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Measuring E-Transformation in the Logistics Industry: A Knowledge Capability Index

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Abstract

The Logistics industry is undergoing radical transformation as retail organisations focus on core competencies, outsource many of their logistics operations and explore online channels. Ongoing research into this transformation process has identified a new breed of "e-fulfilment" providers with a specific set of capabilities. These capabilities can be described using a staged e-business transformation model. Discernible movement towards increased knowledge-based capabilities is evident. This paper reports on quantitative changes in an index of transformation previously developed by the authors, suggesting significant transformation from physical to knowledge based activities. These changes will have long-term impacts not only on the Logistics industry but also on all online retail operations.

Key words*: e-fulfilment, Logistics industry and ICT, e-business and transformation, online retail*

1. Introduction

1.1 The Definition of e-Fulfillment

Over the last decade organisations have been forced to re-examine the role of Information and Communication Technologies (ICT) as a support tool and accept that it has become a major driver for business change (Ash & Burn, 2003). It can be argued that e-Business is no longer optional and has become the standard mode of operating not only in financial services, publishing and retail, where we have already seen rapid and profitable advancement, but everywhere business is conducted. Indeed new business opportunities have arisen solely based on e-business: e-Fulfilment is one such example. These services were estimated to be worth US$1.006 Trillion in the US alone, or 10.1% of their GDP in 2000 (Rogers, 2002). Furthermore, 21% of all logistics transactions are expected to be online by 2005, with the long-term possibility that traditional freight companies will ultimately cease to exist (Homs, Meringer, & Rehkopf, 2001). E-

fulfilment is typically described in general terms as everything an online company does to satisfy customer demand within an e-Business framework and includes both supply chain and logistics functions (Palmer, Kallio, & Heck, 2000).

A review of the literature on e-fulfilment and online retailing identifies the following issues which a provider needs to consider:

- location design and picking systems;
- packing –customized packaging/repacking for delivery of products;
- customer service – managing customer queries and complaints;
- financial transactions – calculating and including fulfilment costs, and electronic payments;
- warehouse costs – associated with product storage;
- delivery – systems and delivery alliances;
- transport mechanisms and flows – using multiple delivery mechanisms to ensure deliveries arrive on time and undamaged
- procurement management – purchasing arrangements automatically (electronically) integrated with fulfilment suppliers, triggering delivery transactions;
- management information systems – integrating and managing all aspects of the process;
- front end (ordering) services – which electronically trigger the fulfilment process automatically from a web-purchaser's mouse-click;
- after-sales service – to ensure fulfilment problems are resolved;
- returns – managing reverse logistics related to incorrect, damaged or fit-for-use product issues; this must not only ensure convenient and quick return of goods initiate re-delivery of the correct goods if necessary;
- real-time tracking –management of all pools of product, and commitment to promises made by front-end ordering systems.

These are recognised as integrated components which create virtual proximity between e-trader and customer, and represents a succession of activities which are necessary for the successful supply of customers and markets (Klaus, 1998). Figure 1 collapses these concepts into a single diagram, and illustrates the scope of what, in this study, is explicitly termed e-fulfilment, and underpins any hypotheses that emerges from the research conducted.

