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SME Adoption of IT: The Case of Electronic Trading Systems

Mohamed Khalifa and Robert M. Davison

Abstract—Literature on the institutional adoption of information technology (IT) can be classified into two approaches, one emphasizing rationalistic goal-oriented behavior and the other focusing on external forces. These approaches, however, are not necessarily mutually exclusive. Organizations adopt IT both to achieve efficiency and in response to a variety of environmental and internal pressures. Consequently, there is a clear need for an integrated model that incorporates both institutional pressures and goal-oriented behavior. We develop, operationalize, and empirically test a model that explains the intention of small and medium-sized enterprises (SME) brokerages to adopt electronic trading systems (ETS). This model integrates the rational factors driving goal-oriented behavior with the internal and external pressures to which these brokerages are subjected. The model is parsimonious, yet explains 67% of the variance in the intention to adopt ETS. The theoretical and practical implications of this model are discussed.

Index Terms—Electronic trading systems (ETS), Hong Kong, information technology (IT) adoption, small and medium-sized enterprises (SME).

I. INTRODUCTION

ELECTRONIC TRADING systems (ETS) have been available to the larger organizations and brokerages since the mid-1970s [78], yet only in the very late 1990s, with the advent of Internet-based trading, did they become accessible to SME brokerages and retail clients (individuals). The adoption of ETS by Hong Kong brokers has been rather slow when compared with the adoption of the same technology by individual investors. While 13% of brokers used ETS in 2000, around 20% did so in both 2002 and 2004 [41], [59]. Individual investors, on the other hand, increased from 7% in 2000 to 26% (2002), 30% (2003), and 36% (2004) [20], [21], [59]. In order to understand why these different adoption rates exist, it is important to develop a better understanding of SME adoption of information technology (IT), in general, and that of ETS, in particular.

The institutional environment where the organization operates exerts an influence on the adoption process exhibited by individual organizations. ETS can be considered a form of interactive technology given the role of mediating transactions between relationship partners. It has been suggested that these

technologies are diffused when they are seen or experienced by others, notably competitors and customers, who would like either to replicate the success of the early adopters, or avoid the possibility that they will be seen by their peers as being slow to adopt the technology, or even to avoid the possibility of losing customers who prefer to use this technology (cf., [20], [48], and [65]).

Much of the research into technology adoption has used theories of individual decision making such as the theory of planned behavior (TPB) [1], derived from the theory of reasoned action (TRA) [28], the technology acceptance model (TAM) [23], and Triandis' [67] model of human behavior. Although individual decision making is also the basis of organizational adoption of technology, the determinants of individual adoption differ from those of organizational adoption. A number of studies have investigated the adoption of IT by organizations, notably [15], [35], [36], [40], [55], [57], [63], [64], [65], and [70]. In [35], the authors identified three main determinants of the intention of small firms to adopt electronic data interchange (EDI). These include perceived benefits, organizational readiness, and external pressure. Chwelos *et al.* [15] developed the model of Iacovou *et al.* [35] further through the decomposition of external pressure and readiness.

Recently, Teo *et al.* [65] applied institutional theory [31], [49] to a study of the adoption of interorganizational linkages in Singapore. Institutional theory explains adoption in terms of pressures exerted on the organization to adopt, pressures that come variously from customers, suppliers, and competitors. However, we contend that institutional adoption is, in fact, neither entirely goal-oriented nor uniquely a response to pressure. It may be that early adopters of technology are more goal-oriented and that their decisions are motivated primarily by the need to achieve a competitive advantage. Likewise, late adopters may adopt due to pressure from customers and competitors. However, the majority of adopters are somewhere in the middle—they adopt both so as to achieve efficiency and in response to a variety of environmental and internal pressures.

With the diffusion of the technology, the pressures from customers, suppliers, and competitors increase. Conversely, one can also argue that with the diffusion of the technology, the uncertainties associated with its adoption are reduced and its potential payoffs become better known. Therefore, rational choice factors also remain salient. Consequently, there is a clear need for an integrated model that incorporates both institutional pressures and goal-oriented behavior. The development and empirical testing of such a model are the main objectives of this paper.

This research makes important theoretical and practical contributions. On the theoretical side, models of the institutional

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adoption of IT are developed further to account both for the rational factors driving goal-oriented behavior and for the internal and external pressures that the organization is subjected to, extending, in this way, the scope of application of the theory. The research also identifies a number of key factors that practitioners should carefully reflect on when they consider the adoption of ETS.

Following this introduction, we review the literature on ETS, before laying out our research model. The methodology section, where we describe the development and administration of a survey instrument, follows. The data obtained from the survey is analyzed with structural equation modeling techniques, and key drivers of the intention to adopt ETS are identified and discussed. The paper ends with implications for e-brokerages, researchers, and customers.

