulos. 2016. "Explaining online shopping behavior with fsQCA: The role of cognitive and affective perceptions." *Journal of Business Research 69*(2): 794-803.

Pearce, P. and U. Lee. 2005. "Developing The Travel Career Approach to Tourist Motivation." *Journal of Travel Research 43* (3): 226-237.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and N. P. Podsakoff. 2003. "Common method biases in behavioral research: A critical review of the literature and recommended remedies." *Journal of Applied Psychology 88*(5): 879-903.

Ragin, C.C. 2008. *Redesigning social inquiry: Fuzzy sets and beyond*. Chicago and London: University of Chicago Press.

Reddy, M. V., Nica, M., and K. Wilkes. 2012. "Space tourism: Research recommendations for the future of the industry and perspectives of potential participants." *Tourism Management 33*(5): 1093-1102.

Reisinger, Y., and F. Mavondo. 2006. "Cultural differences in travel risk perception." *Journal of Travel and Tourism Marketing 20*(1): 13-31.

Richards, G. 2002. "Tourism Attraction Systems: Exploring Cultural Behavior." *Annals of Tourism Research 29*(4): 1048-1064.

Simpson, P. M., and J. A. Siguaw. 2008. "Perceived travel risks: The traveller perspective and manageability." *International Journal of Tourism Research* 10(4): 315-327.

So, K. K. F., Oh, H., and S. Min. 2018. "Motivations and constraints of Airbnb consumers: Findings from a mixed-methods approach." *Tourism Management 67*:224-236.

Speed, R. 2018, "NASA boss insists US returning to the Moon after Peanuts to show for past four decades." The Register. 9, May. https://www.theregister.co.uk/2018/05/09/nasa_boss_aims_for_the_moon_while_putin_fires_russias_space_head_honcho (accessed July 07, 2018).

Swarbrooke, J., Beard, C., Leckie, S., and G. Pomfret. 2003. Adventure tourism. The new frontier. Oxford: Butterworth-Heinemann.

Tabachnick, Barbara G., and Fidell. L. S. 2013. "*Using multivariate statistics"* (Sixth ed.). Boston: Pearson Education.

Tversky, A., and D. Kahneman. 1992. "Advances in prospect theory: Cumulative representation of uncertainty." *Journal of Risk and uncertainty 5*(4): 297-323.

