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van der Heijden, Hans

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Understanding **electronic market usage:**

A **revised** model based on planned behaviour and innovation diffusion theory

Hans van der Heijden

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**UNDERSTANDING ELECTRONIC MARKET USAGE:
A REVISED MODEL BASED ON
PLANNED BEHAVIOUR AND INNOVATION DIFFUSION THEORY**

Hans van der Heijden

hheijden@econ.vu.nl

Assistant Professor Information Systems

Vrije Universiteit Amsterdam

Faculty of Economics, Room **3A-24**

De Boelelaan 1105, 1081 HV, Amsterdam, The Netherlands

Tel. **+31 20 444 6062**, Fax. **+31 20 444 6005**

**UNDERSTANDING ELECTRONIC MARKET USAGE:
A REVISED MODEL BASED ON
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Abstract

This paper is concerned with the identification of determinants that influence the use of business-to-consumer electronic markets. Since the widespread adoption of the Internet, these electronic markets are now commonplace and it becomes increasingly relevant to identify the factors that influence their usage. This paper first reviews the literature on this topic and addresses the theoretical constructs developed so far. Specifically, we acknowledge that current theories have enjoyed little empirical support, and possess limited explanatory power. We then proceed by introducing a revised model based on two theories: the theory of planned behaviour and innovation diffusion theory. Both theories are well established and attempt to explain adoption intention and use of information systems in general. We apply these constructs to electronic markets usage and explain why empirical support of earlier propositions has been weak and inconclusive. We conclude by assessing the implications of this revised theory for further empirical research.

KEYWORDS: Electronic markets, information systems usage, theory of planned behaviour, innovation diffusion theory



1. Introduction

This paper is concerned with electronic markets, generally defined as **interorganisational** information systems that allows participating buyers and sellers to exchange information about price and product offerings (Bakos, 1991). Specifically, the article focuses on **business-to-consumer**, Internet-based electronic market applications, also known as electronic shops or web stores. Since the widespread adoption of the Internet, such electronic markets are now commonplace (Kalakota & Whinston, 1996). Some are clear examples of success, some require improvement, and some are unsuccessful. An important measure for success of electronic markets is the amount of usage by consumers. Buyer usage implies market liquidity and financial revenue, both for sellers and for market operators. In this paper we are concerned with the usage of electronic markets and the factors that cause the use or disuse by buyers of a particular system.

This paper takes primarily a theoretical perspective. In particular, it reviews the previous theory developed so far, and examines the potential contribution of planned behaviour and innovation diffusion theory to this body of research. Planned behaviour theory is concerned with the use of information systems in general. Innovation diffusion theory is concerned with the successful introduction of innovations, and identifies a number of factors that influence the speed of adoption of the innovation. We **analyze** whether these factors are applicable to electronic markets and provide a revised theoretical framework to study the use of electronic market applications.

This paper is organised as follows. Firstly, we review the literature on electronic markets to identify a first set of factors that influence use of electronic markets. In this review, we will adopt the buyer's perspective. Second, we review planned behaviour and innovation diffusion theory and provide an overview of the factors that are typically associated with **successful** use of information systems. In the section the suitability of "electronic market usage" as a dependent variable is also discussed. Thirdly, the integration of previous research on electronic markets is attempted. Finally, we draw a number of conclusions from the theoretical exercise and address some research implications of this revised framework for further empirical research.

2. Previous theory

The move to electronic markets has traditionally been explained from a transaction cost perspective. Transaction cost economists argue that the type of governance of a transaction is dependent on the costs associated with the execution of the transaction. In particular, these costs are incurred because of three variables: asset specificity, complexity, and frequency (Williamson, 1975; 1985). The more specific the assets required to complete the transaction, the more efficient hierarchical governance is as opposed to market governance. Similarly, the more complex and frequent the transaction, the more efficient the hierarchical governance.

