A Virtual Market for Teaching Electronic Market Concepts in Information Systems Education

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ABSTRACT

The Internet has radically altered the context in which business information systems are deployed. Before the Internet, the study of information systems focused on intra-company systems and decisions. Internet connectivity has brought a new focus on markets, market systems, and market-oriented decisions. This new focus on reactive markets requires new teaching methods that can model the behavior of markets and the role of information and information systems in markets. We present an e-market simulation as a means for teaching market-oriented information systems concepts.

Keywords: electronic markets, e-markets, simulation, economics of information

1. INTRODUCTION

Electronic markets are now an integral part of information systems education. The success of online exchanges makes this topic relevant to business. B2B markets such as Covisint in the automotive industry, Exostar in aerospace, ChemConnect in chemicals and plastics, GlobalNetXchange in retail, and e2open for global outsourcing have generated approximately $823B USD in global B2B e-commerce activity in 2002, estimated to grow to between 4 and 8 trillion by 2005 (Butler, 2002). The success of B2C markets such as eBay (also consumer-to-consumer), Priceline, Amazon and Travelocity has demonstrated the transformational potential of electronic markets. However, there have been many widely publicized failures in both B2B and B2C markets including Enron's power trading market, eToys' retail market and Napster's online music distribution which suggests that there is still much to learn about designing electronic marketplaces to operate efficiently and effectively. This paper reports our use of a market simulation tool in which students play the roles of buyers and sellers in a marketplace.

In this section we will elaborate on why we think markets should be incorporated into the IS curriculum, and what the challenges are of doing so. Section 2 provides a brief overview of a typical real market, and our own market simulation software. In Section 3 we provide three illustrations of how to use VM to explore concepts of the value of information in electronic markets. Section 4 discusses the use and value of VM in the IS classroom.

1.1 E-Markets and Information Systems

The inclusion of electronic markets as a topic in the IS curriculum requires a subtle shift in our perspective of the application of information systems theory to business. Prior to the Internet, the subject of Information Systems was about managing systems that deliver useful information in a business setting. Within that context, we could teach about management systems and about functional systems. The first area, which includes such topics as decision support systems and data mining, emphasizes the value of information in the context of semi-structured business decisions. The second topic, which includes transaction processing, enterprise resource planning, and other systems, emphasizes the systems themselves, their functions, and their management. In the pre-Internet era, the context of management systems regarded an individual decision-maker facing "states of nature", while the context of functional systems regarded transactions within a company or with a small number of fixed partners.

Since the Internet revolution, the academic field of Information Systems has paid significantly more attention to a third area: markets and economics. As Bakos (1998) discusses in his popular article on the impact of the Internet on markets, markets create economic value for buyers, sellers, market intermediaries and society at large. They serve to match sellers and buyers, facilitate transactions, and provide an institutional infrastructure for exchange. The Internet increases personalization and customization of product offerings, lower the buyer's search cost, enables new types of price discovery, and improves information sharing between buyers and sellers.

All these effects represent new topics of IS research. They have also redefined the traditional IS topics of functional business systems and management level information systems. Regarding management information systems, decision-makers in the Internet era need information not only about non-reactive states of nature, but also about markets, including information about many other active and reactive players. Regarding functional business systems, these have radically changed since the pre-Internet era. For example, many business-to-business transactions take place through a third-party or consortium exchange – a market – rather through one-to-one EDI. For these reasons, IS *research* has turned its attention to the study of markets.

1.2 Teaching E-markets

Incorporating electronic markets into the IS *teaching* curriculum presents significant challenges.

1.2.1 The Conceptual and Practical Challenges: The conceptual challenge is that these situations are more difficult to formalize – i.e. to teach – and to learn. Markets are dynamic, and the other players are reactive. In this context, describing the business situation – the problem for which a system is offered as part of the solution – means describing a market's behavior. This is conceptually and mathematically more complex than describing the sorts of static business problems that information and information systems traditionally address, e.g. an inefficiency or the need for decision support.

Concepts from many disciplines can help to meet this conceptual challenge, but economic theory is particularly helpful. For example, economic theory treats the many kinds of price discovery mechanisms – e.g. various kinds of auctions – that are now implemented in online markets. It can also characterize and predict the profits of market participants, the value of information, the impact of reduced search costs, and other issues. For this reason, our simulation game adopts some concepts from economics, and the lesson plans we outline below also reflect this orientation.

The practical challenges stem from the conceptual one. First, most introductory courses in e-commerce cover a broad set of topics. The time devoted to e-markets is limited and these more difficult concepts must be explained briefly and effectively. Second, the economics background of e-commerce students may vary. As Information Systems lecturers we may *wish* to emphasize the practical effects of information and information systems in markets, but some knowledge or discussion of economic theory – or some other language with which to characterize market behaviors – is necessary. In short, the dynamics of a multiple-player market scenario are more difficult to teach.

There are many resources available to assist the e-commerce instructor in the teaching of e-markets. Commonly used resources include teaching cases, academic and business articles and book chapters. Hands-on methods are also not widespread, since this requires development of multiple-player market simulations; but this is the direction of the simulation game reported here. In this paper we discuss the use of market simulation to engage students in the discussion of basic and complex concepts of market behavior and the role of information systems in markets.

