Customers' valuation of time and convenience in e-fulfillment

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Abstract

Purpose – The purpose of this paper is to derive monetary benchmarks and managerial implications for omni-channel retailers' B2C e-fulfillment strategies by investigating the trade-offs between lead time, delivery convenience and total price including shipment in the context of online electronics retailing.

Design/methodology/approach – Based on a choice-based conjoint analysis among 550 US online shoppers, the monetary values of lead time and convenience were calculated in a log-log regression model. In addition, latent class segmentation was applied to identify consumer segments according to their differing e-fulfillment preferences.

Findings – From a consumer perspective, the analysis suggests that price is the most important criteria in omni-channel retailer selection, followed by lead time and convenience. The value of time is, on average, $3.61 per day. Regarding convenience, the results indicate that delivery to the home is highly preferred over pick-up options. The value of the consumer's travel time was estimated at $10.62 per hour. The latent class segmentation identified four segment groups with different preferences.

Research limitations/implications – To validate the findings, future research could analyze real data from omni-channel retailers' customers' buying behavior. It should also be interesting to extend the research to other price ranges, market segments and e-fulfillment factors, such as return options, shop ratings and membership programs aiming for further generalization.

Practical implications – The findings guide omni-channel retailers to focus on efficient B2C e-fulfillment strategies. Considerable competitive advantages may be gained by reducing lead times and offering convenient delivery in line with the lead time valuation of the identified customer segment.

Originality/value – This study fills gaps in the academic research of consumer behavior in retailer selection, which has primarily concentrated on the choice between "brick-and-mortar" and online sales channels. It paves the way for a more service-oriented perspective in omni-channel retailing research.

Keywords Choice-based conjoint analysis, E-fulfillment, Latent class segmentation, Omni-channel retailing, Value of convenience, Value of time

Paper type Research paper

Introduction

E-commerce has experienced tremendous growth over the past two decades. Total US B2C e-commerce sales were estimated at $390.8 billion in 2016, which was a 14.9 percent increase from 2015. Overall, e-commerce sales represented 8.0 percent of the US retail sector, whose total sales increased at a significantly lower annual growth rate of 2.9 percent (US Census Bureau, 2017). This increase in e-commerce can largely be attributed to the increased overall use of the internet, but also to convincing consumer benefits: It addresses both, consumers' hedonic motivation to engage into the interactive online shopping experience, such as shopping via smartphone and an interesting product description and commentary, as well as their utilitarian incentives to search for low prices, to access an extensive product range, and to profit from the convenience of shopping at home 24/7 (Liang and Huang, 1998; Childers *et al.*, 2001; Hofacker, 2001; Farag *et al.*, 2007).

While formerly pure online retailers start opening physical pick-up points or stationary retail presences, traditional retailers supplement their conventional stores with an online sales channel. Accordingly, e-commerce and traditional retailing progressively merge into omni-channel retailing, which refers to the synergetic management of multiple channels and customer touchpoints in order to provide customers with a seamless shopping experience across all channels (Verhoef *et al.*, 2015). Hence, the overall value proposition is optimized (Wallace *et al.*, 2004; Boehm, 2008) and consumers gain more opportunities to purchase

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what, when, where and how they want (Hübner *et al.*, 2016). However, the integration of different channels has major effects on retailers' supply chain management (SCM) and order fulfillment (Lang and Bressolles, 2013) as the spatial separation of sellers and buyers requires an efficient e-fulfillment process that extends the traditional supply chain to the customer's home or designated pick-up points (Yao and Zhang, 2012). While this creates opportunities for omni-channel retailers to improve overall operational efficiency (Gao and Su, 2016) and to generate additional sales through cross-selling (Halzack, 2015), their success depends on understanding the cost-to-serve dynamics (Laseter *et al.*, 2006) and – this being the focus of our paper – whether or not the offered services are accepted and valued enough by the customer (Hübner *et al.*, 2016).

Referring to costs, omni-channel retailers encounter enormous logistical challenges in the e-fulfillment process due to the unpredictability of demand, the tight delivery windows, and the nature of e-commerce's small order sizes (Campbell and Savelsbergh, 2006; Hsiao, 2009). Regarding the valuation of e-fulfillment services, customers' satisfaction is of major importance for omni-channel retailers to retain customer loyalty; this makes it a key differentiator (Parasuraman *et al.*, 1985; Reichheld and Schefter, 2000; Urban *et al.*, 2000; Anderson and Srinivasan, 2003; Rao *et al.*, 2009). In this context, Hübner *et al.* (2016) outline the delivery mode and the delivery time as the key service components of last mile distribution in omni-channel e-fulfillment. Commonly, online shopping requires consumers to wait for the product delivery after the purchase and thus creates waiting time (Hsiao, 2009). For the fulfilment, customers can choose between different delivery options ranging, e.g. standard unattended home delivery, delivery to collection and delivery points (CDPs), or to buy-online and pick-up in-store (BOPS). The different options, in turn, affect the perceived convenience gains from online shopping and may have channel-shift effects (Fernie and McKinnon, 2009; Gallino and Moreno, 2014). For each transaction, consumers weigh benefits, such as convenience and time savings, against the costs of each channel (Kollmann *et al.*, 2012). Therefore, understanding consumer behavior is one of the core challenges when designing retailing strategies in today's online environment (Neslin *et al.*, 2006) and makes the offering of suitable, efficient, and reliable e-fullfilment options crucial for the lasting economic success of omni-channel retailers (Ehmke and Campbell, 2014).

