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## The last mile of e-commerce – unattended delivery from the consumers and eTailers' perspectives

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**Abstract:** Many products ordered online need to be physically delivered to the consumers. The home delivery logistics in e-commerce, as it is so-called 'the last mile' of online shopping, has been one of the key factors leading to failures of pioneering dot coms, and is becoming a great challenge facing many eTailers. The convenience and time saving benefits of online shopping may not be realised due to the inefficiency or failure of the last mile delivery. This paper examines consumers' experience with the current delivery services, and the perceptions of unattended delivery from both consumers and eTailers' perspectives. It found that UK e-shoppers do not perceive unattended delivery as favourably as reported elsewhere in Europe, but have a great desire for picking up from local collection points. Differences exist on future delivery preferences between eTailers and consumers. The results have many implications for eTailers to develop their home delivery logistics strategy.

**Keywords:** e-commerce; e-shopping; home delivery; unattended delivery; logistic model; online tracking; UK survey; United Kingdom.

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Mr. Martyn Roberts is a Principal Lecturer in Business Information Systems at the University of Portsmouth. He has worked in both the IS industry and academia, and has taught in the UK and in the USA. His research is based on the strategic use of IS in SMEs and in particular with companies that have experienced high growth rates. His work has been published in a number of journals and conferences. Roberts has pioneered the introduction of e-commerce/e-business in the university and has a growing list of publications in the area.

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## 1 Introduction

Product delivery for online shopping is an important part of order fulfilment that is becoming more salient to consumers (Cooke, 2004). The ability to fulfil and deliver orders on time could determine an eTailer's success (Lee and Whang, 2001). One of the notable benefits of online shopping is the convenience and time saving when compared to traditional shopping (Alreck and Settle, 2002; Roberts *et al.*, 2003). Convenience of online shopping is a lot greater than just buying products that are available on a website from the comfort of consumer's own home. It includes other factors such as ease of online payment, home delivery and return procedures that all combine to make internet shopping more convenient than traditional outlets (Torkzadeh and Dhillon, 2002). This is echoed by eDigital Research that consumers measure an organisation by the end-to-end experience, including e-mail, delivery options and efficiency, the website does not stand alone (Kinnes, 2006). The importance of delivery for online shopping is evident from Charatan (2001) who reports that non-satisfactory delivery schedule topped the list (34%) of dissatisfaction with e-shopping. Forty percent of the respondents prefer easier delivery or collection in addition to cheaper offers and lower delivery charges offered by eTailers. The importance of delivery for online shopping is also recognised by some eTailers. A survey of 100 companies conducted by Consignia (2001) revealed that 58% of the respondents ranked delivery at the time and place that is convenient to the consumer as the second most important factor influencing the market. One of the main issues related to delivery of items ordered online is the "Not-at-home at the time of delivery" problem (Park and Regan, 2004), which causes higher operating costs for eTailers/carriers and dissatisfaction for consumers.

Order fulfilment can be the most expensive and critical operation for both the online and offline business of companies engaged in e-commerce. Frazer (2000) identified that time constraints, poor quality of home delivery services, and lack of variety of delivery options to be the influential factors that make home delivery the weakest link in the internet chain. He argues that in reality, business managers are increasingly realising it is difficult to find delivery options that are both affordable and satisfying consumers. This notion is reinforced by Newton (2001) who states that the central challenge for B2C

companies is to deliver products to the home of individual consumers in a way that is cost effective and meets customers' expectations. Lee and Whang (2001) expect that in the future, e-business that delivers the goods and services at a reasonable cost will have the edge. Empirical study (Ring and Tigert, 2001) examining delivery models adopted by grocery retailers in the USA, UK and Europe found that the two killer costs facing pure internet grocers are the picking costs and the delivery costs. To an eTailer, the primary objective is to select a delivery model that significantly reduces delivery time or increases the number of deliveries per hour. This is akin to the concept of Delivery Value Density – DVD (Lee and Whang, 2001), which is computed by dividing average total dollar volume of the shipment by the average travel distance per trip. In practice however, for many B2C companies, as suggested by Newton (2001), the cost savings promised by e-commerce are eaten up by high delivery expenses. This reinforces Frazer's (2000) assertion that the enormous cost of failed deliveries is a well-kept secret in the delivery industry, which makes many companies struggle for profitability.

Research into home delivery logistics for e-commerce is disproportionate to the large body of literature on e-business adoption (Wu *et al.*, 2003; Gary, 2003; Fillis *et al.*, 2004; Molla and Licker, 2005; Hong and Zhu, 2006; Lopperi *et al.*, 2006); online consumers (Kau *et al.*, 2003; Lokken *et al.*, 2003; Rohm and Swaminathan, 2004; Saarenpää and Tiainen, 2005; Yu, 2006). Nevertheless, the order-fulfilment model (*i.e.*, Distribution centre versus Store pick up) has attracted attention of some researchers (Seybold, 2002; Punakivi and Tanskanen, 2002; Xu and Roberts, 2004). The concept of unattended delivery – a possible solution to deal with the 'not at home' problem, has emerged from EU and US based studies (Ring and Tigert, 2001; Tanskanen *et al.*, 2002; McKinnon and Tallam, 2003). Unattended delivery using reception box or delivery box has been suggested as an effective solution (Punakivi *et al.*, 2001; Park and Regan, 2004). However, there is no clear evidence from the UK on how consumers experienced with delivery services offered by eTailers, and what perceptions are held by consumers and eTailers towards unattended delivery. This study aims to explore these issues.

