



# A Novel Innovation to Statistical Analysis Using Structural Equation Modeling on Management Strategies

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**Abstract:** This report was intended to determine what factors affect online shoppers' purchase intention in the e-business environment and to verify how organizations' internal and external dynamics may underlie the success of e-commerce companies. Although the technology-acceptance model is widely accepted in research of e-commerce topics, the present study went beyond technology and targeted other factors that might have dramatic influence on online shoppers' purchasing intention as well, a conceptual model and a number of hypotheses were proposed. The factor analysis and structural equation modeling (SEM) were adopted for statistical and empirical analyses. The results showed positive correlations among the identified factors indicating a great influence of innovative performance in different areas of management strategies on e-purchase intention; they also demonstrated the great impact from the awareness of sustainability development in e-commerce companies.

**Keywords:** E-commerce, Sustainable Innovations, Management Strategies, E-purchase Intention, Path Analysis, SEM

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## 1. Introduction

An E-business has been defined as the application of information and communication technologies in support of all the activities of business [1]. Electronic commerce involves the use of computer technologies to enable the external activities and relationships of a business with individuals, groups and other businesses [2].

This research focuses on determining the factors that affect consumers' purchase intention in the e-commerce environment and the influence of the organizational internal and external factors on the success of e-commerce companies. Although the technology acceptance model is widely accepted in research on e-business, the present study mainly targeted the effects perspectives beyond technologies, such as innovativeness in segmentation and positioning as well as sustainable innovation in management strategies, which also have dramatic effects on online shoppers' purchasing intention [3]. The terms of e-business and e-commerce are quite common nowadays

and are sometimes used interchangeably. But the two terms are different in ways that matter to companies. Here, the letter e stands for "electronic networks" and describes the application of electronic network technologies e.g., Internet and electronic data interchange (EDI) to improve and change business processes [4]. E-business is a term used to describe businesses run on the Internet, or utilizing Internet technologies to improve the productivity or profitability of a business [5]. In a more general sense, the term may be used to describe any form of electronic business-- that is, any business which utilizes a computer. This usage, however, is somewhat archaic, and in most contexts this term refers exclusively to Internet businesses [6].

The most common implementation of e-business is as an additional, or in some cases primary, storefront. By selling products and services online, such a business is able to reach a much wider consumer base than any traditional store could ever hope for. This function is referred to as e-commerce, and the terms are occasionally used interchangeably [7]. An

online business may also use the Internet to acquire wholesale products or supplies for in-house production. This facet is sometimes referred to as e-procurement, and may offer businesses the opportunity to cut their costs dramatically [8]. Even many e-businesses which operate without an electronic storefront now use e-procurement as a way to better track and manage their purchases [9].

Many individuals or businesses involved in e-commerce, whether buyers or sellers, rely on Internet-based technologies to accomplish their transactions [10]. E-commerce is recognized for its ability to allow businesses to communicate and to form transactions anytime and anywhere. Whether an individual is in U.S. or overseas, business can be conducted through the internet.

The present study elaborates on the key factors for e-businesses success by comparing the financial reports of two most famous e-business groups: Alibaba and Amazon. In order to illustrate the effects of regional difference on customers' purchase behavior, two brands of online shopping websites among different regions of Asia and North America were chosen. Subsequently, 534 surveys were conducted with different groups of online shoppers, supplemented by interviews with senior managers from the e-business companies under investigation.

## 2. Literature Review

As organizations go online, they have to decide which e-business models best suit their goals. A business model is defined as the organization of products, services and information flows, serving as a source of revenues and benefits for suppliers and customers [11]. The concept of an e-business model is the same as that of traditional businesses but used in the online context. The various types of business models determine marketing strategies. For instance, as Alibaba entered into the North American territory, or when Amazon penetrated into the Asian markets, the innovativeness, or the adoption of innovations into their market strategies, varied.

A marketing strategy is based on customers' behavior expected in a certain market. In order to understand the customers and their buying behavior, a process of segmenting and positioning is needed [12]. This process consists of the three main activities: segmenting, targeting and positioning. In the present study, the author mainly focuses on two of them: segmenting and positioning. Also, factors that influence the consumers' purchase intention are many, e.g., environmental elements, products' life cycle, competitive pressures, patents, R&D funding and organizational structure. While some researchers have focused on either marketing strategies or innovation adoptions, surprisingly little research has been conducted on the correlations between those two factors and their influence on consumers'

purchasing behavior.