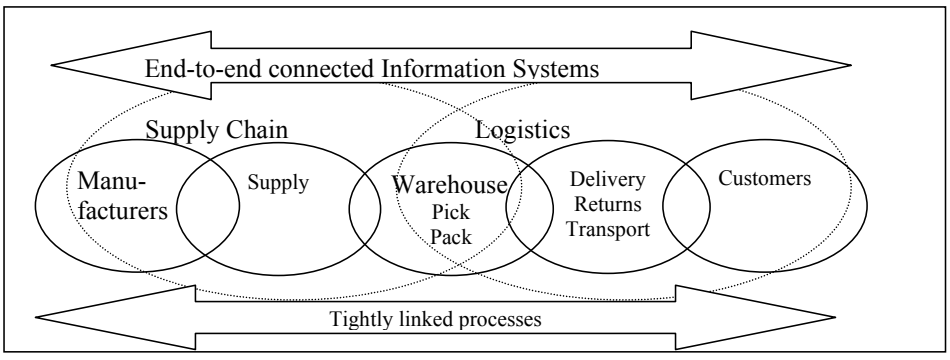

Figure 1: e-Fulfilment Scope

Although components may be aligned with existing activities, e-fulfilment requires its own unique supply chains and distribution networks (DiMaria, 2001). This is integral to the whole concept since the degree of integration between legacy logistics/delivery and supply chain systems must ensure end-to-end coordination and information sharing (Esper & Williams, 2003; Strader, Lin, & Shaw). Additionally, the nature of the product range, customer delivery expectations, and delivery zones have all changed in the online retailing world and forced changes in the supply chains that support them (Rabinovich & Evers, 2003). Brand new issues such as product returns and remote payments must now be addressed by these systems.

1.2 Transformation of e-Fulfillment Businesses

Based on our previous research (P. Alexander & Burn, 2004a, 2004b, 2004c; P. R. Alexander, 2002) we can see evidence of a staged transformation taking place within the industry which can be related to a more general model of e-business change initially identified by (Deise, Nowikow, King, & Wright, 2000) – figure 2. The revised model begins with the use of ICT within the parent company (typically transportation or warehousing) to enhance distribution channels through some form of e-commerce. This is followed by the application of ICT within and across value chains, and extends into e-fulfilment.

New offerings are being considered by e-fulfilment organisations all the time. They appear to be in a highly competitive market place with unmet customer demands offering significant commercial opportunities. The rapid uptake of technology, particularly related to mobile and online, is fuelling rapid change; change that is transformational, not just incremental (P. R. Alexander, 2002; Anderson & Lee, 2001).

This ICT application inevitably leads to industry transformation as networks of organisations are formed through extended e-business operations; for example, the move observed within e-fulfilment companies towards website design activities. Finally there will be a convergence where many e-fulfilment companies and their offshoots come together and work in the same e-space in virtual environments. One example of this type of transformation can be seen in Zendor, one of the UK's best known names in e-fulfilment, who advertise themselves as 'The Total Distance Selling Solution' offering Logistics, Marketing Services, e-Business/Interactive Services, Consultancy, Customer Services and Merchandising. As one of their customers now states:

'Zendor's competencies are N. Brown's competencies. That is what we liked; plus their willingness to think and act as a long term partner and respect that this would be a partnership of equals'(Spice_Court_Publications, 2003).

N. Brown is a home shopping giant and the parent corporation. Zendor now counts in its client base disparate companies such as Toys R Us, Stanley Casinos, Lloyds TSB, Screentrade and Sony.

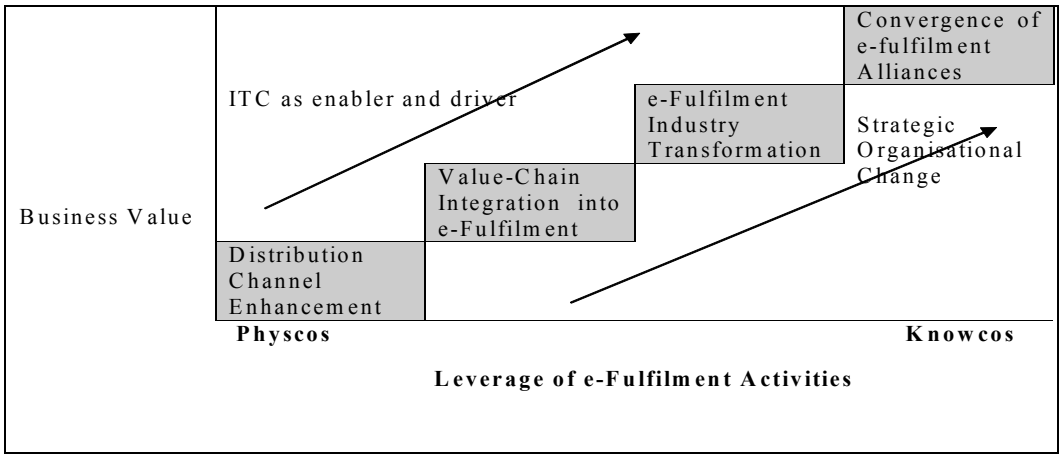

Figure 2: The "Staged e-Fulfilment Transformation" Model (Modified from(Deise et al., 2000))

