

ADOPTION OF ON-LINE TRADING IN THE HONG KONG FINANCIAL MARKET

Adela Lau and Jerome Yen
Department of Systems Engineering and Engineering Management
The Chinese University of Hong Kong, Hong Kong SAR
smlau, jyen@se.cuhk.edu.hk

Patrick Y. K. Chau
School of Business
The University of Hong Kong
pchau@business.hku.hk

ABSTRACT

The purpose of this research is to study what issues may affect investor adoption of on-line trading in the Hong Kong financial market. The studied system is a system that provides straight-through trading for investors, rather than an order routing system that forwards orders from a broker firm to the appropriate market. One communication infrastructure for on-line trading is the Internet. However, other infrastructures, such as wireless communication channels, may also be used to support direct interaction between the investors and the stock exchange.

Feasibility of changing to a new service or system can be viewed from different perspectives, technical, operational, financial, and social/organizational. This paper focuses on the social/organizational perspective by using a research model based on the Decomposed Version Theory of Planned Behavior (DTPB) to identify the factors that affect investors' adoption of on-line trading. A correlation analysis has been performed to investigate whether the hypothesized attributes, variables, and belief structure are correlated with each other. After such analysis, the factors that influence the adoption of the proposed system have been identified, as well as the relationships between the factors. Such results can be helpful to the Stock Exchange of Hong Kong (SEHK) and the Hong Kong Securities and Futures Commission (SFC) for planning the launch of Internet trading.

1. Introduction

Stock exchanges are the places for buyers and sellers to trade securities. This trading is an important indicator of the health of a region's economy. It is desirable to increase the transaction volume and lower operational costs. The stock transaction process includes searching, coordination, and settlement. If this process is supported by information technologies, which provide services such as match making, then the market is termed as an electronic market. Electronic markets in general serve as the middlemen between buyers and sellers. Acting as a broker, an electronic market allows buyers to search for products or services without contacting a large number of vendors individually. However, information technologies have more to offer than providing electronic-based match making. In Section 2, we will discuss the current trading process used in the Stock Exchange of Hong Kong (SEHK) and the initiatives to improve its efficiency using information technologies.

Trends of most markets are moving toward deregulation, open competition, "disintermediation" and "bypassing" to improve efficiency and reduce costs. Since the late 1990s, the Hong Kong financial market has faced strong competition from other financial centers in Asia. For example, Singapore has extended the trading hours of its stock market. In order to respond to such challenges and to maintain its leading position in Asia, Hong Kong has to focus on improving its quality of service, increasing its efficiency, and lowering its operational costs. Anything that cannot make a contribution, but only adds to the costs of the parties involved should be removed.

Under the current securities trading processes, investors have been limited to accessing the stock market indirectly. Their orders must be processed and forwarded to the exchange through brokers. Moreover, the order matching and execution procedures are inefficient. The original order from an investor needs to go through a broker and also staff in the trading room before it actually enters the exchange. The T+2 rule provides room for certain problems to arise, for example, short-selling. These problems in turn created further problems during and after the financial turmoil in 1997. For example, a consequent problem was the surplus of manpower in broker firms even after the trade volume dropped dramatically. The bankruptcy of two investment firms made thousands of private investors demonstrate about the lack of sufficient transparency.

To answer the demands from the public for change and to maintain its leading position, the Stock Exchange of Hong Kong (SEHK) announced the implementation of the new generation of Automatic Order Matching and

Execution System (AMS/3), which includes a new order routing facility for investors via the Internet (<http://www.sehk.com.hk>). It allows investors to input order transactions directly via the Internet. However, investors have to open accounts with broker firms who provide this new service, and so all the problems mentioned above remain unsolved. A solution to the above problems perhaps, is to introduce a new internet-based trading system to provide an alternative trading service. It is important to understand the attitude of the investors first before launching a new information system.

The key question of this research is to determine whether or not investors would like to adopt such an Internet-based trading system to execute their orders. What will happen if the majority of investors resist using a new service? By the end of 1999, Hong Kong had 1.2 M Internet users. If the majority of these Internet users do not accept such a new way of making transactions, the general investor will certainly not, and the service will fail. Understanding the attitudes and behavior of investors, and in particular Internet users toward the new trading system is thus important.

