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ABSTRACT

In spite of the fact that we are in a digital economy, online sales represent less than 2% of the overall retail business. Online retail sales are expected to grow significantly in the future. This presents a significant opportunity for businesses to increase their share of the online retail business and in the process contribute towards the digital economy. In this longitudinal study, we introduce and empirically test over a period of time a business model of online shopping behavior using multinational data. Our study is based on the premise that online shopping behavior may change over time and it is important to undertake a research study to ascertain as to which of these antecedents may remain significant over time. We believe this will allow businesses to come up with a better online shopping channel. To the best of our knowledge, this is the first time a longitudinal study has been conducted in this area to investigate the antecedents of online shopping behavior. Another contribution of this research is the introduction of a powerful structural equation modeling technique, the latent growth curve (LGC) approach, to the information systems literature. We used this approach to validate the on-line shopping model. Our results show that over time trust and economic condition play a significant role in online shopper's behavior.

Keywords

Online shopping, longitudinal study, latent growth curve (LGC), trust, adoption.

INTRODUCTION

With the demise of many dotcoms during 2000-2001, some predicted a similar fate for online shopping. Rather than disappearing, e-businesses are flourishing. In the year 2003, according to Neilsen/NetRatings, online shoppers spent a record $18.5 billion during the holiday season (Nielsen Ratings , 2003). Online spending is up 35 percent over 2002. According to a senior analyst with Neilson/Net Ratings, this is the third straight season of record growth. According to a U.N. report , the share of Internet users buying online was highest in the Nordic countries, the United Kingdom and the United States, where 38 per cent of users had made purchases online; it was lowest in Mexico, where fewer than 0.6 per cent had done so (U.N. Report, 2003).

Several cross-sectional research studies on online shopping behavior have been conducted recently (Ahuja et al., 2003; Bellman et al, 1999; Zhu et al., 2002). A recent study by Ahuja et al (2003), for example, focused on general purchasing behavior of individual online consumers. They found that convenience and customer service can act as strong motivators when present, and can act as strong barriers when absent. Security and privacy concern was the single biggest barrier against online shopping.

According to Bellman et al. (1999), demographics and lifestyle characteristics also play an important role in customer buying habits. Online population is relatively younger, more educated, and wealthier. According to this study, a typical online buyer has a "wired" lifestyle meaning that they have been on the Internet for years, not months. Zhu et al. (2002) made an eight European nation study and observed among other things that technology competence, firm scope and size, consumer readiness, and competitive pressure are significant adoption drivers, while lack of trading partner readiness is a significant adoption inhibitor.

Even though a number of multi-national cross-sectional studies exist in the literature, a longitudinal study on antecedents of online shopping behavior is missing. The main contribution of this paper is in three areas. First, we introduce a business model of online shopping behavior. Second, we empirically validate this model using a longitudinal study in a multinational

environment which has not been done before. It is important that we investigate as to whether on-line shopping behavior changes, if at all, over time.

Third, we use the latent growth curve (LGC) modeling technique to conduct this longitudinal study. Although LGC is a powerful tool and has been used extensively in social science and other disciplines to conduct research (Curran and Bollen,. 2001; Curran, 2000a; Curran, 2000b; Duncan et al., 1999; Khoo and Muthén, 2000; Muthén, 1991; Muthén, 1997), it has not been used in the IS area before. To the best of our knowledge, this is the first application of this powerful tool in the IS area.

BUSINESS MODEL OF ONLINE BUYING BEHAVIOR

In spite of the fact that we are in a digital economy, online sales represent less than 2% of the overall retail business. Forrester Research forecasts that retail online sales will continue to grow at a rate of up to 25% (Microenterprise, 2003). This presents a significant opportunity for brick-and-mortar, click-and-mortar, and pure play companies to increase their efforts to grab a bigger share of the online retail business. In this research, we present an online shopping business model to help researchers and practitioners understand online consumer shopping behavior. More specifically, online shopping behavior is hypothesized to be affected by trust, demographics and lifestyle characteristics, and cultural variables. In this section, these relationships are discussed more in-depth and corresponding hypotheses are set.