II. ETS

ETS are a form of technology that mediates transactions between buyers and sellers. Prior to the development of ETS, all potential buyers (of securities, insurance options, futures, etc.) needed to employ the services of a broker. The broker would take the buying (or selling) order and charge a hefty commission (often hundreds of U.S. dollars) as a fee for making the transaction. The actual transaction would take place on the floor of the relevant exchange under what was known as the "open outcry" system, brokers verbally communicating the details of orders to each other. ETS essentially automates this process, permitting orders to be transacted in seconds over electronic networks. Not only do ETS speed up the transacting process, but they have also made trading cheaper (with the deregulation of procedures and pricing). Some online discount brokerage firms (DBFs) now offer transactions as low as U.S.\$5 per order transacted, or even \$0 in selected circumstances such as large trades or in the case that they are unable to process an order within 60 s of the order being given [78].

The concept of electronic trading can be dated back to the U.S. Commodity Exchange Act of 1974, which required the Commodity Futures Trading Commission to "determine the feasibility of trading by computer" [25]. Financial difficulties experienced in times of recession, for example in the late 1980s and early 1990s, as well as intense global competition, exerted considerable pressure on markets to find cheaper and more effective trading mechanisms. These pressures initially pushed markets toward greater adoption of information and communication technologies, in general, but this move rolled forward with the development of the web in the 1990s to the introduction of fully fledged ETS (cf., [9]). Clearly, the integration of ETS with the Internet represents a new opportunity for business that electronic brokerages are keen to see realized. ETSs currently operate in a number of different sectors, including insurance [7], [9], stock exchanges [18], and futures exchanges [8].

Indeed, ETS are in the process of replacing the centuries old open outcry system with the majority of both stock and futures exchanges now offering an electronic trading environment (for both brokers and individual investors) in parallel with open outcry procedures (see, e.g., [33] and [68]). Consequently, traditional brokers are being subjected to considerable pressure [78]

with online DBFs offering much more attractive services to individual investors. ETSs are seen as advantageous in terms of speed, capacity, efficiency, productivity, cost, improved security and audit trails, transparency, user friendliness, and their general potential for democratizing the personal investment business [8], [9], [26], [29], [30], [34], [37], [38], [45], [53], [69], [74], [77]. Indeed, Weber [74] notes that "electronic markets (such as ETS. . .offer the capability of integrating investors' portfolio systems with the placement of orders into the market," thus combining order placement, risk management, decision making, and knowledge management functions (cf., [78]).

Allgood [3] observes that the stockbroking sector of the economy is especially suited to web-based trading, given the fact that all goods can be delivered electronically, thus eliminating traditional logistical problems. She also notes that ETS can facilitate the development of global operations, in which many investors will be interested, given the potential to diversify risks across a range of markets.

Associated with the ETS environment is the keen customer concern that their transactions through brokers involve a high level of authenticity and integrity (cf., [2]), given the substantial amounts of money that are involved. If customers do not trust the authenticity of transactions conducted through an ETS, they are unlikely to trust a broker that makes such systems available. Consequently, well-known brokers and ETS that receive endorsement from respected and trusted third parties are likely to be favored, particularly by new Internet users and investors (cf., [56]). A specific aspect of authenticity is security: some authors claim that this is primarily a psychological factor [76], but this does not obviate the need for appropriate controls via encryption, firewalls, and restricted access policies (see [16] and [17]).

While many advantages can be identified, there are also drawbacks to ETS, with many counter arguments to the above advantages including: the disruption of established modes of behavior, deskilling of brokers, the potential for redundancies as trading is automated, less flexible order cancellation procedures, poor liquidity, increased market fragmentation, and an increased frequency of trading by individual investors, which conflicts with standard prescriptions of financial theory [8], [9], [38], [52], [69]. Whether one regards disintermediation and the associated job losses and restructuring of the industry as an advantage or a disadvantage will depend on one's perspective and the likelihood that one's livelihood will vanish.

As Barrett and Scott [8] observe, the literature (e.g., [13] and [53]) tends to focus on the technical and financial details of efficiency and liquidity, with considerable attention paid to the activities of electronic brokerages such as E-Trade, Discover, and Datek Online and the agreements that they are reaching with electronic communication networks (ECNs) such as Instinet, Eclipse, and Island with respect to extended trading hours. While round-the-clock online stock trading is not yet available on a single exchange, stocks can be traded around the clock if they are listed on multiple exchanges, e.g., Hong Kong, London, and New York. Despite the fact that considerable attention is being paid to the development of online trading systems, very little attention is being paid to the changes that ETS may bring to brokerages that adopt these new systems. This is a cause for concern, since although there is a clear move

toward ETS that will function both within single markets and globally, there is considerable potential that this move will either be misguided or not guided at all.

III. RESEARCH MODEL AND HYPOTHESES

There has been increasing attention to the adoption of technology by organizations [15], [35], [40], [55], [57], [60], [63], [64], [65]. In fact, “organizational transformation is increasingly enabled through the fabrication of complex, malleable and intrusive technology platforms” [55] which, in combination, push organizations toward greater competitiveness. These technologies may take the form of distributed work arrangements [64], knowledge platforms [55], or executive information systems [57] to name but a few. While individuals are clearly involved in organizational adoption decisions, the issues that influence their decision making are quite different from those that would be salient when they are acting as individuals without an organizational affiliation. In the organizational context, a wide range of institutional, social, and political factors influence their decisions.

