An exploratory study of electronic logistics marketplaces and its impact on customised logistics

Yingli Wang*, Andrew Potter and Mohamed Naim
Cardiff University Innovative Manufacturing Research Centre, Cardiff Business School, Aberconway Building, Colum Drive, Cardiff, CF10 3EU, UK
*Corresponding author: Tel: +44(0)29 2087 9617, Fax: +44 (0) 29 2087 9633
Email: WangY14@Cardiff.ac.uk

POMS 18th Annual Conference Dallas, Texas, U.S.A. May 4 to May 7, 2007

ABSTRACT

Despite the wealth of literature on e-marketplaces, research on electronic logistics and/or transport marketplaces, is scarce. Electronic Logistics Marketplace (ELM) refers to an electronic hub using web-based systems that link shippers and carriers together for the purpose of collaboration or trading.

Via an international scoping study, our research aims to evaluate different types of ELM, establish the likely associated operational models and ELMs relationship with tailored logistics. Multiple case study approach is adopted with data has been collected from shippers, transport companies and the technology providers. The case studies involve interviews, data analysis and process mapping.
The research reveals that the ELM business model is still at its infancy stage but with huge potential for growth in optimising supply chain networks, and enabling the provision of customised logistics.

**KEY WORDS:** multiple case study, closed system, business to business

1. **INTRODUCTION**

Since the 1990s there is a rich literature on B2B electronic marketplaces (EMs), facilitated by recent advances in information and communication technology (ICT) (Kaplan and Sawhney, 2000, Grieger 2003). EMs are seen as an emerging business model with the potential for enormous influence over the way that transactions are carried out, relationships are formed, supply chains are structured and profit flows are operated (Kaplan and Sawhney, 2000, Rayport and Sviokla, 1994). Enabled by web-technology, they provide advantages in low cost inter-organization information connectivity, real time visibility, and flexible partnership configurations. While many aspects of supply chain management have been considered, there are only a few studies which investigate the development of EMs specifically in logistics (Gudmundsson and Walczuck, 1999, Goldsby and Eckert, 2003). These can be termed Electronic Logistics Marketplaces (ELMs) and are defined as an electronic hub using web-based systems that link shippers and carriers together for the purpose of collaboration or trading.

A basic ELM is normally composed of three key parties: shipper, carrier and technology provider with the primary objective of reliable delivery. In some circumstances customers can get access into an ELM. As the functions offered by ELMs are different, there may be other parties involved such as freight forwarders and financial service providers.
Two types of ELM; open and closed, have emerged (Skjøtt-Larsen et al., 2003) since the late 1990s. The former allows shippers and carriers to use their services with no barriers to entry. One of the typical examples is online freight exchanges for spot trading of transport services. A closed tends to be focused towards the needs of particular shippers and/or carriers. Larger carriers or shippers can leverage such ELMs by collaborating on a single platform and eliminating the complex and costly integration of different inter-organisational systems. Small carriers may be able to use them to reach wider sources of logistics demand, or to collaborate with other similar companies. Rather than focusing on the identification and selection of trading participants as per open ELM, the closed ELM focuses more on execution and long-term value-added activities between shippers and carriers. To some extent open ELM has the same operational model as generic trading EMs which have already been well discussed in the literature (Eng, 2004, Howard et al., 2006, Kathawala et al., 2002, Rayport and Sviokla, 1994). However, there has been limited research on closed ELM, and in particular there is a lack of empirical studies.

The aim of our research is to undertake an exploratory study of different types of closed ELMs. Our research uses Wang and Naim (2007)’s conceptual work as a starting point, which we substantiate through multiple case studies. By doing so, we wish to contribute to both academics and practitioners’ understanding of the different operational models that support ELM and ELM’s impact on logistics management especially on provision of tailored logistics.

The paper begins with a literature review which leads to the development of research questions. We then discuss the research methodology and establish our analysis
framework. Next, we conduct an analysis of six case studies. This is followed by the discussion of research findings and its implications. In the end we conclude the paper by examining the limitations of our work and suggesting future research directions.