Some researchers have explored the theoretical foundations of value creation in e-business by examining how American and European e-businesses that have recently become publicly-traded corporations create value. Others have found that in e-business new value can be created while transactions are enabled [13]. Based on the rich data obtained from case studies and informed by theories in entrepreneurship and strategic management, these researchers have developed models on the sources of value creation. Some of these models suggest that the value-creating potential of e-businesses hinges on four interdependent dimensions: efficiency, complementarities, lock-in, and novelty [14]. Studies based on these models suggest that no single entrepreneurship or strategic-management theory can fully explain the value-creating potential of an e-business. Rather, an integration of these theoretical perspectives is needed. To facilitate such an integration, some scholars offer the business-model construct as a unit of analysis for future research on value creation in e-business [15]. A business model depicts the design of transactional content, structure, and governance so as to create value through the exploitation of business [16]. Some papers propose that a firm's business model is an important locus of innovation opportunities and a crucial source of value creation for itself and its suppliers, partners, and customers. However, such models have delineated different effects [17].

Some variables involved in this kind of segmenting are usually geographical, behavioral and demographic in nature [18]. When these segments are known, it is important to determine which market to target. Not every market is an attractive market to enter. A little filtering is usually done in this activity, but there are more factors to take in account before targeting a certain market segment. This process is called targeting. After the most attractive segments are selected, a company should not directly start targeting all of them -- other important factors come into play in defining a target market. Four sub-activities form the basis for deciding on which segments will actually be targeted [18]. One other critical factor is novel performance in corporation management, which in the present study is defined as in four aspects: financial, marketing, technological and sustainable.

### *Conceptual Model*

It was assumed in the present study that there are also some relationships among the existing models and the models borne out of the qualitative interviews. All the factors detected by these interviews with senior managers, clients, business owners who had had online shopping experience for no less than three years contributed to the dependent variables: e-purchase intention. Together, they brought forth a new model, a conceptual model of e-purchase intention (Figure 1).

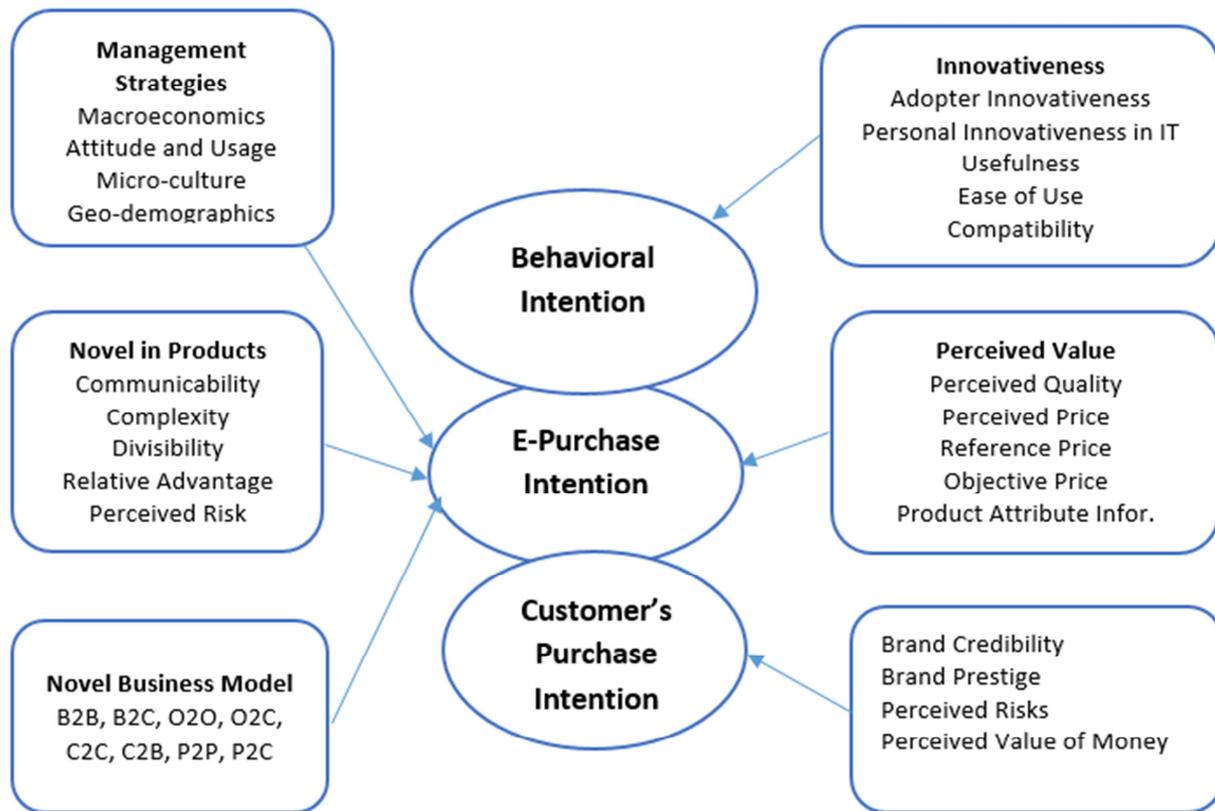


Figure 1. A Conceptual Model of E-Purchase Intention.