In this regard, past studies of organizational innovation (e.g., [36] and [70]) note the importance of studying the environmental factors (cf., [40]) that influence the implementation of technology. Firms face three types of pressure to be isomorphic with their environment [24]. These are “coercive,” “mimetic,” and “internal normative” pressures. Although these isomorphic pressures serve an analytical purpose and are difficult to separate empirically, they are nevertheless distinguishable in terms of the way they normally operate. Coercive and normative pressures operate through connectedness relations. Mimetic pressures, on the other hand, act through structural equivalence. Accordingly, in the context of interorganizational linkages, Teo *et al.* [65] associate coercive and normative pressures with customers and suppliers and mimetic pressures with competitors. They validate such an approach empirically. Similarly, we associate different isomorphic pressures with different stakeholders in the brokerage’s business system. We will explain the significance of these pressures in greater detail when we develop our hypotheses.

While isomorphic pressures are undeniably relevant to the organizational adoption decision, we do not believe that they are the only salient sources of influence. Organizations also adopt IT when they anticipate significant benefits, e.g., efficiency gains, and are positive about their readiness, e.g., financial, technological, and organizational feasibility [15], [35].

The resource-based view (RBV) of the firm [46] provides a good explanation of how IT relates to firm strategy and performance. Based on the RBV, Wade and Hulland [73] present a valuable typology of information system (IS) resources and their attributes. According to this typology, ETS can be classified as an external relationship management resource, which is expected to have a high value of advantage creation for the firm but with low to medium sustainability. Therefore, early adopters of ETS are likely to be motivated by the adoption benefits, i.e., advantage creation. Late adopters, on the other hand, may be pressured to follow the early adopters in order to offer a similar value to their customers and may therefore be constrained to adopt even when not entirely convinced of the benefits. These firms either have to meet industry standards [6] or must conform to peer firm pressure [54].

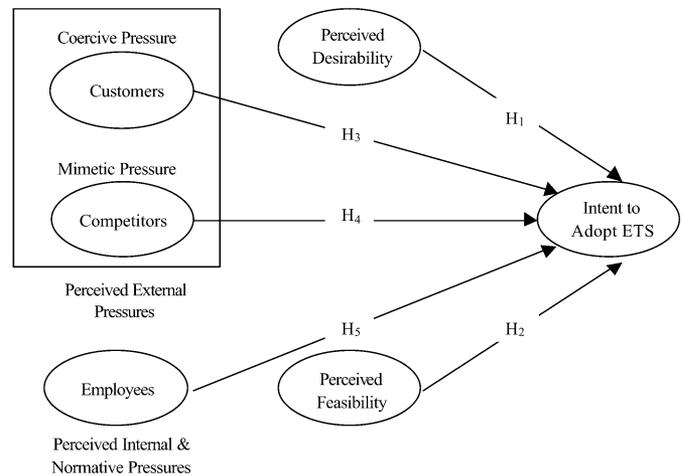


Fig. 1. Research model.

The relative importance of pressures is also dependent on the role of IT. For interorganizational linkages that support relationships with strategic customers and suppliers, the coercive pressures may be more important. Regardless of their relative importance, however, pressures alone cannot explain the organization’s decision to adopt IT. Similarly, efficiency objectives and various constraints suggested by intention-based models are not the only determinants of institutional adoption behavior. We, therefore, rely on both goal-oriented behavior and institutional theories in explaining brokers’ intentions to adopting ETS. As illustrated in Fig. 1, our model stipulates that the organization’s intention to adopt ETS is determined by perceived environmental (i.e., coercive and mimetic) and internal pressures, as supported by institutional theory and by the perceived desirability and feasibility of ETS usage, as supported by goal-oriented behavioral theories, in general, and the model proposed by Shapero and Sokol [61], in particular.

In Shapero and Sokol’s [62] model, perceived desirability and perceived feasibility are the main determinants of intention. Perceived desirability refers to the extent to which the intended behavior (e.g., using ETS) is perceived to be desirable. It corresponds to the constructs of attitude (personal desirability) and subjective norms (social desirability) in the context of individual behavior, i.e., the TPB. In the institutional adoption context, it relates to the anticipated benefits to the organization. Perceived feasibility, on the other hand, refers to the organization’s readiness or ability to undertake the intended behavior. It corresponds to the behavioral control construct in the TPB. Shapero and Sokol’s model was compared to the TPB in the context of entrepreneurship in an empirical study conducted by Krueger *et al.* [39]. The two models exhibited similar explanatory power with Shapero and Sokol’s model having a slightly higher R^2 (0.40) than the TPB (0.35).