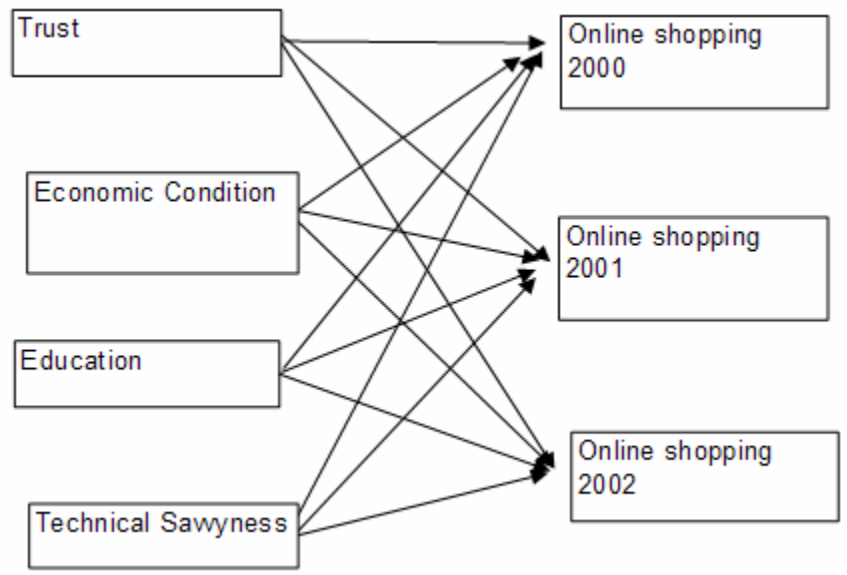


Figure 1. The Overall Business Model of Online Shopping

Figure 1 shows the business longitudinal model of the online shopping behavior over time. The business model shows that trust, economic condition, education and technical saavyness influence an online shopper's decision to buy online. Online shopping of a given year denotes the online shopper percentage in a given nation.

Trust has been shown to play a significant role in all relationships (Fukuyama, 1995; Handy, 1995; Mishra and Morrisey, 1990; Morgan and Hunt, 1994; Zak and Knack, 2001). Ba, Whinston, and Zang (1999), Bryjnolfsson and Smith (2000), and Reichheld and Schefter (2000) found trust as extremely important for online commerce. Trust takes even more critical role in a global setting since trust varies substantially across countries (Zak and Knack, 2001). Higher trust leads to eLoyalty in the eCommerce environment. A small increase or decrease in loyalty can make or break an eBusiness. This leads to the following hypothesis.

H1: Interpersonal trust in eCommerce will positively affect online shopping behavior over time.

Demographic and lifestyle variables, as stated earlier, play an important role in online shopping behavior. Most research studies (e.g., the Wharton Virtual Test Market (WVTM, 2003) and the Georgia Tech Graphics, Visualization and Usability (GVU, 2003)) on online shopping behavior agree that online shoppers are more educated and wealthier. Zak and Knack (2001) found that investment is higher where incomes are higher. The same thing can be said about online shoppers. They are expected to spend more money shopping online if they have more income. It is widely accepted in the literature that higher educated individuals are likely to have higher income. One may keep in mind that education is only one source of competitive advantage for individual human capital.

These lead to the following hypotheses especially in a global setting especially in a global setting.

H2: The education level of an online shopper will positively impact his or her online shopping behavior over time.

H3: The economic condition of an online shopper will positively influence his online shopping behavior over time.

Prior research studies have indicated that the more experience online buyers have with the Internet, the more they are likely to spend shopping online (Donthu and Garcia, 1999; Turbon, King, Lee, Warketin, and Chung, 2002). Gefen (2000) found that both familiarity with an eBusiness and trust in the business itself influence an online shopper's inquiry and buying behavior. The next hypothesis follows.

H4: The technology savvyness of an online shopper will positively affect his or her online buying behavior over time.

METHOD AND DATA

Latent Growth Curve Models (LGC)

In longitudinal studies, elements (individuals, firms, nations) are measured repeatedly through time to model changes over time within elements (Singer and Willet, 2000). In traditional regression analysis, the interrelationships among many constructs are often ignored. This results in producing biased results as relevant and significant relationships are ignored in this process (Bollen, 1989; Chin, 1998; Hoyle, 1995). A better procedure could be the use of structural equation modeling (SEM) that models the interdependencies among various variables. The SEM method tests several equations simultaneously and also provides goodness of fit measures for the overall model. This study will use the SEM-based latent growth curve (LGC) modeling technique to conduct this longitudinal study. More specifically SEM-based LGC modeling utilizes AMOS 4.0 to test the hypotheses (Arbuckle, 2003; LGC, 2003; SEM, 2002). Please refer to (Curran & Bollen 2001; Curran, 2000a; Curran, 2000b; Duncan et al., 1999; Khoo and Muthén, 2000; Muthén, 1991; Muthén, 1997) for details on LGC modeling. This modeling approach combines elements of MANOVA, SEM, and confirmatory factor analysis.