This research attempts to develop a model to describe the behavior of investors towards on-line trading in Hong Kong. The model aims to capture the variables in investor decision-making with regards to the adoption of on-line trading. A brief introduction of the Hong Kong financial/stock market will be given in Section 2. Section 3 provides a short review of various models in technology adoption.

2. The Stock Market in Hong Kong

Over the past few years, the trading process in Hong Kong has moved toward automation. With the advent of the Internet, securities transactions that used to be slow, costly, and heavily reliant on manual operation have become much more efficient and less expensive.

“The introduction of the Automatic Order Matching and Execution System in 1993 (12 November 1993) has increased transparency and efficiency, and in turn these factors were of considerable significance in subsequent years for the high levels of growth in transaction volume. It was therefore, apparent that a policy of continuous improvements to the trading system would help in promoting the growth of the market. Consequently, we constantly look for new technologies as well as keep an eye on what other exchanges are doing” [SEHK].

A computerized trading system is able to, but does not yet, provide round-the-clock trading versus the fixed trading hours of the current markets. With the computer-based trading system, broker firms have already saved efforts and costs in processing transactions. For the Hong Kong securities market, the current order forwarding in the order/dealing room by broker firms has been automated by the 2nd generation of the Automatic Order Matching and Execution System (AMS/2). However, placing orders from the investors is still highly labor intensive.

The trading system, AMS, has automated most of the activities in the trading process. However at present, the benefits of this automation can only be enjoyed by members of the SEHK, but not by general investors. To become a member of the SEHK, the requirement is to be a shareholder of the SEHK and also a securities dealer registered with the Hong Kong Securities and Futures Commission (SFC). General investors still need to place orders by telephone or fax through their brokers. Direct access to the Exchange is not high on the agenda. Yet, the pressure of globalization and competition from other Asian countries, for example, Singapore, leads one to conclude that the only way for the SEHK to maintain its leading position is to reorganize its trading by giving both domestic and overseas investors direct access to the markets.

Electronic Trading System (ETS) in financial market supports trading for securities or futures contracts electronically. It is also called Automated Trading System (ATS). As a result of increased activities and transaction volumes, over the past decade, computer-assisted order handling systems, which permit member firms to transmit orders directly to the exchange without intervention by the floor brokers have been developed. Electronic Trading System or Automated Trading System can furnish the following benefits [SFC 1997]: lower transaction costs, reduced market impact costs, anonymity, passive pricing, competition/specialized services, ease of access, and expanded product ranges.

Electronic markets support buying and selling of information, products and services via computer networks [Kalakota & Whinston 1996]. A key to their success is a wide and stable adoption. Several broker firms have already provided their clients with Internet access as the major transaction channel. Support for the trading of stock on the Internet has become a strategic necessity, not a strategic weapon. On-line trading through the Internet and other on-line services have burgeoned into perhaps the greatest growth area on the Wall Street today. Trade execution companies and several on-line service companies offer other services through the Internet. Eventually, trading on a secure Internet may become the generally accepted method of trading (<http://www.ecommerce.gov>).

In the USA, many traditional broker firms [Dalton 1993] have already offered Internet trading. The most successful one, in terms of the profit gained, is Charles Schwab & Co., who increased the net profit to 69% in the fourth quarter of 1998 compared to the 1997. Also the total number of subscribers has risen from 25,000 at the introduction to 5 million by 2000. In 1998, over 60% of Fidelity Investment's transactions were done

through personal computers and more than 50% of Charles Schwab & Co.'s transactions were done on-line. Apart from selling and buying securities, other highly value-added services are also offered to the customers, which include financial news, industry research, financial analysis, etc. A total of 13.7% of stock transactions in the USA were made through Internet brokers in 1998 [Hong Kong Financial Journal 1998]. Trading stock on the Internet has created a significant threat to the traditional broker firms.