## **2 Literature review and research hypothesis**

### *2.1 The 'Not at home' problem*

Home delivery in e-commerce is becoming an important issue for eTailers and carrier service providers. Park and Regan (2004) suggest that the most significant impact of e-commerce on freight transportation is the increase in direct home delivery of smaller shipments, which may stimulate greater complexity in distribution system management, potentially causing higher costs in carrier's fleet operations. More frequent home-based local deliveries will likely add to traffic congestion and environmental problems in urban areas, making it more difficult for carriers to meet customer demands. The main issue addressed by Park and Regan (2004) is the 'Not-at-home at the time of delivery' problem, which becomes a most critical factor for the success of home delivery operations. When the customer is not at home at the time of delivery, *i.e.*, first time delivery failure, it causes higher operating costs for eTailers/carriers and inconveniences to customers that lead to lower satisfaction. This affirms Lee and Whang's (2001)

assertion that late deliveries, broken promises and unmet expectations of the last mile of e-commerce left both consumers and investors dissatisfied. Recent studies (Morganosky and Cude, 2002; Annon, 2004) show that the convenience and time saving benefits have not always materialised. Some online shoppers feel online shopping takes even longer than traditional shopping, mainly because of delays in delivery or failed delivery. For example, Morganosky and Cude (2002) report that although the majority of the respondents cited convenience as the most important motivational driver for using online shopping service, a notable time savings difference was cited in a longitudinal study of online food shoppers, *i.e.*, 20.6% of respondents felt the time was the same or even longer than traditional shopping. In their 1998 survey (Morganosky and Cude, 2000), the figure was higher at 47.5%. Annon (2001) reports that 42% of home shoppers had to collect missed delivered items from a post office or a depot in year 2000. In their later study (Annon, 2004), 64% of respondents said they would buy more online if they had more delivery options, with unattended delivery option coming out the top of their wish list. Blyth and Geoghegan (2002) cited a DTI (UK Department of Trade and Industry) survey by stating that customers with hectic lives can be put off using home delivery because they are unwilling to wait for hours for a delivery to arrive. This leads to the first hypothesis that:

*H1 The degree of inconvenience of delivery of online ordered items experienced by e-shoppers is high.*

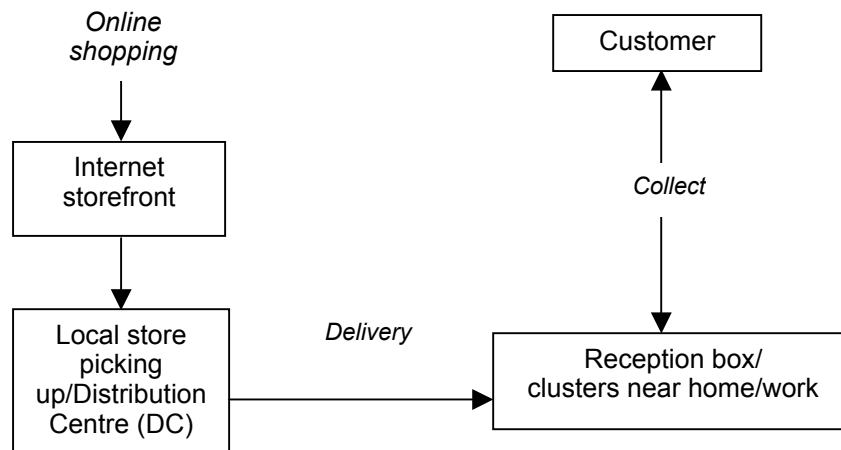
## 2.2 Unattended delivery

Many traditional and innovative delivery options are available, but there is yet a proven operation model of home delivery service accepted by most eTailers (Tinnila and Jarvela, 2000). A traditional delivery option used by many retailers for home shopping is using courier and postal services, the delivery time varied including same-day, next-day and multi-day delivery. Dimaria (2002) argues that same day delivery is unlikely to happen for most online ordering, because companies must have a full inventory located in nearly every local market throughout a country, which is a rather expensive operation. Thus, next day or multi-day delivery prevails. This type of delivery usually requires the recipient to be present to receive the items. Another delivery option is to offer an hourly delivery window when or after online ordering, which has been widely used by many online grocery retailers. Both options require the person to be available to receive the goods ordered for the delivery hour booked. An additional problem revealed by ISOTrack (2003) is the uneven time slots required by e-shoppers, *i.e.*, the majority of e-shoppers want goods to be delivered between 6 pm and 8 pm, with Thursday to Sunday being favourites. A DTI (2001) survey of 317 internet shoppers shows that 34% of the respondents indicated that the best delivery time slots for them would be between 6 pm and 8 pm. This creates large demands of delivery for a short busy period, which results in the delivery fleet runs at low capacity for 80% of the day, then at full capacity for the rest.