This transformation can be viewed as the transformation of a company reliant on physical assets (Physcos) to one which is solely dependent on knowledge assets (Knowcos). As companies collaborate along their value chains the nature of the industry begins to change as organisations decide to outsource some of their traditional functions and focus only on their core competencies. The term "going to market" will no longer be defined as the way a company enters the marketplace but rather it will characterise the way an integrated group of companies creates a set of cascading values to transform the marketplace into a network of value providers. At this stage companies will make a conscious effort to orient their strategies toward becoming knowledge-based "Knowco" or physical goods-based "Physco" companies (Deise et al., 2000).

This paper reports on the findings from year three of the study as we compare the self-reported changes in capabilities within a group of 50 UK based Logistics organisations covering the period 2003-2004.

2. Study Objectives and Approach

The existence of a wave of businesses providing specialised third party e-Fulfilment services is becoming apparent around the world and accompanied by a call for more intensive research into e-business logistics (Auramo, Aminoff, & Punakavi, 2002; Skjoett-Larsen, 2000). This is verified by the annual report produced in the UK by E.logistics Magazine and known as the e-Fulfilment Index.(E-Logistics_Magazine, 2003; Spice_Court_Publications, 2004). These reports provided the target group of e-fulfilment operators for this study, based throughout England and Scotland, mostly in major cities. Their business is largely local in scope, though some organisations offer, or even concentrate on international deliveries.

In previous research by the authors e-fulfilment operators' capabilities were analysed with respect to relevant features and activities. An index of transformation was also developed to allow quantitative comparison between organisations. In this paper the index is recalculated to show the progress of these organisations and this industry. The study consists of an analysis of published results over the two-year period. The researchers have ongoing interaction with the organisations and have conducted several in-depth reviews which support the findings presented in this paper.

An interpretivist approach underpins the research. We focus on context and process, and do not emphasise predefined dependent and independent variables (Mingers, 2002). Simple statistical analysis is used to quantify and group the observed data; specifically capabilities and sectors of operation. We recognise that the data is driven by the direct views, opinions and perceptions of the business's management or as a response to market and industry forces, which themselves are based on their views, opinions and perceptions.

This paper is part of an evolving methodology. We have focused on a data set describing UK companies represented in the market as "third party e-fulfilment service providers" (Spice_Court_Publications, 2003, 2004). The information was analysed to provide concise lists of capabilities and operating sectors and used to develop more appropriate definitions of what these companies offer. This was found to be quite different from definitions extracted from literature reviews (as outlined above). In this paper we concentrate on calculating a "transformation index" for our sample companies, and the changes in this index over the last 2 years.

3. Transformation and Capabilities.

It becomes apparent in approaching this analysis that transformation in these organisations is a function of the aggregate effect of each organisation's portfolio of capabilities; not only the nature of the capabilities but also the combination and range of such capabilities. The number of capabilities themselves may provide an indication of transformation.

3.1 GOs and SOs

Not all organisations provide the same specific capabilities or range of capabilities. Based on these differences we have previously defined two broad but distinct categories. "General Outsourcers" (GOs) represent 30% of e-fulfillers in 2003. They provide a full range of capabilities as defined by our e-fulfilment definition. Specialised Outsourcers" (SOs) target a more niche-market strategy and have typically fewer capabilities. The specific number of capabilities suggested which category they would fall into (Figure 3); two clear breaks being evident.