For Hong Kong, by the end of 1999, three companies, Celestial Asia Securities Holdings Limited (CASH), Boom Securities (H.K.) Limited, and Mansion House Group have entered the arena of Internet stock brokerage. However, the current trading network, as well as the Automated Order Matching and Execution System in Hong Kong have not utilized the available technologies. They still rely on manual work in the trading room, inputting client's order manually into the trading system. The SEHK has now understood the importance of Internet trading and has started to analyze its impacts on key sectors of Hong Kong's market (<http://www.sehk.com.hk>).

3. Literature Review

This section provides a review of technology adoption models developed and reported in the literature. The review serves as the foundation for the development of the research model used in our study to understand and explain the behavior of investors and broker firms.

3.1 Theory of Reasoned Action (TRA)

Theory of Reason Action (TRA) explains the process of adoption of an innovation, which can be a new information system, such as an airline reservation system, or a technology, such as mobile communication. TRA is based on social psychology. "... a person's performance of a specific action is determined by his or her Behavioral Intention (BI) to perform it, which is determined by the person's Attitude (A) and Subjective Norm (SN) concerning the action." [Fishbein & Ajzen 1975].

3.2 Technology Acceptance Model (TAM)

Comparing with TRA, Technology Acceptance Model (TAM) is more oriented to analyze the human behavior on using information systems. In fact, Davis has developed this model particularly to capture the user acceptance of information systems [Davis 1989]. The basic constructs are Perceived Usefulness and Perceived Ease of Use. The construct, Perceived Usefulness, means a person's perception of using an information system that will benefit him or her in an organizational context. The other construct, Perceived Ease of Use, can be interpreted as a person's perception of the extent of the effort required utilizing an information system. These two factors determine other that can induce an individual's decision to use an information system.

3.3 Theory of Planned Behavior (TPB)

Ajzen (1985, 1989, and 1991) has extended TRA to another theory called Theory of Planned Behavior (TPB) to study the adoption intention of people on innovation. TPB is similar to TRA except an additional construct, Perceived Behavioral Control (PBC), has been added. Actually, TPB was derived with the knowledge from TRA, namely that the behavior of a person is affected by his or her intention to perform something. Crucial for predicting the behavior of an end-user and a user's acceptance of a system is the knowledge of what attributes or beliefs lie behind a person to construct or formulate the intention.

In this model, three factors determine the formation of the intention of a person. Attitude (A) reflects feelings of favorableness or otherwise towards performing a behavior. Subjective Norm (SN) concerns the influence of perceived opinions of other groups important to an individual. Perceived Behavioral Control (PBC) points to perceptions of internal and external constraints on behavior [Icek 1985]. Note that the model TPB has incorporated the following attributes: influence from other people, perceived ability and control. These are vital in determining behavior, and indeed behavior concerning usage of a technology or service can be better understood via the application of TPB.

3.4 Decomposed Version of Theory of Planned Behavior (DTPB)

The model, Decomposed Version of Theory of Planned Behavior (DTPB) [Taylor & Todd 1995], is derived from the TPB model but includes a decomposed belief structure. In the DTPB model, A, SN, and PBC are further decomposed into more detailed belief constructs. By the decomposition of beliefs into further constructs, relationships between these become clearer; thus pointing to more specific factors that may influence behavior. In addition, the decomposition can provide a stable set of beliefs that can be applied across a variety of settings.

This DTPB model has advantages over other models in that it identifies specific salient beliefs that may influence IT usage. Since it incorporates additional factors, such as the influence of significant others, perceived ability and control that are not present in TAM, but have been shown to be important determinants of behavior, it therefore may provide a more complete understanding of usage. Thus, by focusing on belief specifics and managing the specific factors that influence it, the adoption behavior could be more manageable. In other words, the model becomes more managerially relevant, pointing to specific factors that may influence adoption and usage [Icek 1985].

4. Research Design

As depicted in Figure 1, the research model that we propose to explain the behavior of investors is based on the Decomposed Version of Theory of Planned Behavior. Some of its constructs or characteristics of beliefs have been selected and adopted. Some have been abandoned for the sake of simplicity. Table 1 outlines the constructs used in the model and Table 2 lists the research hypotheses.