### 3. Methods

Although the technology acceptance model is widely accepted in e-business research, the present study targeted the effects perspectives other than technologies, e.g., the factors of innovativeness in segmentation and positioning strategies which also have dramatic influences on online shoppers' purchasing intention. To a large extent, methodology determines the outcomes of any research. Therefore, it is crucial to choose appropriate research methods and conduct them effectively in order to answer the research questions and to meet the research objectives [19].

From an extensive literature review and a number of quantitative surveys and in-depth interviews with the senior managers of some e-commerce companies, a conceptual model and a set of hypotheses were proposed. Both were instrumental to a comparative analysis between two typical e-business companies, Alibaba and Amazon. The first section of this study presents the conceptual model of the present study. In the second section, the two primary methods used in analyzing novel performance in four areas of corporation management (financial, technological, marketing and sustainable development) are described. The third section is mainly related to the SEM quantitative methodology and how it was combined with the qualitative methods to fit the unique circumstances of the present study. The fourth and fifth sections discuss how the population and sample sizes were determined according to the hypotheses while the final section elaborates on the pilot study by examining the data

collected through it.

#### 3.1. Hypotheses

According to the literature review and qualitative research, the overall conceptual model of the present study yielded a series of hypotheses pertaining to the relationship between novel performances and four main areas of corporation management: financial, marketing, technologies and sustainable development, and purchase intention. Hypotheses are in the following.

H1: The identified factors of innovativeness (adopted innovativeness, personal innovativeness in IT, usefulness, ease of use, compatibility), management strategies (macroeconomics, attitude and usage, micro-culture, geo-demographics), novel in products (communicability, complexity, divisibility, relative advantages, perceived risks), novel business model (B2B, B2C, O2O, O2C, C2C, C2B, P2P, P2C), reference value (brand credibility, brand prestige, perceived risks, perceived value of money) will contribute to e-purchase intention.

H2: There are relationships among adopted innovativeness, personal innovativeness in IT, usefulness, ease of use, compatibility and sustainability.

H3: There are relationships among communicability, complexity, divisibility, relative advantage, perceived risks and sustainability.

H4: There are relationships among management strategies, such as macroeconomics, attitude and usage, micro-culture, geo-demography and sustainability.

H5: There are relationships aspects of innovativeness, such as adopted innovativeness, personal innovativeness in IT, usefulness, ease of use, compatibility and management strategies.

H6: There are relationships between novel performance, such as communicability, complexity, divisibility, relative advantage, perceived risks and perceived value of quality, price, etc.

H7: There are relationships among perceived value of quality, price and management strategies.

H8: There are relationships among reference values, such as brand credibility, prestige and loyalty to management strategies.

H9: There are relationships between perceived value of quality, price and reference value of brand credibility, prestige, and loyalty.

H10: There are relationships among perceived value, quality, price, validity, perceived language, perceived life cycle, and e-purchase intention.

H11: There are relationships between management strategies and e-purchase intention.

H12: There are relationships between reference values (i.e., brand credibility, prestige, and value of money) and e-purchase intention.

**3.2. Quantitative Analyses: Structural Equation Modeling (SEM)**

An SEM structural model is used to capture the causal influences (regression effects) of the exogenous variables on the endogenous variables and the causal influences of endogenous variables upon one another. If the SEM also has a measurement model for the endogenous variables, the structural model will involve latent endogenous variables rather than observed endogenous variables. An SEM have a measurement model and latent variables for exogenous variables. Simultaneous equations (typically estimated with instrumental variables methods) and path analysis are special cases of SEM with observed endogenous variables and multiple observed exogenous variables. An SEM measurement model is used to specify latent (unobserved) variables as linear functions (weighted averages) of other

variables in the system [20]. When these other variables are observed, they take on the role of indicators of the latent constructs. In this way, SEM measurement models are similar to factor analysis, with one basic difference, though. In an exploratory factor analysis, such as principal components analysis, all elements of the matrix defining the latent variables (factors) in terms of linear combinations of the observed variables take on non-zero values [21].