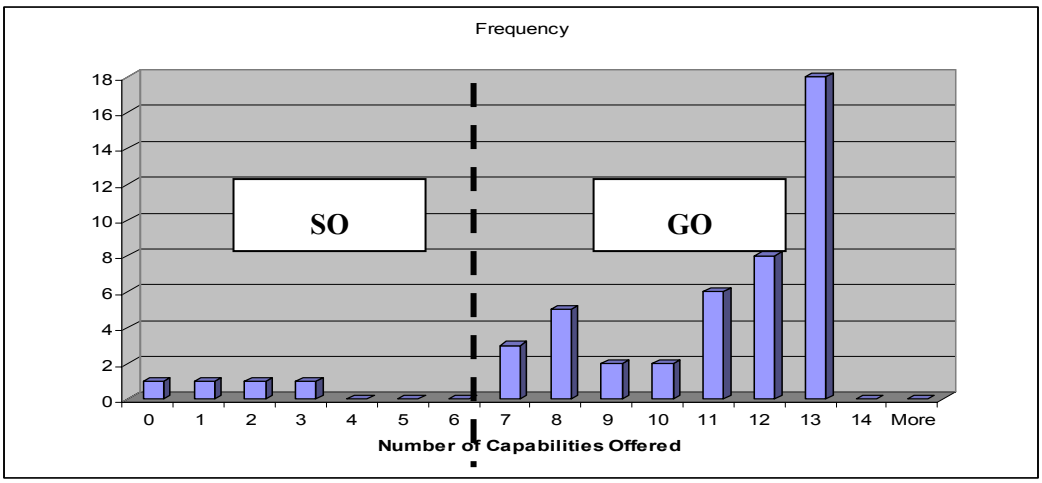

Figure 3: Specialists and Generalists defined by number of capabilities offered

Our previous research (P. Alexander & Burn, 2004c) indicates strong pressures to move to non-traditional capabilities in the GOs, with some, but much less perceived imperative in the SOs, who are more focused on relationships with customers in their sector. This behaviour in turn appears to drive the nature of development of the capabilities. The GOs are developing new customer-facing capabilities while the SOs are more intent on improving internal processes and infrastructure of existing capabilities. Regardless of their degree of specialisation, they are using and recognise the importance of web facilities for their organisations, though it is the GOs who see online services as more significant. They are also more intent on increasing their expertise and developing these capabilities.

Significant changes are evident comparing results from 2003 against 2004 (figure 4). SOs appear to be acquiring capabilities, while GOs are more focused on their capability offerings, though still generalising.

E-Fulfilment companies have two broad sets of capabilities. Physical capabilities such as delivery, storage and packing or goods, and knowledge based capabilities such as call centre management, establishment of online web sites, integration of supply chain systems and assistance with online channel selling.

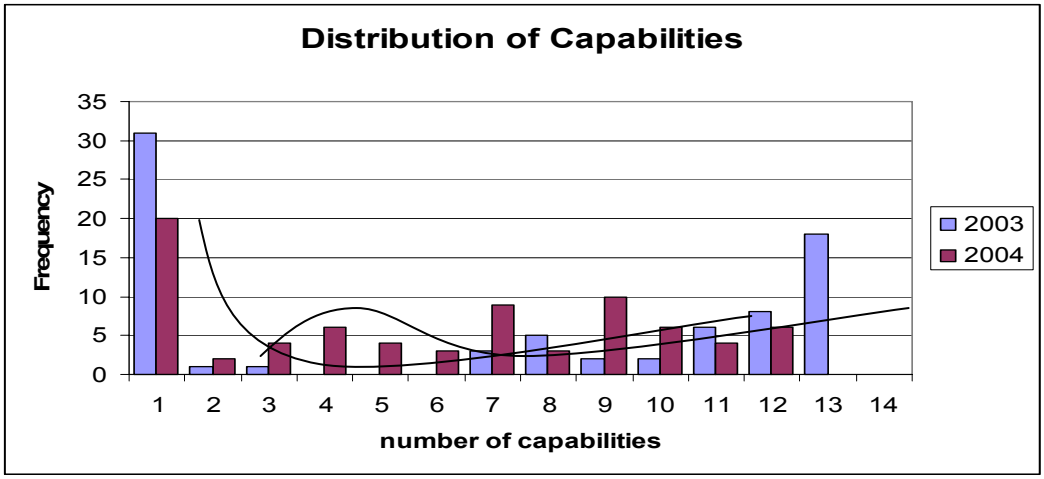

Figure 4: Frequency distribution of capabilities

GOs have a broader range of capabilities which generally include knowledge-based ones. They either have a dominant customer that requires these capabilities or they are able to sustain them. In either case, they can maintain a broader range of customers and also offer cross-capability selling; a situation much more amenable to the e-fulfilment organisation itself planning its offerings strategically.