1.3 The Value of Simulation Tools

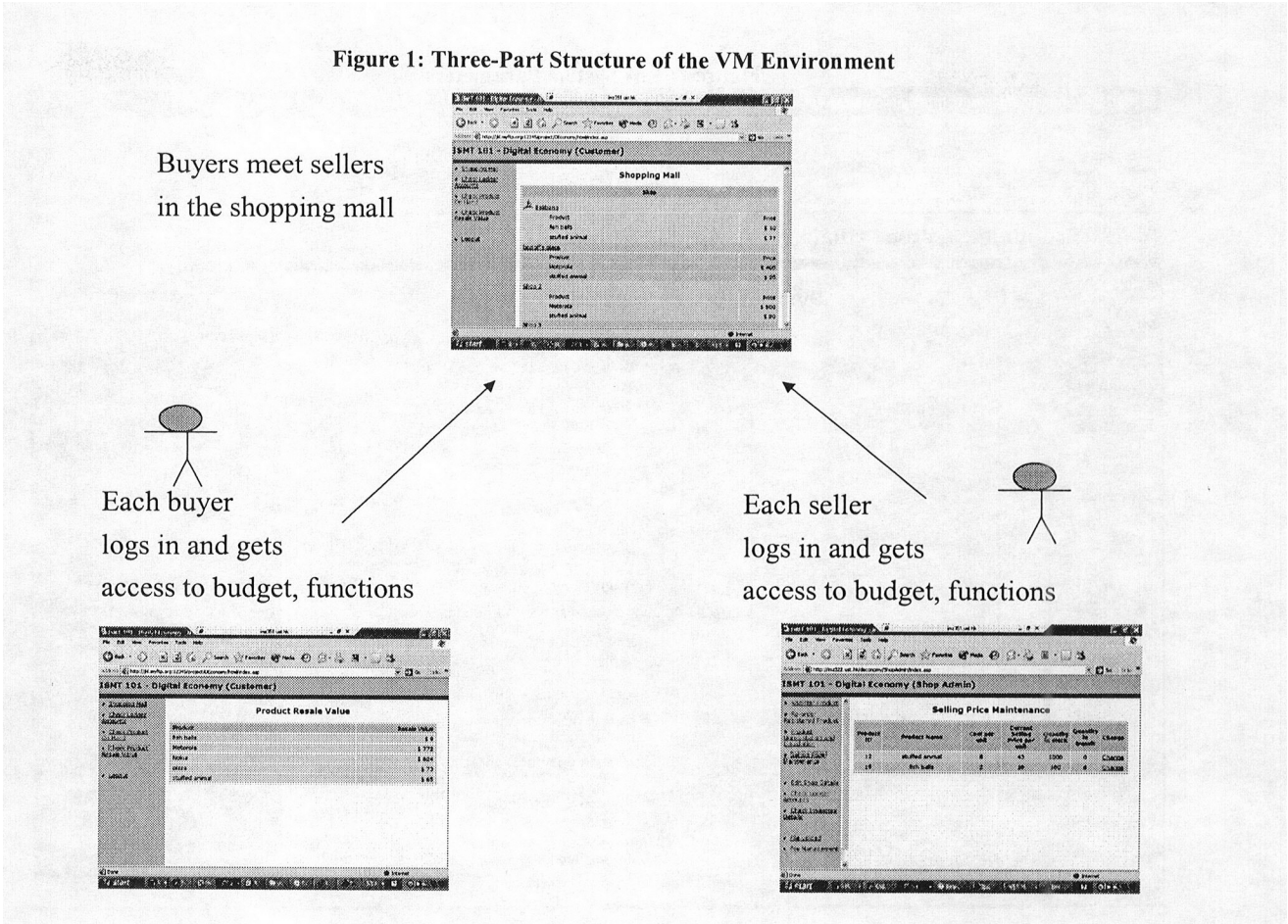
Simulations present students with the opportunity to engage in a dynamic business activity where they can experience the consequences of their decisions in a controlled learning environment. From the perspective of corporate recruiters seeking graduates who can demonstrate "real-world" decision-making abilities, simulations help to address the need for students who have experienced the complexity, uncertainty and ambiguity of real-world business (Chapman and Sorge, 1999). Simulations can assist instructors to identify gaps in student understanding, increase participation and interaction and increase student interest (Ironside et al., 2004). Chapman and Sorge (1999) found that students ranked simulations above textbook and articles across the board on learning-related measures.

The value of simulation software has been recognized in the teaching of economic concepts (e.g. Ironside et al., 2004). In addition to improving student decision-making and analytic abilities (Cadotte, 1995) simulations are effective in demonstrating complex concepts (Windrum, 1999). There is a wide range of simulation tools available for economists (e.g. Murphy, 2004; Holt, 2004). For instance, Holt provides market simulations to demonstrate concepts of call markets, double auction markets, posted-offer markets, vertical monopoly markets, etc. However, many of these experimental economics tools are specific to the teaching of economics within the economics curriculum. From the point of view of Information Systems education, they are too focused on demonstrating economic theory per se.

There are several recent studies that have explored web-based e-commerce simulation tools. Ngai (2004) uses a simulated electronic mall to engage students in role-playing. Through acting out various roles in the simulation students were introduced to e-commerce concepts and gained hands-on experience in the design and administration of an e-commerce. Dhamija et al. (1999) describe an e-market experience in which students designed and developed components of a functioning online market. We view our work as continuing in this research stream but distinguished by its focus on the economic aspects of e-markets, including the economic effect of search costs, the value of information, and other effects discussed below.