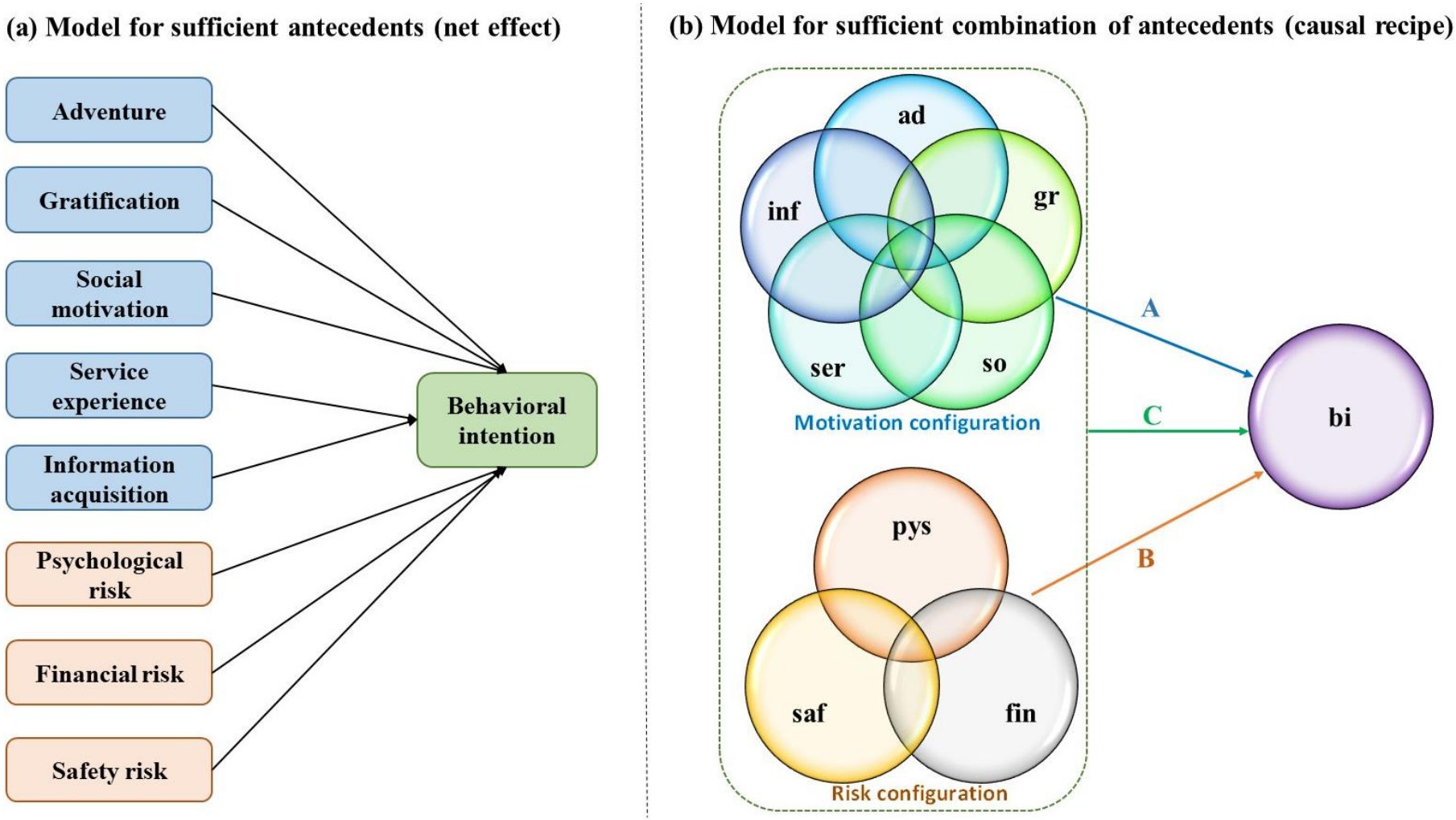
Untaru, E. N., Ispas, A., Candrea, A. N., Luca, M., and G. Epuran. 2016. "Predictors of individuals' intention to conserve water in a lodging context: The application of an extended theory of reasoned action." *International Journal of Hospitality Management 59*: 50-59.

von der Dunk, F. G. 2013. "The integrated approach—Regulating private human spaceflight as space activity, aircraft operation, and high-risk adventure tourism." *Acta Astronautica 92*(2): 199-208.

Wu, P. L., Yeh, S. S., Huan, T. C., and A. G. Woodside. 2014. "Applying complexity theory to deepen service dominant logic: Configural analysis of customer experience-and-outcome assessments of professional services for personal transformations." *Journal of Business Research 67*(8): 1647-1670.

Yüksel, A., and F. Yüksel. 2007. "Shopping risk perceptions: Effects on tourists' emotions, satisfaction and expressed loyalty intentions." *Tourism management 28*(3): 703-713.