A. Perceived Desirability

Perceived desirability refers to the cognitive-based attitude toward ETS resulting from an evaluation of the characteristics of the technology. It refers to the level of recognition of the relative advantage that ETS can provide the organization. As ETS can be considered as an innovation, Rogers’ [60] diffusion of

innovations (DOI) framework supports the significance of perceived desirability. According to the DOI framework, the DOI depends on five characteristics of the innovations, viz. relative advantage, compatibility, complexity, observability, and trialability. Of these five attributes, relative advantage is the only characteristic that has been consistently identified as a critical adoption factor in small firms [22]. Although perceived desirability is influenced by all the characteristics of ETS, its main driver may be the perceived benefits. A higher level of appreciation of the benefits of ETS by decision makers will increase their determination to implement it.

Chwelos *et al.* [15] used a similar construct, i.e., perceived benefits, as a determinant of EDI adoption. Their empirical results showed that although not as important as the effects of external pressure and readiness, the effect of perceived benefits on the intent to adopt EDI was nevertheless significant. Chau and Hui [11] also conceptualized characteristics of the EDI innovation as perceived direct benefits and perceived indirect benefits and reported significant effects of perceived direct benefits on EDI adoption by small businesses. DOI theory and the results of prior studies strengthen our argument for the necessity to account for the effect of perceived desirability in addition to the effects of various forms of pressure even in the context of interorganizational systems. We therefore hypothesize the following.

Hypothesis 1: Higher perceived desirability will lead to greater intent to adopt ETS.

B. Perceived Feasibility

Perceived feasibility refers to the assessment of an organization's ability to successfully implement and use ETS. It captures both internal and environmental practicability. Perceived feasibility is related to both absorptive capacity [19], [42] and organizational readiness [35]. A firm's development of absorptive capacity involves an evolutionary process—the lack of early investment is likely to preclude the later development of corresponding technical capabilities, with the consequent risk of a slide into uncompetitiveness [27]. This suggests that continuous attention to absorptive capacity is critical to a firm's success in adopting innovations such as ETS. Faced with a technical challenge (such as developing ETS capability), organizations may be able to enhance their absorptive capacity by means of internal knowledge dissemination, though the efficacy of this measure depends on employees' familiarity and experience with related practices [42]. Ravichandran [58] showed that organizations that were better positioned to overcome knowledge barriers because of their knowledge stocks were more likely to assimilate complex technologies.

Chwelos *et al.* [15] identified three readiness factors, namely, financial resources, IT sophistication, and trading partner readiness. Their empirical results demonstrated the significance of the positive effect of organizational readiness on the intent to adopt EDI. We expect similar effects in the case of ETS and hypothesize accordingly.

Hypothesis 2: Higher perceived feasibility will lead to greater intent to adopt ETS.

C. Pressures on Institutional Decision to Adopt

Institutional theory suggests that in societies where organizations are generally considered to function as systems, guided by rational rules and activities (cf., [75]), there is an acceptance that it is both legitimate and rational to employ standardized organizational practices and policies in order to achieve organizational goals (cf., [65]). Consequently, there are well-developed expectations as to what practices and policies are reasonable, within the overall organizational environment. Conforming to these practices and policies then becomes an expected form of behavior, since to do otherwise would lead to questions about the legitimacy of the organization and perhaps also negatively affect the organization's ability to function [24], [66].

Schelling [61] observes that such organizations are under pressure to conform to norms of practices and policies that are isomorphic with the environment in which they operate, an environment of organizational responses. This isomorphism includes interconnectedness and structural equivalence [10]; interconnectedness implies that organizations are connected to one or more relationship partners via transactions, and structural equivalence means that these organizations can be considered to occupy "a similar position in an interorganizational network" [65]. In the context of ETS, e-brokerages are connected to their customers (relationship partners) as well as to the Stock Exchange. All e-brokerages share some structural equivalence, given their similar position in the broader interorganizational network.

DiMaggio and Powell [24] identified three types of pressures consistent with the isomorphic environment: coercive, normative, and mimetic. Coercive pressures are effected by customers who urge the brokerage to adopt the ETS. Customers perceive that ETS adoption will improve the quality of the trading process and thereby indirectly bring them benefits.

Normative pressures are associated with norms prevalent in the general business environment and are often indirectly mediated by employees. These norms may not necessarily involve other brokerages but instead reflect the general level of technology adoption by network and Internet service providers, firms in other industries, and technological innovations adopted by government departments and the nonprofit sector.

Mimetic pressures, on the other hand, are directly associated with the behavior of competitor organizations, i.e., other brokerages. If these competitors have decided to adopt ETS, then this will create a mimetic pressure for a brokerage to follow suit, simply so as not to be left behind and thus be seen as a technological laggard. Consequently, the coercive and normative pressures are usually considered to be related to the interconnectedness of organizations, whereas the mimetic pressures are associated with the structural equivalence of competitors.