The user-friendly system we report here, Virtual Market (VM), represents a small step in the direction of deepening the integration of market concepts into the IS curriculum, with more of an IS viewpoint. The virtual environment is elementary. The simplicity helps to focus on the effects of various kinds of market information, within the constraints of an e-commerce course. The aim is to give students first-hand experience with operating in a market, and with the role of information in the market.

Figure 1: Three-Part Structure of the VM Environment



2. VIRTUAL MARKET

2.1 Overview

Markets have three main functions: they match buyers and sellers; they facilitate transactions of goods, services and information; and they provide an institutional infrastructure (Bakos, 1998). A key aspect of the matching function is price discovery, a process that allows participants to discover the price at which demand and supply "clear". In some markets, this is done using auctions. In others, sellers simply post their prices.

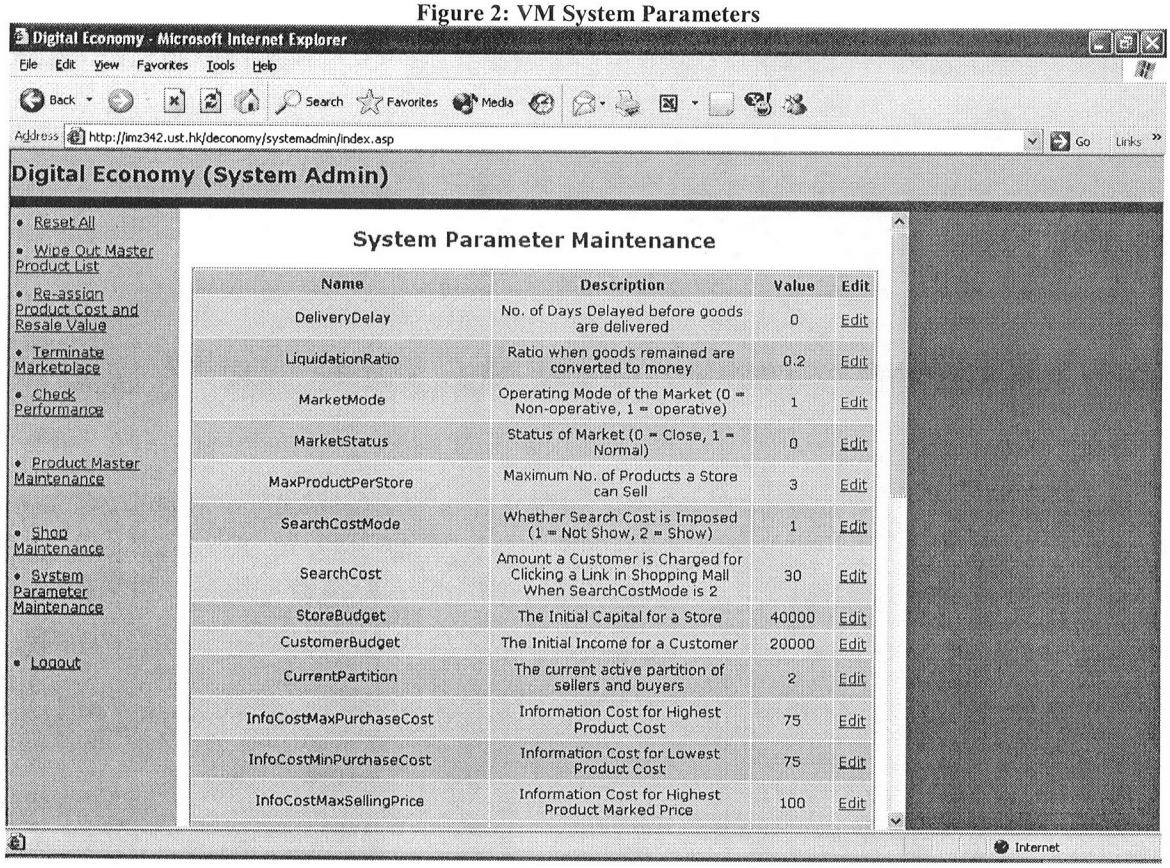
Electronic markets, especially Internet-based markets, serve the same functions as traditional markets, though they differ in meaningful ways. One key difference is that the matching and transactional functions are separated from the physical logistics (Kambil and van Heck, 2002). This raises questions of trust and quality assurance, since the market participants cannot see the physical products or even one another, and it allows participation of a more varied and far-flung pool of participants. Another difference is that information is seamlessly available on the same channel where the transactions will ultimately take place. Our simulation game shares these properties with online markets. A final difference is that the owners of the market can then mine the transactional data to provide more personalized services. Our tool can be extended in this direction, as it does record all the transactional data in a relational database, but our current implementation does not provide these personalization and data mining facilities.

Electronic markets vary on many features. Our particular simulation game is perhaps most comparable to B2C markets such as Amazon.com or B2B markets such as Covisint. These exchanges allow multiple sellers to offer their wares using the pricing method of posted prices, as opposed to auctions. In addition, these exchanges provide searching functions to allow comparison shopping across vendors – Bakos' matching function – and they support all the ordering and billing transactions, so that the buyer and seller transact through the exchange's system – Bakos' transactions function.

In our game, the instructor can adjust a variety of market parameters, especially those pertaining to the matching function. In this way, the game can be used to simulate a pre-Internet market with high search costs, as well as Internet markets that vary in the availability of information and ease of search. We will see below some sample lessons that can be taught.

