A b s t r a c t
Given the transaction as a basic unit of analysis, a comprehensive model of value added roles can be distilled from the synthesis of network design and business process models. Any given implementation may be seen as a cluster of roles that add value for the buyer and produce revenue for the seller. The general representation of the model suggests that there are four common classes of roles from which the possibilities for adding value through e-commerce can be derived: Organic, Structural, Functional and Commercial. These roles are defined and discussed, beginning with the organic distinction of Markets vs. Hierarchies. This comprehensive model provides a solid foundation for the systematic analysis of e-commerce implementations.

I n t r o d u c t i o n
Adding value increases the usefulness or importance of a product or service. Viewing ‘commerce’ as a system where transactions are the interaction between buyers and sellers provides a framework for identifying roles played by the actors in the system. This perspective has two fundamental implications for e-commerce: first, e-commerce is bounded by the limits of technology; and second, buyers and sellers need never meet personally. These, in turn, imply that there is a limited set of roles for adding value through e-commerce, and that some (but not all) of these roles may be specific to the e-commerce environment.

Given the transaction as a basic unit of analysis, a model of value added roles can be distilled from the synthesis of network and business process design. The model of value-added roles presented here represents such a synthesis. It is not an extension of any single description, nor a collection of elements taken directly from several alternative models. Rather, it is a representation of roles that have appeared in various guises as the e-commerce environment has evolved. Any given example in practice can be seen as a cluster of roles implemented to add value for the customer and produce revenue for the supplier. This comprehensive model provides a solid foundation for the systematic analysis of e-commerce implementations, which will in turn aid the development of business plans and metrics for evaluation.

S e r v i c e m o d e l s
Models of e-commerce have evolved from models that provide a theoretical basis for the design of network services. The ITU (1992) began by defining a basic set of network management services: fault, configuration, accounting, performance and security. Eurescom’s P103 project (1994) developed a methodology for service creation and design, and for the definition of ‘service constituents’ in a distributed environment. The MultiMedia Communication Forum (1995) identified a set of service elements and grouped them into profiles, focusing attention on the ‘willingness to pay’ for some categories of features. The link between the cost of service deployment and its profitability is an important factor in a competitive telecommunication environment.

Further refinements have been made to define and model the behaviour of intelligent agents. The European Workshop on Open Systems (1996) identifies five activities in the transaction life cycle: marketing, contracting, logistics, settlement, and interfacing to...
administration. They define intermediary roles between the seller and the buyer as Business Intermediaries, who influence the value of the transaction (e.g. banks and brokers), and Information Service Intermediaries (e.g. directory and advertisement services). The TINAS consortium (1996), closely related to the P103 project, recognizes five roles: consumer, retailer, broker, connectivity provider, and third party service provider; and three main classes of services: telecommunication, management and information.

Service models focus on the mechanics of applying technology to commerce. Actors and roles are defined in granular detail to guide the development of network connectivity, object inheritance, and data structure. Ideally they define a set of generic attributes and methods that can be mixed and matched when applied to a specific dataset or messaging system. This level of abstraction is a useful goal for the development of a model for adding value through e-commerce.

BUSINESS MODELS

Since 1985, the ‘value-chain’ (Porter 1985) has been the basic model used to describe business processes. It has been frequently used to identify opportunities for process innovation through the application of information technology (the ‘virtual value-chain’ of Rayport and Sviokla 1995). The underlying premise is that whether in the guise of ‘customer asset management’, ‘flexible manufacturing’, or ‘concurrent engineering’, processes and information must actively support each other to increase visibility through the supply chain and guarantee predictable delivery of products or services (Rochow et al. 1998). While the basic unit of analysis is the transaction, execution of any individual transaction is less important than the stream of transactions generated by an enterprise. Transaction streams are the interface between the value chain of any given firm, and the value chains of its customers and suppliers.