In LGC modeling, a few repeated measures of online buying over a few time periods are used to estimate a growth trajectory of online shopping behavior. Two elements, a starting point (or intercept) and a rate of change over time (or slope) characterize online shopping behavior. The additive functions of individual intercepts and slopes define the shopping behavior change over time. The individual slope and intercept values become the dependent variable in the next level of modeling.

As stated earlier, we used three time points in the present longitudinal study. Each observed variable at each time point had to be connected to the latent intercept and slope variables. The intercept variable-observed variable path coefficients were set to 1.00. The first time point's slope parameter was set to zero and the last one was set to 1. The interpretation is that growth was zero initially at time 1 and was complete at the last time point. The value of the middle time point slope came out as .62 suggesting a non-linear growth pattern.

Figure 2 shows two types of variables: observed and latent. Observed variables (e.g., online shopping for the year 2000) are provided in rectangular boxes. One must have at least three time periods at which the variables should be measured to estimate any trend. The ICEPT and SLOPE are latent variables (not directly observed) which are enclosed in ellipses. The ICEPT represents the initial level or intercept of online shopping. The SLOPE represents the trend of whether online shopping is increasing or decreasing with time. DevIcept and DevSlope represent latent variable residuals of ICEPT and SLOPE respectively. Finally the covariance between the slopes and intercepts is represented by Cov_Icept_Slope. Figure 2 also shows the effects of antecedents (e.g., trust, economic condition, education and technical infrastructure) on both the ICEPT and SLOPE factors of online shopping.

Data

Data were secondary in nature. The data on online shopping were gathered from TNS Interactive (TNS, 2003) which is the global New Media and Internet Research business within the Taylor Nelson Sofres Group. The data used in the present study

were taken from years 2000- 2002 survey. The coverage has grown considerably from covering 27 nations in 2000 to 37 countries in the year 2002. Across these 37 countries, for example, a total of 42,238 people have been interviewed. The dependent variables used are the percentage of online shoppers to the total population of a nation in years 2000- 2002. Each country result is weighted so that it represents the survey population of its nation.

An online shopper is defined as an Internet user who has bought or ordered goods or services on the Internet during the past month. Face- to-face as well as telephone interviews were conducted. The number of responses varied from 578 in Norway to 2018 in Great Britain. Among the nations selected, several countries are from Asia-Pacific region, North America, South America, and Europe. African nations were not included, perhaps because eCommerce activities are not as prevalent in that that region.

The independent variables used were education level (school enrollment, secondary (% net)), economic condition (represented by GDP per capita), technology savvyness (represented by the number of Internet users per 1000) and trust (represented by Interpersonal trust index). The data for the first three variables were taken from the World Bank world development index (WDI) data base (World Bank, 2003). The base year for the data on school enrollment, secondary (% net), selected is 1999. This is also the latest year for which complete data are available. The GDP per capita for the base year 1998 is chosen. The selected variable for GDP per capita measurement is GDP per capita (constant 1995 US$). Secondary education level and base GDP per capita are fairly standard measures that have been used in main cross-country economy studies (Levine and Renault, 1992; Xavier Sala-I Martin, 1997). The Internet usage variable is Internet user 1998 per 10,000.

The trust index is developed from World Value Surveys. These surveys contain data on thousands of respondents from 26 to 43 nations. The survey results are available from three survey waves. The 1981 survey contained 21 nations, the 1990-1991 survey contained 28 nations, and the 1995 survey contained a set of 43 nations with a total of 60,000 respondents (Inglehart et al., 1998). The question used to measure the level of trust in a given nation is: "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" The trust indicator is the percentage of people in each country who replied "most people can be trusted". Our trust index of a nation is an average value of trust from three such cited surveys. The world value survey indices in general and trust index in particular, have been widely used in research literature that deals with empirical results (WVS data, 2003). Studies conducted with the trust data include (Beugelsdijk, de Groot and van Schaik , 2002; Inglehart et al., 1998; Knack and Keefer, 1997; Raiser, et al., 2001; Rose 1993; Zak and Knack , 2001). It should be noted here that it is acceptable for the antecedent variables to be measured before the dependent variable is measured (Curran et al., 1997).

Since we had data for a limited number of nations (26 only), we used the technique adopted by (Helsen, Jedidi and DeSarbo, 1993) to enlarge the data set, by considering pair-wise difference of each variable. The data set thus obtained was next randomly split to form two sets: experimental and validation data sets. Several data containing missing values were deleted. To start with, the experimental data set contained 144 data points, whereas the validation data set contained 122 data points.

