"Passengers, Readiness for the Use of a New Smart Check-in Technology in Airports"

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Abstract: **- Technological readiness (TR) is defined by a person's propensity for the adoption of new technological advancements in practical engagements, work or home life. In literature, perspectives on what actualizes higher TR as opposed to resistance to new technologies are wide and varied, with multiple studies proposing varying factorial influences and assessors to said readiness. This paper narrows down on the critical observed variables that affect passengers'TR regarding the use of a new suggested smart check-in technology in airports. A survey is conducted with an accepted sample of 215 responses based on an exploratory factor analysis (EFA), to reveal the true affecting underlying factors for passengers'TR of the new suggested smart check-in technology in airports.**

The survey results showed the obvious inclination of passengers to adopt self-service-check-in (SSCI) technologies, in general. In addition, it showed passengers' clear preference touse the new suggested smart check-in technology. Moreover, responses revealed passengers' leaning to utilize any additional technology in case of necessity. They opt to accept using a new mobile application along with the smart check-in technology, in case they are late for a flight, instead of paying extra money on delay fees.

Finally, factor analysis results showed that 5 factors representing 18 variables are affecting the TR of passengers to use the new suggested smart check-in technology. The first factor was labeled as technological passion represented by 4 variables which are playfulness, enjoyment, optimism, and insecurity. The second factor was labeled as technological practicality represented by 5 variables which are self-service experience and habit, self-care versus preference of personal service, usefulness, ease of use, and discomfort. The third factor was labeled as traditional orientation represented by 3 variables which are traditional check-in manned counter (TCI) experience and habit, need for interaction, and age. The fourth factor was labeled as self-experience and necessity represented by 3 variables which are gender, travel frequency, and compatibility. Finally, the fifth factor was labeled as personal preference and will represented by 3 variables which are power of intentionality and will, class, and risk.

I. INTRODUCTION

Previous studies have shown a direct correlation between technological readiness (TR) and a direct effect on whether or not technology is used (Liljander, et al. 2006). In this paper, the effect of the main TR variables, which are found in literature, on the adoption of a new proposed smart check-in technology in airports is studied. The categorization of variables, which are covered in this study, are presented through a list of categories named as nature of self, character and behavior, general interaction with technology, and context of engagement. On the other hand, other exceptional TR variables are introduced and studied, which are not covered in TR studies in literature. They represent individuals' behavior or personal will that is freely arising to utilize a new technology, which might be overriding any other variable. Intentionality & will power and self-care vs. preference of personal service were the exceptional variables which are additionally covered in this study. These exceptional variables along with the main ones found in literature are presented here in the aim of providing a more accurate picture on the nature of the upcoming factors affecting passengers' TR for the adoption of a new suggested smart check-in technology, and how exceptional and contextual parameters of behavior could completely affect or alter the precision of said factors.

Many check-in system alternatives are available in airports which include traditional check-in manned counters (TCI), online check-in systems, and self-service-check-in (SSCI) booths at the terminal itself (Lee, Kim and Choi 2018), (Lee, et al. 2014), (Chalupníčková and Kejmarová 2016) & (Adamčík, et al. 2017). TCI were distinguished for their reliability and convenience; therefore, most passenger sopt to utilize them. However, the huge rise in the traffic of airlines has led to an immense augmentation in passengers' flow, which led consequently to a noticeable waiting time increase in TCI queues (Lee, Kim and Choi 2018). Accordingly, the rise of SSCI booths and other SSCI methods, as a viable alternative, was very noticeable which resulted in a clear minimization in TCI queues, improvement in airport quality and service level (Lee, et al. 2014), (Lee, Kim and Choi 2018), (Chalupníčková and Kejmarová 2016) & (Adamčík, et al. 2017). Therefore, the new presented check-in technology in this study is a type of SSCI. It is a smart cart that it is capable of performing the check-in process till obtaining the boarding pass and baggage label, without the need to stop at a booth.

The following list of categories, with subcategories representing TR variables presented by(Blut, Wang and Schoefer 2016), (Wittmer 2011),(Hemdi, et al. 2016)&(Liljander, et al. 2006), in addition to the two exceptional variables, are the ones covered in this study to check the passengers' TR for the adoption of the new smart check-in technology:

- Self (age, gender, experience and habit),
- Character and behavior (compatibility, enjoyment, need of interaction, power of intentionality & will, self-care vs. preference of service)
- Interaction with technology in general (optimism, innovativeness, insecurity, discomfort, technological playfulness)
- Context of engagement (risk, usefulness, ease of use)

1.1 Self

It is the category used mainly to reveal the personal information of an individual and its effect on TR.

Age: It is observed through studies that younger generations adapt more easily to new technologies, while older generations might find resistance or take more time (Wittmer 2011). It is also found that working memory, planning and attention sometimes decrease independently with aging (Czaja, et al. 2006). Visual impairment, hearing loss, deterioration of fine motor coordination and spatial visualization are all variables that contribute difficulty and resistance to the utilization of technology (Kuerbis, et al. 2017).

Gender: Studies present the case that men are generally more interested in technology and new technological advancements than women and are as such more easily ready to engage with and adopt new technology, where the degree of how often it is used is equal (Blut, Wang and Schoefer 2016),(Gil-Juáreza, Feliu and Vitores 2018)&(Cai, Fan and Du 2017).

*Experience and Habit***:** Generically, frequent and heavy users of technology generally provide a stronger base of likelihood for the utilization of new technology based on previous experience. The previous experience and habit does not only generate ease of utility, but could lead to confidence within the user to utilize a new technology in general (Blut, Wang and Schoefer 2016).

1.2 Character and Behavior

Character and behavior are relevant to the individual's attitude and preset manners which are reflected on the TR.

*Compatibility***:** The compatibility of new technology to align with an individual's directions and lifestyle is presented as a strong variable in its influence on TR(Mairura, Ngugi and Kanali 2016). In studies that assess the role of multiple variables that influence TR in comparison with each other, compatibility presents a strong case as a positive influence in the adoption of new technology(Mndzebele 2013).

