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### Influence of Safety Nets, Uncertainty Avoidance, and Governments on E-Commerce Adoption: A Country-Level Analysis

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**Abstract:** This paper explains differences in e-commerce adoption among countries by examining the pertinent macro-level factors. A model is proposed that combines the technological, institutional, and cultural factors in order to examine country-level e-commerce adoption. Thus, interesting relationships among macro-level factors are hypothesized. The study is facilitated by the availability of authentic data published by reputable organizations such as UN and OECD. Moreover, the study is timely as e-commerce technology has now taken hold in several countries, therefore enabling us to draw data from a significantly larger sampling frame compared to earlier studies. This makes our findings more generalizable. The hypotheses are confirmed using PLS analytical procedures and the findings are reported. We discuss the results and their implications for researchers and practitioners.

**Keywords:** E-commerce adoption, efficacy of institutional safety-net, uncertainty avoidance, government policy.

#### CONTRIBUTIONS TO THE BODY OF KNOWLEDGE

1. Our comprehensive research model identifies important country level dimensions that influence country-level e-commerce adoption. We introduce PEISN as an important determinant of macro-level in e-commerce adoption.
2. The analysis in this section is conducted using a larger data set than earlier studies enhancing the external validity of the findings. The data from seventy countries was used ranging across all continents and developing/emerging spectrum. This enables robust validation of effects of country environments on e-commerce adoption.

## 1. INTRODUCTION

The existing *e-commerce* research emphasizes individual, organizational, *B2C*, and *B2B* environments (Delone and Mclean, 2004; Grandon *et. al.*, 2011; Chiu *et. al.*, 2014). Studies focusing on macro level determinants of *e-commerce* adoption are few. While the investigations of individual and firm level factors are important, they do not explain significant country-level differences in *e-commerce* adoptions despite open access of the core technologies to everyone all over the world. This paper proposes a model that includes technological, institutional, and cultural factors as antecedents of *e-commerce* adoption. The cultural factors are rooted in normative behavior of a society. People generally act in a way that is aligned to the standards of behavior in a society (Deci and Ryan, 2000). The bandwagon effect also influences the behavior of a large group of people. Furthermore, the success of *e-commerce* requires governmental support to ICT such as facilitating access of broadband Internet and high quality technological services to a large number of its people. Secure, stable and predictable environment can reduce uncertainties and build trust and confidence in the marketplace (Gibbs and Kraemer, 2004).

In an ICT (Internet and communication technologies) enabled interdependent world, most countries consider *e-commerce* to be a significant instrument for economic growth (Zhu and Thatcher, 2010). Despite early promise, *e-commerce* revenues remain insignificant in comparison to the overall business volumes (D'Onfro, 2015; Hassanein and Head, 2007) and overall *e-commerce* adoption at the global level remains quite low (Wigder, 2010). However, there are variations in adoption rates among different countries. Zhu and Thatcher (2010) assert that *e-commerce* adoption rates among different countries and regions exhibit significant variations. For example, 37% of online users in China's urban areas used *e-commerce*, in contrast to a meager 7% of the similar population in India (Stambor, 2010). In the global information technology report published by the World Economic Forum in 2010, the United States, South Korea, Canada, and other developed countries in Europe ranked high in the "Extent of Business Internet Use" category. Considerable disparity in adoption rates of *e-commerce* are reported even among the developed countries (Postnord, 2014). In Europe, of the people aged between 15 and 79, those shopping online ranged from less than 40% in Italy to more than 80% in United Kingdom (Postnord, 2014). The question then arises, "what causes such variations?" This paper examines the socio-economic determinants of country level *e-commerce* adoption by developing a research model to examine antecedents of *e-commerce* adoption at the macro level and analyze the proposed hypotheses using the PLS analytic method.