Figure 5 represents this phenomenon, with GOs generally embracing knowledge-based services. Over time SOs are resolving into two quite distinct groups; those concentrating on knowledge-based services such as web-hosting or call centre management (Knowcos), and those concentrating on "traditional" transport and logistics functions (Physcos).

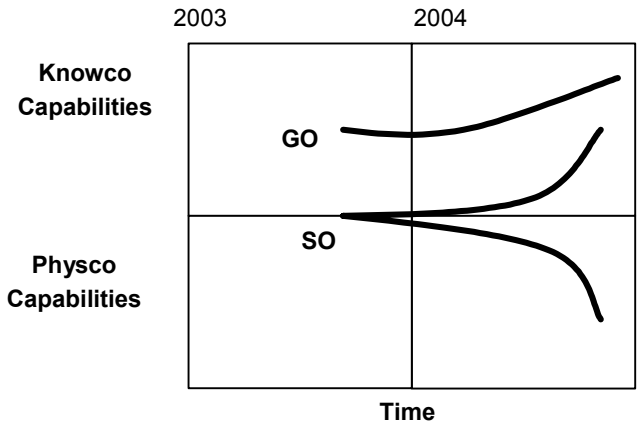

Figure 5: Potential transformation of e-fulfilment organisations over time

Whereas in 2003, when it come to placement in the staged model (figure 2) the majority of e-fulfilment operators were placed in Stages one and two with a few GOs indicating movements towards Stage 3, we are observing a dichotomy within the SO market towards either Physcos or Knowcos. Knowcos will focus on building brands similar to the 'Nike' and 'Addidas' strategies in the late 90s, capturing ownership of the customer-end market relationship, and investing in knowledge-based core competencies such as e-marketing and web services development. They may well expand into providing customer knowledge management services to other companies in their marketplace. Physcos will become hubs of processing expertise. Their success depends on speed, quality and delivery.

Overall, there is a general move towards Knowco capabilities. In some cases such as provision of in-house software, this is pervasive across the whole sample. In others it is determined by the capabilities e-fulfilment companies focus on, and that is in turn influenced by customer demands. GOs are more likely to be Knowcos, but as our previous research indicates, the organisations choose to develop and prioritise each of their specific capabilities to meet customer needs.

Such a process is quite responsive and supports the evolution of dynamic capabilities highlighting the interplay between strategy, ICT and entrepreneurship in a quest for competitive advantage (Wheeler, 2002; Zahra & George, 2002). As such, it mitigates internal long term, strategic foci in favour of those that can adapt to customers needs nimbly. The transformation models we use rely on assumptions that indicate an organisation chooses to develop knowledge-based capabilities to gain competitive advantage. While this is more true of GOs, which are more likely to be proactive with their capabilities offerings, it is less so with SOs.

This reactive, customer-sensitive approach to acquiring and developing capabilities explains the evolving division of SOs into those specialising in physical capabilities and those concentrating on knowledge-based ones.

4. Calculating an Index of Transformation

Deise et al's (2000) definitions point to mechanisms of transformation but essentially treat an organisation as consisting of "capabilities", all with the same level of transformation from Physco to Knowco. We see that a comprehensive transformation model innately requires a heterogenous "set of capabilities". It is also clear that each

capability contributes differently to the degree of transformation; from supporting purely Physco characteristics, such as delivery, to being completely concerned with Knowco capabilities, such as retail-web-site consulting services. Previous research by the authors (P. Alexander & Burn, 2005) extended and tested a model to meet these needs through calculation of an "index of transformation" (figure 6). In this model we assessed the degree of transformation of each of an e-fulfilment organisations' capabilities and posited that e-fulfilment organisations, for pragmatic and compelling commercial reasons, would make conscious decisions about the capabilities they were prepared to advance, grow, adopt, shrink and discard. These decisions appear to be made as part of the organisation's planning processes in line with what is anticipated in the future, and tempered by the organisation's culture and perceived overall capabilities (P. Alexander & Burn, 2005) and discussed above.

We proposed therefore that the degree of transformation is actually made of a portfolio of capabilities, each with a degree of contribution to the overall transformation, which consequently participate in an organisation's overall degree of transformation.