D. Coercive Pressures

DiMaggio and Powell [24] suggest that coercive pressures are exerted by organizations or other entities with which the recipient organization is in a relationship of resource dependence. In the case of ETS, e-brokerages have such a relationship with their customers; without customers, they have no business. A similar argument can be made for the e-brokerage's suppliers, but these are the exchanges via which they buy trades. The number of

suppliers is low, in some jurisdictions it may be only one, and each supplier controls a unique and limited part of the market. If an exchange mandates the use of ETS, then this would be a highly influential coercive pressure. In the context of this paper, however, ETS was offered as an alternative channel without any pressure from the Hong Kong Stock Exchange on brokers to adopt it. The pressure from customers, on the other hand, is significant. Given that switching costs in an electronic business context are generally considered to be low (see [12] for a concise review of the literature), retaining customer accounts is of paramount concern for the successful e-brokerage. Customers can thus be considered to function as a form of resource-controlling entity, and e-brokerages must comply with the coercive pressures exerted by customers in order to secure their own survival [51].

Hypothesis 3: Greater coercive pressures from customers will lead to greater intent to adopt ETS.

E. *Mimetic Pressures*

Mimetic pressures are those that suggest the importance of imitating or copying the practices of competitors. In effect, mimetic pressures push organizations to conform with the industry practices of their significant competitors. In this paper, the practice can be considered as the use of ETS for trading purposes. If competitor e-brokerages are using ETS, then this exerts a mimetic pressure on other e-brokerages to do so as well. As increasing numbers of e-brokerages adopt ETS, so the mimetic pressure on the others to change will increase (cf., [47]), in part out of a concern not to be perceived as being technologically less sophisticated. Furthermore, if a practice adopted by some organizations is notably beneficial or successful, then this is likely to increase the salience of the practice and hence the associated mimetic pressure [32].

Burt [10] suggests that organizations are subject to mimetic pressures if they are structurally equivalent, share similar goals, compete to share similar customers, and experience similar operating or resource restrictions or constraints. Furthermore, quite apart from the pragmatic aspects of mimesis discussed, an organization may also respond to mimetic pressure if it sees that it can gain kudos or social legitimacy by so doing, e.g., if it is seen to follow the practice of a dominant or influential player in the market. Mimesis can also be associated with the need to avoid first-mover risks [44], which is often a concern of SMEs.

Hypothesis 4: Greater pressure to imitate competitors will lead to greater intent to adopt ETS.

F. *Normative and Other Internal Pressures*

Internal pressure from employees, which often reflects normative values or practices prevalent in the general business environment, can be considerable. In an interorganizational context characterized by high levels of communication between employees working for different organizations, covering a range of industry types including government, education, and the nonprofit sector, there will be considerable informal sharing of norms between organizations. Employees may then be in a position to exert pressure on their employing organization

to adopt a technological innovation, such as ETS. In this way, they should not be seen as working for an organization that is technologically less sophisticated, a characteristic which might exert a negative impact on their future employability. This is believed to be a form of normative rather than coercive pressure, since employees are not traditionally seen as being in a resource-control relationship with their own employer.

Employee pressure can also be manifested in nonnormative ways if, for example, it is perceived that access to a technology such as ETS will result in enhanced work performance [5], [72], [79]. The perception in this case is often associated with a performance gap, i.e., in the current technology impoverished environment, it is difficult to achieve a desired level of work performance or productivity. Obtaining access to the technology enables the gap to be bridged, thus enabling the employee to be more effective in his/her work.

Hypothesis 5: Greater employee pressure will lead to greater intent to adopt ETS.

IV. METHODOLOGY

The research methodology consisted of two stages: 1) belief elicitation and 2) survey of intentions and beliefs. The purpose of the first stage was to elicit salient beliefs of senior managers (decision makers) of small-sized brokerages that are currently using ETS regarding specific benefits and risks contributing to their assessment of the overall desirability of ETS for their companies. The belief elicitation process involved semistructured interviews with 20 managers. The participants were asked open-ended questions regarding the main consequences of using ETS, both positive and negative. At the end of each interview, the answers were summarized and reconfirmed. Based on a comprehensive literature review and on a reconciliation of the answers obtained in the semistructured interviews, we identified seven desirability factors, i.e., cost, transparency, speed, volume and accuracy of transactions, order management, and security. We used these as formative items for measuring perceived desirability. All other constructs, i.e., intention, perceived feasibility, customers pressures, employees pressures, and competitors pressures were measured with reflective items adapted from previous research (e.g., [15] and [62]) and validated through the item-sorting procedure of Churchill [14]. All items (see Table I) were measured with seven-point Likert scales, ranging from strongly disagree to strongly agree.