It appears that delivery of packets and parcels could be effective if a person is present to receive them. However, attended delivery may cause inconvenience to consumers as we hypothesised. Unattended delivery may offer an alternative solution to

the ‘not at home’ and ‘uneven time slots’ problem. Punakivi and Tanskanen (2002) suggest that the least expensive delivery model is unattended weekly delivery on a defined weekday, which could reduce home delivery costs to less than a half, while meeting customer expectation. The original concept of unattended delivery is simply leaving an item on someone’s doorstep, or in the garden shed, but this brings many security concerns, particularly when items are perishable or have high value. Secure unattended delivery has been discussed and analysed (McKinnon and Tallam, 2003), which includes various mechanism, *e.g.*, home security access systems, fitted integrated box, fitted external box, mobile reception box. The process of unattended delivery as suggested by Tanskanen *et al.* (2002) is depicted in Figure 1.

**Figure 1** Unattended delivery process



Tanskanen *et al.* (2002) suggest the building of a refrigerated reception box, or shared reception box clusters at the customer’s home or located in an office building for unattended delivery. The cluster can also be placed in dense residential areas to ensure sufficient households access to the boxes. Lee and Whang (2001) described a Boston-based online grocery store – Streamline, installed a delivery receptacle in the customer’s garage in order to improve DVD. The driver is allowed access through a numeric password-based security system installed at the garage door. This eliminates the time cost of the driver having to wait or revisit a customer.

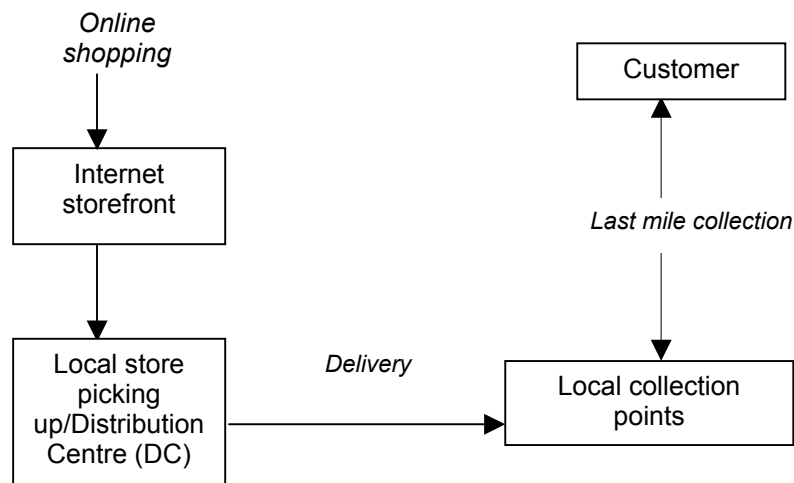
Unattended delivery service appears an effective option to reduce delivery cost while reducing the level of inconvenience. From the eTailers’ point of view, it allows for flexible operating efficiency without sacrificing the service quality; from e-shoppers’ point of view, it could reduce the time in waiting for delivery. This leads to the second hypothesis that:

*H2 Unattended delivery is preferred by both e-shoppers and eTailers for packed items.*

### 2.3 Last mile collection

Another type of delivery model that allows flexibility to both eTailers and e-shoppers is to get customer to handle the last mile of the delivery, *i.e.*, to collect from certain convenient locations that are close to consumers' home or workplace. The convenient locations include, for example, existing retail outlets, local convenient shops, petrol stations, parking bays, *etc.* The process of last mile collection, which is referred to as an Intercept model by Ring and Tigert (2001), is depicted in Figure 2.

**Figure 2** The last mile collection (Intercept Model)



Ring and Tigert (2001) suggest that the objective of delivering to a collection point is to increase the number of deliveries per hour and reduce significantly the delivery time. An example of last mile collection cited by Ring and Tigert (2001) is GIB (Brussels), which shows that the fulfilment ratio (number of orders delivered per hour to the collection point) is 9, this is about 2.5 times higher than deliveries made directly to customer's home per hour. Lee and Whang (2001) suggest that the cost of delivery can be justified only if there is a high concentration of orders from customers located in close proximity – or if the value of the order is large enough. The cost of delivery is excessively high if customer orders are both small and distributed over a wide geographical region. Delivery to a local point where customers can come to collect could potentially increase DVD, provided that customers are willing to handle the last mile. This leads to the third hypothesis that:

*H3 Local collection points are preferred by both eTailers and e-shoppers.*

There are concerns regarding unattended delivery. For example, Borrus (2002) questions whether consumers are 'willing to pay for a lockable service on top of delivery charges?' and suggests that the unattended delivery option is only attractive for 'upscale consumers' who are heavy catalogue or e-consumers. This is echoed by Charatan (2001) who examined what makes consumers dissatisfied with home shopping, and revealed that delivery issues were very obvious and that consumers want to pay less for the item and

have it delivered more cheaply. However, a recent study of delivery pricing and delivery options by Cooke (2004) reveals that although consumers are paying more, they are generally satisfied with the service and willing to pay the extra charge. These issues related to unattended delivery are explored when testing the hypotheses.