Figure 1 illustrates the basic structure of the virtual market. The instructor assigns each student to play the role of a buyer or a seller in one large market. User-friendly Web-based software then allows each student to log in and play

Figure 2: VM System Parameters



his/her role. Each of an unlimited number of players logs in, whether as buyer or seller, and makes choices. Sellers must choose products to order from manufacturers, and must set prices, among other decisions. Buyers decide where to shop and what and when to buy. All players are aiming to maximize profits, as we shortly explain.

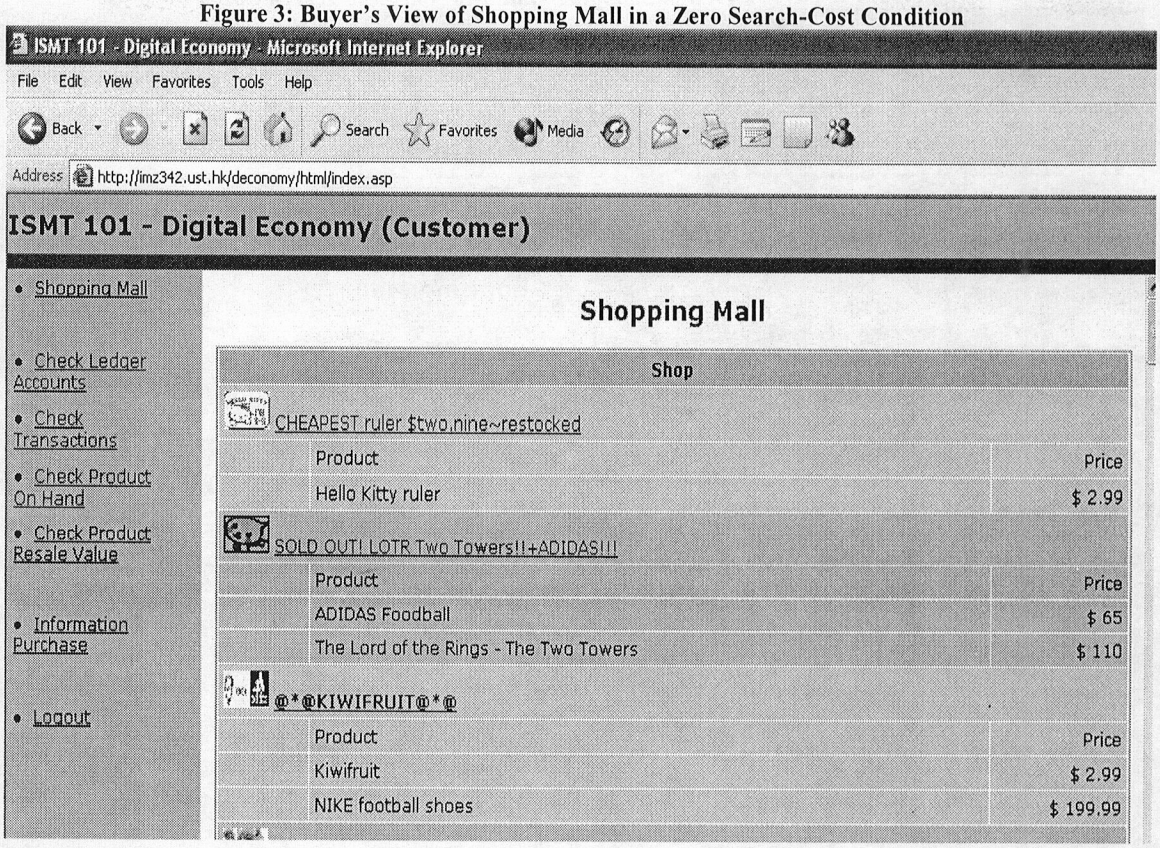
In the VM marketplace the products are not real. Rather, we use the method of induced values, borrowed from the field of experimental economics. Induced values are a method of getting subjects in a fake situation to behave as they might in a real situation. Our subjects don't really buy products, e.g. VCRs, toys, etc. to enjoy. Instead, a buyer gets points for each product he/she buys. These points are called induced values, and the buyer needs to maximize these points (minus the fake money he/she spends, which is also counted as points). It is the same for sellers. One may think of our simulated dollars as points, which players seek to maximize. To make a virtual profit, a seller must sell at a price above his/her cost. Symmetrically, to make a virtual "profit", a buyer must purchase at a price below his/her value. For example, if there is only one buyer and one seller, the instructor might assign a cost of $5 per unit to the seller and a value of $8 to the buyer. In this case there is $3 – or 3 points – surplus available and the only question is how the two players will divide it. Of course, with many players in an imperfect market, the total available surplus will not usually be realized. The percentage of available surplus (profits) that is realized is called the market's efficiency, ranging from 0 to 1.0.

Ultimately, sellers place items for sale at a posted price that they can change at any time, and consumers go to a shopping mall to find sellers' shops. The instructor sets a number of important parameters and these determine the decisions faced by all players, and the lessons to be learned. Figure 2 shows the page on which the instructor chooses parameter values and other options.

One pair of salient parameters is "SearchCostMode" and "SearchCost". With these parameters, the instructor determines whether buyers who go to the shopping mall need to pay anything in order to compare prices across stores (zero search costs), or whether a fee is charged for visiting each store and discovering its private price (nonzero search costs).