Agatz *et al.* (2008), Lang and Bressolles (2013) and Hübner *et al.* (2016) have created strategic planning frameworks for the configuration of omni-channel retailer's e-fulfillment systems in this relatively new field of research. While extensive literature discusses the costs of omni-channel e-fulfillment systems (Lambert and Pohlen, 2001; de Koster, 2002; Lummus and Vorkuka, 2002; Laseter *et al.*, 2006; Agatz *et al.*, 2008; Gevaers *et al.*, 2014), the question of profitability often remains unanswered due to a gap of research in consumers' valuation regarding the offered fulfillment services, i.e. valuing these benefits and trading off the key service components convenience and lead time as well as, ultimately, costs. To the best of the authors' knowledge, the only quantified results to investigate online consumers' perception of the value of delivery time were derived from the internet book retailing market and differed significantly in their findings, ranging from $0.53 (Hsiao, 2009) to $1.84 (Dinlersoz and Li, 2006) per day of delivery lead time. No research could be retrieved referring to consumers' quantified evaluation of delivery convenience.

By investigating customers' valuation of time and convenience in the US online electronics market, this study addresses the outlined gap in omni-channel retailing literature. This market segment was chosen in order to obtain results from a relatively wide price range above the average prices of books. Further, electronics have the highest US retail e-commerce sales share (21.8 percent in 2013) among all product categories (eMarketer, 2014) and electronics were the product that most consumers had previously ordered online. Thus, the online electronics market formed an interesting and relevant setting for this

study's e-fulfilment context and showed the highest potential to derive generalized conclusions across all online market segments as well as for items outside the investigated price range.

The main research objective in this study is to investigate the importance of time and convenience in omni-channel B2C e-fulfillment and to understand how customers evaluate their time and convenience preferences in monetary terms when they have committed to purchase an item via the internet and make their choice between omni-channel retailers with different e-fulfillment strategies. Consumers' preferences are assessed via a choice-based conjoint (CBC) analysis, while theoretical and managerial implications are derived for omni-channel retailers. For academia, the main contribution of this paper lies in the detailed research continuation of existing omni-channel strategic planning frameworks with respect to a consumer-oriented view of e-fulfillment and the extension of Hsiao's (2009) as well as Dinlersoz and Li's (2006) studies outside the internet book market. Further, the value of convenience is investigated for the first time in this context. Based on a latent class analyses, the identification of different consumer segments according to their e-fulfillment preferences as well as to their demographic and endogenous traits amplifies the current literature on consumer behavior and is new to the context of omni-channel retailing. For practitioners, the deviation of real dollar values for customer's valuation of time and convenience in e-fulfillment is a major contribution and can serve as valuable decision support and benchmarks. Understanding their customers' behavior enables managers to determine tailored supply chain and omni-channel e-fulfillment strategies.

The remainder of this paper is structured as follows: in the second section, the literature relevant for the e-fulfillment process and the important literature on delivery lead times, convenience of different delivery methods and e-fulfillment pricing options are reviewed. In the third section, the conceptual framework and the methodology are introduced. In the fourth section, the empirical results are presented, followed by the discussion of theoretical and managerial implications in the fifth section to summarize and conclude the paper.

A consumer-oriented view of e-fulfillment in the literature

Consumer decision making is a process of information processing, in which the variables used may differ among individuals (Howard and Sheth, 1969; Bettman, 1979). An extensive body of literature has been published broaching the issue of consumers' choice between traditional "brick-and-mortar" and online sales channels (e.g. Dholakia *et al.*, 2005; Kollmann *et al.*, 2012). Focusing on consumers who have committed to purchase an item online, the internet has drastically changed the available amount, type and format of information influencing the purchase decision (Alba *et al.*, 1997). Referring to this, Bridges and Florsheim (2008) found that utilitarian flow elements lead to increases in online purchases, while hedonic elements seem to be unrelated to the online buying decision. Accordingly, when making their final choice between the offerings of different omni-channel retailers, next to price, service attributes such as information and user interface quality, individual involvement in online shopping, trust and security perceptions, timely availability, associated convenience as well as payment and return options significantly influence the consumer decision process (Bellman *et al.*, 1999; Childers *et al.*, 2001; Anderson and Srinivasan, 2003; Park and Kim, 2003; Darley *et al.*, 2010; Xing *et al.*, 2010). Concentrating on the decisive utilitarian motives of online shopping, consumers integrate all information available into overall preferences by assigning individual weights and scale values (utilities) to the omni-channel retailers' offered prices and service attributes, ultimately buying from the omni-channel retailer that renders them the highest utility in the purchase process (Degeratu *et al.*, 2000; Balasubramanian *et al.*, 2005). Prior literature has identified different consumer typologies based upon consumer segments' motivations for shopping online and consumer preference in SCM (Rohm and Swaminathan, 2004; Bask *et al.*, 2013).

In accordance with the motivation of this study, our research is focused on three cohesive streams of the literature: lead times in e-fulfillment, delivery convenience in e-fulfillment, and pricing of different e-fulfilment options.

Lead times

Delivery lead time refers to the duration of time from when an order is placed until the customer receives the purchased items (Hua *et al.*, 2010). The lead time is driven by different factors, e.g. availability of goods from inventory, location of warehouses and fulfillment centers, mode of transportation. As consumers tend to be time starved (Bellman *et al.*, 1999) and online shopping tends to be utilitarian, it can be stated that delivery lead time is an important factor in B2C e-fulfillment (Gupta *et al.*, 2004). In addition, it appears intuitive in this regard that customers prefer shorter delivery lead times and immediate consumption (Read and Loewenstein, 1995).