### **3 Scope of the study**

There are vast ranges of products that can be purchased online but require physical delivery. Delivery requests vary according to the type and value of products purchased online. Consumers may need to take a day off work in order to receive a large item such as a sofa or a domestic appliance, but when it comes to smaller items with low value such as books or groceries, the idea of having to take a day off is almost inconceivable. The delivery of letterbox-sized items (except very expensive high value small items) generally is not a concern for both the eTailer and e-shoppers, as the item can be delivered to the consumer's property directly through the letterbox. Delivery of large items is often linked to installation and commissioning of the product purchased, which makes unattended delivery less likely to fit these types of products. This study concentrates mainly on the delivery of packed items and parcels including groceries that require repeating purchase, but generally are not of very high value. This is the category that tends to cause most inconvenience to consumers with regard to delivery methods.

### **4 Methodology**

This study uses questionnaires to collect data from eTailers and e-consumers in the UK. Although questionnaires have their limitations (Partington, 2002), questionnaires are good at gathering descriptive data and for explanatory research (Saunders *et al.*, 1997), which suits the nature of this study.

#### *4.1 Sampling and data*

The sample of e-Consumer survey would ideally have been the consumers with online shopping experience, but unfortunately there is not a compiled list readily available. Thus a sampling criteria has been set, that is a participant must have ordered an item from the internet and the item was delivered (offline) to him/her. This was established through an initial statement before asking for participants to complete the questionnaire. Efforts were made to achieve a balance of male and female participants as well as balance on age groups by referring to the Consumer Knowledge (2004) report, which identifies UK e-consumers who are in the 16–59 year old range. A total of 150 prospective consumers are selected through three channels:

- 1 for consumers aged below 25, students at an university and students at a local college
- 2 for consumers aged 25–50, employees at a south coast Business Park and a Borough Council (via internal contact) and university staff who agreed to participate in the survey

- 3 for aged 50 above, contact details are obtained from members of an 'IT skills for mature learners' course, which is run by a local Borough Council.

The consumer questionnaires were distributed electronically via e-mail to the 150 consumers. A follow up e-mail was sent to non-respondents after five days. A sample of 125 e-consumers was obtained. The questionnaires were initially piloted on ten consumers to test the validity of the questions and external reliability of the questionnaire items and measurements. Appropriate changes were made in the light of feedback. The final response rate for the consumer questionnaire was 71%. Both quantitative and qualitative data were collected. Quantitative data is tabulated and used mainly to test the hypotheses; qualitative data is cited directly as additional evidence to reinforce hypotheses test results. Table 1 shows the demographic profile of the respondents.

**Table 1** Participant demographic profile

<i>Age range</i>	<i>Frequency</i>	<i>%</i>	<i>Male</i>	<i>%</i>	<i>Female</i>	<i>%</i>
Under 15	7	5.6	4	3.2	3	2.4
15–29	42	33.6	25	20	17	13.6
30–44	34	27.2	17	13.6	17	13.6
45–59	38	30.4	22	17.6	16	12.8
Over 60	4	3.2	0	0.0	4	3.2
<i>Total</i>	125	100	68	54.4	57	45.6

The table shows that participants are primarily in the age group between 15–59 years old, which confirms the e-consumer category identified by Consumer Knowledge (2004). The sample consists of a good mixture of male and female respondents.

The eTailers survey sample was taken from the 'UK Shops and Stores' section of 'Shops and Shopping – on the internet' (Lambert, 2000). This section provides information on 50 major online UK shops and stores which all sell products that need delivery. Lambert's (2000) list also includes a mixture of 'click and brick' sites and internet only sites. A total of 15 companies participated in the survey. Over 80% of the respondents are from e-fulfilment departments including 40% from delivery departments; 27% from logistics departments; and 13% from supply chain department. The rest are from the management team. The sample includes eTailers operating in multiple industry sectors, with products mainly in groceries, home ware, technology goods, computers and software, fashion, sport and fitness, health and beauty products, gifts and gadgets, and electrical products.

#### 4.2 Data analysis

Frequency and paired sample *t*-test is used to examine the mean difference between items perceived by consumers and their significance. ANOVA test is used to examine the impact of group's difference (between consumers and eTailers) on unattended delivery and local collection. ANOVA is appropriate when one variable is tested under three or more conditions and different groups are used for each of the conditions. The variance due to each group (between groups) is compared with the error variances (within group),



which is measured by the F ratio. The greater the F ratio, the more likely that the variability in the score due to that group is significant. Internal reliability is appraised by Cronbach's Alpha for item with multiple measurements. Qualitative data generated from the consumer survey is categorised according to thematic topics related to hypotheses test.