RESULTS

We first tested the presence of change of online shopping over three years and the results are shown in Figure 2. The model includes two latent factors (intercept and slope) and repeated measures of online shopping over time. The significant standard deviation of the intercept value was .447, implying that there was variation of online shopping behavior at the start time. The significant standard deviation of the slope value was -.32, implying that there was variation of online shopping behavior over time. The significant mean slope value of -.455 suggests that online shopping for all nations may have decreased over time. The significant parameter estimate value of slope variable path coefficient was 0.65, indicating a faster than expected non-linear change rate (>0.5).

The initial online shopping is not strongly related to changes in shopping behavior over time as the insignificant correlation value of .21 between the slopes and intercepts indicates. The R^2 values of each variable are high; the intercept R^2 is higher than the slope R^2. The three on-line components also show high R^2 -values (Table 1a).

The model results with experimental data set produced a robust model, with a $\chi 2$ value of 9.19 (p= .10 (>.05)). This model fitted the data well (TLI=.985, CFI=.997) (Table 1b). We can accept the null hypothesis that the model fits the data.

Three antecedents, trust, economic condition and education have significant relationships (path coefficients) with both SLOPE and ICEPT (Table 1c). Technology savvyness does not have significant relationships with SLOPE or ICEPT.

SLOPE	0.601
ICEPT	0.806
Online Shopping02	0.994
Online Shopping01	0.980
Online Shopping00	1.000

Table 1(a). Regression (squared multiple correlation) Results from the Experimental Model

Fit Measure	**Full LGM**	**Saturated**	**Independence**
Discrepancy	9.185	0.000	1601.17
Degrees of freedom	4	0	28
P	0.102		0.000
Number of parameters	30	35	7
Discrepancy / df	1.837		55.19
Normed fit index	0.994	1.000	0.000
Relative fit index	0.968		0.000
Incremental fit index	0.997	1.000	0.000
Tucker-Lewis index	0.985		0.000
Comparative fit index	0.997	1.000	0.000

Table 1(b). Fit Measures from the Experimental Model

We next discuss the validation aspects of the model. The initial validation results (after eliminating major outliers) weakly confirm the results obtained earlier ((χ2 (70, 4)= 4.76, p=.01, NFI=.98, CFI=.987). More experiments are needed to measure the impact of outliers.

DISCUSSION

Global electronic commerce requires consideration of various macro indicators from which the global behavior could be generalized. Our longitudinal results showed that online shopping was changing systematically over time in a nonlinear fashion with some nations showing an increasing pattern whereas other nations showing a decreasing trend.

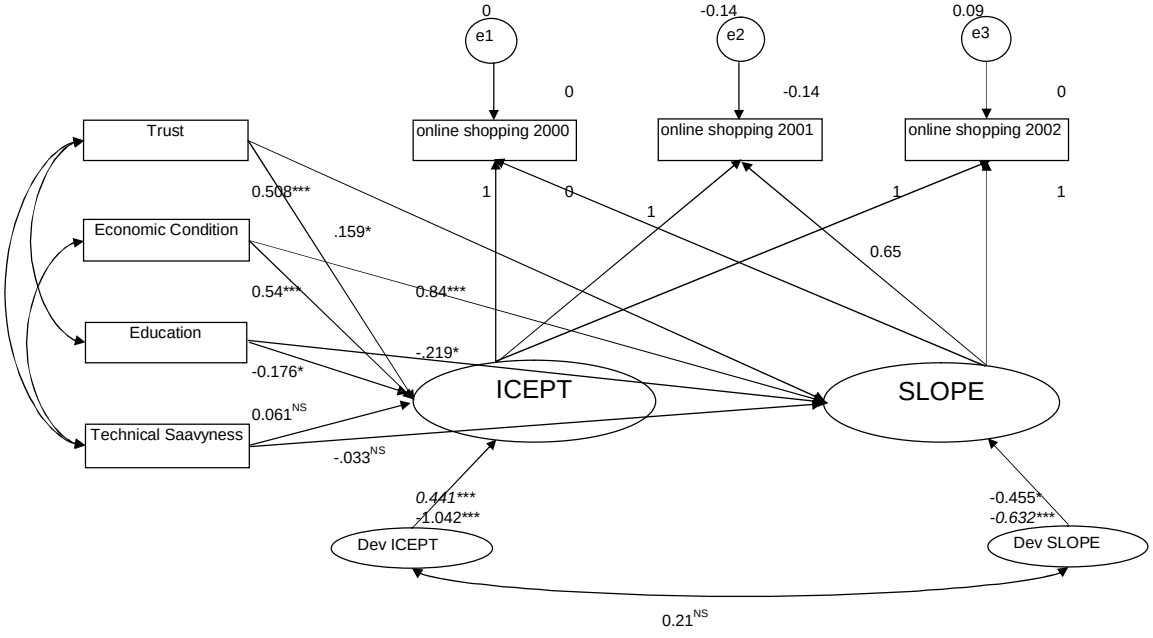
The SEM-based LGC analysis indicates that the model consisting experimental data fit well. More specifically, our longitudinal results show that online shopping behavior over time is indeed affected by interpersonal trust of an online shopper. A number of past cross-sectional studies found trust affecting online commerce (Ba, Whinston, and Zang, 1999; Bryjnolfsson and Smith, 2000; Reichheld and Schefter, 2000).