2. ELM LITERATURE REVIEW

The definition of EM is diverse. Different authors assign different names and definitions under different contexts, such as market space, electronic exchange, electronic market, e-hub, electronic network, portal, and auctions. One of the earliest and broadest definitions is by Bakos (1991), referring to EM as “an inter-organizational system (IOS) that allows the participating buyers and sellers to exchange information about price and product offerings”. Daniel et al (2004) narrows down the definition and describes an electronic marketplace to be only “web-based systems which enable automated transaction, trading or collaboration between business partners”. He argues that web-based systems have distinct features compared with traditional IOS such as EDI and extranet. A detailed summary of definition and classification can be found in Grieger (2003).

ELM is a specific EM model, which acts as an intermediary facilitating the exchange of logistics service. Traditional ways of communication between shipper and carrier are rather fragmented where they communicate with each other individually through different channels. It is costly and sometimes can be very time consuming. The new ways of communicating through an ELM allows the connection of a number of shippers and carriers using a single interface, normally via a web-based system. ELM can be used for either spot sourcing of transport services or long term collaboration.
Early ELMs were open platforms, such as www.teleroute.com, and hence had the same characteristics as generic open EMs. They adopted many-to-many transactions and utilized fixed and/or dynamic pricing (Gosain and Palmer, 2004). Despite the benefits of lower search and coordination costs, there is an increasing need for companies, mainly shippers, in ELMs to retain their linkages with preferred business partners (Dai and Kauffman, 2002). This resulted in the recent development of closed ELMs, aiming not for a large volume of transactions, but based on relational lines emphasizing extent of services. The operational scope provided by closed ELMs goes beyond basic loads posting and matching services, and shifts to complex offerings that might encompass complete order fulfilment services. It is expected to lead to improved pipeline visibility and more efficient planning, execution and responsiveness of all supply chain players (Cruijssen et al., 2007).

Ho et al. (2003) classified three types of virtual B2B trading communities in the supply chain i.e. vertical portal, electronic hub and strategic alliances, of which the last one can be considered as a closed system. However their discussion is only limited to the brief description of the range of activities covered by this type of ELM. Lynagy et al. (2001) found there is limited adoption of ELM in industry but his study focuses only on the logistics service providers’ perspectives. Finally Kale et al. (2007) claimed that shippers may benefit by establishing private communities through a theoretical model. Overall there has been lack of an understanding of the business model of closed ELMs. In fact, it has been argued that the logistics dimension of EM has been largely neglected and there is a very real need for empirical research to fill the gap (Grieger, 2003, Lynagh et al., 2001).
Furthermore there is also increasing awareness that companies nowadays should tailor their logistics solutions to different customer segments, in order not to under serve some customers or overcharge others (Fuller et al., 1993). Supply chains that try to satisfy all marketing priorities are vulnerable to developing common or ‘average’ offerings to their customers that lead to increased costs and poor customer service when specific customisation is required (Fuller et al., 1993). Three main categories of logistics service are further identified by Kallio et al (2000) and Bask (2001); Routine, Standard and Customised logistics, where the level of customisation and complexity of service differ.

To deliver tailored logistics, it has become necessary to proactively rather than reactively manage the provision and execution of logistics. Companies need to streamline their logistics activities, have the complete visibility of real time information for decision making, and build flexible system configuration and connectivity with different business partners (Murtaza et al., 2004). Closed ELM is seen as one of the potential business models to fulfil such needs.

In line with the above discussion, Wang and Naim (2007) argue that a one-size fits all approach to B2B e-business connections is unlikely to work and there should be different information architectures for different logistics scenarios. They then propose a conceptual model which categorises and traces different inter-organisation information control and coordination mechanisms observed in the logistics domain. Four types of B2B e-business architectures are identified and summarised in Figure 3.

- Under **Centralised Market**, organisations are coordinated with the market via bidding and pricing systems. This type is most suitable for ‘routine’ logistics.
- **Traditional Hierarchical Coordination** focuses on vertical integration, and uses authority and other procedural coordination processes instead of a pricing
mechanism. This model can be applied to ‘standard’ logistics operation where some degree of customisation is provided.

- In the *Modified Hierarchical Coordination* model, a degree of horizontal collaboration is introduced with more value-added elements. It can be used for the ‘customised’ logistics stream. Wang and Naim (2007) term this a Type I system to differentiate it from the next description.