Malone et al. (1987) use transaction cost theory to argue that information technology will lead to more market governance. Using IT will reduce transaction costs, in particular those costs induced by asset specificity and complexity of product description. Hence, more transactions can be carried out under market governance. In terms of electronic market usage, less asset specificity and less complexity of product description will increase the use of markets, and possibly the use of electronic markets. It should be noted that Malone et al. generally refer to business-to-business markets, with a few references to consumer markets. Business to consumer electronic markets are the prime focus of our attention in this article.

Unfortunately, the famous “electronic market hypothesis” has not enjoyed tremendous empirical support (Daniel & Klimis, 1999). For instance, Hess & Kemerer (1994) have investigated the move to market governance through the study of five electronic markets in the mortgage industry. Though the time period over which this industry was studied was relatively long (1981-1993) the study indicated no move to market governance. On the contrary, empirical evidence indicated that electronic markets had been abandoned, and that the industry was moving towards more electronic hierarchies. Hess & Kemerer identify a number of other factors: complexity of the transaction, frequency of transaction, relation of goods/services supplier and system supplier, current market structure, relative power of buyers and suppliers, possibility of transaction fees and ability of suppliers to match competitors’ product offerings.

As a second example, in an investigation of an electronic market for air-plane parts, Choudhury et al. (1998) have used the constructs “complexity of product description” and “product specificity” as the determinants of electronic market use. Empirical evidence was not in favour of the theoretical constructs. Their findings suggest that these variables do not by themselves explain why the electronic market was used in the first place.

It should be noted that several authors have also theoretically rejected the electronic market hypothesis. Noteworthy is the work of Clemons et al. (1993) who predict a “move to the middle” indicating intensified coordination with less suppliers, and Gurbaxani & Whang (1991) who argue that IT decreases costs to operate under market governance as well as **hierarchical** governance. The latter argument suggests that IT per se cannot meaningfully explain a shift towards any specific governance mechanism at all.

A possible explanation for the apparent lack of empirical support is the somewhat confusing terminology of transaction cost economics in the context of electronic markets. In a strategic analysis of electronic marketplaces, Bakos (1991) notes that there are different meanings to the term “electronic market”:

“the use of the term “electronic marketplaces” (...) has a narrower, system-oriented focus compared with Malone, et al. (1987)’s more general use of the term “electronic market” in referring to the corresponding governance mechanism ” (Bakos, 1991, p296).

This remark clarifies some of the confusion that arises when electronic market systems are associated with concepts from transaction cost economics. Transaction cost economics attempts to explain the governance mechanism, not the use of the system that supports a market mechanism. Conceptually, the use of the governance mechanism is substantially different from the use of an information system, such as an electronic market. For instance, the use of the system will require the use of the governance mechanism, but the use of the governance mechanism will not necessarily require the use of an electronic market. As a consequence, it is not surprising that the three determinants from transaction cost economics (asset specificity, complexity, frequency) do not empirically explain the rise of electronic market systems: they were never intended to do so.

Strader & Shaw (1997) theoretically derive the influence of electronic markets on an industry and conclude that six factors determine its level of impact. These factors fall into four categories: product, industry, seller and consumer. In terms of products, the **two important** characteristics of product are its form (is the product able to be represented in a digital form, such as music, or film) and product value. The higher the product value, the greater the risk **involved in** a transaction between buyers and sellers who are geographically separated and

may have never dealt with each other before. Consequently, the higher the risk, the less an electronic market will be used. In terms of industry, two characteristics are important: the level of standards for describing products, and whether a broker is required to complete the transaction. The less a broker is needed, the more electronic markets will be used. For sellers, the important characteristic is whether they have an incentive to engage in a market where they are more easily compared on their offerings. If not, then the level of impact in that industry will be lower. Finally, for buyers, the important characteristic is whether they are impulse buyers, patient buyers and analytical buyers. This suggests that the more the market is based on impulse, the less the impact of an electronic market, since there is usually a degree of effort involved in starting up and using the market.