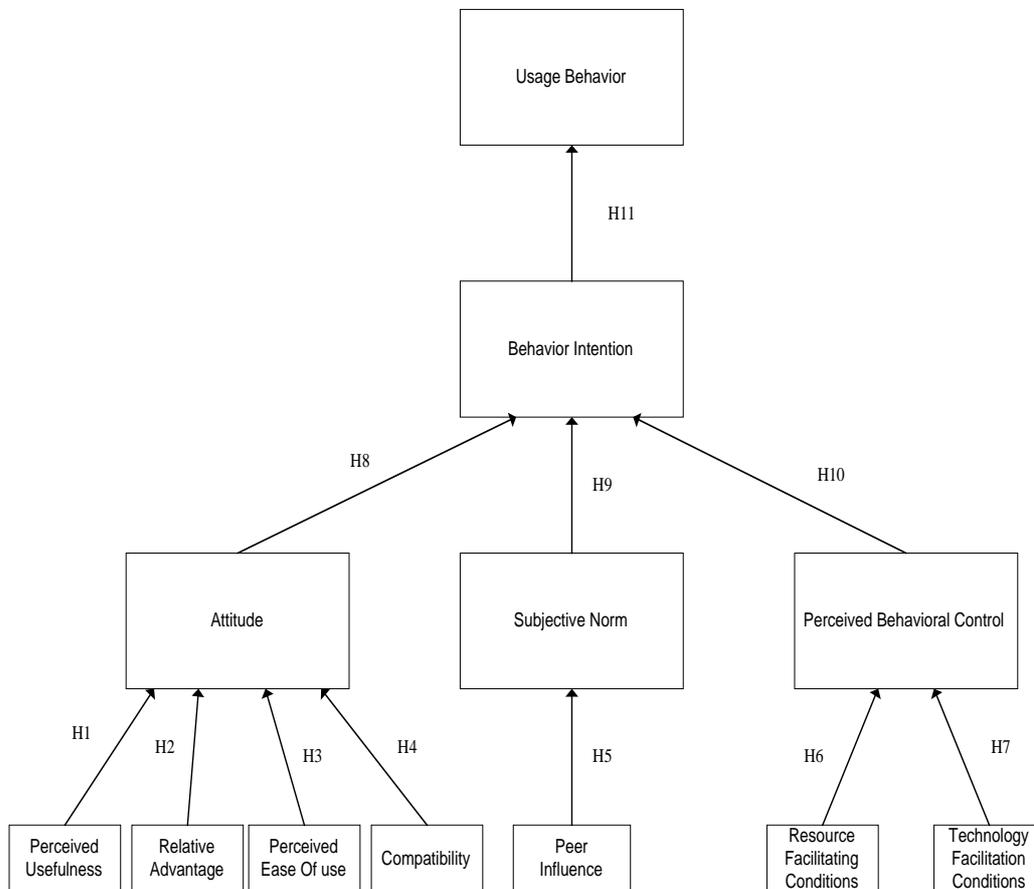


Figure 1: The Research Model

The first set of hypotheses indicates that Attitude depends on Perceived Usefulness, Compatibility, Perceived Ease of Use, and Relative Advantage. This implies that investors possess positive feelings towards using on-line trading if it enhances their efficiency and effectiveness of placing orders.

The second set of hypotheses assumes that Subjective Norm is determined by Peer Influence. The results of data analysis indicate that other investors' influence does not correlate with Subjective Norm.

The third set of hypotheses suggests that Perceived Resource Facilitating Conditions and Technology Facilitating Conditions determine Behavioral Control. From the statistical analysis, the Perceived Behavioral Control of investors is dependent on Resources and Technology. This is similar to what Taylor and Todd found [Taylor & Todd 1995].

The fourth set of hypotheses indicates that Behavior Intention is determined by Attitude, Subjective Norm, and Perceived Behavioral Control. The expected result is that these three beliefs are positively correlated to Intention for investors to accept on-line trading. The results indicate that among the three determinants, only Attitude is statistically significant. While Resource Facilitating Conditions and Technology Facilitating Condition are determinants of Perceived Behavioral Control, they do not statistically support Intention. This is consistent with the previous research findings on PBC-Intention link [Taylor & Todd 1995].