In the second stage, a survey instrument was constructed, pretested, and then administered to senior managers of brokerages that have not yet adopted ETS. We targeted brokerages with 50 employees or fewer, since in Hong Kong, a firm that is not in the manufacturing sector is considered to be an SME if it has 50 employees or fewer [72]. We could not use multiple informants from each firm, since, in SMEs, important decisions such as the adoption of ETS are usually made by a single individual. In fact, we asked the respondents to answer the survey only if they were the sole decision makers regarding the adoption of ETS. We approached 500 brokerages in Hong Kong (the total number of registered brokerages with less than 50 employees). We received 114 responses of which 92 were usable. To check

TABLE I
MEASUREMENT MODEL

| Reflective Constructs | | Loading | Std. error | t-statistic |
|--|--|---------|------------|-------------|
| Intention $\rho = 0.958$ | Contemplating to adopt ETS in a year's time | 0.9502 | 0.0120 | 79.47 |
| | Likely to adopt ETS in a year's time | 0.9408 | 0.0122 | 77.05 |
| | Expect to adopt ETS in a year's time | 0.9287 | 0.0162 | 57.33 |
| Internal & Normative Pressure --- Employees $\rho = 0.959$ | Our employees believe that we should use ETS | 0.9457 | 0.0131 | 72.41 |
| | Our employees believe that ETS are the norm in our industry | 0.9412 | 0.0109 | 86.03 |
| | Our employees believe that using ETS is beneficial to them | 0.9373 | 0.0117 | 80.36 |
| Coercive Pressure --- Customers $\rho = 0.934$ | Customers that matter to us believe that we should use ETS | 0.9202 | 0.0132 | 69.91 |
| | We may not retain our important customers without ETS | 0.8925 | 0.0213 | 41.93 |
| | Customers that are crucial to us encourage us to use ETS | 0.9133 | 0.0220 | 41.47 |
| Mimetic Pressure --- Competitors $\rho = 0.964$ | Competitors that have adopted ETS benefited greatly | 0.9358 | 0.0133 | 70.46 |
| | Competitors that have adopted ETS are perceived favorably by customers | 0.9501 | 0.0113 | 83.90 |
| | Competitors that have adopted ETS are more competitive | 0.9590 | 0.0068 | 141.2 |
| Feasibility $\rho = 0.857$ | We have the resources required for using ETS successfully | 0.8554 | 0.0499 | 17.15 |
| | The effective usage of ETS is well within our control | 0.8271 | 0.0548 | 15.10 |
| | We have all the support we need for using ETS | 0.7634 | 0.0786 | 9.708 |
| Formative Construct | | Weight | Std. error | t-statistic |
| Desirability | Cost | -0.3394 | 0.1545 | -2.197 |
| | Security | -0.2650 | 0.1814 | -1.46 |
| | Transparency | 0.1868 | 0.1608 | 1.16 |
| | Transaction Speed | 0.5164 | 0.1084 | 4.76 |
| | Order Management | 0.2646 | 0.1141 | 2.31 |
| | Transaction Volume | 0.4086 | 0.2367 | 1.72 |
| | Transaction Accuracy | 0.3043 | 0.1158 | 2.62 |

for possible response bias, we compared early with late respondents [4]. The last 25% to submit their response were considered to be late responses and were deemed to be representative of firms that did not ultimately respond to the survey [43]. We then compared the means of all items for the two groups and could not detect any significant differences, as determined by t-tests at the 5% significance level. At the time of the survey administration, the penetration of ETS was only 20%. Therefore, the targeted respondents are neither early nor late adopters. This constitutes a good context for testing the simultaneous effects of rational factors and pressures.

V. RESULTS AND ANALYSIS

Fig. 2 shows the results of the partial least squares (PLS) analysis, including both the structural model and the formative measurement model. In the structural model, the test of each hypothesis can be mapped to a specific path. The estimated path coefficients are given along with the associated t-statistics. The R^2 is given next to each dependent construct. For all constructs, all of the reflective items had high loadings, demonstrating convergent

validity. Furthermore, all items were found to be significant (almost all at the 0.01 level). Table I presents the loadings, standard errors, and t-statistics of the items for their respective constructs and the composite reliability measures. The composite reliability scores of all constructs are higher than the recommended value of 0.80 [50], demonstrating internal consistency. Table II presents the discriminant validity statistics. The square roots of the AVE scores (diagonal elements of Table II) are all higher than the correlations among the constructs, demonstrating discriminant validity.

Our discussion of the structural model (hypothesized relationships between constructs) is organized around the endogenous variables and formative items. First, it is notable that 67.5% of the variance in the model is explained. This compares very favorably with the models developed by Teo *et al.* [65] (33.2%) and Chwelos *et al.* [15] (31.8%). The Teo *et al.* [65] model only considered pressure, without taking desirability or feasibility into consideration, whereas the Chwelos *et al.* [15] model considered readiness, perceived benefits, and external pressure, but not internal or normative pressure. Furthermore, all five hypotheses proposed in this paper are supported by the data we