If the administrator chooses to set search costs to zero, then buyers can see each store's posted price for every product just by browsing through the shopping mall. Figure 3 depicts this condition, which resembles Web sites such as www.shopper.com. On the other hand, if the administrator sets the search cost as non-zero then buyers incur a search

Figure 3: Buyer's View of Shopping Mall in a Zero Search-Cost Condition



cost each time they enter a store, whether or not they choose to make a purchase. Figure 4 depicts a situation in which a buyer clicked on the link to enter a store in order to see its offerings, and is warned that entering the store incurs a cost. This can be understood as a travel cost, as it is incurred once for each time a buyer wants to enter a store.

Other parameters determine the cost of market information that both buyers and sellers can purchase, e.g. information about the distribution of sellers' costs, etc.. In the following section we will discuss how we utilize these parameters in lessons.

To conclude our overview of the system, we note that VM is designed to touch on other aspects of business, besides information systems, in an effort to maintain an applied and business orientation. First, the instructor can set a number of parameters to introduce issues in operations management. For example, the instructor can set a deliver-delay parameter. The effect is that shop owners who buy inventory to sell in their stores do not receive the goods immediately but only after the specified delay. This one parameter introduces supply-chain notions reminiscent of the beer game, a participatory simulation used to illustrate the value of sharing information across the supply chain (Sterman 1989). In addition, the instructor can specify a liquidation value, which is the percent of the original cost of the goods that the store-owner can recover for unsold goods. This aspect illustrates a real-world business situation where sellers are limited in the number of different products they can carry at any one time, and if they wish to change their product mix, they must first liquidate their current product at their liquidation value.

The system also touches on accounting. The database is designed to reflect proper accounting T-accounts. For example, Figure 5 shows a shop owner's view of his/her ledger accounts. The initial infusion of capital was $40,000, the shop owner bought inventory for $155 and $350, respectively, and made one sale for $22. This attention to accounting details is an effort to maintain the applied business orientation of the market simulation.

3. USING VM TO ILLUSTRATE MARKET CONCEPTS

In this section we show how we use VM to teach three concepts in electronic markets. In order to help them make good (profit-making) decisions, both buyers and sellers can purchase information. The first lesson (Section 3.1) highlights that in the context of reactive e markets, useful information is about other players in the market. This differs from a traditional decision-support context, in which

Figure 4: Buyer's View of Shopping Mall with Non-Zero Search Costs

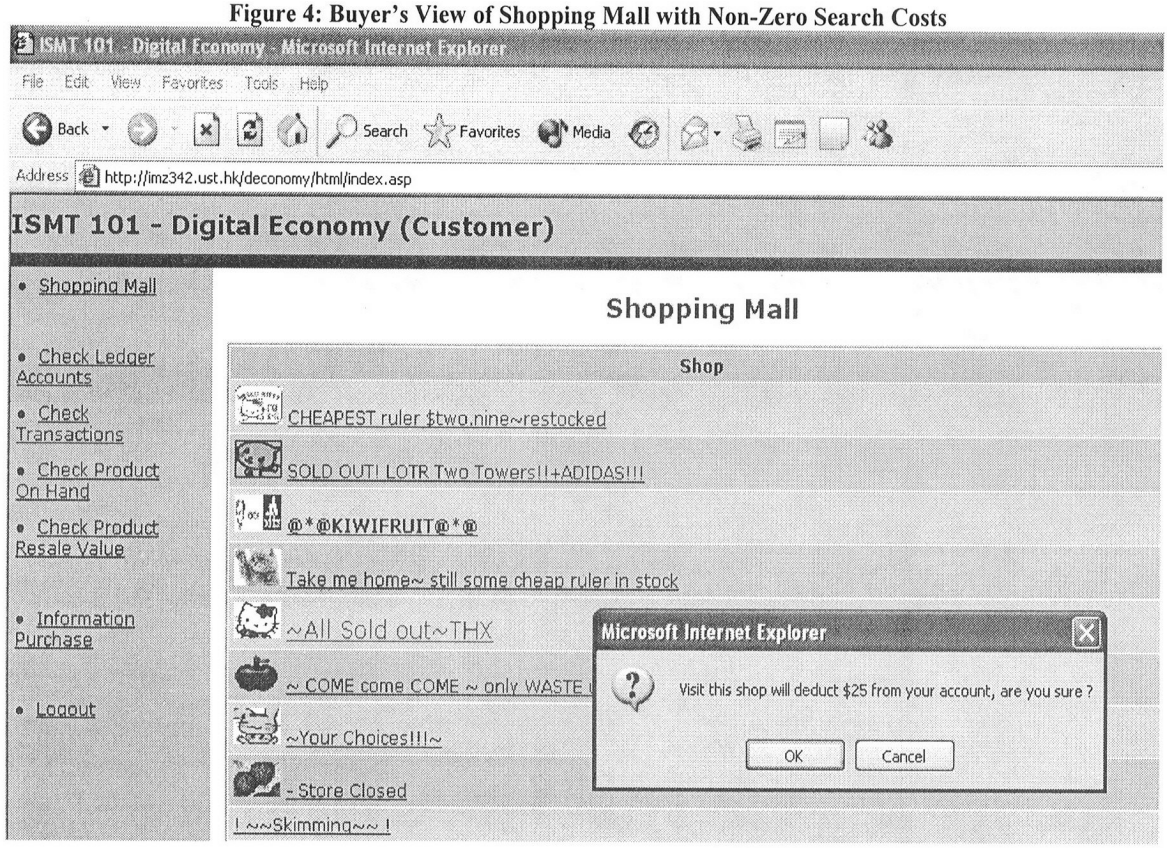
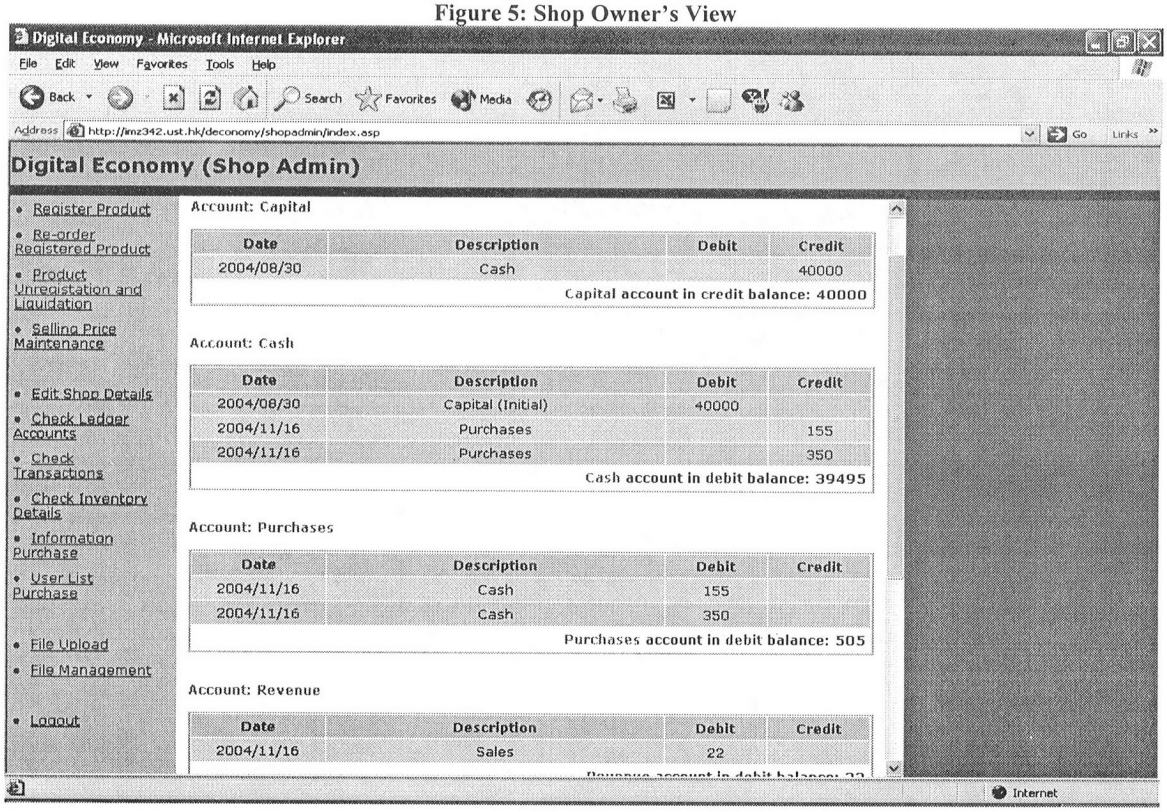