- An *Heterarchical Network* is characterised by great level of horizontal collaboration between organisations. This network is normally a web-based hosted platform which gives companies greater flexibility to collaborate with each other, and enables high level of information sharing and joint activities. Hence it facilitates ‘customised’ logistics (Type II) with a set of value added services.

Figure 1: Four types of B2B e-business reference architectures (Source: Wang & Naim 2007)

Although the conceptual model is developed through both theoretical and secondary case examples from the literature, it has not been empirically tested yet. Our research builds on Wang & Naim (2007)’s work, and uses it to categorise different types of ELM in practice based on the proposed attributes. We wish to corroborate this model through empirical investigation, so that we may acquire practical insights into closed ELMs.
Hence our research aims to fill the void in the literature by exploring the following research questions:

Question 1: What are the different operational models that support closed ELM?

Question 2: How can each type of closed ELM enable the provision of different logistics operations?

3. RESEARCH METHOD

The research adopts a case study approach. This method is particularly suitable when we explore “why” and “how” research questions and examine contemporary events (Yin, 1994). Benbasat et al. (1987) also indicated that case research is very appropriate for those problems in which research and theory are at their early, formative stage. Hence, as the Wang and Naim (2007) model is conceptual and yet to be tested, we undertake a study of six examples of the practical application of closed ELM.

3.1 CASE SELECTION

As discussed in section 2, different ELMs have different information architectures which are determined by the nature of how they are formed (Wang and Naim, 2007). Under a Centralised Market structure, organisations are coordinated with the market via bidding and pricing systems. This represents open ELM, and thus has been deliberately excluded from our study. We then choose case examples which can represent the other three categories.
The descriptions of the B2B e-business architectures given in Section 2 are quite generic. In order to choose appropriate case studies we first have to define specific applications of these architectures within the context of ELM. Traditional Hierarchical Coordination means that a dominate player (usually shippers) creates an ELM for its own use. This type of ELM uses authority and other procedural coordination processes, instead of a pricing mechanism. Sometimes it is referred to as a ‘private’ marketplace (Standing et al., 2006). It can be hosted by either third party or mostly by the shipper itself. In the Modified Hierarchical Coordination model, a number of shippers start to share one single platform to get connected with their carriers. Shippers themselves are technically connected with each other. But there is limited horizontal collaboration between them. In most cases, the ELM is hosted by an independent technology provider.

The Heterarchical Network model has recently evolved in line with ‘Pay As You Go’ (PAYG) pricing model. A few shippers collaborate with each other and create an ELM for joint use. Through this, they try to encourage the reduction of empty running by identifying synergies within product flows and sharing the capacity of carriers. There is a greater degree of horizontal collaboration between both shippers and between carriers. The ELM is normally hosted by third party technology providers.

Relevant case companies are identified based on the business directory B2B markets for transportation and logistics (www.business.com/directory) as well as other sources of information such as industry peers’ recommendation and government listings. Initial contact was then made with senior representatives of interested companies through email and an introductory presentation. This was followed up by phone calls. The goal was to undertake six to ten case studies, as ‘in most conditions six to ten cases should provide
enough prevailing evidence (Ellram, 1996)’. The net result was that out of a total of ten companies contacted six agreed to participate the study as shown in Table 1, with two case examples selected for each type of architecture. This gives us in-depth detail and richness of data, as well as a manageable size of study in a period of eight months.

<table>
<thead>
<tr>
<th>Architecture Type</th>
<th>Case companies</th>
<th>Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Name</td>
</tr>
<tr>
<td>Traditional Hierarchical</td>
<td></td>
<td>Case A</td>
</tr>
<tr>
<td>Coordination</td>
<td></td>
<td>Case B</td>
</tr>
<tr>
<td>Modified Hierarchical</td>
<td></td>
<td>Case C</td>
</tr>
<tr>
<td>Coordination</td>
<td></td>
<td>Case D</td>
</tr>
<tr>
<td>Heterarchical Network</td>
<td></td>
<td>Case E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Case F</td>
</tr>
</tbody>
</table>

Table 1: Overview of Case Examples

3.2 RESEARCH PROCESS

Participating companies can be very different in each individual case. However to keep consistency across case examples, we focus on the three parties indicated in Section 1.