Now, we briefly describe the reasoning underlying the proposed research model. *E-commerce* is distinct from conventional commerce in the aspect of feedback delay experienced by consumers. In conventional commerce, the feedback is immediate, thus the consumer experiences no delay. Therefore, the likelihood of a conflict between the sellers and buyers is reduced. In *e-commerce*, the consumer gets to touch and feel the product after a time gap post the decision to purchase. Even though the purchase decision is based on many other factors, the interaction with the actual product occurs later leading to a delay in feedback response. This delay increases the likelihood of a conflict between the purchaser's expectation of what the product would be and the actual experience with the product. After having paid for the product at the time of purchase decision and completed one side of the commercial transaction, the consumer needs to be assured that her interests are protected, should a conflict subsequently occur. An efficient and fair legal system can strengthen this assurance (Merhi and Ahluwalia, 2015). Presence of effective safety nets and uncertainty avoidance are other pertinent factors that can enhance or diminish

people's assurance in *e-commerce* technology. This is the first paper that examines the role of Perceived efficacy of Institutional Safety Nets (PEISN) in influencing *e-commerce* adoption at a macro level. Additionally, a reliable and good quality access to the Internet is a necessary *pre-condition* to using *e-commerce*. Other papers have noted the dependence of *e-commerce* adoption on internet diffusion (Kraemer *et. al.*, 2002; Migiro, 2006; Oreku *et. al.*, 2007).

We summarize the foregoing discussion by noting that the research model proposed in this paper identifies macro-level factors that influence *e-commerce* adoption. These factors are : Government's focus on IT (GFIT), perceived efficacy of institutional safety nets (PEISN), and uncertainty avoidance (UA). Specifically, this study postulates that PEISN, uncertainty avoidance, and government's focus on IT directly and positively impact *e-commerce* adoption. We also argue that uncertainty avoidance is an antecedent to PEISN.

Lastly, generalization of the results reported in the existing research that examine macro-level determinants of *e-commerce* adoption is rather limited because of sample size constraints. The studies that examine macro-level *e-commerce* adoption consider data from a single country or at best few countries. Our paper overcomes this limitation in the extant literature by generating a significantly robust sampling frame comprising of seventy countries in order to improve the generalizability of its findings.

The remainder of this paper is organized as follows. Section 2 provides a brief review of the literature on *e-commerce* diffusion and adoption. Section 3 explains the research model and research hypotheses. Section 4 describes the methodology, the results and their implications. Finally, section-5 concludes the paper by summarizing the paper, highlighting its contributions, noting its limitations, and identifying opportunities for future research.

## **2. LITERATURE REVIEW AND CONCEPTUAL BACKGROUND**

Though most existing research in *e-commerce* adoption considers individual consumer as the unit of analysis, it is useful to explore the adoption of *e-commerce* at various levels. Kalakota and Whinston (1996) focus on consumers as they define *e-commerce* as “the delivery of information, products/services, or payments *via* telephone lines, computer networks or any other means.” Zwass (1996) provides an organizational context to *e-commerce* as he defines it as “the sharing of business information, maintaining business relationships, and conducting business transactions by means of telecommunications networks.” Treese and Stewart (1998) define *e-commerce* at a higher level by stating that it is the “use of the global Internet for purchase and sale of goods and services, including services and support after the sale.” While scholars have abundantly explored the first two perspectives (*i.e.* individual and organizational), studies that focus on the global aspect of *e-commerce* remain scarce.

At the same time, the *e-commerce* revenues continue to grow across the world as a consequence of explosion of Internet adoption (E-marketer, 2014). The development of reliable and advanced mobile commerce technologies and the exponential increase in the use of smart devices is fueling this growth even more. According to a 2013 status update report published by Statistic, the number of consumers purchasing goods and services through the Internet channel is steadily rising (Statista, 2013). According to this report, 40% of worldwide Internet users purchased products or goods online *via* desktop, mobile, tablet or other online devices resulting in \$1.2 trillion in revenues. US retail *e-commerce* sales totaled \$145

billion in 2009 resulting in an average annual growth rate of nearly 18% during 2002-2009, compared to a modest 2.2% increase in the total retail sales during the same period (Bureau, 2011). In 2015, it is projected that North American *e-commerce* sales will be \$375.89 billion, up 14.3% from \$328.6 billion in 2014 (Linder, 2015). In 2013, the European online revenue of B2C goods and services grew by 16.3% (Europe, 2013). In 2014, the worldwide *e-commerce* sales were projected to increase by nearly 20% over 2013 aggregating \$1.471 trillion (E-marketer, 2014). The findings of these studies show that despite the growth in absolute numbers, the *e-retail* sales remain a small fraction of overall retail sales volume.

B2C *e-commerce* enables several advantages to buyers and sellers over the brick and mortar retail marketplace. Consumers can purchase products without having to travel to the stores, saving them time and money; moreover, they have access to a wider selection of products. A comparison between B2C *e-commerce* and brick and mortar shopping reveals various convenience advantages associated with *e-shopping*; namely search convenience defined as “products easy to find and compare” (Kaufman-Scarborough and Lindquist, 2002), possession convenience, time convenience, and schedule convenience (Pavlou and Gefen, 2004). *E-retail* provides consumers with enhanced services; namely to research and compare products, expanded choice in products, and ability to transact anytime-anywhere.