These values (factor loadings) generally measure the correlations between the factors and the observed variables, and rotations are routinely performed to aid in interpreting the factors by maximizing the number of loadings with high and low absolute values. In SEM, the modeler decides in advance which of the parameters defining the factors are restricted to being zero constant. Also, in SEM one can specify non-zero covariance among the unexplained portions of both the observed and latent variables [22]. Specification of each parameter allows the modeler to conduct a rigorous series of hypothesis testing regarding the factor structure. Since there can be a large number of possible combinations in a measurement model with more than just a few variables, exploratory factor analysis is sometimes used to guide construction of an SEM measurement model [22].

The general SEM system is estimated by covariance (structure) analysis, whereby model parameters are determined such that the variances and covariance of the variables implied by model system are as close as possible to the observed variances and covariance of the sample. In other words, the estimated parameters are those that make the variance-covariance matrix predictable by the models as similar as possible to the observed variance-covariance matrix while respecting the constraints of the model [22]. Covariance analysis appears at first to be quite different from least-square-regression methods, but it can be viewed as an extension of least squares into the realm of latent variables, error-term covariance, and non-recursive models (i.e. models with feedback loops). In some simple cases, a covariance analysis is identical to least squares [23]. Figure 2 illustrates how the hypotheses were tested by means of the structural equation modeling technique.

*Table 1. Reliability Statistics.*

Cronbach's alpha	Cronbach's alpha based on standardized items	N of items
.920	.927	17

*Table 2. Model Summary.*

Model	NFI Delta 1	RFI rho 1	IFI Delta 2	TLI rho 2	CFI
Default	.944	.926	.972	.963	.972
Saturated	1.000		1.000		1.000
Independence	.000	.000	.000	.000	.000