Enjoyment: The enjoyment of a technological process positively affects not only readiness (Song and Han 2009) , (Shamy and Hassanein 2017) to utilize said technology, but affects the ease of use of the new technology as well (Blut, Wang and Schoefer 2016)

Need for personal interaction: Studies present strong cases for not only the validity of the importance of personal interaction, but add that it is found to be extremely important. As well as refuting the idea, that technology has replaced the need for personal interaction (O'Donnell, Durkin and McCartan-Quinn 2002). In addition, it is of tremendous importance to note that studies show that even when customers thought the utilization of a self-service technology would save them time, those that preferred it still choose personal interaction(H.-J. Lee 2017).

Power of intentionality and will: The possession of this attribute could potentially completely override any presence of technological resistance. For an individual that is willful will accomplish a task regardless of what inherent resistance variables could arise.

Self-care vs. preference of personal service: The desire and preference to be cared for, could completely override any interest in utilizing any technology that contains aspects of self-reliance. Contrary to this point is whether an individual has an attribute streak of self-reliance and prefers to take care of him or herself, cultural nature and trends are also of relevance.

1.3 Interaction with technology in general

In literature, four aspects of TR are usually and repeatedly proposed as central and most important. Optimism, innovativeness, discomfort and technological playfulness are commonly selected due to the results of extensive empirical investigations(Liljander, et al. 2006).

Optimism: This variable describes when one has an overarching positive, optimistic and forward looking view of technology in general, and not only a particular technological task. When an individual feels they have control over the technology, their optimism towards technology increases as a whole(Liljander, et al. 2006). Optimism is considered and is shown to increase the perceived usefulness of a technology prior to utilization (Wang, So and Sparks 2017).

Innovativeness: Innovativeness is defined as the attribute of an individual to be a technological pioneer, and includes the willingness of an individual to utilize and explore new technology(Liljander, et al. 2006). Innovative customers are also better at handling uncertainties in technology use (Wang, So and Sparks 2017).

Insecurity: This aspect of TR is defined by a lack of trust in a particular technology and its capacity to work properly, or lack of trust in technology in general for the same reasons(Liljander, et al. 2006). Insecurity is also sometimes, confusingly, referred to as computer anxiety, which has been shown to affect attitude, intention, behavior, learning and performance (Venkatesh 2000).

Discomfort: When one experiences a lack of control and a sense of being overwhelmed by technology, this accurately describes this variable of TR. (Liljander, et al. 2006).

Discomfort was found to be a better predictor on the utilization of self-service technologies than demographic variables such as age and gender (Meuter, et al. 2003).

Technological playfulness: this describes a state of openness and a sense of utilization being playful in relation to a particular technology or another, or technology is a whole. Studies argue that individuals who possess this positive quality are ready to utilize a technology for the sake of the interaction itself (Blut, Wang and Schoefer 2016). It is also shown in a study that computer playfulness influences continuity of its use as well (Lin, Wu and Tsai 2005).

1.4 Context of engagement

These variables are extensively mentioned in literature, due to the fact that they are logical and critical TR variables. They represent the interaction of an individual based on the context of a certain situation towards technology.

Risk: Literature presents the case that fear of technical difficulties could result in aversion to utilization of technology (Blut, Wang and Schoefer 2016), (Curran and Meuter 2005). Research also shows that risk yields as the more overpowering and important variable in the choice of utilizing a technology(M.-C. Lee 2009).

Usefulness: Literature states that a client will perceive usefulness based on whether it will save them time or cost and when a technology is convenient (Blut, Wang and Schoefer 2016)&(Ding, Verma and Iqbal 2007). Obviously, efficiency and design have been found to have a significant positive correlation to usefulness (Chin, Ahmad and Ikram-Uniten 2015).

Ease of use: Literature supports the notion that when a technology is perceived to be easy to use, it is more likely to be used. Moreover, this likelihood increases when one considers that ease of use could be taken as a reason that correlates directly to how quickly the task is accomplished and thereby a variable on utility and effectiveness (Blut, Wang and Schoefer 2016). As with usefulness, design and efficiency is also found to increase ease of use as a variable in a user as a trait when using a particular technology (Chin, Ahmad and Ikram-Uniten 2015).

II. METHODOLOGY

The main objective of this research is to study whether the TR related variables would affect the actual readiness of passengers to a new check-in technology presented in airports. Reaching this objective requires a methodology based on the construction of a customized survey supported by an extensive literature review to cover most of the important TR related variables. In addition, other relevant TR exceptional variables, not covered in literature, are presented to be tested by the authors of this study. The survey strategy starts by targeting the general TR of passengers to get an insight about some important psychological patterns relevant to their reactions about general technologies. Consequently, it tackles the exact required technology needed to be tested. The tackled technology in this study is based on a new suggested smart check-in technology, as an alternative to the current adopted systems. It is specifically a substitute to the SSCI booths in airports; where passengers don't need to move to the booth to accomplish the check-in process. Each cart will be acting as a booth on its own. Therefore, the potential savings in time, which might be wasted in case of congested queues at booths, is very obvious. It is a smart cart having a tablet installed above the fixed bar of the pushing handle, that provides the passenger with passport/ticket scanning, printing the baggage label, and information about the baggage drop locations and any other required locations in the airport. Once this process is done, the check-in procedures are accomplished and the only action left to be done by the passenger is to go to a self-bag drop area to place the baggage.

The survey was done using Google forms and sent to various groups known to be frequent travellers and over 18 years old. The responses were automatically collected online and the analysis of the results was done using Minitab and SPP software. The survey design presented in this study is based on different types of scales, which include nominal(Krasula and Callet 2018) and Likert (Clason and Dormody 1994). Nominal scale was used to differentiate gender, nationality, and travel class; whereas, the adopted scaling of Likert was a five-point Likert-type(Boone and Boone 2012)&(Clason and Dormody 1994). After deciding on the scaling, the next step in the survey is deciding on the intended sampling plan.