Because of the widespread diffusion of Internet, and unlimited availability of information to consumers, electronic markets are considered to be more efficient than the traditional markets (Ghose and Yao, 2011). Additionally, because the search costs are trivial and there is no restriction of geographical product differentiation, mass-produced physical goods are expected to exhibit none or at most minimal price differentiation in the electronic markets (Luo *et. al.*, 2007). Therefore, it is important to understand the reason why growth in *e-commerce* revenues is somewhat subdued despite the attractiveness of the digital markets for all its users. Only a handful of studies examine the causal factors underlying this differential adoption among countries (Gibbs and Kraemer, 2004; Merhi and Ahluwalia, 2015).

Researchers found that the adoption of *e-commerce* by consumers is hindered by multiple factors (Mahmood *et. al.*, 2004; Pavlou and Gefen, 2004; Rose and Straub, 2001). These are:

- Consumer mistrust of local Internet service and products
- Lack of awareness of technology
- Uneven diffusion of Internet across countries
- Need of infrastructure that supports these systems
- Low *e-maturity* levels
- Low level of education
- Government policies

Wong (2003) found that demographic structure, financial and legal institutions, physical infrastructure, human resources, and *e-commerce* policy initiatives impacted the adoption of *e-commerce* in Singapore. Molla and Licker (2005) indicated that perceived organizational *e-readiness* and perceived environmental *e-readiness* influenced *e-commerce* adoption in South Africa. Ho *et. al.* (2007) found that Internet penetration, telecommunication investment intensity, educational level, and regional contagion affected *e-commerce* adoption in 17 European countries. Government policies, supportive legal environment, compatible socio-

cultural infrastructure, ICT infrastructure, and culture differences also affect *e-commerce* adoption (Ferguson and Yen, 2006; Javalgi and Ramsey, 2001; Zhu and Thatcher, 2010). Merhi and Ahluwalia (2015) argue that Internet connectivity, social and cultural environment and legal environment influenced *e-commerce* adoption at the country level.

We now discuss the relevance of safety-nets in prompting growth of *e-commerce*. Safety net is defined as “a guarantee of professional or financial security” (Word Net 2.1, 2005). Safety nets are risk-shifting devices that are used in situations where normal-risks cannot be tolerated (Hovakimian *et. al.*, 2003). The typical process of *e-commerce* transactions leads to unbalanced risks, purchasers sustaining their greater proportions. Therefore, institutional and social safety nets are useful mechanisms for balancing these risks by shifting some to the sellers. This paper proposes PEISN as a new high level construct to examine its effect on *e-commerce* adoption within and across countries.

PEISN in the context of *E-commerce* is based on a sense of assuredness that the online transactions are backed by presence of institutions that provide financial or professional guarantees safeguarding consumers’ interests. Also, uncertainty avoidance, a sense of discomfort with vulnerability and/or uncertainty, is a cultural construct (Hofstede *et. al.*, 2010). Societies with high uncertainty avoidance look for more structural regimens to guide behavior. Because the feedback delay is a characteristic of *e-commerce* transactions, we argue that PEISN and uncertainty avoidance are pertinent factors in affecting people’s *e-commerce* adoption. Accordingly, we extend the arguments made in Merhi and Ahluwalia (2015) to posit that PEISN and uncertainty avoidance are antecedents of country level *e-commerce* adoption. Because uncertainty avoidance and PEISN both are based on risk, we posit that uncertainty avoidance influences PEISN.

Summing up the discussion so far, we emphasize that the country level *e-commerce* adoption is influenced by technological, institutional, and cultural factors. In this paper, we assess the influence of the following macro-level determinants on country-level *e-commerce* adoption:

- Government’s focus on IT (GFIT)
- Perceived efficacy of institutional safety-net (PEISN)
- Uncertainty avoidance (UA)

### **3. RESEARCH MODEL AND HYPOTHESES**

In this section, we explicate the determinants of country-level *e-commerce* adoption and reason out the hypotheses examined in this paper.