Figure 5: Shop Owner's View



useful information is about the "states of nature". The second lesson (Section 3.2) takes this one step further, by requiring buyers and sellers to decide practically, how much they would be willing to pay for various kinds of information. The third lesson (Section 3.3) shows that where the marketplace is itself an information system, system details affect market structure and directly affect the fortunes of market participants.

The following three sections explain how the VM helps to teach these lessons.

3.1 Two-Sided Information in an Electronic Market

In our virtual market there can be a wide variety of products available but a limit on the number of products each store can carry. So sellers face a most basic strategic decision: *Which product(s) to sell?* What information does a seller need in order to determine which products promise the highest profits?

In our game, any product is more profitable to the seller if its profit margin is higher. From the point of view of economics, this means that a seller can benefit from any information that helps to predict each product's equilibrium price. This includes each product's market demand, as well as other sellers' costs for each product, i.e. supply. Intuitively, even if we choose not to introduce the formality of equilibrium price, a product's profit potential to a seller depends both on the product's market demand, as well as on his/her relative price competitiveness in that product. But we have found that before instruction, students are often unable to fully explain how they should choose which products to sell. Specifically, our experience has shown that when we ask students what information they need to decide which product to sell, their answers focus on market demand, and neglect the issue of competition (i.e. supply). That is, students tend to say that they would want market research information. Hardly any students include they would also want information on other sellers' cost structures for the various products. Our students have already taken both economics and marketing courses before they take our Information Systems course. But they always tend to frame the seller's decision in marketing rather than in economic terms.

We believe that one explanation of this phenomenon is that a one-sided decision is much easier for students to grasp than is a decision in a two-sided reactive market. Our students can easily grasp the notion of themselves facing (alone) a sea of potential customers, and trying to attract their interest. In such a scenario, the unknown market demand represents various states of nature, and students readily grasp the usefulness of information about market demand. But the presence of competition radically alters the nature of the decision-making and the role of information. The problem becomes reactive, it becomes a problem of markets and equilibrium behavior. The role of information in such a game is much more complex. While an experienced businessperson will instinctively speak about competition in addition to consumer demand, our students have not experienced market competition as business owners, and it simply does not occur to them to consider the usefulness of information regarding the competition, i.e. information about their own relative competitiveness in each market. But once they are forced to participate in our simulated market, this lesson is better internalized.