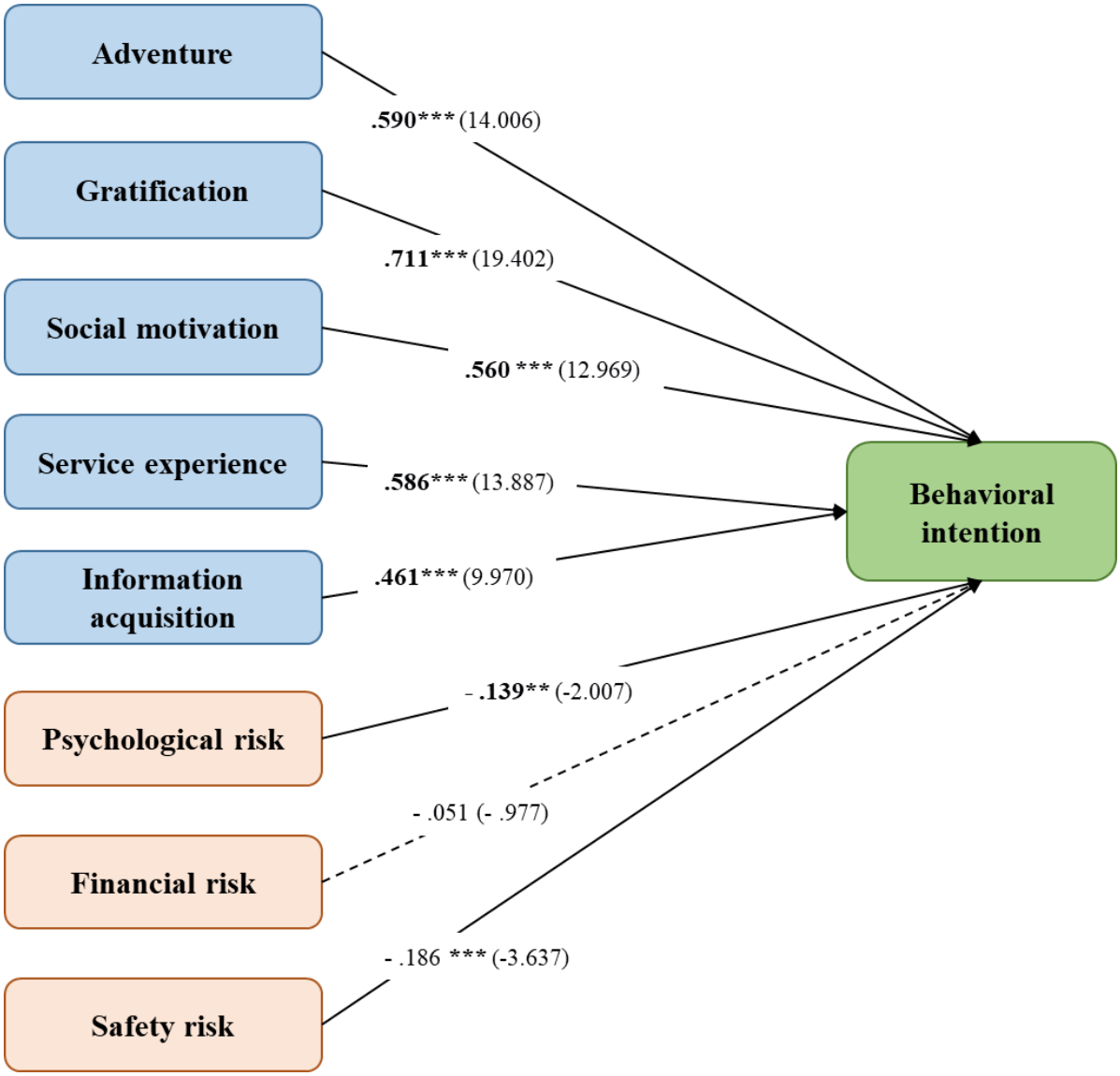
Olya, H., & Han, H., (2019). Antecedents of Space Traveler Behavioral Intention. *Journal of Travel Research,* Doi: https://doi.org/10.1177/0047287519841714. in press.



Note: bi: behavioral intention, ad: adventure, gr: gratification, so: social motivation, ser: service experience, inf: information acquisition, pys: psychological risk, fin: financial risk, saf: safety risk.

Figure 1. The proposed conceptual models

Olya, H., & Han, H., (2019). Antecedents of Space Traveler Behavioral Intention. *Journal of Travel Research,* Doi: https://doi.org/10.1177/0047287519841714. in press.



*Note: ***: p<.001; **: p<.01, t-value presented in the parenthesis, non-significant effect*