#### **3.1. Government’s Focus on IT (GFIT)**

A robust and reliable telecommunication infrastructure is essential for large-scale diffusion of *e-commerce* and other similar technologies (Mbarika *et. al.*, 2005). The lack of telecommunication infrastructure acts as a barrier in the growth of ICTs such as *e-commerce* (Kaba *et. al.*, 2009). Digital economies have become significant contributors to the overall economic growth of several countries. In an increasingly interconnected world, countries are constantly competing with each other in order to increase their share in the global trade and commerce. In the last several years, digital technologies have spurred growth in several countries.

It is reasonable to expect that economically lagging countries are bound to emulate those that have benefited from adopting ICT technologies. Digital economy being an increasingly significant contributor to trade and commerce, it is natural that responsible and aware governments would focus their attention and resources on putting in place adequate supporting ICT infrastructure in order to augment the breadth and quality of information technologies (Hardware, software, networks, and telecom). Governments also provide *e-government* services to its citizens using ICT platforms (*e-government*). *E-government* applications have yielded expanded reach, faster speeds, and greater effectiveness in provision of the services (Merhi and Koong, 2013).

Furthermore, as keepers of public interest, governments are obliged to pay attention to reducing digital divide and to provide a fair technological platform for private sector to participate and compete. As trustees of national resources such as wireless spectrum, governments need to frame policies for transparently allocating these resources to technology providers (such as cell phone service providers). Several governments have benefited by realizing large revenues by auctioning wireless spectrum (Merhi and Koong, 2016). IT products and services now contribute significantly to the national assets of many countries. Therefore, governments have a significant stake in expanding *e-commerce* based technologies.

**H.1:** Countries with greater governmental focus on IT exhibit greater *e-commerce* adoption rates.

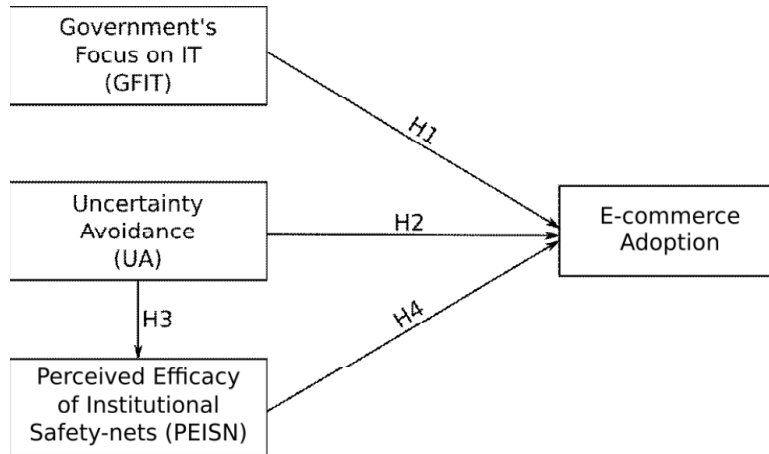
### 3.2. Uncertainty Avoidance (UA)

Uncertainty avoidance is a cultural determinant of *e-commerce* adoption. Uncertainty avoidance is defined as “the extent of feeling threatened by uncertain or unknown situations” (Dorfman and Howell, 1997). In countries with high uncertainty avoidance, individuals often try to minimize all kinds of ambiguity because they feel anxious in uncertain situations (Hofstede *et. al.*, 2010). In contrast, in countries with low uncertainty avoidance, individuals relatively feel more comfortable with uncertain situations and can tolerate different opinions and behaviors. Uncertainty avoidance was found to negatively impact consumers’ buying decision on Internet (Lim *et. al.*, 2004) and adoption of technology products (Bagchi *et. al.*, 2003). Hofstede *et. al.* (2010) argues that individuals in countries with high uncertainty avoidance index are generally less willing to accept personal risk than those in countries that have low uncertainty avoidance index. Risk taking behavior is inversely proportional to the uncertainty avoidance index. Typically, *e-commerce* puts the purchaser in a weaker position relative to the seller, therefore invoking risks. Some examples of risks are: receiving a product different from one expected, not receiving a product at all even after payment is made, not receiving product when it was promised, and breach of personal and financial information. People in high uncertainty avoidance societies are expected to avoid risky behavior (Kahneman and Tversky, 1979). Thus,