Here is how to orchestrate the VM game to emphasize this point. In the extreme, all sellers may be forced to carry the identical products, and have their decision limited to what prices to charge for each. When the simulation is initialized, the instructor announces that different sellers are being assigned different underlying costs for these products. Then the market opens with zero search costs, so that buyers can do easy price comparisons (the next section will explore what happens when we vary the level of search costs; for this lesson, they are zero). Each seller will find that he/she may be able to compete on price on some products, but not on others. The reason is of course that his/her cost for that product is just too high. In the VM, the only way the seller can respond to this realization is to try to sell other products. If the instructor limits all sellers to carrying the identical products, then the point will be quite clear that no matter how high is the consumer demand for a product, a seller will not fare well if his costs for that product are non-competitive. This lesson is most clear when the market is in equilibrium; before that, players may just get lucky or unlucky. In order to bring the market to equilibrium, the simulation would need to be initialized, run, and terminated, a number of times in quick succession. Each player is assigned the same induced costs and values in each round, so that they really are identical repetitions. The main point of this game is to drive home the fact that one's success as a seller depends not only on consumer demand, but also on one's competitiveness vis-à-vis other sellers.

3.2 Value of Information to Buyers and Sellers

The second sample lesson shows how to use VM to explore the value of information in markets. We begin with a review of the decisions facing players, and then a discussion of the various kinds of information that the players may wish to buy. We conclude with a few notes on how to set up the VM for these lessons.

3.2.1 Decisions: A buyer's goal is to find products being sold below their induced values. If the instructor sets search costs to zero, then a buyer can always choose the product and the seller who offer the best deal at that time. But buyers still face the decision of whether to buy now, or whether to wait. Buyers cannot know which products' prices might later rise or fall. Sellers, for their part, always face the decision of which products to carry and what prices to charge.

Next, the instructor can set nonzero search costs. In this case buyers' decisions are more complex. Instead of just two choices – buy now or wait -- the buyer now has three choices, i.e. buy now, search now, or wait. Here, the buyer must consider not only whether he/she thinks prices will fall if he/she waits, but also whether it is worthwhile to spend

money on search. Sellers face the same basic questions as always – what products to carry and what prices to charge – but now the question of pricing is complicated by the fact that the seller knows that buyers cannot easily compare prices, and so the seller will want to decide how much to raise prices to take advantage of that fact.

The challenge of decision-making results, as always, because the decision-makers have incomplete information. What is special in the case of markets is that the missing information is about other players in a dynamic two-sided environment.

3.2.2 Useful Information and its Value: The goal of this lesson is to explore with students the value they put on market information. The instructor can discuss the various kinds of information that are for sale, and how they can benefit the decision-makers.

With both zero or nonzero search costs, a buyer may want to purchase information on the distribution of buyers' values and sellers' costs, in an attempt to gauge what a fair (equilibrium) price is for each product. This can help the buyer – who is deciding whether to buy now at a given price or to wait – to predict whether posted prices are likely to fall or to rise in the future, or whether the prices already seem to reflect a reasonable "equilibrium" price that is not likely to change much. In the case of nonzero search costs where the current posted prices are not visible for free, the buyer may also choose to purchase information about the distribution of currently posted prices.

For sellers, we have already seen that seller's main business decision is what products to carry and what price to post, and that these depend on finding the products whose equilibrium prices yield a high profit margin for that seller. To help make these decisions, sellers may also purchase the distribution of buyers' values and sellers' costs. In addition, in the case of nonzero search costs, sellers can also purchase something that has no parallel for buyers, i.e. targeted advertising lists of buyers, for the purpose of advertising. "Targeted" means that the seller can specify that they want to buy the identity of all buyers who have a value greater than $X for a certain product. For example, a seller considering to carry iPod players can specify that he/she wants to purchase the e-mail addresses of all buyers whose value for an iPod player is greater than HK$700. On the one hand, the seller can learn from this list how many high valued buyers there are for this product. This information can help the seller to make the most basic decisions of whether to carry the product and what price to set for it. Not only does this information reduce uncertainty about the world, but it can be used to *change* the world. The seller can *contact* these buyers and make them a private offer. If there are search costs in the market, and buyers cannot readily compare prices, some of the buyers may accept such an offer.

In all these scenarios, the discussion can lead to the additional question, what is the precise business value of having information? How much should a seller be willing to spend in order to learn the distribution of buyers' values for a product? How much should he/she be willing to spend for a list of targeted e-mail addresses? How much should a buyer search before deciding that it's time to just take the best price so far? Depending on the complexity of the scenario arranged by the instructor, analytical solutions may be available, and lead to an optional module on calculating the exact value of information. The data will in any case speak for itself, and the instructor can lead a reasoned discussion as students justify the prices they were willing to pay for the information.

The setup of the VM for this lesson is flexible. There is no particular need for reaching market equilibrium, and therefore no need for repeated rounds. The instructor can set the price of each kind of information, can report which kinds of information were the big sellers, and students can discuss which information they purchased and whether they thought it was worth it. If information has any value, and it should, then players who purchase information should achieve higher average profits if we ignore (i.e. return to them) the price they paid for the information. We can also see whether they paid too much for the information, by calculating whether their net profits were higher.

3.3 Effects of Search Costs

Search cost is a parameter under the instructor's control. Students gain an opportunity to experience the effects of reduced search costs, which is (at least in the theory we teach) one of the principal effects of the Internet on commerce. This lesson plan focuses attention on its effects.