This index focuses on capabilities that are externally-facing relative to the e-fulfilment organisation. The assessment is made in two dimensions; transformation associated with the online retailer (the e-fulfilment organisation's customer), and that associated with the customer's customer (also referred to as the "end-customer"). This recognises that third party e-fulfilment organisations are acting as intermediaries in the supply chain between the end-customers and the online retailers and it is at the two ends of the supply chain that interaction occurs. For convenience we call thes the ORF (online-retailer-facing) and ECF (end-customer-facing) components of the index. These are indices themselves, though they do not describe the overall transformation process.

To establish knowledge-content weightings of ORF and ECF components, capabilities were assigned a rank according to each one's knowledge component (table 1).

Table 1: Knowledge weighting for e-fulfilment capabilities

Weighting	Assessment guideline	Examples of capabilities
0	Falls into the traditional fulfilment supply chain	Warehousing, transport, track & trace systems
1	fulfilment-related extension of the chain into the business processes of either end-customer or online retailer	Managing transaction finance, returns management, call centre, data entry, mail order management, designing multichannel logistics solutions, decoupled replenishment
2	major extension into online-retail or end-customer business, including outsourcing a complete non-fulfilment function	Transaction bureaus, call centres, campaign management, web enabled mail order, POS
3	completely non-fulfilment business functions performed for end-customers or online-retailers	CRM, database cleansing, management of complete e-commerce solutions, web and site development, printing, product enhancements services, web content provision and hosting, catalogue production

Aggregating these weightings with separate measures for ORF and ECF capabilities generates a plot point for any e-fulfilment organisation.

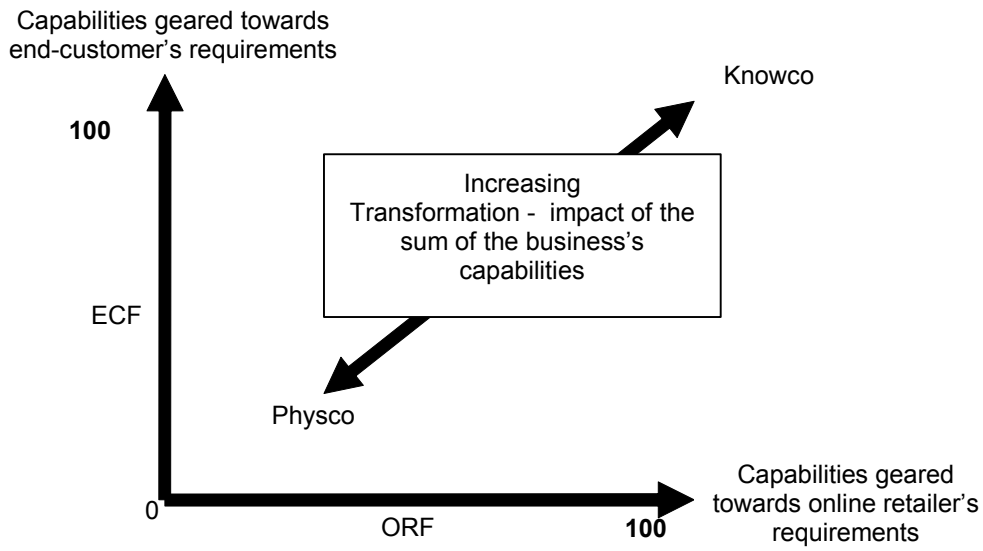

Figure 6: Two-dimensional Index of Transformation

The original Deise model refers to "stages" of transformation. While we recognise and agree with this assessment, when aggregating capabilities it is quite possible that while the total capability portfolio will place a company clearly into one of the 4 stages of transformation, contributing capabilities may actually relate to other stages. Rather than complicate the model we opt instead to represent the degree of transformation as an index of a baseline value which is the current maximum for all organisations currently surveyed. We give this maximum the value of 100 in each dimension. Importantly, this approach allows us to measure companies comparatively. This is summarised in Figure 6.

5. Application of the Index of Transformation

Figure 7 & 8 applies our Knowledge Capabilities model and the indices of transformation it generates, to UK e-fulfilment companies for each of the years 2003 and 2004 . Each point represents, for a single company, the aggregated degree of overall knowco capability in both ECF and ORF dimensions, measured as we described above.