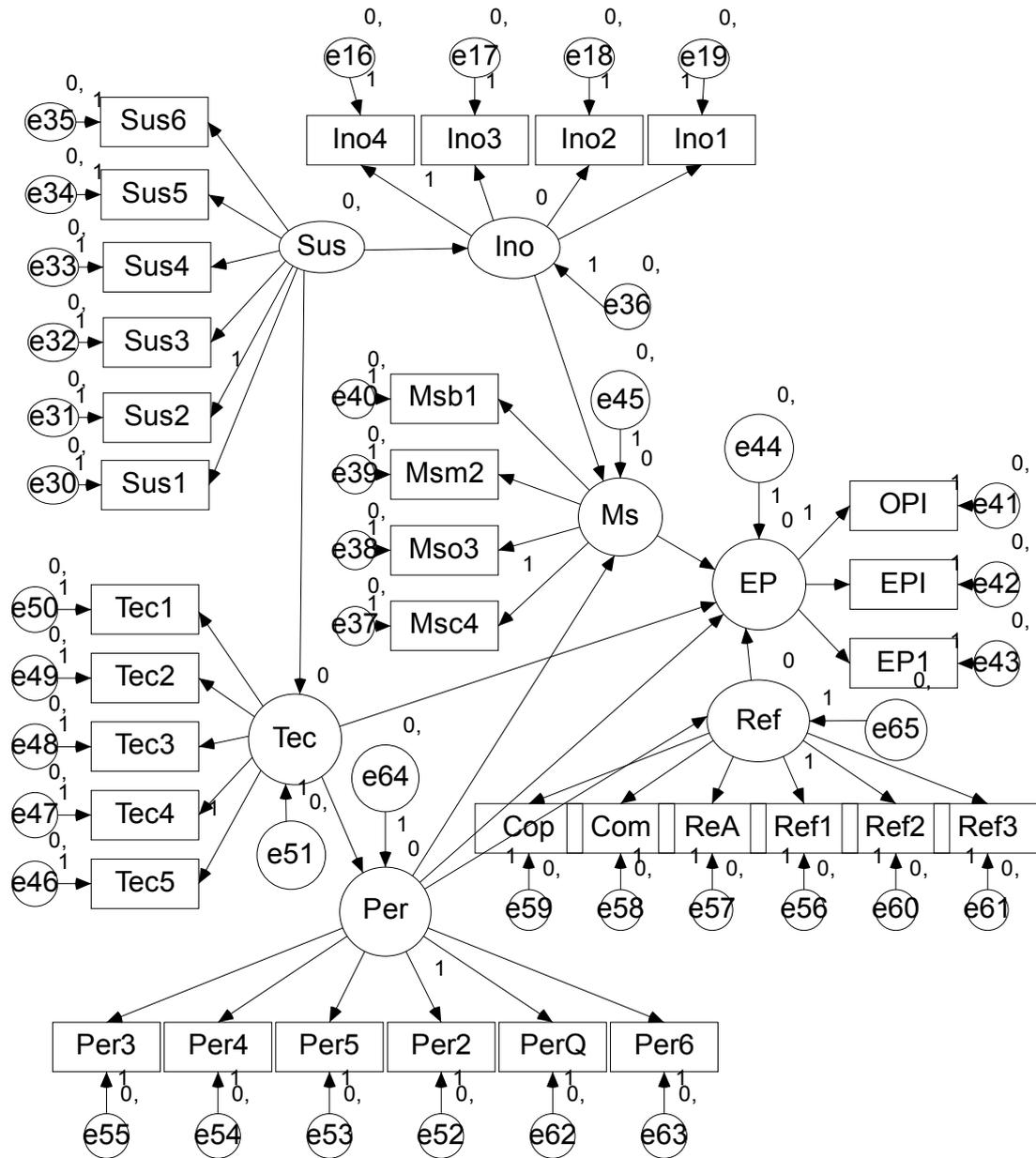


Figure 2. Pilot Test of Concept Model.

As shown in Figure 2, variables with factor loadings lower than 3 were deleted from the model. Six groups were explored for this study. A formal questionnaire was developed from the results of the pilot study. SPSS 22 and Amos 19 statistical software were adopted for data analyses. The questionnaires were fit for further inquiries. Six groups were explored for further inquiries. The conceptual model was revised, with 47 variables from interviews and literature reviews being retained for further inquiries. The conceptual model was revised, with 47 variables from interviews and literature reviews being retained for further inquiries. As shown in Table 1, the Cronbach’s alpha, at.920, indicates the significance and reliability of the dataset.

Factor analysis is a technique used to identify factors that explain common variances among variables. This statistical method is often used to reduce data by grouping variables

that measure a common construct. Principal-components analysis is one of the most commonly used methods of extraction since this method will evaluate all sources of variability for each variable [22]. Since the value of CFI is .972 > .80 (see Table 2), the model fit is acceptable.

Testing Hypothesis 2, for example, would involve the following:

Independent variables (IVs): Sustainability: sustainable development, technological innovation, awareness.

Dependent variables (DV): Adopted innovativeness, personal innovativeness in IT, usefulness, ease of use, compatibility.

Method: SEM path analysis

First, missing data would be assessed for each variable. Multivariate outliers would be examined using Mahalanobis distances within regression for each group. Secondly, to test the factorial analysis, the data were to be screened to ensure

that the assumptions of factorial were fulfilled. To eliminate outliers, subjects with income values of less than or equal to 3 or greater than or equal to 22 were to be removed. Because groups were being compared, assumptions of normality, linearity and homoscedasticity had to be examined for all groups of quantitative variables. Prior to multivariate examination, univariate examination should have taken place for each variable within each group.

Although these variables had been assessed for assumptions in the previous example, examination was to be conducted with ungrouped data. Consequently, assessment of normality and homoscedasticity would need to be conducted for each variable within each group. The exploring procedure was used would provide the histograms, test of normality, descriptive statistics and normal Q-Q plots, all of which indicated that the four quantitative variables were fairly normal. Homoscedasticity (homogeneity of variance) were assessed with Leven's test within the t-test of independent samples. These results indicated equality of variance for each variable between groups. In summary, the first step in interpreting the factorial path results is to determine if an interaction is present among factors by looking at the F ratio and its level of significance for the interaction. From the foregoing tables and figures, it is clear that there is no significance, so the hypothesis had to be rejected.

Data were collected from Alibaba's and Amazon's online shoppers, vendors, and owners from different industries. After that, a large-scale questionnaire was administered to secure more information from the CEOs, top managers, HR officers and so on. Because a comprehensive questionnaire such as this one requires much time to answer, most of the respondents were approached through acquaintances. Although the sample was selected on a convenience basis, there are several benefits from this sampling technique. First, the rate of response was greater than that of a typical mail survey. Second, about two-thirds of the sample was not anonymous, and the dataset was controlled. The lack of anonymity is conducive to the quality of data while ensuring that the appropriate individuals in the industry will actually complete the survey. Third, to keep the present study manageable, efforts were made to restrict the sample to manufacturing companies only.