A variety of concepts and skills can be highlighted by manipulating search costs. One question that can be explored is, "Who benefits from reduced search costs?" In this case reduced search costs should increase buyers' welfare; the net effect on sellers is less clear, since on the one hand they can no longer charge inflated prices, but on the other hand, they may get some additional customers which they wouldn't have in the presence of higher search costs. After experiencing the two conditions – before or after hearing the theoretical explanation of the effect of Internet on search costs – students can report their personal experiences, and the administrator can announce the market's buyer and seller surpluses under each condition in a table such as Table 1 using real numbers from the database.

4. DISCUSSION

We have provided three illustrations of how a virtual market simulation can be used to present the role of information

Table 1: Actualized Surplus

	Buyer Surplus	Seller Surplus
Zero Search Costs	$...	$...
Nonzero Search Costs	$...	$...

and information systems in an electronic marketplace. The first illustration makes clear to students the two-sided nature of business information. The second explores the value of various kinds of market information. The third allows students to experience the purported main effect of Internet on commerce, i.e. the effect of reduced search costs.

The above lessons pertain to both virtual and real markets. But the Internet has increased the prominence of markets, especially online markets, for both online and traditional companies. For this reason, we feel that students will benefit from more practice and deeper understanding in the operation of markets. Our pedagogical examples suggest how a virtual market can offer lessons regarding all markets, to all information systems students.

In addition to this, these markets are implemented as Information Systems, i.e. the software *is the market*. The instructor in our virtual market can radically alter the market behavior and the value of various kinds of information, just by changing a software parameter. The same holds true on the Internet's online markets, where real money, goods, and services are traded. Whole markets can appear or disappear with the rise or fall of a Web site. Market behaviors can turn upside down because of a "software" change, e.g. a change that eases the comparison of prices, or a change in an auction's time limit. IS professionals, in collaboration with the owners of business and markets, are making design decisions with far-reaching industry implications. For this reason, we feel that IS students, perhaps even more than typical business students, need to be especially learned in the behavior of online markets, and the role of information and information systems in those markets.

Within the information systems classroom, VM inherits the benefits of simulation tools in general. VM engages the students in learning in a dynamic business environment that assists them to understand the consequences of their decisions, thus improving their decision-making abilities. It promotes discussion and interaction between instructor and students, as well as amongst the students themselves. It also provides a concrete example of a complex economic system that makes theoretical notions come alive. While we did not conduct a formal test of our student's improved learning, many students specifically mentioned their appreciation of this simulation in the open-ended section of the course evaluations. That is, they volunteered positive unsolicited feedback.

A tool such as VM can be used within the context of a single laboratory session in which the instructor prepares much of the system beforehand in order to focus discussion on a few topics. Or, the simulation can be run over several sessions – including outside of class time – in order to allow students to more fully explore the potential of markets and experience more subtle implications of an Internet-enabled market. We have found in our experience that allowing students to explore can result in unexpected consequences that demonstrate information concepts. During the first semester of use, we encountered a phenomenon that is very typical and widely reported in implementation studies. We found that students were using system features in unintended ways, to get what they wanted. For example, we allowed each shop owner to give a name to his/her store. In the market mode where search costs were imposed, buyers in the shopping mall could not see shops' prices except by paying a search fee and entering the stores one by one. So, shopowners began posting prices as part of their store name. For example, someone would *name* the store "fishballs for $3 here". Of course this defeats the purpose of the search-cost mode, but it illustrates a widely recognized phenomenon in IS implementations. Inevitably, teaching with a real system raises issues that pertain to real-life information systems.

Regarding future research, we are developing modules for using VM in different contexts: undergraduate, postgraduate and MBA. While we have used examples in this paper of basic economic and information-value concepts, VM can be extended to more advanced concepts such as fixed vs. dynamic pricing, personalization, group pricing, fraud and strategic manipulation. Because the software has a robust SQL back-end, it is also possible to extend the tool – and the related lesson plans – to allow store-owners to analyze their transactions, produce reports, and conduct other MIS/DSS related functions.

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6. ACKNOWLEDGEMENTS

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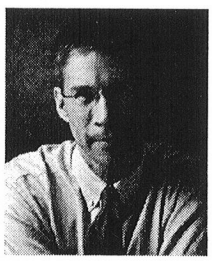

APPENDIX 1

The system can be accessed by guests. As the following instructions provide only one buyer and one seller guest login, it is theoretically possible that multiple users will access the account, or that one person has logged in as system administrator and is manipulating system parameters while another is trying to play. This will not cause any system problems, but note that your budgets, etc. may be affected by someone else who is using the guest login.

To login as a shopper (buyer):
http://imz342.ust.hk/deconomy/html/index.asp
Use login name: demouser2 and password: 1234

To login as a shop-owner (seller):
http://imz342.ust.hk/deconomy/shopadmin/index.asp
Use login name: shop112 and password 5678

Please note that in order to sell a product, you must register it, then order it and set its price. The current setting limits all sellers to carrying at most 3 different products at a time (in any quantity).

Because our system is occasionally in production use, please coordinate with the authors if you would like to login as system administrator and thereby change market parameters such as search costs. The URL and login is below:
http://imz342.ust.hk/deconomy/systemadmin/index.asp
Use login name *systemadmin* and password *hkust* – but please coordinate with authors.

Guest administrators will mostly want to restrict themselves to the category of options labeled **System Parameter Maintenance**. One parameter is especially dramatic, i.e. Search Cost Mode, which toggles between zero and non-zero search costs for buyers. If this is set to "Show", then all currently posted prices are visible to buyers in the shopping mall.

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