2.1 Sampling Plan

The sampling plan is based on the objective of the study, which intends to investigate the TR of airport passengers to use a new smart check-in technology. TR is examined through several variables found commonly literature, in addition to other exceptional variables presented by the authors of this study which were seen to be relevant to the study objective.

The first step in this sampling plan should start with the selection of the precise target population needed to be studied(H. Taherdoost 2016). In this study, the target population is defined to be all frequent adult (over 18 years old) airport passengers, travelling through airports using airlines. The second step is to decide on a sample unit. Generally, sample units are selected based on the researcher's decision, which represent the units, items, or subjects needed to be studied, tested, observed, or traced (Hitzig 2004). Based on the particular nature of this study which focuses on human factor interacting with new technology; therefore, the sampling unit will be any present airport passenger, which is simply a non-biased person who would be frequently travelling through airports using airlines. Passengers would consequently represent the unique source of data. Another added detail for the previous description is a guarantee of being independent, assured by being an adult person. The

third step is concerned with choosing the sampling technique. There are many available options in this part varying from two main kinds, non-probability/non-random sampling(H. Taherdoost 2016)or probability/random sampling(Acharya, et al. 2013).The type of study presented here is based on measuring the TR of passengers towards a new presented technology. The measurement is done for a set of variables based on human interaction with the technology. It is a psychological social response for some variables that are qualitatively evaluated and measured in terms of human preferences. Therefore, based on the claim proposed by Marshall in his paper, the preferred type of sampling to adopt in this study should be non-random sampling (Marshall 1996). Moreover, the type of non-random sampling technique is specified as the voluntary sampling technique, as it satisfies the requirements of this study. It is a novel non-probability sampling design method, requiring no sample frame to be used and one of the most common methods in educational research (Briggs, Coleman and Morrison 2012)&(Elder 2009).The voluntary sample in this survey is obtained from volunteers who are self-selected, instead of being pulled out by the sample designer. Responders of this survey were mainly qualified and interested and in the survey topic, aimed at reaching sensitive, accurate, and reliable results (Murairwa 2015). The next step after deciding on the sampling plan is factor analysis.

2.2 Factor analysis

Factor analysis is widely adopted technique dealing with multivariate statistics used for the interpretation of surveys and questionnaires, where a certain point of interest is to be studied by a researcher, based on study objective. It starts with a group of asked questions based on some proposed variables/items relevant to a designed sampling plan. The responses are then combined into lesser factors which become the observed factors of the underlying latent constructs explaining the study point of interest (Williams, Onsman and Brown 2010), (Costello and Osborne 2005)&(Fricker, Kulzy and Appleget 2012). Factor analysis is distinguished from other widely adopted statistical methods, by having special criteria needed to be considered when the decision is made to use it (Fabrigar, et al. 1999). Many suggestions relevant to the adopted criteria are found literature; however, all of which start with a clear decision about the items/variables needed to be included in the study, where irrelevant items lead to wrong conclusions. Passengers' TR variables which are explained in introduction are the ones considered in this study. Moreover, an agreement was found on some common factor analysis criteria as follow (Fabrigar, et al. 1999), (Williams, Onsman and Brown 2010),(Taherdoost, Sahibuddin and Jalaliyoon 2014)&(Fricker, Kulzy and Appleget 2012):

1. Data should be appropriate for factor analysis, in terms of the chosen sample size and data adequacy.
2. The chosen method of factor analysis, EFA or CFA, should be clear based on the study scope.
3. The number of factors to be contained within the model should be critically decided, using factor extraction or retention criterion. Utilizing multiple criteria is preferred.
4. The factor extraction method should be chosen very carefully.
5. A rotation technique should be implemented to initial obtained factor solution to make the interpretation of the final answer easier and more accurate.
6. Reliability testing should be applied to measure internal consistency and homogeneity of items.
7. The interpretation of latent underlying factors and the proper labeling should be done very cautiously. The extent of wrong labeling might lead to a complete faulty conclusion.

2.2.1 Sample size & Data adequacy

Data should be appropriate for factor analysis in terms of sample size and data adequacy. Appropriate sample size is the start of an adequate factor analysis, where its choice is very critical. There are many arguments concerning its selection in literature (Williams, Onsman and Brown 2010). Some authors presented their findings in literature, as an absolute sample size, by stating that it was argued about the minimum accepted number which could be 100, 200, or 250 (MacCallum, et al. 1999).On the other hand, other authors presented some guidelines found in literature to help researchers get the sample size by correlating the number participants to variables, as sample to variable ratio (N:P ratio). They presented several suggested number of participants per variable; specifically 3, 6, 10, 15, or 20 (Williams, Onsman and Brown 2010). The sample size in this study was 215 valid samples to test 19 variables, where the N:P ratio in this case is around 11, which is close to the upper limit of (Williams, Onsman and Brown 2010) and approaching the absolute high limit of sample sizes of (MacCallum, et al. 1999).

Adequacy of the chosen sample is the other step to check if data is appropriate for factor analysis. Data adequacy is a measure of the matrix factorability as a total, to prove whether the obtained results of the responders are appropriate for factor analysis or not. It is typically done before the factors' extraction process. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity are commonly adopted methods by many authors in literature for this purpose (Hassan, et al. 2012), (Williams, Onsman and Brown 2010), (Taherdoost, Sahibuddin and Jalaliyoon 2014), (Sharma 2012), (Hargreaves and Mani 2015)& (Olawale and Garwe 2010) . When KMO measure reaches more than 0.5, the sample is assumed to be adequate and factor analysis is appropriate; moreover, a KMO value above is 0.6 leads ta assumed factorability (Hargreaves and Mani 2015), (Tabachnick and Fidell 1996), (Olawale and Garwe 2010), (Williams, Onsman and Brown 2010), (Hassan, et al. 2012)&(Coakes and Ong 2011). The Bartlett's Test of