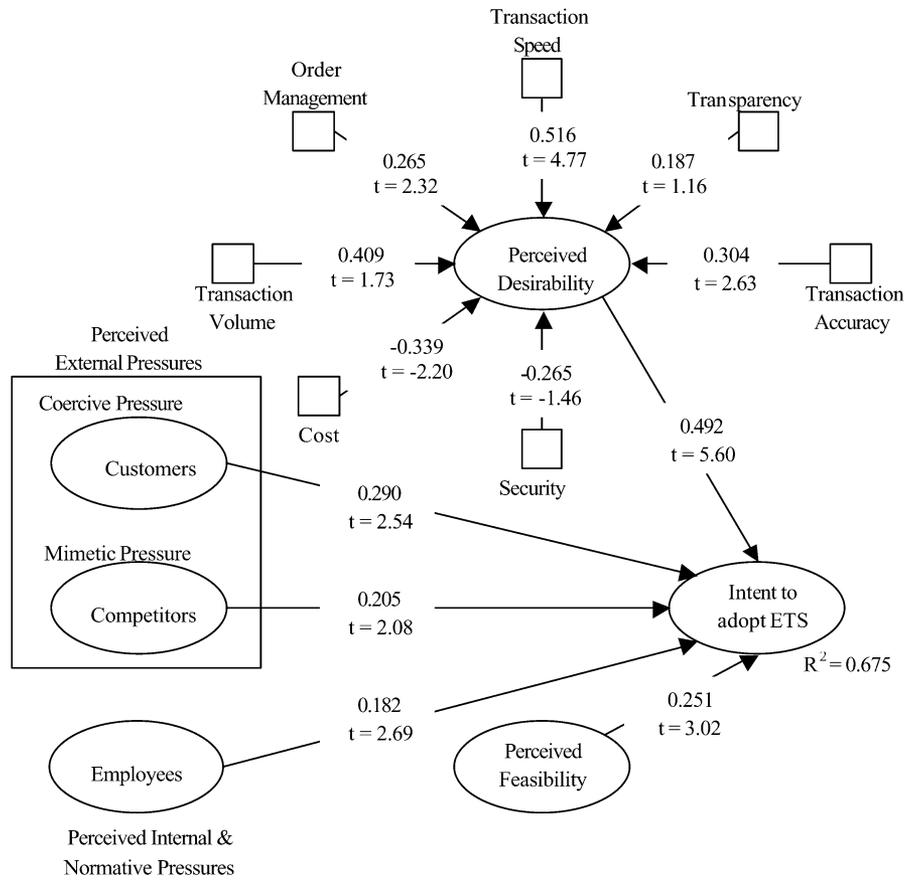


Fig. 2. PLS model.

TABLE II
CORRELATIONS AMONG CONSTRUCTS AND SQUARE ROOT OF AVES (DIAGONAL)

| | Intention | Internal/Normative Pressures | Coercive Pressures | Mimetic Pressures | Perceived Feasibility |
|------------------------------|-------------|------------------------------|--------------------|-------------------|-----------------------|
| Intention | 0.93 | | | | |
| Internal/Normative Pressures | 0.67 | 0.94 | | | |
| Coercive Pressures | 0.60 | 0.38 | 0.90 | | |
| Mimetic Pressures | 0.67 | 0.56 | 0.64 | 0.94 | |
| Perceived Feasibility | 0.52 | 0.56 | 0.64 | 0.62 | 0.81 |

collected, indicating the importance of perceived desirability, coercive pressure from customers, perceived feasibility, and the effect of internal and normative pressures exerted by employees.

Perceived desirability has the highest effect of all the endogenous variables with a magnitude of 0.492. This provides strong support for our argument that goal-oriented behavioral theories should be integrated with institutional theories of technology adoption. It also suggests that pressure alone will not determine institutional adoption of technology—the desirability, including an assessment of both benefits and drawbacks, is of significant importance. This situation contrasts markedly with the study reported by Chwelos *et al.* [15] where perceived benefits (draw-

backs were not included in the study) constituted the least important variable. We explain this by considering the precise context of the two studies. In the EDI context, both suppliers and customers may exert coercive pressure on the firm, explaining the prominence of external pressure. In the context of our paper, however, the suppliers did not pressure the adoption of ETS, as explained earlier. This may, in part, explain the relative importance of perceived desirability.

Coercive pressure from customers is the second strongest driver of the intention to adopt ETS with a magnitude of 0.290. While perceived desirability is evidently critical, the pressures that customers can bring to bear cannot be ignored, given the

relatively low switching costs for customers in a market with many competing e-brokerages. Aligned with coercive pressure is mimetic pressure, as exerted by competitor firms, with a magnitude of 0.205. While this is not a strong driver, it is nevertheless a significant one. If some competing e-brokerages adopt more advanced technology such as ETS, then the industry as a whole will be driven to move up a notch in order to compete effectively. Failure to do so means risking a loss of new customers who judge that one e-brokerage is technologically less sophisticated compared to others.

Perceived feasibility is the third strongest driver of the intention to adopt ETS with a magnitude of 0.251. This is of similar importance to the functionally comparable "readiness" measure (0.272) used by Chwelos *et al.* [15]. Feasibility taps into issues associated with the extent to which the organization has the financial and operational resources to engage in technology adoption. The importance of those resources, and hence of feasibility, is recognized by the individuals surveyed in this paper.