Based on the depth of responses provided, in 2003 we were able to make a transformation assessment for 38 organisations out of our total study sample, while in 2004 this was reduced to 17 organisations; still a significant number.

In the analyses we observe that with respect to knowledge content of their capabilities there are "generalists" who attempt to become Knowcos in all aspects of the business, and "specialists", becoming Knowcos either in end-customer-facing capabilities or in etailer-facing capabilities. For both years we observe that lines of the same slope show clustering. From this, it appears organisations have followed 3 distinct paths to transformation. They confine their transformation to online retailor-facing capabilities, they confine their transformation to end-customer-facing capabilities, or they develop transformation in both dimensions. This relates well to our predictions in previous research (figure 5)

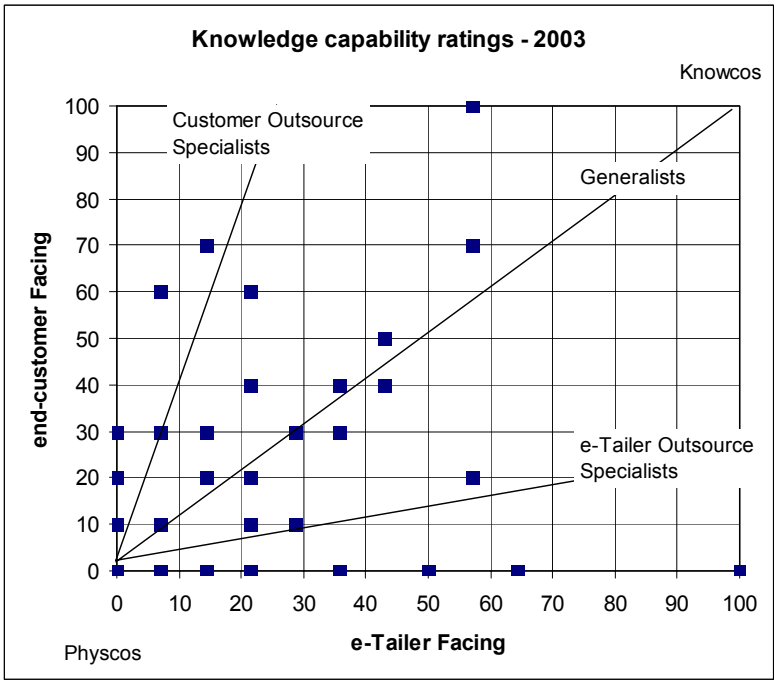

Figure 7: Level of Knowco ratings for capabilities - 2003

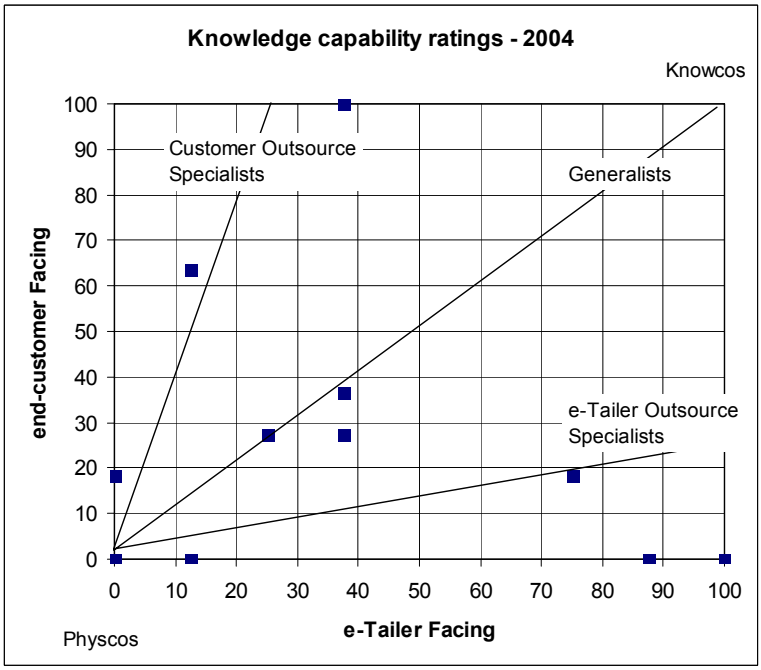

Figure 8: Level of Knowco ratings for capabilities - 2004

Our index is re-established at 100 for each of years of analyses, but we can nevertheless compare the years by looking at differences in clustering. Table 2 highlights extremes in the data gathered.