Sphericity is another adequacy test using the chi-square output. It is considered to be significant and appropriate for factor analysis when p<.05, at which the correlation matrix is not an identity matrix (Williams, Onsman and Brown 2010), (Tabachnick and Fidell 1996), (Taherdoost, Sahibuddin and Jalaliyoon 2014), (Hassan, et al. 2012)&(Coakes and Ong 2011).Correlation matrix is another essential step in the evaluation of the data to check its suitability for analysis. It is used with the EFA to demonstrate the relationships between individual variables and justify factorability (Williams, Onsman and Brown 2010). It was found out in literature that correlation coefficients with over 0.3 are the ones to be considered for analysis (Williams, Onsman and Brown 2010), (Taherdoost, Sahibuddin and Jalaliyoon 2014)&(Tabachnick and Fidell 1996). It is also referred as variables having p-values less than the significance level of 0.05 are considered to be significant and correlated to each other (Minitab 2019). In this paper, accepted KMO and Bartlett's Test values were obtained. In addition, all 19 variables included in this study showed accepted correlation with at least one other variable.

2.2.2 Factor analysis method

Choosing the factor analysis method is the main step to orient the survey to the required path of exploratory factor analysis (EFA) or confirmatory factor analysis (CFA). CFA and EFA are considered to be significantly used statistical procedures adopted in the analysis of surveys (Suhr 2006). EFA is chosen to be adopted in this study due to the fact that it is concerned with surveys with exploratory nature intending to investigate the effect of some variables on a specific intended effect and discovering the interrelation between them to reveal the underlying latent constructs which are mainly causing the effect. It doesn't assume any previous hypothesis on the variables; in other words, it doesn't force a predetermined structure on the outcome (Suhr 2006). Moreover, another reason to choose EFA is that it is known for its usage in surveys for defining the group of items which are coherent together in a survey (Fricker, Kulzy and Appleget 2012).

2.2.3 Factor extractioncriteria

The most common criteria adopted in literature were the Scree test (Cattell's Scree test), Kaiser Criterion, and parallel analysis. However, there are other available criteria which are also used, such as the cumulative percentage of variance, minimum average partial method, Bartlett's chi-square test (Hayton, Allen and Scarpello 2004), (Suhr 2006), (Ledesma and Valero-Mora 2007)& (Williams, Onsman and Brown 2010). It was proposed by many authors in literature to adopt multiple criteria in extraction; in addition, this agrees with the requirements of most educational and psychological based journals(Hayton, Allen and Scarpello 2004)& (Williams, Onsman and Brown 2010). Scree test and Kaiser Criterion are the ones used in this paper. Scree test is a viewgraph of the eigenvalues of the correlation matrix in descending order (Fabrigar, et al. 1999), which is evaluated visually by checking the three main parts of the plot: straight line, bend (elbow-like shape), and a steep curve. Points on the upper left part above the bend are the ones considered to be important factors, shown as a straight line, explaining relatively more variance and vice versa (Suhr 2006), (Ledesma and Valero-Mora 2007)& (Minitab 2019). On the other hand, Kaiser Criterion works by looking for common factors having an Eigenvalue more than 1 (Suhr 2006). However, Kaiser Criterion was criticized for being sometimes subjective and illogical due to the fact that it uses a cut-off number fixed at 1 instead of a limit or relative range (Fabrigar, et al. 1999)&(Hayton, Allen and Scarpello 2004).

2.2.4 Factor extraction methods

There are many methods found for factor extraction in literature. These methods include principal axis factoring (PAF), maximum likelihood, principal components analysis (PCA), unweighted least squares, generalized least squares, alpha factoring, and image factoring (Costello and Osborne 2005)&(Williams, Onsman and Brown 2010). Evidence about the comparative strengths and weaknesses of these methods is very limited. PCA is the utilized extraction method in this study due to its widespread adoption in literature and availability in most computer statistical packages (Costello and Osborne 2005).Within any of the extraction methods, factor loadingis an indication of how much a factor explains a variable, which can range from -1 to 1 (Minitab 2019). One paper leaned to a factor loading of 0.32 as a minimum accepted, without loading of variable on multiple factors (crossloading) (Tabachnick and Fidell 1996). Multiple crossloading variables may lead to faulty factors (Costello and Osborne 2005). Moreover, the variable-to-factor ratio should be around three or more to consider the factor as accepted, and more than five to be called a strong solid factor (Costello and Osborne 2005)&(Taherdoost, Sahibuddin and Jalaliyoon 2014). Two other important aspects were mentioned regarding the variables. First, they should be sharing a certain conceptual meaning if they are loading on a factor. Second, when they are loading on other factors, they should be measuring different constructs (Suhr 2006). Additionally, communality value obtained out of the loading outcomes of the variable shouldn't be violated as it might lead to a faulty variable. Communality is the amount of variance in calculated items or variables reproduced by a common latent underlying factor. In other words, items with low communalities, for example, indicate a low influence by a common latent factor. Item communality is calculated by summing the squares of loadings of factors (Suhr 2006)&(Fabrigar, et al. 1999).Obtaining communalities less than 0.4 means that an item is independent from other items, or there is a possibility of an undiscovered latent factor. The range lying from 0.4 to 0.7 is referred as low to medium communalities, which is the most common(Taherdoost, Sahibuddin and Jalaliyoon 2014). High communality values are referred by other authors as 0.7 or higher. However, they should be related to the measured

variables properties, mainly the sample size. A variable to factor ratio might be considered being around 4 to 5 in case of high communality (0.7 or more), leading to a sample of 100 to be appropriate. However, obtaining higher sample is always preferable. Moreover, in case of medium communalities (0.4 to 0.7), a sample of 200 is recommendable. In case of low communality, no sample might lead to good results (Fabrigar, et al. 1999). In this paper, factor loading and communality showed general accepted values for 18 out of 19 variables, with loading values above 0.32 and communality values above 0.4. Moreover, the sample size was 215 which lead to good results agreeing with the literature findings (Fabrigar, et al. 1999).