The term ‘business model’, especially in the Internet era, is used to describe the combination of product, service, and information flows along with a scheme for revenue generation (Timmers 1998). While Internet commerce is only a subset of e-commerce, it highlights the inconveniences of two-dimensional presentation, absence of physical presence, and the inherent limitations of computer networks. Taxonomies of business models, like those offered by Lawrence et al. (1998) and Timmers (1998), catalogue the evolution of methods to live within these limitations. In general, while these descriptions of business models are useful for identifying specific functions that businesses hope will be of value to customers, they are too firm-specific to provide more than a model of competition, rather than a model of adding value. In other words, they are based on an implicit value-added model which may or may not imply a set of common assumptions about how value is added through e-commerce.

Dropping the projected revenue stream from a business model comes closer to the mark, as Sarkar et al. (1995) do in their taxonomy of intermediaries. The question is ‘why’ a customer might want to pay, not ‘how much’ and ‘when’. For example, in his study of Internet commerce Ho (1997) identified four types of value creation from ‘extensive empirical observations’: Timely, Custom, Logistic and Sensational. He uses these as indicators of efforts to add value for the customer within the business purpose of the site: (a) providing information on products and services; (b) provision of information to gain goodwill, exposure, credibility, etc.; and (c) processing business transactions.

ADDING VALUE

Synthesis of the purely commercial perspective represented by business models and the purely technical perspective represented by service models can yield a comprehensive model of value-added roles. Ideally the model will represent generic components that can be inherited by a business model; it will, on the other hand, be composed of elements that increase the value of a product or service.

Although in implementation they may be combined, there are a limited number of roles that can be distinguished. The general representation of the model suggests that there are four common classes of roles from which the possibilities for adding value through electronic commerce can be derived:

- **organic roles** are economic; widely identified and accepted;
- **structural roles** provide infrastructure for organic roles;
- **functional roles** describe jobs that need to be done within structural roles; and
- **commercial roles** define pricing, product focus, and implementation.

These roles are defined and discussed below. The representation of the model and the relationships within is repeated throughout, as the decomposition of more general roles leads to discussion of more specific roles. Finally, some examples in practice are offered, as an application of this model to the analysis of business plans.

ORGANIC AND STRUCTURAL FOUNDATIONS

Zwass (1996) provides a succinct distinction between the two organic environments. Markets facilitate transactions between multiple buyers and suppliers. Relationships among buyers and sellers can be short-lived, since purchasing is done on per-transaction basis. Hierarchies are long-lasting supplier–customer relationships, coordinated by management rather than by market forces. In effect, management selects suppliers for a number of transactions. Thus market roles add value based on freedom of choice
Table 1.

<table>
<thead>
<tr>
<th>Organic</th>
<th>Structural</th>
<th>Functional</th>
<th>Commercial</th>
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<tbody>
<tr>
<td>Discovery</td>
<td></td>
<td>Free Search</td>
<td>Database Query</td>
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<tr>
<td>Market</td>
<td>Directed Search</td>
<td>Click-Through</td>
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<td>Evaluation</td>
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<td>Order Entry</td>
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<td>Display</td>
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<td>Commodity</td>
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<td></td>
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<td>Custom</td>
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and variety of offerings; hierarchical roles add value based on contracts and long-term relationships.

This is the sentiment that seems to be captured by the popular distinction between ‘Business to Business’ and ‘Business to Consumer’ e-commerce, but these terms are obfuscatory; after all, consumers have cheque accounts and credit cards, which are long-standing contractual relationships covering multiple transactions. Even the distinction between market and hierarchy can be fuzzy: brand loyalty might be said to fit the definition of hierarchies, and a single long-running transaction (e.g. software development or product design) might be considered an anomaly of the market mechanism. Nevertheless, the distinction between electronic markets and electronic hierarchies is clear enough to conclude that e-commerce in these two environments requires support structures that are fundamentally distinct.

Structural roles underlying the market environment facilitate evaluation of product offerings and initiation of individual transactions. Discovery services provide tools that buyers and sellers use to search through a shared information resource. Realization signifies the offerings of a particular party, who do not offer alternatives for the products they sell. The distinction is similar to what Hoffman et al. (1995) call ‘Traffic Control’ and ‘Destinations’. One is meant to facilitate mapping while the other is meant to provide specific details.