Since this theoretical exercise adopts a buyer's perspective towards the use of electronic markets, we will not incorporate the seller's perspective. This leaves us with the following five determinants from their analysis: product form (positive relationship), product value (negative relationship) and standardisation of product description (positive relationship), degree to which broker is required (negative relationship), degree to which buyers are analytical purchasers (positive relationship).

Based on their empirical evidence, Cloudhury et al. (1998) argue for the inclusion of four more determinants: frequency (negative relationship), market variability (positive relationship), product value (positive relationship) and scope of the electronic market (positive relationship). In contrast with a previous theoretical argument, product value is discerned here as a positive influencer: the higher the value, the more savings can be gained from an electronic market, and the more it will be used.

Focusing on the implications of electronic markets, **Bakos** (1991; 1997) argues that, all other things equal, the introduction of electronic markets will reduce product prices. The argument starts with the assumption that the electronic market will reduce buyer search costs (see also Choi et al., 1997). Hence, buyers will be able to consider more suppliers and • assuming suppliers are price-competitive – suppliers will lower excess profit margins. There is empirical evidence supporting this claim, for instance in the U.S. security industry (see Clemons & Weber, 1996).

Based on empirical evidence from AUCNET, a computerised secondhand car auction, Lee (1998) provides a supplementary argument to this “reduced price hypothesis”. The computerised auction gives buyers a number of administrative advantages, eventually to such an extent that they are willing to pay a premium over the prices that are standard in the traditional secondhand car market:

“Buyers are willing to pay the premium (a slightly higher price) because they not only avoid an immense waste of time spent on attending physical auctions but also easily locate a vehicle that best matches their preferences. “(Lee, 1998:80).

Electronic market intermediaries - such as the electronic auctioneer in the case of AUCNET - are able to realise significant benefits other than price for both buyers and sellers. This research implies that an important factor for electronic market use are the advantages realised by the electronic market application, whether price related or non-price related. Indeed, non-price related advantages may offset the higher prices carried by the electronic market. This line of argument is also empirically supported by Liang & Huang (1998) who find that consumer acceptance of buying products over the Internet is to a large extent determined by the amount of saved transaction costs.

The determinants arising out of this earlier work are listed in Table 1.

<i>Factor explaining electronic market use</i>	<i>Nature of relationship to electronic market use</i>
Asset specificity	Negative
Complexity of product description	Negative
Frequency	Negative
Market variability	Positive
Product value	Positive, negative
Scope of the electronic market	Positive
Product form (digitisable)	Positive
Standardisation of product description	Positive
Degree to which broker is required	Negative
Degree to which buyers are analytical purchasers	Positive
Price advantage through electronic market	Positive, negative
Non-price advantages through electronic market	Positive

Table 1 An overview of variables explaining electronic market use

Concluding our overview of past research, a number of observations can be made. In the first place, there is little theoretical research on electronic market use specifically, and there appears to be no integrated theory explaining the use of electronic markets from a buyer's perspective. In the second place, many of the factors brought forward have experienced few or contradictory evidence (asset specificity, complexity of product description). There is theoretical disagreement about the sign of the relationships (product value and product

prices), with no empirical guidance to conclusively support either of these claims so far. Clearly, both theoretical and empirical advances are in order.

3. Alternative theories

We propose an alternative theory on the use of electronic markets. In order to avoid any confusion, the revised theory will attempt to explain use of electronic market applications from a buyer's perspective. We will not attempt to explain the move to more market governance due to information technology, nor the use of electronic markets from a seller's perspective.

It is relevant to examine in more detail the following question first: is "use of electronic market applications" a valid construct? Is it a useful dependent variable and is it to be regarded as a meaningful concept to denote the success of an electronic market? These questions are important because if they are answered negatively, the whole theoretical exercise is relatively meaningless.

Indeed, information systems usage has not typically been considered a reliable proxy for information systems success (DeLone & McLean, 1995). As a construct, it has at least five disadvantages: 1. it assumes that more usage is always better, 2. it assumes perfect congruence between the organisational goals and the goals of the user, 3. it is difficult to value the amount of usage, 4. subjective measurement may be subject to social desirability and 5. measurement may be subject to time-dependent noise (Gelderman, 1998).