2.2.5 Factor rotation

Factor rotation is another step done to facilitate labeling of factors after extraction (Hadi, Abdullah and Sentosa 2016). It aims to make the data arrangement simpler and clearer (Costello and Osborne 2005)&(Fabrigar, et al. 1999). Two main types of rotations are found in literature, oblique and orthogonal (Fabrigar, et al. 1999), (Williams, Onsman and Brown 2010),(Fricker, Kulzy and Appleget 2012)&(Hadi, Abdullah and Sentosa 2016). Orthogonal rotation is often linked to the varimax method while oblique to the promax method (Fricker, Kulzy and Appleget 2012). Orthogonal rotation using varimax method is utilized in this paper, where orthogonal rotation is preferred by many authors due to its simplicity and theoretical clarity and its ease to be interpreted (Fabrigar, et al. 1999)&(Costello and Osborne 2005). In addition, varimax is claimed to be the most commonly used and best option for orthogonal rotation, which acts to increase the high loadings as possible for each factor and vice versa (Fabrigar, et al. 1999), (Costello and Osborne 2005)&(Fricker, Kulzy and Appleget 2012).

2.2.6 Reliability test

Reliability is a measure whether the measurements are accurate and dependable or not. It is achieved through various tools of measurement for internal consistency and homogeneity of items. It explains the degree of whether the set of items in a particular experiment measure the same construct or not. Internal consistency is done to validate the experiment (Tavakol and Dennick 2011)&(Davenport, et al. 2015). There are several ways found in literature for testing reliability such as Cronbach alpha, Kuder-Richardson formulas, and the split half methodology. Cronbach alpha and Kuder-Richardson formulas are the most adopted for multipoint scaled items and dichotomous tests, respectively (Sekaran 2003). Cronbach alpha is adopted in this study to test reliability. It is commonly adopted in literature and presented as a numerical value varying from zero to one. Generally, high alpha values are recommended and interpreted as items are more correlated with the increase of alpha value reflecting on the factors to be more reliable (Bland and Altman 1997), (Hargreaves and Mani 2015)&(Tavakol and Dennick 2011). There have been a lot of discussions about the minimum acceptable value of Cronbach alpha to prove internal consistency of a test. The most common seen value was 0.7, which it is supported by many authors and claimed to be the minimum accepted rule of thumb (Sharma 2012), (Hargreaves and Mani 2015), (Tavakol and Dennick 2011).The value of Cronbach alpha of this study was above 0.7 which agrees with the findings in literature; therefore, internal consistency assumed and experiment is validated.

2.2.7 Factor interpretation

After finishing the rotation and completing the analysis process, a crucial step of doing factor's interpretation should be carefully done. It is mainly the accurate naming or labeling of the latent concluded factors. The process requires accurate understanding of the observed variables' meanings and precise insight of the correlation between the variables and relating them to a factor with meaningful label. Meaningful interpretations are usually obtained when 2 or 3 variables are loading on a factor. However, the problem with this step lies in its relative subjectivity to the researcher, where the labeling would be inductive and theoretical (Suhr 2006).Labeling and its reasoning were done very carefully in this study, which revealed 5 underlying latent factors presenting the 18 accepted variables.

2.3 Used software

Minitab is the utilized software for this analysis. Minitab is a statistical package capable of performing most of the statistical analysis tests needed to explain a set of data. It has a very user-friendly interface and preset lists with a clear help menu explaining every detail of any test. Moreover, it is easily compatible with MS office features making the import/export of MS office files and viewgraphs very convenient and easy. It is described in the official library website of Kent State University as simple, suitable for both beginners and professionals with easy drop-down lists (Kent-State-University 2019). Adding to all the previous advantages, Minitab has detailed, clear, and easy tools for analyzing questionnaires. SPSS is the other utilized software. It is known for its capability in dealing with surveys and questionnaire analysis; however, it doesn't give the same output quality of viewgraphs and simplicity of dealing with such as Minitab. On the other hand, it provides statistical means to analyze surveys more than any other package including Minitab.

III. RESULTS AND DISCUSSION

The obtained survey yielded a total of 232 voluntary responses. It was done using Google forms and sent to various groups known to be frequent travellers and over 18 years old. 17 of the obtained responses were disqualified and omitted, as a result of incomplete surveys or based on the number of travels within the last 5 years. Any response having less than

1 travel in the last 5 years was disqualified, due to the fact that either the individual might have forgotten part or whole of the airport experience, or he/she has missed part of the latest advanced technologies available nowadays, so he/she won't be familiar with. Therefore, only 215 accepted responses of frequent travellers (Figure 4) are the ones considered for analysis.

The results showed a huge amount of diversity, especially in terms of age and country of origin, giving more trust in the obtained results. 44 nationalities participated (Figure 5) representing 205 responses, in addition to 10 unspecified ones. They were divided into the 5 continents were the responders from Africa were 105 representing 51.7% of the total responses, Europe were 49 representing 23.9%, Asia were 30 representing 14.6%, North America were 12 representing 5.9%, South America were 5 representing 2.4%, and Australia were 3 representing 1.5%, as shown in

Figure *1*.On the other hand, various age groups responders aged from 18 to over 60 years old were obtained, as shown in Figure 2.The young to middle aged responders (22-30 and 31-40) were the dominant in the age groups representing both about 74.5% of the total responses, with percentages of 31.2% (67 participants) and 43.3% (93 participants), respectively. 2.3% of the participants were under 21 years and the least percentage of participation was in the age group above 60 with a percentage of 1.9%. These percentages showed the increased interest of young and middle aged people to participate in airport technology related topics and showed that these are the keenest people to be involved in any technological advances.

Considering gender, 49.3% of participants were males and 50.7% females, which gave a balance outcome among all participants showing that there is no biasness in responses toward a specific gender; therefore, results are proven to be more dependable. In addition, responders were from the three classes (Figure 3)with the dominating majority of ecomony class (88%), which agrees also on the diversity of results leading to increased trust and reliance on the outcomes.