Furthermore, samples relate to the online shoppers. Among them, 100 were online shop owners, and another 100 were online customers. According to SurveyMonkey.com, the drop-off return rate of surveys with 40 questions is about 8%-10%. Thus, 1,250 questionnaires were sent to randomly selected individuals. About 100-125 of these questionnaires were expected to be collected from online store owners and shoppers. Face-to-face interviews, with incentives provided, were also conducted with online shoppers who had experiences with both Alibaba and Amazon. One hundred questionnaires were expected to be collected from these interviewees. Altogether, 223 online shoppers, owners, vendors, and managers at e-commerce companies were involved into this survey. The time period for this study was from 2013 to 2016.

## 4. Results

As previously mentioned, SEM provides a more stringent test of hypotheses than multiple regression analysis or path analysis because it enables the researcher to take account of complete information in a theoretical model and to search for appropriate models with the criteria provided by the goodness of fit in AMOS [22]. The data analysis presents survey responses and exhibits an exploratory factor analysis (EFA), conducted to verify the construct validity of the measuring scales, along with structural equation modeling (SEM). SEM was used to verify both the overall model and the detailed ones on, respectively, attitudes, perceived risks, and perceived ease of use, perceived value, relative advantages, loyal brand strategies, innovation, sustainability, and efficiency in technologies.

The purpose of this analysis was to test the construct validity [24] of the eight factors (viz, attitudes, perceived risks, perceived ease of use, perceived value, relative advantages, loyal brand strategy, innovation, sustainability, efficiency in tech and e-purchase intention) and to reveal the underlying structure among them. Empirical validation of the measurement of behavioral intention was performed with an exploratory factor analysis and a reliability test. On hundred questionnaires are expected to be collected from these respondents. Altogether, 223 online shoppers, owners, vendors, and managers at e-commerce companies were to be involved into this survey.

### 4.1. Structural Equation Model and the Hypotheses

Following the EFA test, structural-equation model (SEM) was used to test the hypotheses. This is a technique for testing and estimating causal relationships among the endogenous, or dependent variables, and the exogenous, or independent, variables. Three approaches to testing hypotheses have been presented within a conceptual model.

In the present study, the first step toward testing the hypotheses is to examine the overall fit of the structural model as proposed. If this model did not show a good fit, individual regression paths could not be considered meaningful, and a better-fitting model would need to be identified. According to Arbuckle and Wothke [20], goodness-of-fit tests can help researchers determine if the model being tested should be accepted or rejected. These overall-fit tests cannot be used to prove that particular paths within the model are significant. If the model is accepted, the researcher will then go on to interpret the path coefficients in it. At the second step, the ten hypotheses developed were tested using the standardized regression coefficients, which were preferable because they were independent of the units of measurement and were not affected by the choice of the identification constraints.

### 4.2. The Overall Model

The overall model was developed to test the proposed hypotheses. Figure 3 is a graphic representation of the results

of the overall model. Maximum likelihood was used to estimate the parameters of this structural model. The statistics in Figure 3 not only suggest that the hypothesized model considerably explained the causal relationships between the endogenous and the exogenous variables but also indicate that the constructs did have a good predictive validity. Moreover, the estimates of the path coefficients are positive and significant (Figure 3).

**4.3. A Summary of the Overall Measurement Model**

An exploratory factor analysis was used to explore the effects of sustainable innovation in management strategies on

e-purchase intention. Subsequently, structural equation modeling was used to create a model for sorting out the interrelationships of the individual models. Of the twelve hypotheses tested with SEM, nine had statistical significance and were accepted.

**4.4. A Summary of Hypothesis Testing**

The results of hypothesis testing, which were based on the best-fitting model, are summarized in Table 3, which indicates that all hypotheses were supported at the significance level of .001.