To support hierarchies, the infrastructure must provide a foundation for coordination over time, distance and organizational boundaries. Account management ensures that each individual transaction has a consistent final state, through actualization of the settlement process. Account management is purely reactive; after the account is established, nothing happens until a transaction is initiated. The primary concern of Channel Management is logistics and communication. Added value might take the form of reductions in product inventories, shorter cycle times, reduced working capital and/or displacement of facilities costs. The essence of this role is captured by what Malone et al. (1987) describe as the ‘electronic integration effect’.

DISCOVERY: FUNCTIONAL AND COMMERCIAL ROLES

If a network of information sources is readily available, the buyer may elect to attempt to discover the desired information personally. Hence, Free Search, where discovery is active, ad hoc, and personal. Uncovering information about product and transaction characteristics may be time consuming, but necessary when the product itself or information about the product is complex, needs are not well-defined, or when there are many competing vendors in the market.

Free search relies on breadth of coverage to uncover potential sources of information. It may initially be based on a Database Query, much as one might look to an encyclopaedia for the initial answer to a question. It is convenient to assume, temporarily, the special case of a database that has been assembled ‘without fear or favour’, i.e. that there is no commercial bias to either data collection or presentation of query results. Click-Through relies on advertising or recommendations. Indeed, terms like ‘browsing’ and ‘surfing’ the ‘Web’ that have been adopted
to describe the structure and use of hypermedia make the significance of this role readily apparent.

Directed Search is discovery via an intermediary. If the marginal value of new information is great and the cost of the buyer’s time is relatively high, the buyer may elect to turn over the responsibility for information discovery to an intermediary. The buyer may also rely on an intermediary when a search is initiated, if an existing network of information sources does not exist or proves unreliable.

Information Brokers package and present information. They may be narrowly focused on a particular topic (e.g., calls for tender), or may simply present a particular subset of the global information space, often organized by product-line or category. The listings may be enhanced by additional information, such as evaluations based on frequency of access or explicit review of the source. Timmers (1998) and Laudon and Laudon (1998), among others, use this term in a less precise but consistent manner. Agents are distinguished from information brokers by the source of their classification scheme: agents follow instructions from the user when gathering information, and then present it for further analysis. Information brokers gather and disseminate information they feel will be interesting to a defined target audience.

REALIZATION: FUNCTIONAL AND COMMERCIAL ROLES

Evaluation complements the discovery functions discussed above. Pre-purchase, shopping offers opportunities to gather information without becoming committed to a transaction. Information about product characteristics must be collected and analysed; once a product is selected, the value-for-money propositions offered by the various vendors must be compared. Post-purchase, sellers may want to encourage repeat purchasing, which requires further marketing communications to develop brand loyalty. There is also a place for product technical support, and transaction-based customer service: quantity, quality and delivery terms must have been met, or some compensation may be due.

Social Interaction plays a key role in evaluation. The customer will not rely on vendors alone, but will also seek the opinions of people who have purchased the same or similar products, and those whose opinions they find valuable. Where social interaction is active, Display is passive and two-dimensional. Although technology may allow innovative and sophisticated displays (e.g., virtual reality) the goal is to present information about the product and the firm.

The point of Order Entry is the actual initiation of a transaction, i.e. commitment on the part of the buyer to a set of terms by the vendor. A myriad of issues on both the vendor and the customer side, including integrity and security concerns, lead to degrees of implementation for e-commerce, ranging from tentative reservation of a quantity to fully automated execution systems. Whatever form the implementation takes, commitment to a transaction marks the transition from a casual to a contractual relationship between the two parties. From this point forward, roles associated with Account Management and Channel Management provide the infrastructure to bring the transaction to its ultimate conclusion.

Commodity order entry offers routine options for product, price and/or delivery. ‘Off-the-shelf’ products and standard services are available; payment and delivery options may vary according to the nature of the product and the nature of the transaction, but can only be chosen from within a limited set. Custom order entry offers opportunities to order customized goods or customized bundles of goods and services. This facility may serve solely as a vehicle for opening negotiations, which require further (possibly offline) interaction.