From an omni-channel retailer's perspective, Hua *et al.* (2010) note the importance of delivery lead times but state that shorter delivery lead times generally lead to increased logistics costs. This perspective can mainly be attributed to distributed fulfillment strategies with various market- and operational-related factors, such as additional delivery costs and higher capital lockup of inventory (Seifert *et al.*, 2006; Liu *et al.*, 2007). In contrast, longer lead times could reduce customers' channel acceptance and loyalty. Agatz *et al.* (2008) conclude that this contrast is a trade-off between economies of scale and risk pooling, on the one hand, and delivery efficiency, on the other hand, which determines inventory locations and the degree of inventory centralization in e-commerce.

Considering the omni-channel environment, Xu *et al.* (2012) found that Maltz *et al.*'s (2004) classification of "slow down, deliver later" is more often applied in centralized modes, while the "bragging about better services" was more often observed in distributed set-ups. This finding is in accordance with Boyer and Hult (2005), who emphasize the indispensable match of marketing and operations strategy; that is, marketing low prices needs to be matched with an operations strategy of possibly longer lead times to achieve lower costs. Therefore, it can be summarized that short lead times in e-commerce can yield a competitive advantage but need to be aligned to the overall strategy to make a business case.

Delivery convenience

The perceived convenience accentuates the impact of e-satisfaction on e-loyalty (Anderson and Srinivasan, 2003). In particular, the offered delivery method has a direct impact on the perceived convenience, which is one of the primary reasons why buyers shop online (Rohm and Swaminathan, 2004). The delivery is considered a major motive for customers to intensify a relationship with a service provider (Seiders *et al.*, 2007) or to discontinue buying from an omni-channel retailer in case of inconvenience (Keaveney, 1995; Pan and Zinkhan, 2006). While it should be noted that it is often the logistics service providers (LSP) executing the actual delivery, it can be concluded that the convenience of internet shopping highly depends on the effective management of the physical interface between the omni-channel retailer and the customer (Goebel *et al.*, 2012).

Beginning with home deliveries, retailers encounter the challenge of balancing marketing's intentions of short delivery windows, which are acknowledged to be more appealing and convenient to consumers, with logistics' preferences for longer delivery windows, which allow more flexibility and choice in route planning, yielding overall higher efficiencies (Solomon, 1987; Boyer *et al.*, 2009). Although customers generally prefer delivery windows (Campbell and Savelsbergh, 2006), standard home delivery, where LSPs can deliver any time during the day, is the most common method used due to its cost advantage of approximately one-third lower transportation costs than a three-hour delivery window, as

investigated in a London experiment (Nockold, 2001). In contrast, CDPs are associated with higher operational efficiency and were suggested to be one of the five best means to solve delivery problems and reduce costs on the last mile (Lee and Whang, 2001). BOPS can yield in high overall operational efficiency, while its usage is moderated by locational convenience (Kim *et al.*, 2017).

Similarly, from a SCM perspective, distribution via (the combination of) multiple channels provides opportunities for creating synergies and exploiting economies of scale (Agatz *et al.*, 2008) when consumers order from a retailer with distributed operations sites, which offers free BOPS possibly alongside a fee-based delivery service to the home. However, online shopping's main benefit is the elimination of travel costs and the possibility of 24/7 shopping regardless of geographic location (Cairncross, 2001). Needing to pick up an item via CDPs or BOPS reduces the convenience utility gained by ordering online and may only be acceptable to a small group of online shoppers (Fernie and McKinnon, 2009; Goebel *et al.*, 2012). Overall, it can be concluded that convenience plays an important role in e-fulfillment, and several trade-offs must be considered when omni-channel retailers design their e-fulfillment strategies.

Pricing of different e-fulfillment options

As the retailing market is becoming more price transparent, and consumers are becoming more price sensitive, price is the main reason why people shop online (Verdict, 2004; Xing *et al.*, 2010). Despite the outlined importance of lead time and convenience, these observations also hold for the B2C e-fulfillment process. However, the approach to the pricing of different e-fulfillment options is twofold.

On the one hand, pricing largely depends on omni-channel retailers' e-fulfillment strategy. For instance, a retailer can achieve lower inventory holding costs leveraging pooling effects of centralized operation sites, whereas distributed operations strategies achieve lower transportation costs and enable short lead times (Agatz *et al.*, 2008). Accordingly, the total product price is highly dependent on the overall e-fulfillment strategy and the size of the omni-channel retailer.

On the other hand, consumers usually perceive shipping fees as the only cost of fulfillment. In fact, Lewis *et al.* (2006) found that consumers are more sensitive to shipping fees than to price. A recent experiment confirmed that free shipping is wanted although it accompanies long lead times: 92.0 percent of US American consumers are willing to wait four-plus days for free shipping (JOC, 2014). Therefore, the charged shipping fee is not only a question of order size, weight of the product, distance from the last distribution center to the destination, chosen lead time option (e.g. faster delivery for a surcharge), and selected delivery method (e.g. standard vs time-window-based delivery). The fee is also a key marketing decision to a heterogeneous customer group (Lewis *et al.*, 2006; Schultz and Block, 2015) and free shipping policies might affect consumer order patterns (Boone and Ganeshan, 2013).

There is intuitive rationale for directly passing on shipping fees for omni-channel retailers to be a transparent, trustworthy partner. Many omni-channel retailers also use contingent free shipping for orders larger than a predefined cut-off level to incentivize customers to buy more or bundle orders. Furthermore, regarding profit shipping, companies may offer low base prices and high shipping costs to initially attract customers and assume that they are willing to pay higher fixed shipping fees to achieve low base prices, because such customers make sizeable purchases. In particular, free shipping is a main driver of e-commerce. Although Yao and Zhang (2012) found that omni-channel retailers significantly increase their base prices when offering free shipping, this increases order incidents (Lewis *et al.*, 2006). Overall, total price and shipping fees are both important in e-commerce and can help to win business.