Figure 2. Results of logarithmic regression analysis

Table 1. Results of reliability and validity

Scale items	SFL (α)	AVE	MSV	ASV	CR
Behavioral intention [a] (Meng and Han 2016)	(.913)	.787	.588	.266	.787
I am planning to undertake space travel in the future.	.869				
I will make an effort to travel to space in the future.	.941				
I am willing to travel to space in the future.	.848				
Adventure [a] (Arnold and Reynolds 2003)	(.914)	.786	.865	.355	.741
Space travel would make me feel like I am in a new universe	.855				
Space travel would make me excited and stimulated.	.901				
To me, space travel would be an adventure.	.903				
Gratification [a] (Arnold and Reynolds 2003; Kim et al. 2013)	(.870)	.700	.588	.286	.724
Space travel would help me to get my mind off what stressing me out.	.832				
Space travel would be a way to relieve stress.	.870				
Space travel would make me feel happy and better in mood.	.806				
Social motivation [b] (Kim et al. 2013)	(.845)	.683	.569	.283	.734
Space travel would help me to tell my friends and family about what I experience during the travel.	.649				
Space travel would help me to meet new friends.	.896				
Space travel would help me to be connected and meet other people with similar interests.	.909				
Service experience [a] (Knutson et al. 1993)	(.857)	.669	.865	.410	.723
Space travel would be a new service experience.	.802				
Space travel would be an opportunity to experience space facilities and equipment.	.834				
Space travel would provide an attractive travel experience.	.818				
Information acquisition [a] (Kim et al. 2013)	(.911)	.784	.854	.325	.791
Space travel would keep me updated about space information.	.897				
Space travel would keep me informed about space tourism.	.918				
Space travel would get information I'm interested in.	.839				
Psychological risk [a] (Reisinger and Mavondo 2006; Simpson and Siguaw 2008)	(.895)	.753	.301	.083	.784
The thought of space travel makes me feel anxious.	.717				
The thought of traveling to space makes me feel psychologically uncomfortable.	.942				
The thought of space travel causes me to experience unnecessary tension.	.926				
Safety risk [a] (George and Mawby 2015)	(.787)	.552	.301	.082	.707
Space travel is an unsafe trip to undertake.	.788				
Space travel is just as safe as any other travel*.	.747				
Told that space travel is dangerous.	.691				
Financial risk [a] (Reisinger and Mavondo 2006; Simpson and Siguaw 2008)	(.904)	.772	.296	.068	.776
I worry that an additional fee must be paid when I undertake a space travel.	.870				
I worry that space travel would involve unexpected extra expenses.	.970				
I worry that space travel would be more expensive than other travels.	.787				

Fit statistics: X^2= 1129.121 (df=288), X^2/df= 3.921, CFI= .902, IFI= .903, PGFI= .704, RMSEA= .089.

Note: [a]: strongly disagree (1)/strongly agree (7), [b]: not at all important (1)/ extremely important (7). SFL: standardized factor loading, AVE: average variance extracted, MSV: maximum share variance, ASV: average share variance, CR: composite reliability. [*]: reversed coded item. CFI: comparative fit index, IFI: incremental fit index, PGFI: parsimonious goodness of fit, RMSEA: root mean square error of approximation.

Table 2. Sufficient causal models from motivation configuration (see arrow A in Figure 1b)

Models for predicting high scores of desired behavioral intention (*Bi*)	**Raw Coverage**	**Unique Coverage**	**Consistency**
Bi = f(ad, gr, so, ser, inf)			
M1: ad*ser*inf	.958	.093	.742
M2: ad*gr*so*ser	.869	.004	.923
Solution coverage: .962			
Solution consistency: .840			
Models for predicting low scores of desired behavioral intention (~*Bi*)			
~Bi = f(ad, gr, so, ser, inf)			
M1: ad*~gr*~so*inf	.490	.002	.923
M2: ~gr*~so*ser*inf	.498	.006	.928
M3: ad*~so*ser*inf	.518	.019	.852
M4: ~ad*~gr*~so*~ser*~inf	.381	.063	.990
M5: ad*gr*so*ser*~inf	.400	.031	.897
Solution coverage: .629			
Solution consistency: .845			

Note: Bi: behavioral intention, ad: adventure, gr: gratification, so: social motivation, ser: service experience, inf: information acquisition, ~ indicates negation (1 - condition).

Table 3. Sufficient causal models from risk configuration (see arrow B in Figure 1b)

Models for predicting high scores of desired behavioral intention (*Bi*)	**Raw Coverage**	**Unique Coverage**	**Consistency**
Bi = f(pys, fin, saf)			
M1: ~pys*~saf	.416	.156	.952
M2: ~fin*saf	.418	.158	.878
Solution coverage: .575			
Solution consistency: .889			
Models for predicting low scores of desired behavioral intention (~*Bi*)			
~Bi = f(pys, fin, saf)			
M1: pys*~saf	.494	.494	.779
Solution coverage: .494			
Solution consistency: .779			

Note: Bi: behavioral intention, pys: psychological risk, fin: financial risk, saf: safety risk. ~ indicates negation (1 - condition).