According to DTPB, Behavior is directly influenced by a person's Intention. We use this relationship as the last hypothesis and assert that Behavior Intention towards using the system will positively affect the Behavior Usage. It is important to note that the path from Behavior Intention to Usage Behavior is statistically significant in this model. Our results are similar to what Ajzen [Icek 1985] found in his study. Based on this relationship, the Intention or the decision to use the system will be influenced by the Perceived Usefulness, Relative Advantage, Perceived Ease Of Use, and Compatibility.

Table 1. Belief Structure and Behavior

Construct	Description
Usage Behavior	A person's performance of a specific action/ an individual's decision to use an IS
Behavioral Intention (BI)	A measure of the strength of intention to perform a specific action
Attitude (A)	Whether a person possesses positive or negative feelings toward the behavior he or she performs
Perceived Usefulness (U)	The degree to which a person believes that using a particular system would enhance his or her job performance or the person's subjective probability that using the IS will be of benefit in an organizational context.
Compatibility (C)	The degree to which an innovation is perceived as being consistent with the existing values, needs and past experience of the potential adopters.
Perceived Ease Of Use (EOU)	The degree to which the person thinks that using the IS will be free of effort.
Relative Advantage (RA)	The degree to which an innovation is perceived as better than the idea it supersedes.
Subjective Norm (SN)	The perception that the person feels that other people feel strongly about the behavior or whether he or she should or should not perform.
Peer Influence (PI)	Influence of significant referents in our case
Perceived Behavior Control (PBC)	The perception of the availability of skills, resource and opportunities
Resource Facilitating Conditions (RFC)	The money and time that are needed to make use of the innovation/IS
Technology Facilitating Conditions (TFC)	Technology available that is needed to make use of the innovation/IS.

Table 2. Research Hypotheses

Hypothesis	Statement
H1	The perceived usefulness of using the Internet Electronic Trading System will positively affect attitude toward the system.
H2	The relative advantage of using the Internet electronic trading system will positively affect attitude toward the system.
H3	The perceived ease of use of using the Internet electronic trading system will positively affect attitude toward the system.
H4	The compatibility of using the Internet electronic trading system with existing mechanisms will positively affect attitude toward the system.
H5	Other investors' influence on using the system will positively affect the subjective norm
H6	Resources facilitating conditions of the system will positively affect the perceived behavioral control.
H7	Technology facilitating conditions of the system will positively affect the perceived behavioral control.
H8	Attitude toward the system will positively affect the behavior intention.
H9	Subjective norm concerning the system will positively affect the behavior intention.
H10	Perceived behavioral control to the system will positively affect the behavior intention.
H11	Behavior intention of the system will positively affect the usage behavior.

5. Research Process

In this section, design of the questionnaire, pilot study and final study will be briefly discussed.

5.1 Questionnaire Design

The questionnaire was divided into two parts. Section I provided a narrative introduction to the study, an explanation of the purpose of the questionnaire and a description of the concept of an electronic trading system. In Section II, in addition to measures of the constructs in the research model, several demographic-related answers were sought. All questions for measures of the constructs in this section were scaled by a 7-point Likert-type scale with anchors from "extremely disagree" to "extremely agree". The items used in the questionnaire are presented in the Appendix.

5.2 Pilot Studies and Final Study

A pilot study was conducted where twenty investors participated to see where the questionnaire needed to be improved. Comments and suggestions received from the pilot test were used and incorporated into the final version of the questionnaire for the main study. In the main study, one thousand questionnaires were sent out with 178 useful responses received for the subsequent data analysis.

6. Data Analysis and Results

Based on the responses, we conducted a correlation analysis. The objective of the correlation analysis is to study the strength of correlation between any set of two variables, measured by the value of the correlation coefficient. In our study, we selected a significance level to be 0.05. Based on 178 valid questionnaire responses, of the eleven hypotheses in the research model, only three of them were found to be not supported by the empirical data collected. Table 3 shows the results of the hypothesis testing.