ACCOUNT MANAGEMENT: FUNCTIONAL AND COMMERCIAL ROLES

Authentication establishes trust in the identity of a person or thing. It is intimately related to authorization, which is the basis of the contract that forms the foundation of the account management relationship. Authentication may take various forms; Hughes (1995) describes them as ‘something you have; something you know; or something you are’. These have an additive effect on trust; authentication based on two tokens (e.g., ATM card and PIN) gives more

<p>| Table 3. |</p>
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<td>Database Query</td>
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<tr>
<td>Directed Search</td>
<td>Click-Through</td>
<td>Information Broker</td>
<td>Authentication</td>
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<tr>
<td>Social Interaction</td>
<td>Agent</td>
<td>Hierarchy</td>
<td>Clearing</td>
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<tr>
<td>Order Entry</td>
<td>Display</td>
<td>Channel Management</td>
<td>Continuity</td>
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<td></td>
<td>Commodity</td>
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<td>Visibility</td>
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<td>Custom</td>
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confidence than using only one or the other. Currency notes generally have a number of physical characteristics (e.g. watermarks, detailed designs, and the paper they are printed on) which are meant to cumulatively guarantee their authenticity.

The examples above illustrate the general principle that the Issuer of the authentication token bears ultimate responsibility for authentication. However, sometimes even the issuer cannot be trusted; Stallings (1999) describes a number of scenarios in the case of digital signatures. It may also be cumbersome for the issuer to be involved in every transaction. Trusted Third Parties allow for a network of assurance (a ‘web of trust’ (Khare and Rifkin, 1997)) which can be followed to provide confidence in an authenticating third-party. This effectively adds a fourth possibility, ‘who trusts you’, to the three classic forms of authentication. While mutual authentication is important in the market environment, assurance is based on the confidence that some party (e.g. a certificate authority) has staked their reputation on the validity of the credentials.

The essence of Clearing is to provide for the transfer of value from one account holder to another, bringing the transaction to a successful resolution. The account may effectively exist only for the duration of the transaction, but in the absence of physical presence longer-term accounts will be involved, especially for financial transfers. If the transfer of value fails for any reason, the account must revert to its state before the initiation of the transaction; information about failed transactions may be valuable for refinement of the process.

The clearing function divides itself into two distinct parts: the Delivery itself, and the associated Audit Trail. Digital products and digital cash may never be manifested as physical objects, although in some cases they may be. Physical delivery of products or services may be complemented by digital delivery of payments. Audit trails provide a record of account activity. The form and level of detail are agreed upon when the account is established, to meet the requirements of regulatory bodies and internal control systems.

### CHANNEL MANAGEMENT: FUNCTIONAL AND COMMERCIAL ROLES

In value-chain terms, modern production environments require tight regulation of incoming and outbound logistics. Continuity is often assumed to be a foundation of stable, long-term relationships: Nouwens and Bouwman (1995), for example, state that hierarchies are likely to form when transaction costs are high, supplies must be guaranteed, and/or suppliers are not competitive enough to limit opportunistic behaviour. Continuity provides the level of predictability necessary for accurate forecasting and just-in-time scheduling.

The CCITT (1988) definition of Quality of Service (QOS), ‘the collective effect of service performance which determines the degree of satisfaction of a user of the service’, is clearly applicable beyond the bounds of the telecommunications environment. Quantitative measures (response time, failure rates) and qualitative characteristics (compatible corporate culture, willingness to cooperate)
may work together to differentiate QOS levels. Beyond QOS, cartels may effectively form around adoption of Standards, especially in the case of technology. Membership in the cartel, or reliance on a cartel member, provides continuity through the assurance that activity will be conducted in a controlled manner and at a predictable level of quality.

Visibility ensures that information is available to decision-makers. The nature of the decision and the information required will determine the scope of dissemination, and therefore, visibility. ‘Come and get it’ public notices may be sufficient in some cases, while in others tightly controlled exchanges of confidential information are required to build consensus will be called for. Decomposition of aggregated data (drill-down) may be necessary for building projections, or forecasts may be presented without reference to influential sources. In any case, providing information is meant to reduce risk by controlling uncertainty in the decision-making environment.