## 5 Results

### 5.1 Consumer experience: level of inconvenience of delivery

This section reports consumers' online shopping experience with regard to the delivery locations used and the level of inconvenience. Firstly, home delivery option is examined to reveal if 'not at home' is an increasing problem for many e-consumers. Table 2 shows the locations used by e-shoppers to receive online purchased items.

**Table 2** Delivery locations used

<i>Delivery Options</i>	<i>Paired sample t-test (t value, df = 124)</i>				
	<i>Mean†</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
A. Deliver to home	4.18				
B. Deliver to work place	2.04	13.285*			
C. Deliver to other locations	1.58	21.362*	3.501*		
D. Local collection point	1.51	16.972*	-4.035*	-0.621	
E. A safe box	1.29	23.188*	6.502*	-2.843*	2.528•

Notes: †1–5 Scale, 1 – Never, 5 – Very frequently; \*  $P < 0.01$ , •  $P < 0.05$ .

The table shows that most participants frequently have their online purchased items delivered to their homes. Statistical testing indicates the mean difference is significant when compared to other delivery locations. This indicates that as the majority of delivery is to the consumer's home, 'not at home at the time of delivery' could be a major problem for both consumers and eTailers. Delivery to work place is limited to very few consumers. Other locations are rarely used; these include local collection points, and using safe boxes for unattended delivery.

Consumers' experience of inconveniences caused by delivery is measured by four items: re-collect an item from a distributor's depot (*e.g.*, Royal Mail Sorting Office), reorganise your day to stay at home in order for an item to be delivered, re-arrange a failed home/office delivery, and wait for a delivery that did not arrive on the specific day or time. Internal reliability analysis is conducted by using Cronbach's coefficient alpha, an overall coefficient alpha of 0.613 is obtained, which is above the usual acceptable level of 0.6. The level of inconvenience experienced, *i.e.*, Hypothesis 1 test result, is shown in Table 3.

The highest mean score (3.60) shows that most people (87% by frequency) have to re-collect items from distributors' depots or the mail sorting office, which is significantly higher than other delivery inconvenience. The mean score (2.78) for item 'reorganise your day in order to wait for delivery to arrive' also tested significant when compared to

other type of inconveniences. There are over half (53%) of the respondents who consider this causes inconvenience. Re-arranging delivery location or slots (43%) adds to the inconvenience of online shopping. Scheduled delivery that failed to arrive does not often occur, which implies eTailers' delivery channels are reliable. This is in contrast to the argument (ISOTrack, 2003) that in the early e-commerce days, delivery success rate was low, with many deliveries not taking place on the scheduled day. The result indicates that Hypothesis 1 is supported, as the level of inconvenience is high due to the 'not at home' problem.

**Table 3** Inconvenience experienced with home delivery

<i>Inconvenience with delivery</i>	<i>Paired sample t-test (t value, df = 124)</i>			
	<i>Mean†</i>	<i>A</i>	<i>B</i>	<i>C</i>
A. Re-collect an item from distributor's depot	3.60			
B. Reorganise your day to stay at home for a delivery	2.78	-6.575*		
C. Re-arrange a failed home/office delivery	2.36	10.788*	3.523*	
D. Wait for a delivery that did not arrive	2.18	14.189*	6.313*	1.549

Notes: †1–5 Scale, 1 – Never, 5 – Very frequently; \*  $P < 0.01$ .

## 5.2 Perceptions on delivery options

Items used to measure e-consumers' perceptions on delivery issues in this study are largely drawn from recent literature that related to delivery process. This includes unattended delivery and charge (Borrus, 2002), more delivery options (Annon, 2004), satisfaction level of delivery, delivery charge (Charatan, 2001), and extra charge for convenience or speed delivery (Cooke, 2004). To test Hypotheses 2 and 3, we firstly examined consumer perception and eTailer perception on various delivery issues respectively, then made a focused comparison using ANOVA to examine the difference between consumers' and eTailers' perceptions on unattended delivery and local collection. Table 4 shows the results of participants' perceptions on unattended delivery and other key issues which emerged.

The results show a tendency to consumers being willing to collect purchased items from local collection points, which suggests Hypothesis 3 is supported from the consumers' point of view. With regard to using a safe box for unattended delivery, the data and test results show a tendency of disagreement (mean  $< 2.5$ ), which means Hypothesis 2 is not likely to be supported. The survey also reveals that there is an urgent need for online delivery tracking by e-shoppers, the mean score (4.2) is significantly higher than that of other options, and consumers prefer to have more delivery options (mean  $> 3.5$ ). The mean score (2.42) of satisfactory level on the current delivery processes has been low, which is consistent with the inconvenience experience expressed by the e-shoppers.

The current delivery processes used by the eTailers are examined, and the results are presented in Table 5.