Finally, the effect of internal and normative pressures exerted by employees is smaller in magnitude, 0.182, but is nevertheless significant. As we suggest, employees may exert normative pressure on their superiors to acquire ETS, comparing their situation with that of their peers in competitor firms, or they may argue that their own work performance could be enhanced if the ETS was available. This twofold pressure evidently does exert a significant impact on senior managers' intention to adopt ETS, suggesting that the role of employees in influencing technology adoption decisions must be taken seriously and, in addition, addressed more explicitly in future research.

Turning now to the formative measures associated with the perceived desirability construct, five measures are found to be significant, viz.: transaction speed, transaction volume, cost, transaction accuracy, and order management. Two measures were found not to be significant, security and transparency. Transaction speed is the most important contributing item toward perceived desirability with a score of 0.516. ETS evidently have very considerable potential for speeding up the rate at which transactions can be conducted and this is a desirable outcome for e-brokerages. Closely associated with transaction speed is transaction volume (0.409), another key measure of the likely profitability of an e-brokerage as well as its competitiveness. Transaction accuracy (0.304) is also rated positively here, as electronic transactions are perceived to be more accurate than those conducted through voice-oriented media such as telephone or open outcry systems. Order management (0.265), which is associated with the handling of transaction from order to execution, is also perceived as a significant factor.

Cost is also a significant desirability factor with a score of -0.339 . Cost here refers to ownership cost, including the acquisition, operation, and maintenance of ETS. These costs are seldom seen as being justifiable to senior managers in e-brokerages. This is a common situation, especially in bricks + clicks e-commerce, where electronic channels represent an additional channel for communication rather than an exclusive channel (as in pure e-commerce).

The only desirability factors that do not have significant effects are security and transparency. A possible explanation for the insignificance of the security factor is that a high level of

security has already been built into financial trading systems and so that security is no longer a major concern for managers. Moreover, the people most likely to use ETS at this stage are very likely to be technically competent already. As the profile of ETS users changes, so the attitude toward security may change. This is an issue worth monitoring in the future. Where transparency is concerned, the participants in the belief elicitation process reported it as a possible concern, but the majority of respondents do not share that view. This may, in part, relate to the absence (so far) of a major problem such as a questionable transaction, a confused audit trail, or a significant security breach. When such events do occur, attitudes toward transparency may well be reconsidered.

VI. FUTURE RESEARCH, LIMITATIONS, AND CONCLUSIONS

Prior research (e.g., [55] and [57]) has noted the importance of top management support for the successful adoption of technological innovations. Much of this research, however, has targeted larger organizations. Future research can usefully test the extent to which top management support is also critical in the case of SMEs and specifically ETS. This focus on top management support, however, is juxtaposed by our finding that employees also exert a significant influence on the decision to adopt ETS. The role of employees in influencing IT adoption is a topic worthy of future research investigations in other contexts.

A weakness of our paper that should be addressed in future research is the distinction between internal normative pressures (captured in employee pressures) and external normative pressures (norms prevalent in the general business environment). Furthermore, we caution against generalization of the results of this research beyond the cultural context of Hong Kong, where the research was conducted, and the adoption of IT in the organizational and industry-specific context of small-sized e-brokerages.

A further direction for future research involves a longitudinal study of the benefits that actually do occur when these technological innovations are adopted. While our study indicates the overriding importance of perceived desirability, which corresponds to the perceived benefits expected to be realized from adopting ETS, it is necessary to ascertain whether these benefits are in fact achieved. This would involve ascertaining whether the attributes of desirability were realistically perceived and modeled.

In this paper, we have developed the theory for SME adoption of IT further and test it empirically in the context of ETS. Important theoretical and practical implications follow. The model developed explains some 67% of the intention to adopt ETS. All five hypotheses tested in the research are supported, with the perceived desirability of adopting ETS, the coercive pressures from customers, and the perceived feasibility of adopting ETS having the strongest effects.

On the theoretical side, this paper demonstrates the need for the simultaneous consideration of the rational drivers of goal-oriented behavior along with the internal and external institutional pressures in explaining the organization's adoption of IT. Firms do not adopt IT uniquely as a response to coercive, mimetic, and normative pressures from external and internal sources. They are

also strongly motivated by the perceived desirability and feasibility of the technology under consideration. In the case of ETS, which is an electronic linkage with suppliers, coercive pressures are of less importance than the perceived consequences of ETS adoption. In other contexts, i.e., EDI, coercive pressures may be more important. Although the relative importance of the various factors may differ depending on the context, their significance remains unchanged. It is therefore important to have a more comprehensive model, such as the one developed and tested in this research, to account for the contingencies of different contexts.

On the practical side, the belief elicitation coupled with the survey study identified the main consequences of using ETS, as perceived by decision makers. The drivers of ETS adoption include transaction speed, transaction volume, transaction accuracy, and order management. Cost is perceived to be the main obstacle. Security is not considered to be an important concern at this stage, though this may change as the ETS-user profile changes with time. The significance and relative importance of the desirability factors should be of great interest for ETS vendors. They can also provide guidelines to ETS adopters for benchmarking and evaluation purposes.

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