Methodology

Conjoint analysis

For this study, the CBC analysis, a multivariate technique, was chosen due to its ability to accurately capture the true preferences of customers and to understand the composition of individual preferences based on the models of information integration and functional measurement (Louviere, 1988; Green and Srinivasan, 1990; Hair *et al.*, 2009). The main reason for selecting CBC over traditional or adaptive/hybrid conjoint assessments was that it is most realistic for a set of objects or concepts being evaluated as a bundle of attributes and using participants' overall assessment of varying product alternatives to derive part-worth utilities for particular product attributes.

Consequently, this approach can capture complicated trade-offs in which customers must make decisions with realistic constraints (Wind *et al.*, 1989). While conjoint analysis has existed for decades, this technique has rarely been applied in the field of SCM (Sachan and Datta, 2005). However, several prior studies used conjoint analysis in a similar manner to this study, e.g., to estimate logistics managers' preferences of freight service (Danielis *et al.*, 2005), to identify factors in LSP and carrier selection (Anderson *et al.*, 2011; Garver *et al.*, 2012) or to understand hiring criteria for SC personnel (Flöthmann *et al.*, 2018).

Experimental design

For the experiments, the authors selected Sawtooth Software, Inc.'s SSI Web, which is considered the market leader in conjoint software, in striving to include all determinant attributes that have a positive or negative impact on preference and that best differentiate between concepts (Alpert, 1971), while being in accordance with Hair *et al.*'s (2009) design and execution of a conjoint analysis experiment. Focusing on the online market of electronic goods, the online experiment consisted of two phases.

In the first phase, participants were introduced to the actual conjoint interrogation. The experiment applied three different scenarios with separate CBCs to test and verify findings across different price points using different products: a digital camera (26x zoom, 20-megapixel, full HD 720 P) with a base price of US$129.99, a laptop (128 GB, 2.7 GHZ, up to ten hours of battery life) with a base price of US$1,279.99 and a smartphone (LTE, 16 GB, factory unlocked) with a base price of US$479.99.

Each scenario provides the participant the three attributes "Estimated Delivery" to capture lead time effects, "Delivery Method" to investigate convenience preferences and "Total Price incl. Shipment." Figure 1 provides a screenshot with the participant's view.

If you were considering buying a digital camera (26× zoom, 20 megapixel, Full HD 720P) online and these were your only options, which online retailer would you choose?

Choose by clicking one of the buttons below:
(1 of 6)

	Retailer A	Retailer B	Retailer C	None-option
Estimated Delivery	In 1–2 days	In 1–2 days	In 5–10 days	
Delivery Method	Pick up in Store	Standard Home Delivery	Standard Home Delivery	I would not choose any of these
Total Price incl. Shipment	$179.99	$179.99	$159.99	
Select	○	○	○	○

Figure 1.
Screenshot of experiment

The chosen levels and ranges of each attribute (see Table I) were based on extensive research among the offerings of the US American Top 10 electronics internet retailers. The attributes' levels were mutually exclusive and balanced in their number across the three attributes to avoid a variable's gain in relative importance (Verlecon *et al.*, 2002). Except for price, the attributes' levels were the same across all three scenarios to ensure comparability. In the case of total price incl. shipment, the base price differed according to the average external reference prices (Mayhew and Winer, 1992). However, the scale of price surcharges on the base price remained the same in absolute terms (+$20.00, +$40.00, +$60.00) for all three scenarios. Note that the delivery fees were included into the total price to avoid any confounding effects, such as the miscalculation of total price or penalties for high delivery fees. For each of the three product scenarios, the respondents needed to make six purchase decisions between three different omni-channel retailers offering the exact same product, but differing in the aforementioned attributes, and a none-option.

In the second phase, individual data were collected from the participants on demographic and endogenous characteristics. The conceptual framework of this study suggests that demographic and endogenous consumer characteristics lead to different perceptions of the utility of omni-channel retailers' varying B2C e-fulfillment offerings. To identify the relevant covariates, information was gathered on demographics such as gender, age, occupation, education, household size and income in accordance with Chang *et al.* (2005). In addition, endogenous variables with a potential impact on online shipping preferences such as "urbanization," "car ownership," or "travel distance to the next physical electronics shop" (see also Farag *et al.*, 2007) were investigated. Furthermore, Boyer and Hult (2006) indicated that customer perceptions of omni-channel retailers' service quality improves as they gain experience with online shopping. Accordingly, we also gathered variables on the experience with online shopping such as "frequency of online shopping" and "online shopping categories."

Data collection

The study's target population encompassed US Americans of diverse demographic backgrounds who regularly shop online. The experiment was conducted among participants from Amazon Mechanical Turk (MTurk) in accordance with the guidelines of Paolacci *et al.* (2010). Buhrmester *et al.* (2011) found that results using MTurk participants are at least as reliable as those obtained via traditional approaches. Each participant was

Attributes	Estimated delivery	Delivery method	Total price incl. shipment
Levels	Delivery today	Standard home delivery	US$479.99
	Delivery 1–2 days	LSPs deliver the order at any time during the day to the	US$499.99
	Delivery in 3–4 days (standard)	customer's home. The customer needs to be home in order to receive the parcel	US$519.99
	Delivery in 5–10 days		US$539.99
		Time-window-based home delivery	
		When placing the order online, customers select a time-window of typically 3 hours on a specific date, in which LSPs deliver the order. The customer needs to be home in these three hours in order to receive the parcel	
		Pick-up in store	
		LSPs deliver the order to a predefined collection and deliver point (CDP), from which customers have to pick up their parcels themselves	

Table I.
Attributes and levels (for smartphone)

paid $0.50 to complete the experiment. A pretest with 30 participants was conducted in accordance with Cooper and Schindler (2006) to test participants' heterogeneity and to identify possible shortcomings in the research design. In the online experiment, of 635 participants who began the experiment via MTurk, 589 completed the experiment. Of these, three participants never shopped online, and 36 failed to answer a verification holdout question correctly. This finding yields the total usable sample size of 550.