The main data collection technique is the semi-structured interview. Interview notes are transcribed and crossed checked between interviewers and/or with interviewees. In total 26 interviews were conducted. In order to gain sufficient depth as well as width in the research, we investigate in more detail the Heterarchical Network architecture, which is
rarely seen in practice in contrast to the other two types. Gaining access at its infancy stage should provide us with the opportunity to observe whether such a model is sustainable in the long term. More importantly, while the two common architectures are targeting logistics improvements at a supply chain level, the Heterarchical Network type has potential for network optimisation across supply chains. The complexities involved in this model imply that there are higher risks for failure. In fact, Case F is a failed example which we deliberately selected in order to understand fully the factors behind the failure.

To complement the interviews and triangulate the research findings, other techniques adopted include system demonstrations, process mapping and industrial seminars. For the purpose of conciseness we do not include all the data that this triangulation yielded.

4. ANALYSIS FRAMEWORK

There are various ways to analyse information architectures. According to Baeza-Yates and Nussbaum (2006), there are three fundamental elements that need to be considered. The discipline of Computer Science mainly focuses on ‘technology’, along with a small element of ‘process’. Information Systems concentrates on the research of ‘process’, while Sociology studies ‘people’. Therefore it is argued that the study of information architecture should incorporate all of above, not just one specific element. Because we specifically researching B2B models, we have specified the ‘people’ element as ‘collaboration’ as given in Figure 5. The shading in Figure 5 indicates the weighting put on each of the three elements in our study and is in line with the recommendation given by Baeza-Yates and Nussbaum (2006).

5. DATA ANALYSIS
This section discusses the key elements of each type of closed ELM, as outlined in Section 4 and hence lays the foundation for determining the existence of the supporting operational models. Next section builds on this discussing the most significant findings relating to the two research questions given in Section 2. Table 2 gives a summary of the six case studies, identifying their B2B e-business architectures, the degree of logistics tailorisation that they support, the associated operational scope, collaborative arrangements and underlying technologies.

Case A is developed and owned by a fourth party logistics (4PL) provider mainly for its own use to communicate with its carriers and customers, that is, shippers. To add value to their customers, Case A uses sophisticated logistics management systems to enable seamless and automated processes, and to support the reengineering of its customers’ current business processes in order for cost reduction and efficiency improvements. Case B is developed by an independent software service provider. The solution is sold to individual shippers, mostly large organisations, to aid their transport management. Cases C and D are both developed and owned by technology providers. Both Case E and Case F are owned by groups of industrial consortia, and hosted by independent technology providers.

5.1 Traditional Hierarchical Coordination

Technology

Both ELM solutions are traditional client-server systems but with web-based functions for communication with carriers and shippers. Orders can be imported from shipper’s ERP system automatically or can be input manually via the web. The system can interface
with a wide range of enterprises systems. Carriers are assigned a username and password to a website to gain access to the orders. Large carriers can afford to build automatic linkages with the system, while small hauliers simply use the web to input or output data where only an Internet connection and a browser are needed. Case A does not charge either shippers or carriers for data transactions but requires one-off fee to cover the costs associated with system integration. In Case B, it is the shippers who buy the solution and pay most of the charges. As with Case A, carriers are occasionally asked to pay one-off charges to cover system integration costs.