The data is not directly used for hypothesis testing, but it establishes the context of testing eTailers' perception on future delivery options. As indicated in Table 5, the majority of the participating companies offer implicit delivery days (2–3 days). Forty percent of the companies provide specific delivery date with am or pm options. Only a quarter of the companies can give exact delivery time. It is worthwhile to note that delivery options that appear convenient to customers, such as delivery to work place, weekend and evening delivery, are less common (under 15%) among the participating companies. Delivery to convenient points for collection is offered by very few companies (6.7%) and a notable finding is that none of the participating companies currently offered delivery to unattended safe boxes in or near customers' homes. The findings show a rather different picture of delivery options offered by UK eTailers when compared to the logistics models adopted in Europe and the USA as reported earlier. eTailers' perceptions on future delivery options is examined and the results are presented in Table 6.

**Table 4** Consumers' perception on delivery issues

<i>Items</i>	<i>Paired sample t-test (t value, df = 124)</i>				
	<i>Mean†</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
A. I believe there is a need for online delivery tracking, with hourly accurate delivery information.	4.20				
B. Willing to collect the item from a local convenient collection point within a reasonable distance of my house.	3.57	–4.581*			
C. I am more likely to buy a product from a store that offers more delivery options.	3.54	–5.405*	0.299		
D. I would like to be offered the chance to leave a safe box on my premises that the goods could be delivered to.	2.43	–11.898*	9.394*	8.048*	
E. Current delivery processes are satisfactory to me.	2.42	–12.714*	–10.996*	–9.461*	–0.134

Notes: †1–5 Scale, 1 – Strongly disagree, 5 – Strongly agree; \*  $P < 0.01$ .

**Table 5** Current delivery options offered to e-consumers

<i>Delivery options offered</i>	<i>Frequency (%) N = 15</i>
Expected delivery days (e.g., 2–3 days)	93.3
Delivery date with AM or PM slot	40.0
Delivery date with specific time slot	26.7
Work address delivery option	13.3
Evening delivery (after 17.00)	13.3
Weekend delivery	11.8
Local collection point option	6.7
Safe box (unattended) delivery option	0.0

**Table 6** eTailers' perception on future delivery

Delivery options	Paired sample t-test (t value, df = 124)			
	Mean†	A	B	C
A. Unattended delivery	3.87			
B. Time slot delivery	3.80	0.151		
C. Delivery tracking	2.87	1.871	2.956•	
D. Delivery collection hubs	2.40	3.076*	3.309*	1.131

Notes: † 1–5 Scale, 1 – Never, 5 – Very likely; \*  $P < 0.01$ , •  $P < 0.05$ .

The data shows that unattended delivery (mean = 3.87) and time slot delivery (mean = 3.80) are the most likely delivery options to be favoured by eTailers over the next three years. This indicates Hypothesis 2 is likely to be supported from the eTailers' point of view. Delivery tracking has been seen as an important function that needs to be added to the current delivery process. However, eTailers do not appear to see the urgency of offering delivery collection hubs in the near future, which means Hypothesis 3 is unlikely to be supported.

### 5.3 A comparison of perceptions between consumers and eTailers

Three key issues emerged from the two surveys and are compared between the consumers and the eTailers. The results in Table 7 show a gap between what is wanted by e-shoppers and what has been offered by eTailers. The variance ratio F is derived from ANOVA test.

**Table 7** Variance on delivery options between consumers and eTailers

Items	Mean (Consumer) N = 125	Mean (eTailer) N = 15	Mean variance	One way ANOVA F ratio	P (Sig.)
Unattended delivery/Safe box	2.43	3.87	-1.44	17.743	.000
Collection hubs/Local collection points	3.57	2.40	1.17	15.538	.000
Delivery tracking information	4.20	2.87	1.33	26.991	.000

The data shows a notable variance exists on the perception on unattended delivery. ANOVA test ( $F = 17.743$ ) indicates the difference between the consumer and the eTailers is significant, *i.e.*, eTailers appear in favour of unattended delivery, whereas consumers do not show a strong interest in this method, which means Hypothesis 2 is not supported from consumer's point of view, but is supported from the eTailers' point of view. The data also suggests that consumers prefer undertaking the last mile of e-commerce than having products delivered unattended, *i.e.*, willing to go to a collection point (hub) to pick up items ordered online by travelling a reasonable distance from home or office. Whilst eTailers are not keen to offer a collection hub as an alternative delivery option. The variance ratio ( $F = 15.538$ ) indicates the difference between the two groups is significant. This means Hypothesis 3 is supported from the consumer's point of view, but

not supported from the eTailers' point of view. The biggest difference between consumers and eTailers ( $F = 26.991$ ) is the function of tracking delivery information. Consumers expressed a high desire (4.2) for tracking delivery process, as this could help consumers to plan their time for receiving products, whilst eTailers tend to perceive it is useful but costly to implement.

Additional evidence was collected from consumers and are summarised in Table 8 to shed light on other related issues and to reinforce the hypotheses test results. These evidences were sought through two open questions.