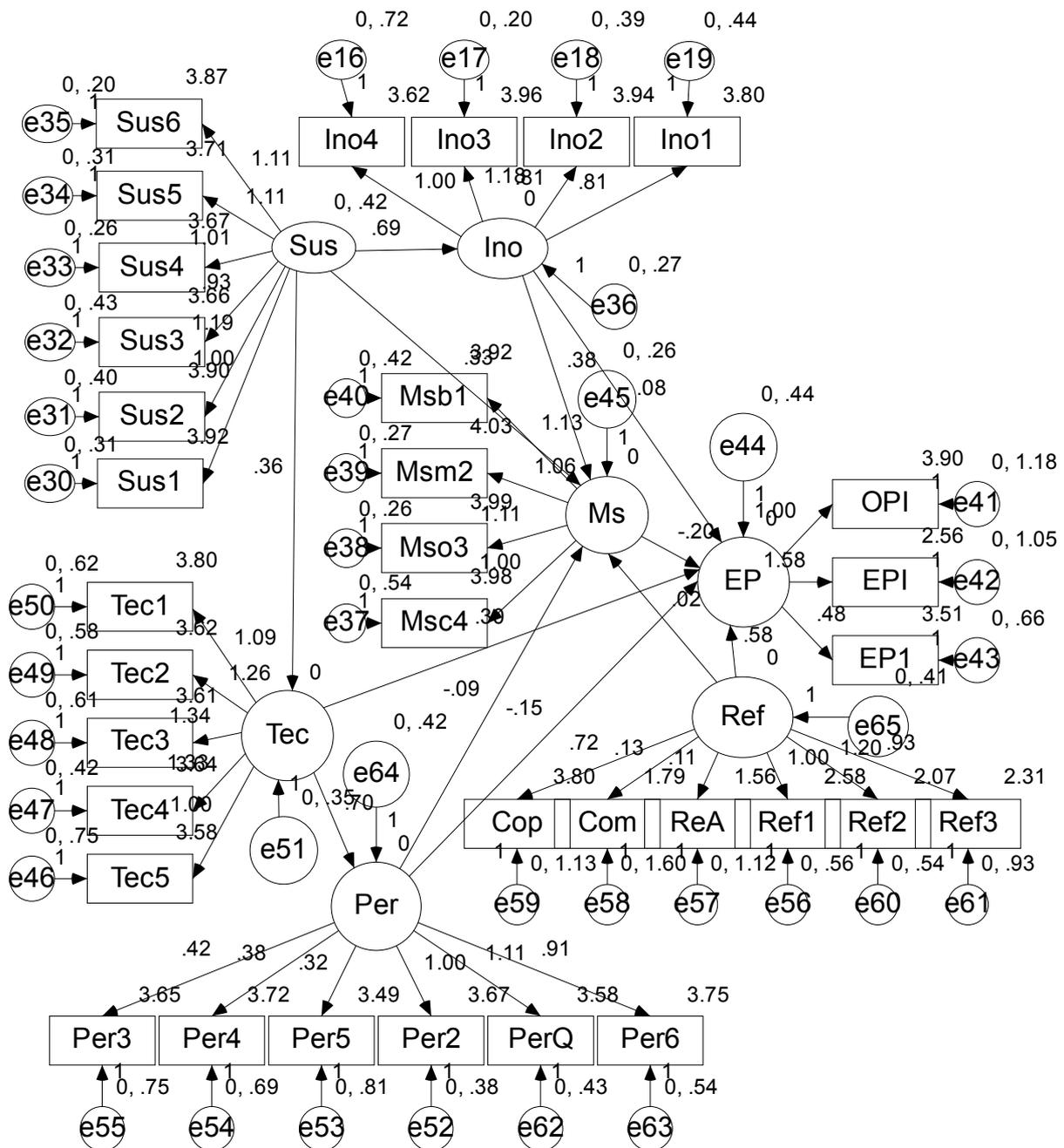


Figure 3. An Overall Model.

**Table 3.** Results of Hypothesis Testing.

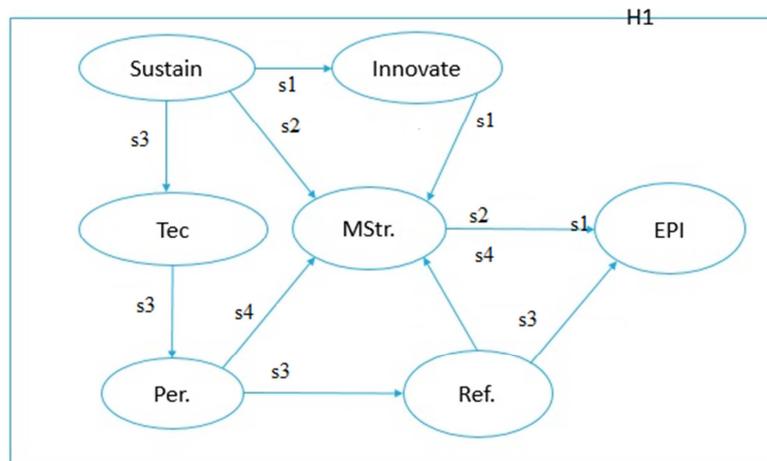
Hypotheses	Coefficient estimates	Standardized regression weights	p	Results
1	Overall model		.000***	Supported
2	Sustainability -> Innovation	.69	.001***	Supported
3	Sustainability -> Technologies	.36	.001***	Supported
4	Sustainability -> Management S	.42	.016*	Supported
5	Innovation -> Management S	.38	.046*	Supported
6	Technology -> Perceived V	.70	.001***	Supported
7	Perceived V -> Management S	.42	.001***	Supported
11	Management S -> E-purchase intension	.44	.001***	Supported
12	Reference V -> E-purchase intention	.58	.005**	Supported

Note: \* p < .05, \*\*p < .01, \*\*\*p < .001

The standard regression weights are .52 for H1, .69 for H2, .36 for H3, .42 for H4, .70 for H6, .38 for H5, .42 for H7, .44 for H11, and .58 for H12, so 8 hypotheses are accepted out of 12.