Empirical results

The analysis follows the standard conjoint experimental design (Hair *et al.*, 2009). First, we report the descriptive statistics on the sample's characteristics. Next, we estimate the attributes' pat-worths and the aggregate attribute importance using the choice simulation. Finally, we test for the heterogeneity of consumer groups in a latent class segmentation.

Sample description

As previously noted, the total usable sample size was 550 (296 females, 254 males). Table II provides the sample's descriptive characteristics. The results indicate that the majority of participants (86.4 percent) regularly shops online at least once a month, and no participant never shops online. Adequate for this study, electronics was the product that most people had previously purchased online. Demographics show that 71.3 percent of the participants are between 18 and 39 years, and 53.8 percent of the participants have completed a college degree. Participants' locations are well mixed among urban, suburban and rural areas, while 85.3 percent of the participants own a car. Accordingly, it takes the average participant 17.1 min to travel to an electronics store. Overall, the sample was found appropriate to yield representative results for the total population of 208 million people who regularly shop online in the USA (comScore, 2015).

Aggregate results

To provide methodological consistency, the sample's aggregate results were calculated using Sawtooth Software, Inc.'s Latent Class Segmentation Module. Accordingly, the number of groups was set to one, making the assessment on the aggregate level analogous to CBC's logit approach (Sawtooth Software, Inc., 2004).

Importance of attributes. The results are presented showing the utilities for the different attribute levels and their importance. Note that the overall usage of the none-option was modest across the three products' CBCs (digital camera: 7.1 percent; laptop: 13.1 percent; and smartphone: 13.4 percent), which is lower than the standard expectation of 15.0 percent. Table III contains the attributes' part-worth utilities, which were rescaled for comparability using the zero-centered "diffs" method.

Interpreting the estimated part-worths in Table III provides a number of interesting observations. In accordance with expectation, we find that, across all three products, the lowest price incl. shipment was associated with the highest utility (e.g. 109.17 for the digital camera), while the highest total price is the least desired (e.g. −100.54 for the digital camera). However, the relative advantage of low prices in comparison to other attributes, such as "Today," is smaller for laptops and smartphones than for the digital camera.

Next, regarding the estimated delivery, "Today" and "In 1–2 days" yield positive utilities in all three cases, while longer lead times are associated with lower preferences. The range between "Today" and "In 5–10 days" slightly increases from the digital camera over the smartphone to the laptop, which has the highest reference base price (RBP) of all three products. Furthermore, as the utilities closely center around zero, the impact of the delivery method is limited when consumers make their choice between different e-fulfillment offers.

Variable	*n*	%
Online shopping experience		
About once a day	5	0.9
A few times a week	76	13.8
A few times a month	276	50.2
About once a month	118	21.5
Less than once a month	75	13.6
Never	0	0.0
What products do you shop online?[a]		
Books	343	62.4
Clothes and shoes	385	70.0
Drugstore and convenience goods	158	28.7
Electronics	400	72.7
Groceries	85	15.5
Music, movies, access to digital content etc.	335	60.9
Specialty goods (i.e. furniture, washing machines)	139	25.3
Toys, leisure articles, and/or household products	344	62.5
None of the above	0	0.0
Gender		
Female	296	53.8
Male	254	46.2
Age		
Between 18 and 29 years old	208	37.8
Between 30 and 39 years old	184	33.5
Between 40 and 49 years old	73	13.3
Between 50 and 59 years old	57	10.4
60 years or older	28	5.1
Area		
Urban	175	31.8
Suburban	284	51.6
Rural	91	16.5
Car ownership		
Yes	469	85.3
No	81	14.7
How many people live in your household?		
1	115	20.9
2	183	33.3
3	114	20.7
4	84	15.3
5 or more	54	9.8
What is the highest degree or level of school you have completed?		
Some high school	4	0.7
High School degree, GED or equivalent	57	10.4
Some college credit, no degree	193	35.1
Bachelor's degree	220	40.0
Master's degree or higher	76	13.8
Occupation		
Student	49	8.9
Working full time	316	57.5
Working part time	89	16.2
Unemployed	74	13.5
Retired	22	4.0

(*continued*)

Table II.
Descriptive sample characteristics

Variable	*n*	%
Total household income before taxes		
Less than or equal to 30,000 USD	169	30.7
Between 30,001 and 60,000 USD	183	33.3
Between 60,001 and 120,000 USD	153	27.8
More than 120,000 USD	39	7.1
Answer refused	6	1.1
Does same day delivery add a significant additional benefit to shopping online?		
Yes	322	58.5
No	198	36.0
Don't know	30	5.5
When shopping online, is "pick-up" in a store or at a CDP a valid option for you?		
Yes	375	68.2
No	137	24.9
Do not know	38	6.9
Distance: How long does it take you to travel closest to an electronics store? (one-way, in minutes)		
Mean	17.1	
SD	17.4	
Total	550	100.0

Table II.