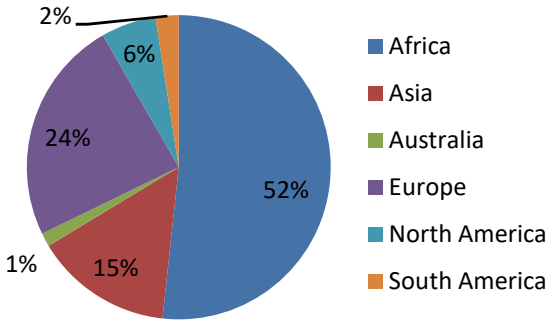

Figure 1: Continents of participants

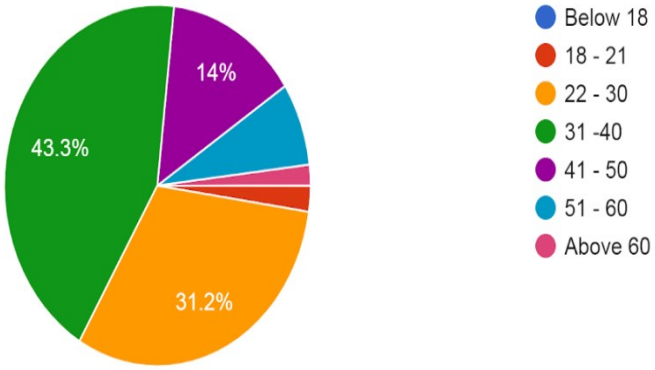

Figure 2: Age groups of participants

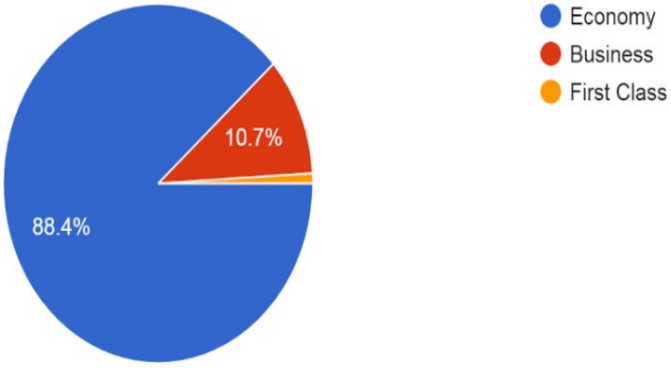

Figure 3: Travel class

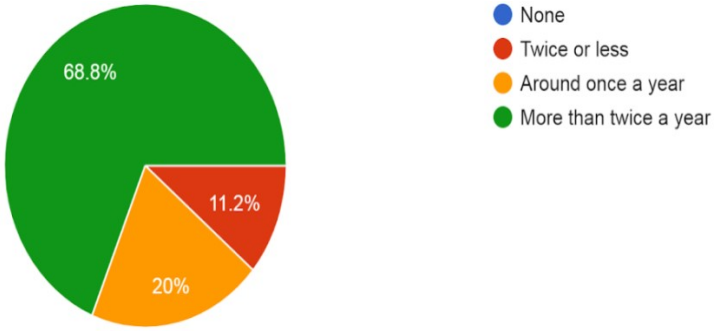

Figure 4: Travel frequency within the last 5 years

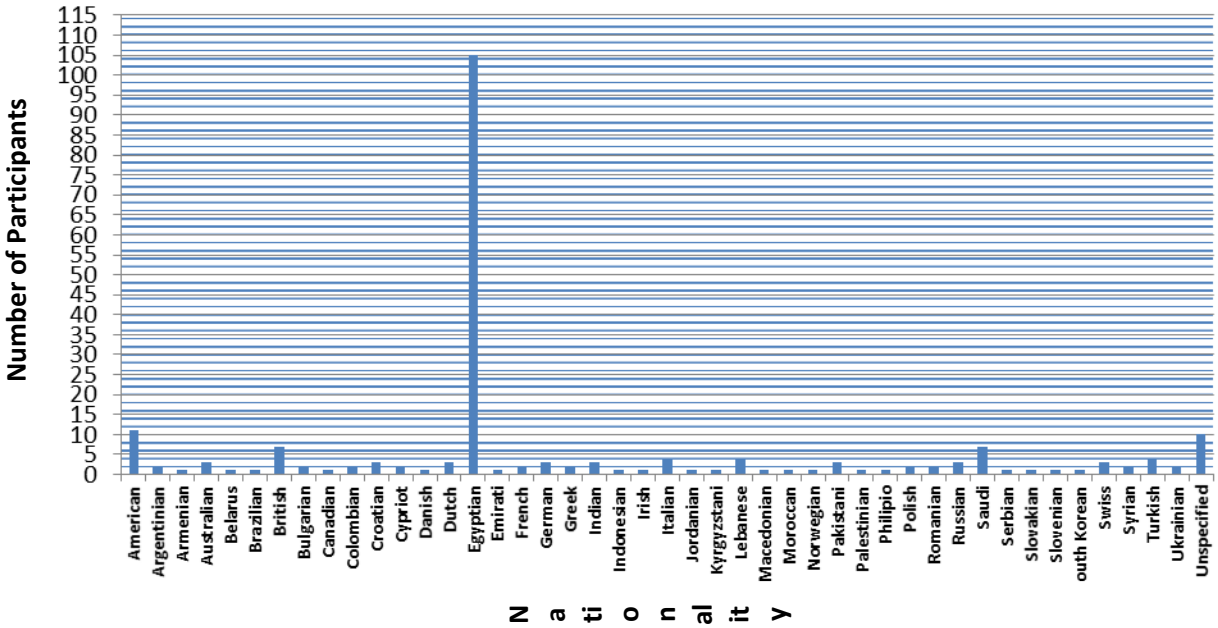

Figure 5: Participants by nationality

The responders showed a clear orientation towards the use of SSCI instead of TCI,when they were asked about facing queues or using an alternative of SSCI. The responses led to the responders' preference of using SSCI with 72%; on the other hand, only 14.5% persisted to choose TCI. This finding should be tied to the fact that most responders described themselves as being self-reliant during check-in (83%) and frequent users of SSCI (65%), which tells that their inclination towards using SSCI is a reasonable choice based on experience and habit rather that random guessing. Moreover, this relationship was reassured where correlation coefficients showed positive correlation among the three variables of self-care VS preference of personal service, experience and habit of SSCI, and usefulness. The correlation coefficient between the first and second variables was 0.36, first and third was 0.44, and finally second and third was 0.53.In addition, responders showed their positive impression towards SSCI systems as easy to be used (80%) and safe (81%). In addition, they declared that they would persist to use them even when facing problem (66.5%) and trust their work ability (70%).On the other hand, the results showed minimum percentages of passengers' discomfort or technology anxiety (9%) compared to passion (63%), excitement and enjoyment (57%), andfeeling of engagement and optimism when engaging a new technology (75%).

Additionally, the results showed that 85.6% of responders are willing to use the new smart check-in system. Moreover, they showed a huge orientation (90%) to use a new mobile application along with a smart check-in system, in case they are late for a flight, instead of paying extra money on delay fees. Therefore, the claim of the adoption of the new suggested smart check-in system is supported by passengers, based on the survey results.

3.1 Factor Analysis

Adequacy of the chosen sample is the first test in factor analysis applied to the results obtained. It is measured using SPSS, to prove whether the obtained sample from the responders is appropriate for factor analysis or not. It is done before the factors' extraction process using Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity. KMO revealed a value of 0.82 which is more than the agreed value of acceptance and factorability assumption of 0.6, based on literature. The Bartlett's Test of Sphericity revealed a p-value of 0.00, which is considered to be significant and appropriate for factor analysis, based on the test assumption in literature where p-values are significant if less than 0.05. This means that the correlation matrix in this study is not an identity matrix and significant, therefore analysis could be applied.