Nevertheless, "for Internet sites (or other information systems aimed at a general public) usage may remain the most appropriate and most easily assessed success measure" (Gelderman, 1998: 17). This statement is supported by Downing (1999) who has found strong correlations between the use of a survey-based customer satisfaction instrument and actual usage behaviour statistics. Downing acknowledges that the relationship holds for systems of a voluntary nature only (p. 214).

In electronic markets, usage typically implies financial revenue, which is among the most commonly applied measurements for financial success. Indeed, many electronic market intermediaries would argue that "more usage is always better". Furthermore, usage of electronic markets, or indeed of many Internet-based systems is of a voluntary nature. Therefore, we argue that system usage in the context of electronic markets is a proper "proxy construct" for electronic market success.

3.1 Theory of Planned Behaviour

We argue that in order to understand electronic market usage we can benefit from the theory developed around usage of information systems in general. The Theory of Planned Behaviour has shown to be a good predictor of IT usage (see in particular the review by Taylor & Todd, 1995). Following this theory, the usage of an information system is a function of two constructs: 1. behavioural intention to use the system and 2. perceived behavioural control over the use of the system. The intention to use the system is explained by a person's attitude towards the system, his subjective norms, and, again, the perceived behavioural control over the use of the system. Each of these constructs will now be discussed in more detail.

Behavioural intention refers to the intention of an individual to use an information system. There is a straightforward relationship between intention and use. In the context of electronic markets, behavioural intention would refer to the intention to use the electronic market, e.g. purchase a product over the electronic market. The greater my behavioural intention, the greater my use of electronic markets.

Perceived behavioural control refers to the degree to which an individual believes he has control over his behaviour to use an information system, or in other words, reflects perceptions on his internal or external constraints. This belief not only influences information system usage directly, but also indirectly through behavioural intention. In the context of electronic markets, perceived control over one's ability to use the electronic market influences electronic market usage, and the intention to use it. Thus, the more I feel capable to purchase a product over the Internet, the more I will. Likewise, the less I feel able to buy through an electronic market, the less I will intend to. Perceived control may depend on the perceptions a person has on his ability to use computers and the internet.

Attitude refers to feelings of favourableness or unfavourableness towards performing behaviour, i.e. use an information system. The more positive the attitude, the greater the intention to use it. In the context of electronic markets, the more positive my attitude about an electronic market, the more I will feel inclined to use. In particular, attitude is influenced by the features of the electronic market. Innovation diffusion theory provides a classification of these features, and these will be discussed later on in the paper.

Subjective *norms* refer to the perceptions that significant referents desire the individual to perform or not perform a behaviour. These referents may include peers, friends, colleagues, family, etc. The more I think my peers would value use of an information system, the more I will feel inclined to use it. In the context of electronic markets, for example, the more my friends or family think I should buy over the net, the more I will want to use it.

Applying this model to electronic markets, the resulting model looks as follows:

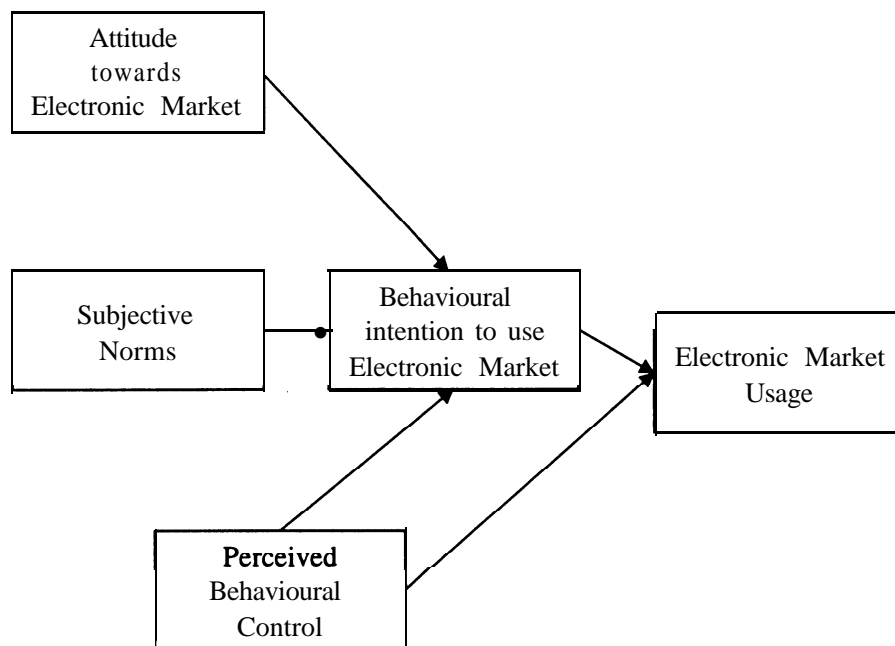


Figure 1 Theory of Planned Behaviour applied to Electronic Markets (adapted from Taylor & Todd, 1995:146)

In this paper we will not go further into subjective norms and perceived behavioural control, but would like to stress that both constructs should be incorporated into any further research into electronic market use. The theory suggests that non-compliance with subjective norms and behaviour control may well cause disuse of electronic markets, even if the attitude towards using is overwhelmingly positive.

Our present analysis focuses upon attitude towards the system, which according to the Theory of Planned Behaviour is dependent on Perceived usefulness, Ease of Use and Compatibility. These determinants are directly borrowed from innovation diffusion theory, and will be discussed in the following section.

3.2 Innovation diffusion theory

Although innovation diffusion theory has not typically been applied to the adoption and use of electronic markets, it is certainly not a new theory in the **MIS** field. On the contrary, many studies in IS are based on innovation diffusion theory in any number of ways. Recent applications of the theory include the adoption of expert systems (Shao, 1999), the adoption of Electronic Data Interchange (Iacovou et al., 1995) and the adoption of teleworking (Sia et al., 1998). The next section will discuss innovation diffusion theory in the context of electronic markets use.

An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption (Rogers, 1995). Depending on the perspective taken, innovation diffusion has several dependent variables, in particular “rate of adoption” and “intention to adopt”. Classical innovation theory is primarily concerned with the *intention to adopt*: the degree to which members of a social system (i.e. a collection of individuals) intend to adopt the innovation. The resulting rate of adoption is typically measured by the number of members of the social system that adopt the innovation in a given time period.

To incorporate innovation theory into electronic markets research, we will treat electronic markets as innovations and substitute “intention to adopt” with “behavioural intention to use electronic market” and “rate of adoption” with “electronic market usage”.

Innovation theory argues that rate of adoption is affected by the following characteristics of the innovation: relative advantage, compatibility, complexity, trialability and observability. In the following section, we will discuss each characteristic in more detail, and apply the concepts in the context of electronic markets.

Relative advantage refers the degree to which an innovation is perceived as better than the idea it supersedes. Perceived relative advantage is to be **equaled** to the concept of “Perceived usefulness”. In the context of electronic markets, the application should be perceived as better than the traditional market mechanism it replaces. Thus, an electronic **bookshop** will be used if it can deliver a product faster than a traditional **bookshop** (as is the case for relatively unavailable books). Likewise, an electronic **bookshop** will not be used if delivering the book is more expensive than using a traditional bookshop. The “relative advantage” argument also illustrates why the rate of adoption of electronic markets in rural areas would be faster than in densely populated areas: the relative advantages for the potential users are higher.