Process

There are only slight differences between Case A and B in terms of functionality. In Case B, orders are consolidated to maximise full loads in the in-house transport management system before being imported into ELM. The reverse logic holds for Case A. Another difference is that in Case B, once orders are loaded into the system, carriers can input which routes they would like to undertake, as well as their capacity and rates. Therefore the transport planner has visibility of each carrier’s availability before finalising the schedule. In Case A the schedule is first undertaken before tenders are sent to carriers. The transport scheduler will fine tune the plan if there any rejections. Once the job is accepted by carriers, the system traces and tracks the status of shipments and alerts relevant parties in case of any exceptions. Proof of Delivery is obtained and uploaded onto the system for financial settlement. Finally, tailored performance reports will be created for different users.
<table>
<thead>
<tr>
<th>Cases</th>
<th>Information architecture</th>
<th>Supporting tailored logistics&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Operational scope&lt;sup&gt;2&lt;/sup&gt; (process/functions)</th>
<th>Collaborative Arrangement&lt;sup&gt;3&lt;/sup&gt; (I, II, III)&lt;sup&gt;*&lt;sup&gt;</th>
<th>Underlying technology&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
</table>
| A     | Standard logistics      | • Order receiving  
• Loads building  
• Shipment planning  
• Jobs tendering  | • Tracing and tracking  
• Proof of delivery (POD)  
• Self billing  
• Reporting  | II  
Has optimisation of carriers, and of shippers. But carriers and shippers themselves do not collaborate.  | - Client–server with web based functions  
- Pricing model: software licensing fee plus implementation fee |
| B     | Standard logistics      | • Planning  
• Communication (accept/deny loads)  
• Tracing and tracking  
• Pre-invoicing  
• Performance report  |  | II  | - Client-server with web functions  
- Pricing model: software licensing fee plus implementation fee |
| C     | Customised logistics (Type I)  | • Purchase order generation  
• Shipment planning  
• Carrier sourcing  
• Visibility and events  | • Import and export  
• POD  
• Self billing  
• Reporting  | I + II + III  
I+III limited to technical collaboration  | - Hosted, web-based  
- PAYG: predicated volume range |
| D     | Customised logistics (Type I)  | • Order receiving (purchase order=PO)  
• Suppliers communication (delivery note = DN)  
• Trade compliance  
• Match PO with DN  
• Carrier communication (accept/deny loads)  
• Tracing and tracking  
• Performance report  |  | I + II + III  
I+III limited to technical collaboration  | - Hosted, web-based functions  
- PAYG per transaction |
| E     | Customised logistics (Type II)  | • Job alerts  
• Real time tracking and tracing  
• Performance report  |  | I + II + III  | - Hosted, web-based functions  
- PAYG per transaction |
| F     | Customised logistics (Type II)  | • Planning  
• Communication (accept/deny loads)  
• Tracing and tracking  
• Pre-invoicing  
• Performance report  |  | I + II + III  | - Hosted, web-based functions  
- PAYG per transaction |

<sup>1</sup>This research output relates to Research Question 2 as defined in section 2.

<sup>2</sup>This research output relates to Research Question 1 as defined in section 2.

<sup>*</sup> Keys: I, horizontal collaboration (HC) between shippers; II, vertical collaboration (VC) between shipper and carrier; III, HC between carriers.

Table 2: Summary of case study
Collaboration

In both cases there is a great degree of vertical integration between carriers and shippers, Case A is facilitated by the 4PL and in Case B there is a direct link between shippers and carriers. In contrast, horizontal levels of collaboration are very limited.

In Case A, shippers themselves do not collaborate with each other, nor do the carriers. This is due to the fact that they operate in very diverse industries where there is no requirement for collaborative arrangements. But in Case A, the 4PL does act as an intermediary and understands both parties’ requirements. They can mediate between partners with potentially conflicting interests. Therefore though there is a low level of horizontal collaboration, the whole ELM community benefits from both economy of scope and scale. Hence carriers are guaranteed volume of deliveries and high vehicle utilisation, and shippers are ensured quality of service as efficiently as possible.

The Case B solution is enabled via vertical integration, which is traditionally the way shippers communicate with carriers. However, because communication with many small carriers is fragmented and time consuming, some shippers have urged those small carriers to work together to create a cooperative in order to provide a single interface with shippers. In doing so, the small carriers could now compete with bigger carriers and are secured volumes from shippers. The cooperative may then allocate the loads amongst its members based on, say, their geographic coverage.

5.2 Modified Hierarchical Coordination

Technology
Both Case C and Case D are web-based solutions, deploying the ‘on-demand’ model. They are browser based systems; hence no desktop installation is required. A single database ensures that all data is located in one place which improves transaction speed and information visibility. The system can be integrated with a range of legacy enterprise systems. As with Traditional Hierarchical Coordination, shipment status can be input in various ways, for example, via EDI, Web, email-based methods or mobile phone.

In both cases the technology provider is the ELM hosting company and is responsible for creating communities based on a community leader’s requirements. Such leaders may be either shippers or carriers. Different homepage configurations are established for different users as required. Usually it is the community leader who takes the initiative and pays for all services. Both cases deploy the PAYG pricing model. For Case C the fee is charged annually based on predicted transaction volume ranges, while in Case D there is a charge per transaction.