Table 4. Sufficient causal models from motivation and risk configurations (see arrow C in Figure 1b)

Models for predicting high scores of desired behavioral intention (*Bi*)	**Raw Coverage**	**Unique Coverage**	**Consistency**
Bi = f(ad, gr, so, ser, inf, pys, fin, saf)			
M1: ad*gr*so*ser*inf*~pys	.619	.162	.961
M2: ad*gr*so*ser*inf*fin	.643	.016	.940
M3: ad*so*ser*inf*pys*saf	.509	.019	.899
M4: ad*so*ser*inf*fin*saf	.621	.019	.913
M5: ad*~gr*ser*inf*pys*fin*saf	.627	.002	.878
Solution coverage: .870			
Solution consistency: .902			
Models for predicting low scores of desired behavioral intention (*~Bi*)			
~Bi = f(ad, gr, so, ser, inf, pys, fin, saf)			
M1: ~ad*~gr*~so*~ser*~inf*~pys*~fin*saf	.321	.039	.994
M2: ad*~gr*so*ser*inf*pys*~fin*saf	.479	.025	.912
M3: ad*~gr*so*ser*inf*~pys*fin*saf	.538	.059	.827
M4: ad*~gr*~so*ser*inf*pys*fin*saf	.446	.026	.950
M5: ad*gr*so*ser*inf*pys*fin*~saf	.465	.049	.822
Solution coverage: .707			
Solution consistency: .775			

Note: Bi: behavioral intention, ad: adventure, gr: gratification, so: social motivation, ser: service experience, inf: information acquisition, pys: psychological risk, fin: financial risk, saf: safety risk.

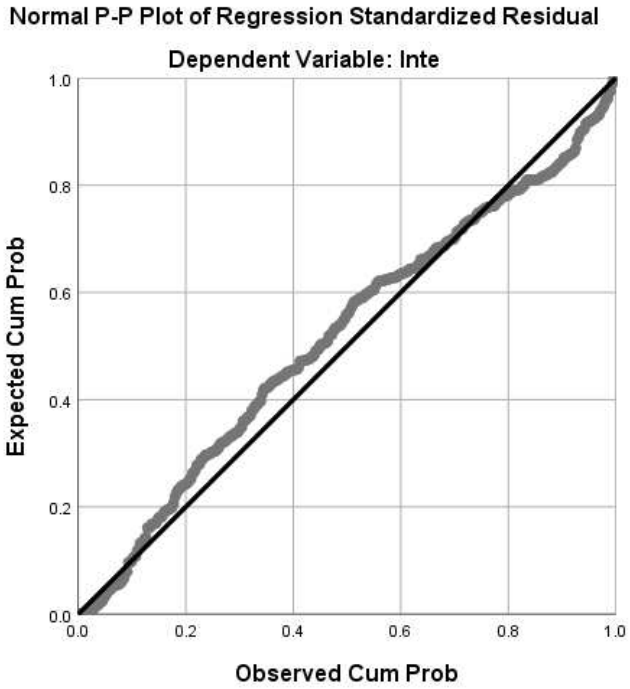
Table 5. Necessary conditions for attaining desired behavioral outcome

Configuration	Antecedent condition	Outcome condition: behavioral intention	
		Consistency	Coverage
Motivation	**adventure**	**.988**	**.807**
	~ adventure	.171	.748
	gratification	**.905**	**.905**
	~ gratification	.355	.782
	social motivation	**.954**	**.845**
	~ social motivation	.258	.796
	service experience	**.978**	**.817**
	~ service experience	.202	.787
	information acquisition	**.969**	**.806**
	~ information acquisition	.207	.822
Risk	psychological risk	.560	.826
	~ psychological risk	.684	.882
	financial risk	.709	.845
	~ financial risk	.538	.875
	safety risk	.773	.803
	~ safety risk	.458	.932

Note: bolded item represents necessary condition (consistency > .9).

Appendix A. Normality test of observed standardized residuals

Results of normality test of observed standardized residuals—which are depicted in the following graph below—indicated emerged deviations may be a sign for non-normal distribution of observed standardized residuals.



We also tested normality of observed unstandardized residuals and the results showed that observed residuals are not normally distributed ($p<.001$).

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Unstandardized Residual	.075	370	.000	.963	370	.000
Standardized Residual	.075	370	.000	.963	370	.000

a. Lilliefors Significance Correction