Thus in 2003 44% of organisations were offering capabilities with insignificant knowledge content with respect to customer-facing capabilities (ie. Their ECF capability index components are less than 10), while 50% were in this group for ORF capabilities. Only a small percentage were offering strong Knowco capabilities for both faces.

In 2004, just one year later, although there are not major changes with Physco characteristics for ECF capabilities, half the business in the low ORF category have acquired more significant knowco capabilities.

As significantly, there has been a three-fold increase in extreme Knowco capability (index components above 70) in both dimensions of the index.

Year	End-customer-facing (ECF) index		Online-retailer-facing (ORF) index	
	<= 10	>= 70	<= 10	>= 70
2003	44%	2%	50%	6%
2004	47%	6%	23%	18%

Table 2: Frequency of extreme indices of transformation in e-fulfilment organisations

6. Discussion

The Index of Transformation quantitatively measures, across 2 dimensions, e-fulfilment organisations' moves to acquiring the knowledge-based capabilities that define a Knowco. Compared to the fastest transforming organisations (those with an index of 100), most are about half this rating indicated by their capabilities. There is an even balance between ORF and ECF capabilities. Part of this balance is because many organisations are acquiring both these kinds of capabilities equally. However, we are beginning to see significant stratification within the industry which may lead to extreme differences in future behaviour and marketplaces. One strong area of interest relates to 'last mile' services. UK e-fulfilment companies are either active or manoeuvring to operate in that space. They are intensely interested in anything to do with that part of the business. Enough organisations do it to suggest it represents a real customer need; and enough wish to do it to indicate that this may become a source of rapid growth and fierce competition in the near future.

We see that many of these businesses have chosen to become generalists, offering the whole range of services we collect under the heading of e-fulfilment. This is driven, at least for some businesses, by a perceived opportunity in outsourcing online retailers' fulfilment needs completely. Such a marketing strategy is logical when not only does the outsource provider have individual capabilities, but has developed systems and skills that link them closely together, enhancing efficiency and reducing problems. There is also a place for specialists, who although fully embracing online and general capabilities, are very focused on meeting their customers' needs with respect to efficiency and services offered, even if this means favouring Physco characteristics.

E-Fulfilment businesses are preparing for a market place that is incrementally expanding. They feel constrained by delivery infrastructure and threatened by a potential backlash from traditional retailers. But even though the market appears to be evolving persistently and rapidly now, e-fulfilment organisations are transforming at a fast rate, acquiring knowledge-based capabilities that integrate them better with their customers. When those capabilities are integrated with online solutions such as customer web-integration, we note that many companies have now chosen to outsource these capabilities. This may well have been a suitable response to rapidly acquiring skills not part of the traditional e-

fulfilment businesses from which many e-fulfillers are descended, but if this has suppressed development of core online skills then strategic decision-making in the area may be affected. We believe having such core skills may become a differentiator for gaining competitive advantage in the future.

Our research has identified trends and activities undertaken by this industry, and connected them to a capabilities model which attempts to resolve what "e-fulfilment" is becoming. In assessing transformation, we have had to expand the Diese model to two-dimensions and recognise an organisation's overall transformation is made of the net effect of a portfolio of individual capabilities. This recognition allows companies to be measured, which opens up a range of longitudinal comparisons allowing us to track the evolution of the industry quantitatively. Finally, it poses the question: what makes these organisations successful?

With these questions in mind our research will focus on the "edges" of our model of e-fulfilment service provision; the interfaces to end-customers, and those to customers. With the progression to Knowcos we observe in this sample, we anticipate these will be the focus of rapid change in these businesses, explored using a longitudinal study of the data with the Knowledge Capabilities model. In-depth interviews have been scheduled with a number of the Logistics companies covered by the data and in addition, the 2005 data will also be incorporated into the transformation models.

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