Unlike Case C, Case D’s system does not have all the functions under one umbrella, rather they deploy a modular approach and the participants can buy just one or several functions based on their individual needs. The central data bus is the key function of this ELM, where customers, shippers and carriers are connected. Based on this, the hosting company create a number of databases for specific purposes. For example, there is a database to support consignment visibility applications and performance reporting application and there is another database to support transport management applications. Because it is usually the shipper who initiates the ELM, the connection between the systems and the shipper is highly automated and integrated.
Process

Compared to Traditional Hierarchical Coordination, the operational scope is extended. It is not only the shippers and carriers that get involved but the customers, or the recipients of the goods shipped, are also integrated into the system. Customers can either generate Purchase Orders in Case C or have the visibility of inbound delivery through the ELM in Case D.

One distinct feature of both cases is that they support global logistics. Therefore ‘import and export’ functions are built-in and the systems provide global trade compliance checks and customs clearance assistance. The ELM communities also benefit from value-added services provided by the hosting company such as currency converters and cross boundary legal advice.

Collaboration

Through the hosted system, there are many private ELM communities sharing one single platform. But there is no horizontal collaboration between those community leaders or participants, though technically they share the same infrastructure and database. Compared with Traditional Hierarchical Coordination, there is greater level of vertical integration in Cases C and D. Shippers, carriers and customers are all integrated together through sharing of the same system. This leads to enhanced speed of communication and the full audit trail of all shipment changes. Because the shippers can get spot quotes from the connected carriers, hence these systems incorporate a limited feature of open ELM.

5.3 Heterarchical Network
Technology

Both cases are hosted and web-based systems. Shippers share a single database and website, and are charged based on transaction volume. The ELM hosting companies, or technology providers, will be responsible for setting up different homepages for different shippers. The carriers do not need to pay any transaction fees nor for system integration. In Case E, a real-time tracing and tracking is deployed hence carriers need to bear the capital cost of buying telematics and consequently the variable cost to download data via the telecommunication system. In Case F there is no specific requirement to purchase any hardware.

Process

Although the underlying technology is the same, there are large differences between Cases E and F in terms of functionality. In Case E, as currently deployed, the ELM provides only three functions; real time tracing and tracking, exception alerts, and performance reports. Other functions, such as transport planning, tendering and financial settlement are conducted through legacy systems. Despite limited functionality, this does not mean ease of deployment or implementation of the system. Because real time tracing and tracking is much more advanced than retrospective tracing and tracking, as observed in other cases, it requires more investment and collaborative effort to execute. In the future, functions such as joint scheduling and delivery would be included if current functionality sustains performance and fulfil shippers’ needs. Case F’s functionality is the same as Case B’s, but with the added capability of identifying back haulage opportunities and enabling joint deliveries between shippers. In both cases customers are not integrated into the ELM system.
Collaboration

In both cases, in contrast to Cases A-D there is a greater degree of horizontal collaboration between shippers. Not only do they share the same ELM infrastructure, they might also share the same carriers and deliver to the same customers. This involves a certain level of information sharing. However, the collaboration between shippers and their carriers through ELM has some issues and conflicts. In Case E it has been found that carriers are reluctant to join due to the heavy investment required to buy and maintain telematics. Nevertheless, shippers attempt to incentivise their common carriers to join by promoting volume synergies. But for some carriers who just provide service to a single shipper, the incentive is not big enough to justify their investment.

Compared with Case E, in Case F the scope for horizontal collaboration is improved. Shippers attempt to optimise transport operations not only within a single company but also across companies. However, it also creates some practical problems. For example, shippers might compete with each other for carriers when the demand of transport service is greater than the supply; or shippers are reluctant to share commercial sensitive information such as rates and volumes. Such issues largely explain the practical failure of the Heterarchical Network model in Case F. More importantly, the lack of synergies of loads between shippers failed to secure a ‘critical mass’ because of the very different products being delivered. Such as one shipper requiring delivery of fast moving consumer goods while another required the transportation of chemical products.