Note: [a]Multiple response possible

Attributes and levels	Digital camera (RBP: $129.99)	Laptop (RBP: $1,279.99)	Smartphone (RBP: $479.99)
Estimated delivery			
Today	25.10	41.09	36.65
In 1–2 days	9.24	15.78	17.34
In 3–4 days	−6.38	−11.68	−12.63
In 5–10 days	−27.96	−45.19	−41.35
Delivery method			
Standard HD	15.95	16.64	12.88
Time-window-based HD	5.32	−0.96	2.22
Pick-up in store	−21.27	−15.69	−15.10
Total price incl. shipment			
RBP	109.17	90.25	98.32
+$20	31.24	36.54	32.07
+$40	−39.86	−35.66	−34.69
+$60	−100.54	−91.14	−95.69
None-option			
None	−45.66	−20.49	−25.28

Table III.
Aggregate choice-based conjoint utility estimates (rescaled for comparability)

Note: HD, home delivery; RBP, reference base price

While the literature assumes time-window-based home delivery to be preferable to consumers (Boyer *et al.*, 2009), i.e., generating higher utility than standard home delivery, the survey results indicate the opposite; standard home delivery is preferred over time-window-based home delivery, which contradicts expectations and may indicate insufficient familiarity with this concept among the sample. Pick-up in a local store is the least preferred method across all three product categories.

Despite relative differences of utilities between the products, the rankings of the attributes' levels remain the same across all three conducted CBCs. These observations were confirmed when examining the importance of the investigated attributes, which are displayed in Table IV.

The results show that, when selecting an omni-channel retailer, the total price incl. shipment is the most important criterion across all three products, with an average attribute importance of 65.0 percent. The importance of the delivery method is modest at an average importance score of 10.8 percent but constant across all products. However, at the cost of the importance of total price incl. shipment, the importance of the estimated delivery increases with the RBP of a product; that is, the importance of lead time is higher when purchasing a laptop (28.8 percent) or a smartphone (26.0 percent) than for a digital camera (17.7 percent). While the difference between the laptop and the smartphone is negligible, there is a distinct increase in the importance of the estimated delivery between the digital camera (with an RBP of $129.99) and the smartphone (with an RBP of $479.99). This finding suggests a price threshold in e-fulfillment between these two price points, in which the lead time of the estimated delivery garners significantly more importance than the importance of total price incl. shipment when purchasing electronics online. On average, the attribute importance of the estimated delivery is 24.2 percent across all three experimented product categories.

An extensive assessment of interaction suggested minor interaction between the described attributes. However, these interaction effects were not sufficiently large to add substantial predictive validity to the conjoint model. Therefore, the selected aggregate additive model was confirmed as valid and appropriate for this study.

Value of lead time. Next, we want to determine the monetary value of lead time in B2C e-fulfillment. Therefore, Sawtooth Software, Inc.'s SMRT choice simulator was used to simulate a number of competitive scenarios and then estimate how the participants react to each scenario. The simulation compares the sample's share of preference for different lead times at differing price points against a standard e-fulfillment scenario. In accordance with Hair *et al.* (2009), we first specify the scenario, then simulate choices, and finally calculate the share of preference.

Beginning with the specification of the scenario, we assume a standard e-fulfillment profile, in which the estimated delivery is set to "In 3-4 days." For the delivery method, "Time-Window-Based Home Delivery" was selected across all scenarios, as this level's estimated part-worth utilities varied the least among the different CBCs and avoided the conjoint models' prohibition to combine a delivery "Today" with the "Standard Home Delivery" option. The price point of the standard profile was specified at the second lowest price, i.e., the RBP plus $20.00 for all three products. To the best of the authors' knowledge and thorough market research, this standard profile was found to best reflect common practice among the leading online electronics retailers. The standard profile was compared in multiple isolated scenarios against profiles with shorter and longer lead times at differing price points. In the next step, choices were simulated by using the individuals' estimated part-worths to predict the choice between two profiles in each scenario.

Attributes and levels	Digital camera (RBP: $129.99)	Laptop (RBP: $1,279.99)	Smartphone (RBP: $479.99)	Average
Estimated delivery	17.7	28.8	26.0	24.2
Delivery method	12.4	10.8	9.3	10.8
Total price incl. shipment	69.9	60.5	64.7	65.0

Note: In percent; RBP is reference base price

Table IV. Aggregate choice-based conjoint attribute importance

Finally, preferences for each individual were predicted and then used for calculating the proportion of preferences for each profile by aggregating the individual choices. This study used a logit rule-based preference probability model as it approximates certain elements of product similarity and is well-suited for repetitive purchase situations (Green and Krieger, 1988). In this regard, the calculated proportion of preference predictions reflects the relative indications of preference and should not be interpreted as market shares (Chakraborty *et al.*, 2002).

The initial simulation findings further revealed that consumers have a higher willingness-to-pay (WTP) for shorter lead times. However, it was not possible yet to precisely derive this finding's monetary value. Therefore, in accordance with Orme's (2014) proposal, this study applied log-log regression on the proportion of preference simulation results to accurately determine the scenarios' demand curves. We apply the log-log regression model: $ln\ y = \alpha + \beta\ ln\ x$, where x is the total price incl. shipment, y is the share of preference, β is the price elasticity of the demand curve, and α is the intercept's coefficient. Next, the natural log of preference share was regressed on the natural log of price. The regression results proved that the applied model is a significant fit. Accordingly, the log-log regression model was applied for both the standard and the alternative profile in each scenario across all three products. For reasons of simplicity and comparability and its limited overall impact, the none-option was not included in the scenarios. A limitation in this context is that the log-log regression proportion of preference values do not always add to (or may exceed) 100.0 percent, as the functions for the alternative and standard profile were calculated separately. However, this method remains more accurate and realistic than other comparable approaches, such as the midpoints formula, because more than two price points were estimated along the preference curve (Orme, 2014).