**4.5. A Summary of the Path Analysis**

Results from the factor analysis and SEM revealed the interrelationships among innovation, sustainability, sustainable innovations, management strategies and technological efficiency on e-purchase intention in the overall model. The indices of fitness show that the proposed model was supported by data.



**Figure 4.** The Overall Model of All Paths.

The hypothesis testing in the present study made it possible to understand the magnitude of impact, both direct and indirect, among identified variables. These path coefficients represent the strength of a direct or indirect effect of an exogenous variable (e.g., task-technology fit or perceived ease of use) on behavioral intention. Bollen [24] showed that both direct and indirect effects can help answer

important questions regarding the influence of one variable on another and that, overall, the total effect is more relevant. Figure 4 illustrates the effects and path coefficients for each independent variable in the overall model. Table 4 exhibits how e-purchase intention was affected by reference value, perceived value.

**Table 4.** Direct, Indirect and Total Effects.

Paths	Direct effect	Indirect effect	Total effect
Perceived value (Per) -> Reference value (Ref)	.72		
Reference value (Ref) -> EPI	.58		
Management S (MS) -> EPI	.44		
Sustainable (Sus) -> Innovations (Ino)	.69		
Sustainable (Sus) -> Technologies (Tec)	.36		
Technologies (Tec) -> Perceived value (Per)	.70		
Path 1			
Sus -> Ino -> Ms -> EPI	.36	.69	.51
Path 2			
Sus -> Ms -> EPI		.32	.71
Path 3			
Sus -> Tec -> Per -> Ref -> EPI	.30	.58	.42
Path 4			
Per -> Ms -> EPI		.29	.45

Based on the table 4, the detailed model analyses for all factors provided an answer to research questions, what are the relative degrees of impact of these key factors on consumers' online purchasing intention.

## 5. Conclusion

The objective of the present study was to investigate the identified how factors of innovativeness (adopted innovativeness, personal innovativeness in IT, usefulness, ease of use, compatibility), management strategies (macroeconomics, attitude and usage, micro-culture, geo-demographics), novel in products (communicability, complexity, divisibility, relative advantages, perceived risks), novel business model, reference value (brand credibility, brand prestige, perceived risks, perceived value of money) will contribute to e-purchase intention. Path analyses were conducted to show the impact of different factors. A total of 223 questionnaires were collected and subject to analyses. The survey instrument was a self-administered questionnaire, which sought information about the use of mobile banking as well as the demographic data. Data bearing on the research questions were analyzed with EFA and SEM. Results of these statistical analyses were presented.

This research presents conclusions and recommendations based on the findings of the present study. The first section of this chapter consists of a summary of the findings along with some discussion. Section Two holds the suggestions while Section Three offers scholarly contributions. Section Four, the last section, displays the study's conclusions and their implications.

The results from factor analyses and structural equation modeling revealed important implications for bankers. A number of action steps will be offered according to the path analysis earlier may answer the research questions as well. Figure 4 represents these steps in a sequence. This overall model and the four steps it features, as shown in Figure 4, answered Research Question for the present study. The inter-correlations among the factors were determined by their direct, indirect and total effects. The four steps in Figure 4 were produced from the analyses of the inter-correlations among the identified factors. The effects of the four steps were accounted for when developing measuring scales of the impact of the various factors on e-purchase intention. A strong effect represents a close inter-correlation.

In the future, researchers should examine the extent to which the present study's results may be generalized to other areas of China or other countries. Longitudinal studies should be conducted to gain information on how users' adopting behavior may change over time. Researchers should also differentiate among specific versions of mobile banking. Finally, they should further analyze how demographical differences may be utilized to generate business insight. More specifically, future studies' populations should covered diversified areas, instead of being confined to two counties or two giant companies. Since e-commerce and mobile

commerce often overlap each other, efforts should be made to have their differences and similarities teased out. Online shopper's demographical differences and their impact should also be considered, and more variables in this area should be considered in future studies.

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