6. DISCUSSION AND CONCLUSION
Research question 1: What are the different operational models that support closed ELM?

Through six case studies we are able to identify each type of ELM’s key features in terms of technology, process and collaboration arrangements as described in Section 5. These serve as fundamental prerequisites to deploy a specific model as summarised in Table 2. Which type to choose is largely determined by the strategies of the ELM leader or business needs of participating companies. Three different types coexist in practice and their boundaries tend to blur. Many companies, especially large organisations, who can afford a large investment and are capable of hosting in-house systems still use the traditional package solution. This approach is dominant in private ELMs, that is, Traditional Hierarchical Coordination types. The ‘on-demand’ model is prevalent in Modified Hierarchical Coordination and Heterarchical Network types of ELM. Nonetheless it is observed that overall there is a trend of adoption from Traditional Hierarchical Coordination to Heterarchical Network.

Under Traditional Hierarchical Coordination, ELM is customised for shippers’ use. Hence carriers who serve different customers might need to build individual integration with each ELM or log into different systems to communicate individually with each shipper, which can be costly and time consuming. But because the solution is largely shipper driven and carriers are not in a powerful position to influence decisions. They will have to follow what the shippers require in order to secure contracts from them. The situation improves in Modified Hierarchical Coordination. For example, there are increased chances for the shippers, who engage the same carriers, to utilise a common ELM. In such cases carriers can integrate easier and efficiently with the shippers.
The Heterarchical Network has the biggest potential to enable network optimisation across companies but it implies greater risks as well. As mentioned in the analysis of Cases E and F in Section 5, in practice there are a number of constraints. As we find with the Traditional Hierarchical Coordination of Case A, there is a need and an opportunity for third parties to move in and engage in Heterarchical Networks. Traditional technology providers do not necessarily understand the requirements, nor can they mediate effectively between partners with potentially conflicting interests. This supports previous generic research on horizontal collaboration by Bytheway and Dhillon (1996)

Research question 2: How can each type of closed ELM enable the provision of different logistics operations?

Our study confirms Wang & Naim (2007)’s proposal that different type of ELMs should be adopted for different provision of customised logistics. The Traditional Hierarchical Coordination type of ELM tends to focus on process automation with a limited offer of value added services. Therefore it facilitates the ‘standard’ provision of logistics operation. The Modified Hierarchical Coordination type of ELM tends towards the ‘on-demand’ model and has more flexibility than the Traditional Hierarchical Coordination with a degree of horizontal collaboration between shippers. Thus, it has more elements of Type I customisation. Finally the Heterarchical Network is highly customised for each consortia group’s specific needs. It provides most advanced features of logistics services with a far greater level of both horizontal and vertical collaboration involved. Therefore it enables Type II ‘customised’ logistics.

The choice of information architecture is driven by customer demand and is determined by an organisation’s logistics strategy. However, one size does not fit all. According to
Wang and Naim (2007), the requirements for efficiency and economy of scale can be better met by hierarchical structures, while flexibility and speed are best achieved by open market structure. Yet we found that the emergent heterarchical network mechanism seems to have the potential to satisfy the dual challenges in logistics operation of ‘flexibility’ and efficiency. However we feel that there is a long way to go before the full potential of this type of ELM is fully realised, as there are many practical constraints to be resolved. Moreover it has found that technically it is possible for the shippers to use a hosted platform, creating a closed ELM for long term collaboration with its carriers, while leveraging the open ELM on the same platform for spot purchasing of transport services. This has not happened yet in practice, but we believe it is highly possible for such a hybrid model to emerge.

The case study research findings support Wang and Naim’s (2007) proposed B2B e-business architecture model. This research has established the foundations of our understanding of the operational models available to support closed ELM. The research provides insights on how different closed ELMs are structured, what they do and how they impact tailored logistics. As B2B ELM is changing rapidly, this research can also facilitate our understanding of future development in this field. ELM, although still at its infancy stage, may be seen as an emerging business model to facilitate the provision of customised logistics and with the need for extensive connectivity of business partners with appropriate relationship configurations. The research indicates that the ‘on-demand’ concept and closed ELM will continue to prosper along with the development of ICT especially web-based technology. Both shippers and carriers should keep abreast of technological developments, as technical innovations are at the core of many companies’ aspirations to gain logistics efficiency.
REFERENCES