The exact point of indifference between the "Today" and the standard profile scenario for the laptop is $1,315.08. When subtracting the standard profile's total price incl. shipment of $1,299.99, a value of $15.09 was obtained. This maximum value is the most consumers are willing to pay to receive the item today instead of a lead time of 3–4 days. The results for all scenarios are displayed in Table V.

On average, the sample's simulation results suggested that consumers are willing to pay as much as $12.80 for a same day delivery when compared to the standard lead time of 3–4 days. This amount is nearly double the monetary value of lead time of 1–2 days. In contrast, consumers expect lower overall prices of as much as an average of −$9.20 when the estimated delivery is longer than the standard lead time.

Again, the results are similar for the smartphone and vary for the digital camera. Accordingly, it is suggested that the absolute monetary value of lead time increases with the product's total price incl. shipment to a maximum certain threshold value of the product's total price, which is in between the RBP of the digital camera ($129.99) and the smartphone's

Attributes and levels	Digital camera (RBP: $129.99)		Laptop (RBP: $1,279.99)		Smartphone (RBP: $479.99)		Average	
	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative
Today vs standard	8.49	6.5%	15.09	1.2%	14.83	3.1%	12.80	3.6%
Today vs In 1–2 days	4.08	3.1%	6.17	0.5%	5.57	1.2%	5.28	1.6%
In 1–2 days vs Standard	4.02	3.1%	6.87	0.5%	8.84	1.8%	6.58	1.8%
Standard (in 3–4 days)	–	–	–	–	–	–	–	–
In 5–10 days vs standard	−5.98	−4.6%	−12.73	−1.0%	−8.90	−1.9%	−9.20	−2.5%

Note: Absolute Values in US$; RBP, reference base price

Table V.
Comparison of the monetary value of lead times for tested scenarios

RBP of $479.99, and then increases at a considerably lower rate. The detailed assessment of such a threshold value implies a need for further research.

After the calculation of the absolute monetary values of lead time in each scenario, a precise value per day of lead time can be derived. This finding was achieved by applying a further log-log regression, in which the natural log of lead time was regressed on the natural log of total price incl. shipment (RBP plus the coparticipant absolute monetary values of lead time from Table V). The first observation from these results can be shown as an indifference curve of the price surcharge on a product's RBP along specified lead times compared to the standard profile's lead time of 3–4 days, which is displayed in Figure 2.

Due to the applied log-log regression, these values slightly differ from Table IV. Nevertheless, these values realistically map the sample's indifference of price surcharges on the RBP of a product along the specified lead times. For instance, on average, a price surcharge for a delivery "Today" of $14.09 on the RBP of the standard alternative yields the same preference among the sample as an e-fulfillment with a lead time of seven days at a price of −$7.01 below the RBP. Again, prices vary from product to product.

By dividing the monetary values from Figure 2 by their corresponding lead times we find that the monetary value per day of lead time for each scenario ranges from $6.28 to $1.54. The average monetary value of lead time per day is considerably higher for the laptop ($4.44) and the smartphone ($4.04) than for the digital camera ($2.33). Furthermore, shorter lead times than the standard lead time have a higher monetary value than lead times exceeding the standard. Therefore, the monetary value of lead time per day decreases with longer lead times. The average value of delivery lead time was found to be $3.61 per day.

Value of convenience. Next, we consider the value of convenience in B2C e-fulfillment. While certain differences between standard and time-window-based home deliveries exist, we are particularly interested in the comparison of home delivery and in-store pick up. Similar to the approach for lead time, a standard profile across all three products was designed using the "Pick-up in store" option in "1-2 days" at the RBP of "+$20." Calculating the point of indifference to which consumers are willing to pay more to receive the ordered item at their home instead of needing to travel to the next electronics store is shown in Table VI.

The results suggest that the sample is, on average, willing to pay a maximum of $8.94 more for a standard delivery to the home compared to the "Pick-up in store" option.

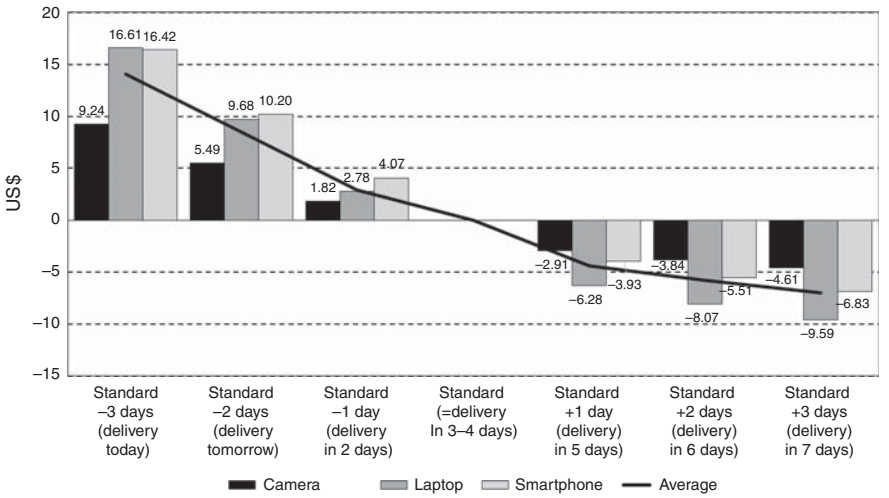

Figure 2.
Price surcharge indifference curve along specified lead times

We further consider the role of the distance the customer must travel. The experiment contained a question about the time needed to travel to the closest electronics store (one-way; in minutes). The sample's mean was 17.1 min. Assuming that a consumer would need to travel back and forth from home to the electronics store and that the pick-up in the store requires 5 min, it would take, on average, 39.2 min to pick up an online ordered item from a local electronics store. A limitation of this assumption is that it does not consider the possibility that customers combine activities and shopping trips (see Bhat, 1996). This assumption also does not examine the impact of transport costs, such as costs for fuel or public transportation, as included by Hsiao (2009).