Our research also confirms the result of earlier studies (Mankiw, Romer, and Weil, 1992; Zak and Knack, 2001) that showed that online shoppers are wealthier Although education is one source of competitive advantage for individual human capital, our results showed that education has a negative impact on both initial value as well as growth rate. Education does not appear to have a positive influence on online shopping, probably because of the fact that online shopping is a relatively easy task that does not require a lot of higher education. This fact needs further investigations in future.

We are also unable to empirically validate that online shoppers' technology savvyness affect their online shopping behavior. One possible reason can be that in order to use the Internet, one does not need a lot of formal technical knowledge. This requires more research.

Paths	Estimate	S.E.	C.R.	P	Label
ICEPT<--DevICEPT	2.613	0.203	12.855	0.000	Sd-Icept
SLOPE<--DevSLOPE	-1.885	0.302	-6.235	0.000	Sd-Slope
ICEPT<--Trust	0.147	0.017	8.853	0.000	
ICEPT<--Economic Condition	0.000	0.000	7.191	0.000	
ICEPT<--Education	-0.056	0.020	-2.849	0.004	
ICEPT<--Technical Savvyness	1.300	1.265	1.027	0.304	
SLOPE<--Trust	0.023	0.013	1.842	0.065	
SLOPE<-- Economic Condition	0.000	0.000	7.450	0.000	
SLOPE<-- Education	-0.035	0.015	-2.366	0.018	
SLOPE<-- Technical Savvyness	-0.353	0.956	-0.369	0.712	
Online Shopping00<--ICEPT	1.000				
Online Shopping00<--SLOPE	0.000				
Online Shopping01<--ICEPT	1.000				
Online Shopping01<--SLOPE	0.650				
Online Shopping02<--ICEPT	1.000				
Online Shopping02<--SLOPE	1.000				
Online Shopping00<--E1	0.000	High value	0.000	1.000	EV1
Online Shopping01<--E2	-1.025	0.135	-7.602	0.000	EV2
Online Shopping02<--E3	0.637	0.331	1.924	0.054	EV3

Table 1(c). Path Coefficient Values from the Experimental Model



*****: p<.000; **:p<.01; *:p<.1; NS: Not significant**
Note. Standard deviation values of ICEPT and SLOPE are in italics
Figure 2. The LGC Model of Online Shopping with Path Coefficients from the Experimental Model

CONCLUSIONS AND LIMITATIONS

The present research significantly contributes to the stream of research in the business modeling area in a number of ways: first, it puts forth and empirically validates a business model of online shopping behavior using multinational data. Second, it conducts a longitudinal study and provides longitudinal results in the business modeling area by utilizing data from three time periods. Third, it introduces the LGC modeling technique to the IS literature.

In conclusion, the present research empirically demonstrates that online shopping behavior, in a global setting, is influenced over time by online shoppers' interpersonal trust and economic condition. Education and technology savvyness did not seem to positively affect online shopping behavior. These areas need to be investigated further. Although the findings have been quite encouraging and insightful, like most research, the present research also has several limitations: first, the measurement data it uses is secondary in nature and like most secondary data these are susceptible to measurement errors and other research problems. Second, the number of nations used in the study is limited mainly due to the lack of available data. Third the number of available time units is small and this can only be increased in the future when more data becomes available. Finally, research shows that consumer trust is important to online commerce as well as the widely accepted TAM use-antecedents, perceived usefulness and perceived ease of use (Gefen et al., 2003). These and other relevant antecedents of on-line shoppers can be tested in the context of a longitudinal model

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