Compatibility refers to the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters. In the context of electronic markets, one would expect that electronic markets are more “compatible” with individuals who 1. have previous experience in using the Internet, and/or 2. have previous experience with ordering goods directly. Since electronic markets typically follow the order by mail or telephone business model, this would explain why, at present, the U.S. has a higher rate of adoption than Europe: the order by mail, phone or television industry is more advanced in the U.S. than in Europe. More people are familiar with the concept, hence, more people will tend to use electronic markets in the U.S. than in Europe.

Innovation compatibility also suggests that previous experience in electronic markets would increase the intention to use subsequent electronic markets. This would be an argument pro the controversial strategy of Amazon.com to introduce a wider range of products into their shop assortment.

Complexity refers to the degree to which an innovation is perceived as difficult to understand and use. Complexity is to be equated to “Perceived ease-of-use”. In the context of electronic markets, complexity is a straightforward concept implying that the application should be simple to use and easy to understand. The more complex the electronic market is perceived to be, the less the application will be used. As with relative advantage and compatibility, not the objective complexity counts, but the perception of the innovation characteristic. Therefore, groups of individuals who find the Internet difficult to use will slower adopt the electronic market than people for whom the Internet has no secrets. It is possible that unsuccessful electronic markets sell products that typically attract people who have difficulty understanding the Internet.

Trialability of an innovation refers to the degree to which an innovation may be experimented with on a limited basis. The argument is that trying an innovation will reduce the uncertainty with which it is associated. In the context of electronic markets, trialability would refer to searching the electronic market before actually buying a product. Or, to buy a product of little value first before buying a product of high value later. Again this is an argument pro Amazon’s strategy to sell not only books but also higher value products such as cameras and VCRs. The strategy suggests that buyers who have gained confidence in buying books through Amazon are more likely to buy higher value products than without such confidence.

Observability refers to the degree to which the results of an innovation are visible to others. Innovation research has confirmed that most adopters of innovations are influenced by the experiences of their peers (family members, colleagues, friends), rather than, for example, the results of scientific research (Rogers, 1995). The argument is that the more observable the

results of the innovation, the more peers are able to show the benefits of the innovation, and the more the potential adopter will be favoured to adopt.

In the context of the electronic market, an individual is prepared to use an electronic market, once he has observed the benefits that others have experienced in using electronic markets. The more observable these benefits, the more it will influence the adoption by the potential user.

In summary, innovation diffusion theory predicts that *the attitude towards using the electronic market will improve if the perceived usefulness increases, if the perceived compatibility increases, if the perceived ease of use increases, and if the trialability and observability increase.*

This is depicted in the following model:

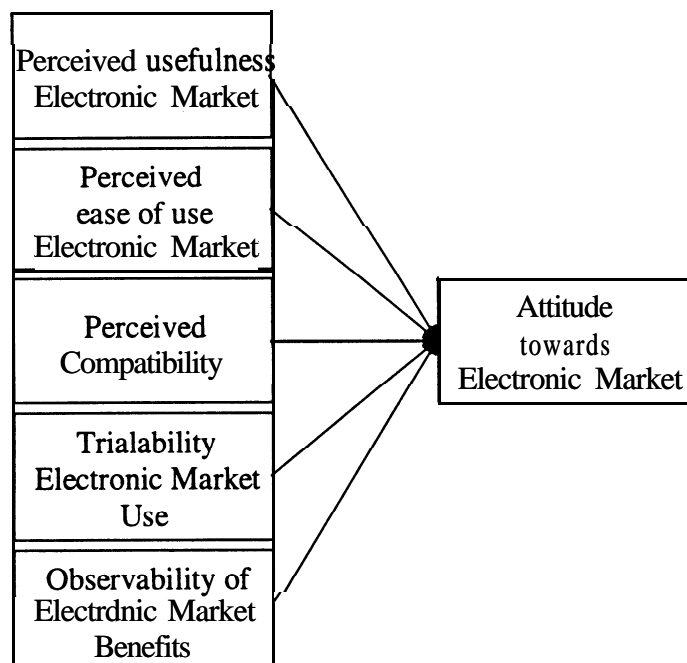


Figure 2 Innovation diffusion theory applied to electronic markets (adapted from Rogers, 1995)

4. Integrating previous research with revised theoretical framework

The next step in the theoretical argument developed in this article is to take the determinants derived from prior theory and integrate these into the model derived in the previous two sections. We have tried to meaningfully link these determinants to innovation-theoretic variables. The results are displayed in Table 2. They suggest that prior determinants can be

categorised as factors determining either 1. perceived usefulness, 2. perceived ease-of-use, and 3. perceived compatibility. It is interesting to note at this point that there are no determinants from prior theory who can be meaningfully linked to 4. Trialability and 5. Observability.