**H2:** Countries with greater uncertainty avoidance exhibit lower *e-commerce* adoption rates.

### 3.3. Perceived Efficacy of Institutional Safety-net (PEISN)

Safety-net is defined in Wordnet as “a guarantee of professional or financial security” (WordNet2.1, 2005). We posit that uncertainty avoidance is an antecedent to PEISN but bears negative relationship. PEISN is defined as the assessment of the effectiveness of safety-nets such as legal protection to buyers of online products and services. In addition, societies with higher uncertainty avoidance expect stronger rules and



**Figure 1: Research Model**

regulations. Therefore, people in these societies (with higher uncertainty avoidance) are likely to more stringently assess the safety-nets compared to the individuals in societies having low uncertainty avoidance. Therefore, we hypothesize that:

**H3:** Countries with greater uncertainty avoidance exhibit lower trust in the perceived efficacy of institutional safety nets.

Safety nets are risk-shifting mechanisms that are used in situations where normal-risks cannot be tolerated (Hovakimian *et. al.*, 2003). The typical process of *e*-commerce transactions leads to unbalanced risks, purchasers sustaining greater proportions. Therefore, institutional and social safety-nets may be useful mechanisms to balance these risks by shifting some to the sellers. This paper proposes a new high-level construct named “Presence of effective safety nets” to examine its effect on *e*-commerce adoption within and across countries.

**H4:** Countries with greater perceived efficacy of institutional safety-net (PEISN) exhibit greater adoption of *e*-commerce.

In this section, we described the hypotheses being confirmed in this paper and provided arguments supporting each hypothesis. Figure 1 summarizes the foregoing discussion and shows the hypothesized relationships.

## 4. METHODOLOGY

### 4.1. Data and Variables

Country level data consisting of seventy countries formed the sample for conducting the empirical analysis. Because the determinants comprise of macro-level indicators, we draw the data from various indexes published by credible organizations, which possess the wherewithal to systematically track various macro-level metrics at the global scale. The data used for analysis was obtained from the resources available in the websites of United Nations, OECD, and the EIU.

We now describe each of the factor, its indicators, and the source from where it was obtained.

### 1. E-commerce adoption

The e-commerce adoption data was obtained from EIU website. The index comprises of consumer spending on ICT per head, level of e-business development, use of Internet by consumers assessing both the range of Internet features used by individuals and their online purchasing activity, use of online public services by citizens and businesses.

### 2. Government's focus on IT (GFIT)

The GFIT data was obtained from EIU website. The index comprises of Government expenditure on ICT as a proportion of GDP, digital development strategy, e-government strategy, online procurement, availability of online public services for citizens and businesses, e-participation based on the UN e-participation index.

### 3. Perceived Efficacy of Institutional Safety Net (PEISN)

The PEISN data was obtained from the World Economic Forum, Executive Opinion Survey. The index comprises of how would you assess your country's laws relating to the use of ICT (e.g., electronic commerce, digital signatures, consumer protection)? [1 = highly undeveloped; 7 = well-developed].

### 4. Uncertainty Avoidance (UA)

The uncertainty avoidance index is drawn from Hofstede's website (geert-hofstede.com) based on 116,000 questionnaires about the work-related value patterns of employees in IBM which was the biggest IT firm at the time (Hofstede, 1980; Hofstede *et. al.*, 2010). Table 1 presents results of descriptive statistics of the variables.

**Table 1**  
**Descriptive Statistics**

Variable	N	Range	Mean	Std. Deviation	Variance	Skewness	Kurtosis
PEISN	70	3.60	4.52	0.82	0.67	-0.26	-0.73
GFIT	70	6.85	6.30	1.90	3.60	-0.11	-1.01

## 4.2 Analysis and Discussion

The data were analyzed using descriptive statistical analytic procedures and correlation analysis followed by testing the path model using SmartPLS software. The output summary of PLS analysis is shown in Table 2.

**Table 2**  
**Results of PLS Analysis**

Relationship	Path Coefficient	Statistical Significance	R <sup>2</sup> of Endogenous Variable
GFIT → Adoption	0.86	Significant at 0.001 level	0.88
UA → Adoption	0.86	Not Significant	0.88
UA → PEISN	-0.26	Significant at 0.01 level	0.07
PEISN → Adoption	0.70	Significant at 0.05 level	0.88



The results of the PLS analysis show that all hypotheses except H2 were confirmed by the data. Now we briefly discuss the results and their implications. We posited that government's focus on IT (GFIT) has a significant influence on *e-commerce* adoption. There are many factors that prompt increasing focus of governments on IT. This is because IT, directly and indirectly, contributes significantly to the economic well-being of many countries (Van Dijk, 2003).