**Table 8** Preferred delivery options

<i>Themes</i>	<i>Comments</i>
Delivery tracking (31.6 %)	<p>"Taking a whole day off because of ineffective delivery systems is not acceptable. Some companies manage it, so why not all."</p> <p>"Delivery schedules and tracking would be good."</p> <p>"It would be good if you could track your purchases delivery time online."</p> <p>"Most firms track their delivery lorries so why cannot we know that info?"</p>
Cost of delivery (29 %)	<p>"I would pay slightly more for allocated delivery time."</p> <p>"I would pay a reasonable extra amount for a faster delivery."</p> <p>"I would pay more for a faster delivery."</p> <p>"I prefer to use the cheapest delivery available."</p> <p>"I have no motivation to pay more for faster/rapid delivery."</p> <p>"I tend to choose the cheapest/free delivery option."</p> <p>"I will always tend to order from a company offering free shipping."</p>
Work place delivery (18 %)	<p>"I like items delivered to my work place but many companies don't offer that option."</p> <p>"Delivery to work place, as it is the only place I can guarantee successful first time delivery."</p> <p>"My work place is the simplest place for my purchase to be delivered to."</p>
Collection point delivery (16 %)	<p>"I prefer to collect items from a collection point than wait at home for delivery of items larger than my letter box."</p> <p>"Collection points, as they save time and money, <i>e.g.</i>, WHSmiths."</p> <p>"It would be good if items are too large for your letterbox could be delivered to a convenient collection point <i>i.e.</i>, local petrol station."</p> <p>"Collection points if very local and open at convenient times."</p> <p>"Local collection point, <i>e.g.</i>, store pick up."</p> <p>"Must be local, I cannot stand having to go to a depot miles away to collect something, this to me defeats the whole point of online shopping."</p>
Non office hour deliveries (16%)	<p>"Weekend deliveries should be more freely available."</p> <p>"Companies should open their eyes, people are not at home during office hours, they should offer a lot more out of work hours delivery options."</p> <p>"Companies should offer more evening and weekend deliveries, at this time the roads are a lot quieter and people are more likely to be at home."</p>

**Table 8** Preferred delivery options (continued)

<i>Themes</i>	<i>Comments</i>
Convenient delivery options (13.6 %)	“A delivery that is convenient so that I can take the item in.” “I like to uses services that phone me 30 minutes before delivery.” “I like to select delivery options that at least specify if the delivery will be AM or PM.”
Neighbour (10 %)	“Companies could leave more items with neighbours.” “I don’t see why items cannot be left with my neighbour if she is in, why do they have to take them back to a depot 3 miles away?” “Why do some firms leave items with neighbours yet others refuse?”
Speedy delivery (7.7 %)	“I prefer first class delivery.” “Will choose the option that delivers the item quickly.” “I am more likely to choose a delivery option that that I can pay more for a faster delivery.”
Standard delivery (6.8 %)	“I prefer to pay a standard charge.” “Standard delivery, whatever the company offers.” “Standard delivery is adequate for me.”
Safe box (1.7 %)	“I have a porch with a lock, it would be nice if delivery companies could leave items in the porch.” “Companies could leave items in a box outside the property.”

Note: N = 117, (8 Participates chose not to answer the question).

The comments confirm most of the findings reported in Table 4. For example, 37 respondents expressed a strong desire for delivery tracking, and the need to be informed prior to delivery arrival. This supports Dimaria’s (2002) argument that many consumers do not necessarily mind the wait, provided that they are properly informed about how much they are saving and given an accurate and reliable delivery window. Collection points also appear an attractive option. Petrol stations, 24 hours convenient stores, local store outlets, *etc.*, are suggested as the possible collection points, which enforces Hypothesis 3 test results, but the concern is the distance between the collection point and the customer’s home, and the time available for collection. To enable effective and efficient home delivery, delivery outside office hours (evening, weekends) is strongly suggested by some respondents. The benefit is obviously that it can increase the delivery quantity per hour, due to reduced road traffic, and delivery is more likely to be attended by the customer. With regard to Hypothesis 2, a preference to use unattended delivery by consumers is not supported, as only two respondents agree with unattended delivery. There are concerns on cost, safety, space, and planning permission with regard to the installation of receptive devices at consumers’ homes. By tradition, UK consumers are used to, and prefer to have, items delivered to neighbouring houses, rather than attempting to use safe boxes for unattended delivery.

Other issues are observed. These include using the work place for delivery in addition to standard home delivery, and cost of delivery is an influential factor that affects their choice of delivery and e-shopping. However, no general consensus on cost was found, as about half of the respondents in this category expressed willingness to pay extra for speedy delivery service, whilst half the respondents prefer no or low delivery charges.

## **6 Managerial implications**

It is evident from the survey that there is a gap between consumers' perceptions on delivery process and the actual delivery options offered by eTailers. Failure to address consumers' concerns over the last mile delivery undermines many of the benefits of online shopping. The comparison suggests that three areas need to be considered by eTailers in order to improve their delivery process:

### *6.1 Local collection points*

The use of local collection points is an area that eTailers should consider for future delivery. The idea is to let customers undertake the last mile to collect their items from a collection point, such as petrol stations, local corner shops (which normally open longer than normal shops), and existing retail outlets. This method leverages the existing logistic network that is close to consumer's home. The benefits are obvious: to consumers, it is convenient and time saving, because they do not need to be present in order to receive goods; to eTailers, it could save delivery costs, because DVD can be increased and delivery time can be reduced (drivers' waiting time and re-delivery can be minimised). Compared to the Intercept model described earlier, the collection points model is more attractive in terms of time saving and convenience, because it avoids using a parking bay and van that waits for customers to pick up during a fixed time period. To succeed however, eTailers need to form into logistics partnerships with local convenient stores.