Table 3. Results of Hypotheses Testing

Hypothesis No.	Statement	Correlation Coefficient	t value	Hypothesis is Supported
1	H Perceived Usefulness of using Internet Electronic Trading System will positively affect Attitude toward the system.	0.605	1.07	Yes
2	H Relative Advantage of using Internet Electronic Trading System will positively affect Attitude toward the system.	0.286	3.96	Yes
3	H Perceived Ease of Use of using Internet Electronic Trading System will positively affect Attitude toward the system.	0.612	1.28	Yes
4	H Compatibility of using Internet Electronic Trading System with existing mechanism will positively affect Attitude toward the system.	0.611	1.23	Yes
5	H Other investors' influence (Peer Influence) of using the system will positively affect Subjective Norm	0.128	1.34	No
6	H Resource Facilitating Conditions of the system will positively affect Perceived Behavioral Control.	0.322	4.52	Yes
7	H Technology Facilitation Conditions of the system will positively affect Perceived Behavioral Control.	0.245	3.35	Yes
8	H Attitude toward the system will positively affect the Behavior Intention.	0.266	3.66	Yes
9	H Subjective Norm concerning the system will positively affect the Behavior Intention.	0.059	0.63	No
10	H Perceived Behavioral Control to the system will positively affect the Behavior Intention.	0.135	1.47	No
11	H Behavior Intention of the system will positively affect the Usage Behavior.	0.254	3.49	Yes

7. Discussions and Conclusion

The main objective of this study is to understand the initial adoption factors and behavior of investors to an Internet-based on-line trading system. Based on the Decomposed Version Theory of Planned Behavior (DTPB), a research model was developed to understand the social or human-factor feasibility of on-line trading.

The results of the analysis indicate that regarding the hypothesized model, there is strong statistical significance that Perceived Usefulness, Perceived Ease of Use, and Compatibility significantly affect the Attitude towards using the proposed system. This implies that investors will possess positive feelings for using on-line trading if it can enhance their efficiency and effectiveness of placing orders.

Instead of placing trading orders via telephone to brokers with a risk that disputes may occur due to an unclear voice/written message, on-line trading is likely to improve the process of placing orders, provide an electronic audit trail for each transaction, and there can be trading around the clock. The study reported here provides empirical support to the feasibility of moving towards the adoption of an Internet-based on-line trading system.

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Appendix: Items used in the Questionnaire

Construct	Question Number	Description
Perceived Ease of use	1	I believe that the electronic trading system will cumbersome to use.
	2	I believe that it will be easy to get the system to do what I want to do
	3	I think learning to operate or master the system will have no difficulty to me
Perceived Usefulness	4	Using the system will improve my performance of investment.
	5	Using the system will enhance my effectiveness of investment.
	6	Using the system will increase my profit gained from my investment.
	7	Performing any kind of transaction on Internet is safe.
Compatibility	8	Using the electronic trading system to place order will be equal to the way of using telephone and telling the broker what I want to buy or sell.
	9	I believe the past knowledge in investment market will help me to use the system.
Relative Advantage	10	I think placing order through this system will give me more advantage more than the existing manual method.
	11	It will be _____ to replace the traditional method of placing order with such system.
Attitude	12	I think it will be _____ to use the system rather than to place order in the existing way.
Usage Behavior	13	The usage of electronic trading will allow me to react to the market more quicker
	14	I think my future usage of the system is _____ if the system is developed.

Construct/ attribute	Question Number	Description
Behavioral Intention	15	If the system is ready to be used, the commitment to using the system is.
	16	If the system is ready to be used, how likely is it that you will use it.
Subjective Norm	17	I think it will be _____ to let investor of Hong Kong participate or give ideal in the development of such system.
	18	The people who promote the system think it will facilitate your investment, so you use it
Peer influence	19	If most of the Hong Kong investor think the system is useful, so you will follow them
	20	If the stock market expects every one to use the system, you will follow.
Resource facilitating conditions	21	I will spare time, money and other resources like effort to learn in order to use this system as long as the advantage of using it can cover the resource used.
	22	I think I will have the enough knowledge to manage the system as my tools.
Technology facilitating conditions	23	I believe under the existing technology, such kind of electronic trading system is possible
Perceived behavioral control	24	I believe that using the system would be completely within my control