<i>Previously identified variables</i>	<i>Relationship with construct in revised model</i>
Asset specificity	Influencing perceived compatibility
Complexity of product description	Influencing perceived ease of use
Frequency	Influencing perceived usefulness
Market variability	Influencing perceived usefulness
Product value	Influencing perceived usefulness
Scope of the electronic market	Influencing perceived usefulness
Product form (digitisable)	Influencing perceived usefulness
Standardisation of product description	Influencing perceived ease of use
Degree to which broker is required	Influencing perceived compatibility
Degree to which buyers are analytical purchasers	Influencing perceived compatibility
Price advantage through electronic market	Influencing perceived usefulness
Non-price advantages through electronic market	Influencing perceived usefulness

Table 2 Previously identified variables and their relationships to constructs in the revised model

Frequency, market variability, product value and scope of the electronic market, price and non-price advantages are factors that can be linked to the usefulness of an electronic market. Since these are all factors that can be directly related to system features of an electronic market, some implications for practitioners are relatively straightforward. Does the electronic market include features to exploit advantages it potentially has over other retail formats? According to theory, these advantages are 1. efficiency gains from frequent purchasing, 2. availability of products that are traditionally unavailable in traditional retail formats, 3. cost savings for higher value products, 4. leverage of full scope of product lifecycle, 5. price and non-price (for example administrative) advantages.

Complexity and standardisation of product description are factors that determine the ease-of-use of an electronic market. Again implications for practitioners are simple: do electronic markets exploit these features enough? Is their easy for users to buy products? Is the description standardised?

Finally, asset specificity, degree to which broker is required and degree to which buyers are analytical purchases all influence the compatibility of the electronic market with the norms of the individual. The more specific assets required, the less compatible the electronic market is with carrying out transactions the way the company did it traditionally. The more brokers are required, the less compatible the electronic market is with traditional means of trading. And the more analytical an individual is, the more compatible the electronic market is with his view of purchasing products.

5. Conclusions and future research

At the end of this theoretical **exercice**, a number of conclusions can be drawn. In the first place, planned behaviour and innovation diffusion theory are able to embrace all variables previously identified in the context of electronic markets to explain adoption and use. Thus, in order to test the explanatory power of the revised model in contrast to previous models, all constructs could be surveyed, and examined on the way they are dependent on each other. Subsequent empirical research will be able to see whether the revised model will more completely aid in our understanding of electronic market use.

In the second place, usage is a complex phenomenon that is only explained **in the third or fourth order** by constructs previously identified as determinants for use. This makes these constructs weak in their explanatory power. Furthermore, since contradictory evidence is a signal of irrelevant constructs (although neither a necessary nor a sufficient symptom), this would explain why empirical investigation have found inconclusive evidence for these variables.

In relation to this conclusion, our analysis points at the inclusion of trialability, observability and more importantly, to subjective norms and perceived behavioural control as important determinants for electronic market usage. These determinants may well cause an electronic market to fail, i.e. not used, even if the attitude of a buyer towards an electronic market is positive. “My friends would think that I should not use the electronic market“ (subjective norms) and “I do not feel comfortable using the electronic market on my own” (perceived behavioural control) are examples of questionnaire items that take these determinants into account (adapted from Taylor & Todd, 1995: 173). Again, subsequent empirical research will need to be directed towards these variables in order to more completely understand electronic market usage than we do today.

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