### *6.2 Unattended delivery using safe boxes*

Although the results showed that UK consumers have less interest in using safe boxes to receive products than the consumers in Europe, UK eTailers are in favour of unattended delivery. eTailers see this option as an effective and efficient way of minimising delivery cost. However, the cost of installing safe boxes may be a concern, although saving on time and delivery costs per trip may offset the cost of the storage device and installation. In addition, determining which household needs to install such a device may be problematic, for example, installing a device for a less frequent e-shopper may not be economic. There are also unanswered questions as to, for example, can the storage device be used by other companies? If so, how to ensure the access and the safety of the device, how to share the cost of the device? How to avoid repudiation (denial of goods delivered, or goods received)? It is revealed from this study that UK consumers are divided on the extra charge of delivery services, paying more for using unattended delivery services (devices) is a burden to some e-shoppers. Using safe boxes needs further investigation in order to ascertain the complexity of its implementation. This includes specification of the function and condition of the device (*e.g.*, hygiene, safety, and repudiation), installation, and its impact on consumer behaviour and even culture.

### *6.3 Online delivery tracking*

Online delivery tracking is highly requested by UK e-shoppers. Online real-time order tracking solutions could increase transparency of order processing and delivery status, so that consumers can proactively adjust their time in order to wait for products to be delivered. By using real time information systems, accurate predictions of forecasted

delivery times can be generated. The system can then inform the customer of this information at a pre-arranged time in advance of their delivery via SMS text message or e-mail (Blyth and Geoghegan, 2002). This can, in particular, ease their anxiety when goods are not delivered according to schedule due to unforeseen circumstances, (*e.g.*, vehicle break down, traffic congestions, accident, bad weather, *etc.*). For eTailers, offering delivery tracking service is an added value to their online services, which has been perceived as a strategic weapon to gain competitive edge and retain customers. Online order tracking is not a technical challenge, however adding delivery process tracking to the storefront requires a great deal of integration between the back-end order processing systems, geographic information systems, satellite positioning systems and customer relationship management systems. Now that most delivery vehicles can be equipped with satellite navigation and communication systems, and more consumers can access the internet through wireless connection, online delivery tracking is not something that is impossible to implement by many eTailers.

## **7 Conclusion**

The findings reveal that there is a gap between current delivery options and services offered by eTailers and the expectation of e-consumers. The limited delivery options are dominated by standard home delivery methods. Inconvenience caused by current delivery methods undermines the convenience benefits of online ordering. Most UK consumers want flexible delivery windows prior to e-shopping and want to be able to track the delivery process, and to be informed instantly. Although most UK consumers prefer no or low delivery charges, paying extra for better service (more convenient or faster) is not seen as a financial burden for those consumers. The main delivery location currently is the consumer's home. Most consumers are against unattended delivery using safe boxes; but in favour of using collection points to handle the last mile of e-shopping. Most busy working families welcome weekend delivery and off-office hour delivery, but this poses challenges to eTailers because of uneven demand for delivery.

This study is important to eTailers: first, eTailers need to be aware that delivery is becoming a significant factor affecting e-shopping expansion. Customers with hectic lives can be put off using home delivery because they are unwilling to wait hours for a delivery to arrive. Failed delivery or re-arranging delivery causes inconveniences to consumers as well as increased cost to eTailers. Reviewing current delivery practice in the context of changing consumer behaviour and emerging technology for improvement should be on the top agenda of e-business managers. A variety of delivery options may need to be offered to meet consumers' needs while retaining economic efficiency. Second, cost issues that affect eTailers in choosing which delivery options need to be considered in conjunction with satisfying consumer needs. This includes factors such as delivery cost, DVD, cost of devices for unattended delivery, delivery charge, extra charge for special delivery. As Dimaria (2002) suggested there may not be a best method to use as all options have both advantages and disadvantages. The right choice for a company depends on the industry, revenue, inventory situation and particular set of customer service initiatives. Third, consumers' behaviour and preferences on shopping and receiving products are changing, which is driven by increased experience and the



influence of peers and eTailers. eTailers also need to effectively guide and educate consumers on using innovative delivery methods if they are beneficial to both companies and consumers.

Limitations of the study are noted, namely the small sample size, particularly the number of eTailers that participated in the study. Further study with a large representative sample of both consumers and eTailers would produce more convincing results. The current delivery methods used by most eTailers can be further examined with consideration of cost issues and satisfactory level. This would develop insight as to why UK consumers are not inclined to unattended delivery (delivery box) that appears to be widely accepted in the USA and Europe.

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