Therefore, it is reasonable to expect that most governments would pay abundant attention towards implementing and sustaining a robust IT infrastructure. Governments are expected to fulfill their fundamental responsibilities of framing and implementing policies for equitable participation of all stakeholders in the development and operation of IT infrastructure. Governments are also direct beneficiaries of the affordances offered by IT applications as they offer many of its services (e.g. *e-tax*) to citizens using digital platforms in order to reduce costs, improve speed of their and empower people. Thus, government's involvement in diffusion of IT can be as a market regulator and as a provider of public good (Picot and Wernick, 2007). The data show that GFIT significantly affects *e-commerce* adoption (H1).

Uncertainty avoidance taps into the perception that people feel threatened by uncertain, unstructured situations, and ambiguity (Yoon, 2009). Individuals in countries with higher uncertainty avoidance index are more reluctant to engage with ambiguous situations (Hofstede, 1980). *E-commerce* transactions involve an element of uncertainty because the purchaser gets to touch and feel the product after having paid for it, putting the purchaser in a weaker position compared to the seller. Therefore, one would expect that uncertainty avoidance is a deterrent to using *e-commerce*. However, institutional mechanisms can mitigate the consequences of uncertainty avoidance. We propose the construct perceived efficacy of institutional safety-nets (PEISN) to represent consumers' perceptions of the effectiveness of formal fallback mechanisms that safeguard their interests when they transact online. Thus, PEISN mediates the path between UA and *e-commerce* adoption. The data support this mediated relationship (H3 and H4).

The data failed to confirm the direct relationship between UA and *e-commerce* adoption, thus suggesting stronger support to the significance of safety-net in societies with high UA. The practical implication of this finding is wide ranging. For example, governments can set up effective and easy to use legal structures that can expeditiously arbitrate disputes arising from *e-commerce* transactions. Industries can devise their own mechanisms that serve as deterrents for dishonest digital firms. For example, in USA, Best Business Bureau allows consumers to file complaints against businesses and provide information to other consumers about the complaint-data. At the firm level, companies can clearly state and honor hassle free return policies and provide easy to use communication methods (*i.e.* telephone, email, mailing address) that consumers can use to seek help and request redress.

## 5 CONCLUSION

This study investigates the causes for country-level differences in *e-commerce* adoption and examines specific relationships between macro-level factors and *e-commerce* adoption. PLS analytic procedure is used to confirm the hypothesized relationships. This study contributes to the literature in two important ways. First, this paper takes a comprehensive look at the causes of country-level *e-commerce* adoption by identifying five important higher-order factors of country environments relevant to *e-commerce* adoption. Second, while previous research has studied the effects of country-level factors on organizations and

consumer decisions regarding the adoption of *e-commerce*, these studies were limited by small sample sizes. This study enhances the generalizability of the findings by using a larger data set thus overcoming a major limitation in the existing research.

The findings of this paper offer important implications for policy makers. The comprehensive model presented provides a diagnostic tool for policy makers and governments to find out which specific areas need more focus in spurring *e-commerce*. *E-commerce* provides organizations and consumers with numerous advantages such as cost savings and convenient way to deliver the products/services, which increase the profit of the organizations (Uzoka, 2008; Zhu and Thatcher, 2010). This increase in turn affects the national economy since these organizations compose a big part of the economy. According to our study, policy makers need to consider their country's institutional and resource environments. For instance, when people are reluctant to conduct Internet-based commercial transactions because of uncertainty avoidance, setting up effective safety-nets can be beneficial. Industry and individual firms can device their own safety-nets. Policy makers may promote the development of *e-commerce* supply markets. For instance, they may encourage government agencies to use *e-commerce* while buying. This will increase the demand for *e-commerce* and support the growth of *e-commerce* supply market.

While this study makes many significant contributions to practice and research, there are few limitations, which offer opportunities for further research on this important topic. Firstly, we used secondary data to assess the relationships. Although we ensured integrity of the data by using very credible sources, we were limited by the composition of the indexes that formed our higher order factors. Therefore, future research can consider the second order dimensions that formed the higher order constructs/factors. This would further improve the diagnostic value of the model proposed in the paper. In addition, using the raw variables that compose the indexes can also enrich the literature since it might yield fine-grained results, which will give practitioners as well as researchers more details about the factors that lead to *e-commerce* adoption.

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