Another step used to prove factorability and adequacy of the sample is the correlation matrix. Based on literature, the variables having correlation coefficients more than 0.3 are considered for analysis. It is also referred as variables having p-values less than the significance level of 0.05 are considered to be significant and correlated to each other(Minitab 2019).All 19 variables included in this study showed accepted correlation with at least one other variable. The highest obtained correlations of variables were ease of use (correlated highly with 9 variables), usefulness (correlated highly with 8

variables), insecurity (correlated highly with 8 variables), technological playfulness (correlated highly with 7 variables), optimism (correlated highly with 7 variables), and enjoyment (correlated highly with 6 variables), respectively. The highest correlation value was found with technological playfulness and enjoyment with a correlation coefficient of 0.765.

The next step in factor analysis was determining the number of factors using several extraction methods, as recommended in literature, through the use of Kaiser Criterion and the Scree plot obtained from SPSS. Kaiser Criterion revealed 6 factors with an eigenvalue more than 1, with the 6th variable eigenvalue of almost 1, which is very close to rejection. Moreover, the Scree plot didn't show a clear set of 6 points almost behaving as a straight line; additionally, the bend started earlier at the 2nd factor, as shown in Figure 6. Consequently, the number of factors was determined based on the Kaiser Criterion with 6 factors as start.

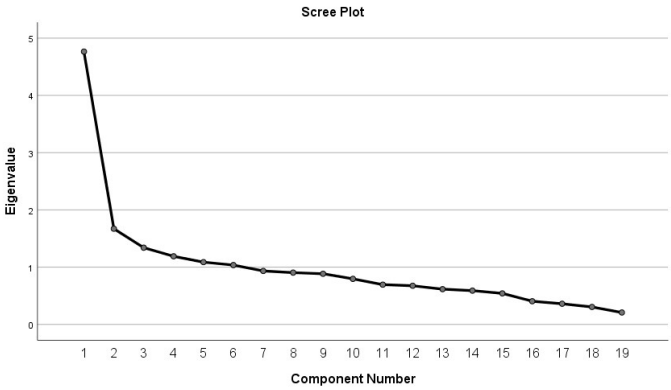

Figure 6: Scree plot using SPSS

Factor analysis with 6 factors was the starting iteration, where tests were run using Minitab. The highest loadings on factors were acquired when factor analysis was done using principal component analysis and the rotation was done through varimax rotation. Based on literature, minimum accepted factor loadings should be more than 0.3 with avoidance of crossloadings, where the value is the one of concern not the sign. Moreover, variable-to-factor ratio is considered were three or more per factor would lead to acceptance, and more than five to be called a strong solid factor. The findings of the rotated factors' loadings showed that only two variables are loaded on the 6th factor, where the second variable crossloaded on 3 factors with a high loading value. Moreover, 2 variables out of 3 of the 5th factor crossloaded several times. The first variable crossloaded on the 2nd factor, and the second crossloaded on the 2nd factor and 6th factor, with high loadings. In addition, 1 variable out of 3 of the 4th factor crossloaded on the 3rd factor, with high loading. Therefore, the decision was to reduce the number of factors to 5, aiming at reaching appropriate variable-to-factor ratio and less crossloadings. Moreover, this decision could have been also supported by the unclear Scree plot and the Kaiser Criterion finding, where the 6th factor barely crossed the eigenvalue of one.