A Repository is the focal point for collecting and storing information. This provision of ‘real-estate’ is easily separable from the tools used to manage the information. With advances in technology Collaboration is an implementation of visibility that is becoming more widespread, especially in project and operations management. Where the repository is static, collaboration is dynamic; it relies on bilateral information flows. Both commercial roles are based on a continuing commitment to a relationship: the repository on a freehold, lease or rental basis, and collaboration on the basis of trust and mutual benefit.

PRACTICAL APPLICATION

This comprehensive model provides a solid foundation for the systematic analysis of e-commerce implementations. The set of roles defined here is complete enough to provide a meaningful description of any e-commerce implementation. Three brief examples are offered here as application of the model.

EDI over VANs

EDI over a Value-Added Network (VAN) clearly illustrates how Channel Management and Account Management add value. To begin with the obvious, without Standards, there would be no EDI; automated message processing, be it EDI or XML, requires knowing the document structure. Adoption of EDI as a mode of communication between business partners generally implies anticipated benefits from Collaboration within the supply chain, through advance notice of requirements (see Mukhopadhyay et al. (1995)).

While the ubiquity of the Internet might be seen as a threat to VANs, reliable message Delivery (as opposed to the Internet’s ‘best effort’ approach) and network-level Authentication are the two key elements that will ensure their survival. Beyond that, common Quality of Service criteria such as bandwidth and availability should favour the private network, although the differences are beginning to shrink in some areas.

The Online Auction

The nature of an auction is Commodity order entry based on a catalogue of unique lots of goods. In other words, while the goods or the lots they are bundled into may be unique, there is generally little possibility of changing their nature or mix. Auctions are commonly encountered in environments where each individual unit has unique characteristics, but fit a defined set of parameters for evaluation. This is the case, for example, with fine art, antiques, used cars, and livestock; another type of auction simply establishes the market value of a commodity, as in the case of government bond auctions.

The organizer of the online auction provides some method for the Display of the goods on offer to facilitate evaluation. ‘Caveat Emptor’ may be the general rule, or a Trusted Third-Party in the form of an assessor or appraiser may offer some assurance that the reserve price is appropriate. The bidding process itself is a form of Social Interaction, each bidder watching the others and relying on the organizer as a Trusted Third-Party to ensure that the bids are genuine and the process is orderly. The organizer may also take part in the Clearing process, by taking possession of the goods that are sold, and/or acting as a guarantor of settlement.

The Internet Portal

What we now know as the Internet Portal has gradually evolved from services like archie and gopher: automated tools for cataloguing files stored in any number of independent repositories. For the user, the original attraction of the portal site was the Database Query facility. Now, advertising commonly appears alongside selected sites which are categorized in a directory, encouraging the user to Click-Through on the suggestions provided by the Information Broker (this role is especially clear when the advertising that appears is linked to keywords used in the database query).

From the advertiser’s point of view, the portal is a Repository for their advertising messages, and a medium for digital Delivery of them. Calculations of the effectiveness of the advertising will be based, at least in part, on data from the Audit Trail provided to the advertiser. Indeed, the increasing sophistication of this audit trail has caused concerns about privacy, which have in turn inspired the development of ‘anonymizers’ to limit the effectiveness of customer profiling.

As competition has heated up, Internet portals have begun to offer their users additional services. Agents, in the
form of ‘shopping bots’, may be available to compare prices and packages of goods and services. Social Interaction is encouraged through electronic mail, messaging, and chat (message Delivery services); electronic mail and free homepages additionally require space in the Repository. Administration of these services normally requires the Issuer to validate passwords, which creates additional data for the Audit Trial. These Account Management and Channel Management services are meant to create a body of regular customers, which can act as a surrogate for brand loyalty when advertisers assess their audiences. Thus they add value for both the users of the Internet portal and the advertisers.

CONCLUSION

Improving the applicability of this model and gathering empirical evidence of its validity is currently underway. This model has two major advantages. First, it is well grounded in the literature, and describes value-added from both the customer and vendor perspective. Second, it is composed of roles that may be part of the business plan, or provided by third-parties. Any given e-commerce implementation takes on some of these roles, and will rely on the existence of others. Thus adoption of a comprehensive model like this one will aid the development of business plans and metrics for evaluation.

References