The results of this iteration showed that 18 out of 19 variables loaded adequately with high loadings on the 5 factors. 4 variables are loaded on the 1st factor with high loadings (0.826, 0.802, 0.721, and 0.578). 5 variables are loaded on the 2nd factor with high loadings (-0.736, -0.686, -0.646, -0.607 and -0.496). 3 variables are loaded on the 3rd factor with high loadings (-0.692, -0.626, and -0.613). 3 variables are loaded on the 4th factor with high loadings (0.71, -0.595, and 0.553). 3 variables are loaded on the 5th factor with high loadings (-0.596, -0.536, and -0.484). Moreover, communality values of variables should be considered along with loadings. Referring to literature, variables with low communalities indicate a low influence by a common latent factor. The range lying from 0.4 to 0.7 is referred as low to medium communalities, which is the most common. The output of Minitab showed that 18 of 19 communalities are above 0.4, ranging from 0.41 to 0.74. One variable (innovativeness) was excluded from the analysis due to its low loading (0.393) on the factor in addition to its low communality value (0.335). Therefore, 18 variables were taken into consideration, which were loaded on 5 factors.

Consequently, a reliability test using Cronbach Alpha was done to assure data internal consistency and guarantee stable and consistent results. It revealed a value of 0.785 using Minitab, where values above 0.7 are considered significant, based on literature. Therefore, chosen variables in this study add up to a set and are able to individually quantify the same perception of passengers' TR effect on the use of the new smart check-in system. In other words, this tells that the internal consistency is definitely assumed and the experiment is validated. Moreover, an additional test relevant to Cronbach Alpha was performed, aiming at knowing the effect of omitting a variable on the total Cronbach Alpha value. If the value increases significantly, the variable is preferred to be omitted to enhance the outcome reliability (Minitab 2019). The values obtained didn't show any clear enhancement of the Cronbach Alpha value, where the maximum enhancement reached a value of 0.8; therefore, no need to exclude any variable.

Interpretation of the factors is labeling them, as mentioned in literature, relative to the researcher's perspective to explain factors effect on the study scope. Various interpretations could be done to the same set of variables. Based on the outcome presented in this study, 18 variables are considered as a result of factor analysis, which are assigned to 5 underlying latent factors or constructs which are labeled or named. Factor 1 is loaded with playfulness (0.826), enjoyment (0.802), optimism (0.721), and insecurity (0.578) variables which could be labeled as technological passion. Factor 2 is loaded with self-service experience & habit (0.736), Self-care VS preference of personal service (0.686), usefulness (0.646), ease of use (0.607), and discomfort (0.496) variables which could be labeled as technological practicality. Factor 3 is

loaded with TCI experience & habit (0.692), age (0.626), and need for interaction (0.613) variables which could be labeled as traditional orientation. Factor 4 is loaded with are gender (0.71), travel frequency (0.595), and compatibility (0.553) variables which could be labeled as self-experience and necessity. Finally, factor 5 is loaded with power of intentionality and will (0.596), class (0.536), and risk (0.484) variables which could be labeled as personal preference and will.

IV. CONCLUSION

The conducted survey in this study aimed at discovering the effect of passengers' TR on the use of a new technology of smart check-in system in airports. 215 accepted responses were obtained from the survey, yielding responders from over 40 nationalities covering all the 3 main traveling classes with about 70% of them travelling for more than twice a year, making the results of this survey more diverse and dependable. Moreover, genders of responders were almost balanced with 50:50 which gives more trust in the lack of biasness towards a specific gender.

Survey statistics showed that the majority of responders tend to be self-reliant (60%), prefer SSCI instead of TCI in case of queues (72%), feel SSCI systems are easy to be used (80%) and safe (81%), persist to use them even when facing problem (66.5%), and relatively highly trust their work ability (70%).Moreover, responders showed to be passionate (63%) and excited (57%) about the utilization of new SSCI systems. These results showed that passengers' are technologically ready to adopt new technologies in general. In addition, further specific items were added in the survey to show the particular passenger's TR towards the new suggested smart check-in system. The results showed that the vast majority of passengers (85.6%) are willing to use the new presented smart check-in system and any additional technology in case of necessity (90%), when compared with paying extra cost. Therefore, the claim of the adoption of the new suggested smart check-in system is supported by passengers, based on the survey results.

On the hand, the next step performed was factor analysis. The adequacy of the chosen sample was tested using KMO and Bartlett's Test, which revealed the acceptance of factorability and eligibility of this analysis. Another testing of data validity was done through correlation matrix. It showed that all variables are correlated significantly toat least one variable with varying coefficients. This finding proves the presence of relationships between individual variables and justifies factorability.

Factor analysis disclosed that passengers' readiness to use the new presented smart check-in cart is affected by 5 main factors. The first factor is labeled as technological passion represented by 4 variables which are playfulness, enjoyment, optimism, and insecurity. It explains the effect of passengers' state of being into technology and having passion about it when faced with the new smart check-in technology, which was found to be relevant to passengers' sense of insecurity. The second factor is labeled as technological practicality represented by 5 variables which are self-service experience & habit, self-care VS preference of personal service, usefulness, ease of use, and discomfort. It explains the effect of passengers' practical orientations, beneficial and worry senses when subjected to the new smart check-in technology. The third factor is labeled as traditional orientation represented by 3 variables which are TCI experience& habit, need for interaction, and age. It explains the effect of passengers' inclination to follow the habit of TCI when subjected to new smart check-in technology. The fourth factor is labeled as self-experience and necessity represented by 3 variables which are gender, travel frequency, and compatibility. It explains the effect of passenger's work trend, experience, which were found to be relevant to gender, on the direction of passengers' towards using the new smart check-in technology. Lastly, the fifth factor is labeled as personal preference and will represented by 3 variables which are power of intentionality and will, class, and risk. It explains the effect of passenger's individual way of thinking towards new smart check-in technology, including willingness and doubts about any potential risks, which were found to be relevant to the travelling class.

Finally, the reliability of the test was checked using Cronbach Alpha, revealing that results are internally consistent and stable. Therefore, the chosen variables in this study add up to a set and are able to individually quantify the same perception of passengers' TR effect on the use of a new smart check-in technology in airports. Moreover, this tells this experiment is validated.

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Acronyms

TR	Technological readiness
SSCI	Self-service-check-in
TCI	Traditional manned check-in counter
CFA	Confirmatory factor analysis
EFA	Exploratory factor analysis