When dividing the absolute monetary values of convenience from Table VI by the travel time, the convenience-related absolute monetary value of travel time per hour can be obtained. The obtained results show that the monetary value of travel time per hour to the closest local electronics store may vary between $4.21 and $15.53. Thus, the actual order-related value of convenience depends on the customer's proximity to the next electronics store. On average, participants value their personal travel time at $10.62 per hour.

Latent class segmentation

To identify consumer segments with different utilities, we tested the sample for heterogeneity using Sawtooth Software, Inc.'s Latent Class Segmentation Module. In line with the "Consistent Akaike Information Criterion" (Desarbo *et al.*, 1995) we decided to apply the four segment solution and analyze the attribute importance, the monetary value of time and the convenience for the segments. Using a maximum likelihood criterion, the latent class algorithm computes the probability (membership) of belonging to each segment for every participant. In line with the prior literature, we adopted the segments "budgeter" from Bask *et al.* (2013) as well as "convenience shopper" and "balanced buyer" from Rohm and Swaminathan (2004), while we newly added the group "lead time shopper" to this field of research. The segment groups were identified across all three products due to their very similar CBC utility estimates and attribute importance evaluation enabling a clear distinction of groups with differing preferences. The segment groups' importance of attributes and their segment sizes are reported in Table VII. Figure 3 summarizes the average segment size and average attribute importance per segment group.

The budgeters represent the largest segment with an average of 48.4 percent of the participants. Accepting possibly longer lead times and bearing inconvenience (e.g. pick-up at CDP or BOPS), this segment sets a high priority on the total price incl. shipment (average attribute importance of 77.7 percent). Budgeters' utilities and importance of attributes remained stable across all three products. Nevertheless, this segment size was bigger for the cheaper digital camera (59.5 percent). Validated by a one-way analysis of variance and Bonferroni *post hoc* tests according to Field (2013), budgeters tend to have the highest income ($p < 0.05$) and the largest households ($p < 0.01$) across all segments. The lead time shoppers (on average, 24.2 percent of the sample) appreciate short delivery lead times (average attribute

Table VI. Comparison of the monetary value of convenience for tested scenarios

Scenario	Digital Camera (RBP: $129.99)		Laptop (RBP: $1,279.99)		Smartphone (RBP: $479.99)		Average	
	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative
Standard HD vs pick-up	10.15	7.8%	8.44	0.7%	8.23	1.7%	8.94	3.4%
Time-window-based HD vs pick-up	7.10	5.5%	2.75	0.2%	4.96	1.0%	4.94	2.2%
Pick-up in store	–	–	–	–	–	–	–	–

Note: Absolute Values in US$; HD, home delivery; RBP, reference base price

Table VII. Segment sizes and attribute importance of identified segments for all products

Attributes	Digital Camera (RBP: US$129.99)				Laptop (RBP: US$1279.99)				Smartphone (RBP: US$479.99)				Total
	Budgeter	LT shopper	Conv. shopper	Balanced buyer	Budgeter	LT shopper	Conv. shopper	Balanced buyer	Budgeter	LT shopper	Conv. shopper	Balanced buyer	
Segment size (n)	327	78	51	94	237	166	98	49	235	155	106	54	550
Percent of total	59.5	14.2	9.3	17.1	43.1	30.2	17.8	8.9	42.7	28.2	19.3	9.8	100
Estim. delivery time	15.6	42.8	11.3	12.6	17.7	49.4	13.9	22.9	15.9	51.6	7.9	27.6	24.1
Delivery method	5.8	12.3	39.8	15.1	8.1	7.5	39.4	4.2	3.8	4.6	34.7	12.5	10.8
Total price	78.6	44.9	48.9	72.3	74.1	43.1	46.7	72.9	80.2	43.8	57.4	59.9	65.0

Note: In Percent; RBP, reference base price; LT, lead time

importance of 47.9 percent) but also value low price. Shoppers of this segment tend to live in urban areas ($p < 0.05$), rather work full time than being differently occupied ($p < 0.10$), and report highest preference for same day delivery, when compared to other segments. The convenience shopper, which comprised an average of 15.5 percent of the sample, is motivated more than the other groups by the delivery method (average attribute importance of 38.0 percent). While the segment values low prices to a higher extent (average attribute importance of 51.0 percent), convenience shoppers reported the lowest utilities and attribute importance for the estimated delivery. Regarding demographic and endogenous variables, convenience shoppers tend to be older ($p < 0.10$) and less likely own a car ($p < 0.05$), while their average distance to the next pick-up store is longer than for other segments. Finally, the balanced buyers are the smallest segment. On average, 11.9 percent of the sample were assigned to this group of online shoppers. Similar to the budgeter, the balanced buyer places a high average attribute importance of 68.4 percent on total price incl. shipment. However, this segment also appreciates the advantages of short lead times and home deliveries by reporting considerably higher utilities for these attributes than the budgeter segment.

Next, we investigated the segments' individual values of lead time. Table VIII provides a comparison of the monetary value of lead times per day. The value ranges from \$0.91 to \$10.79 across all segments, which is a significantly wider range than in the aggregate assessment. The average monetary value of lead time per day is considerably higher for the lead time shoppers (\$8.08) than for the aggregate average (\$3.61). Balanced buyers associate higher monetary values with lead times than do convenience shoppers or budgeters. Again, shorter lead times than the standard lead time of 3-4 days appear to have a higher monetary value per day than lead times exceeding the standard. Overall, the findings appear to justify the existence of lead time-oriented e-fulfillment strategies for the segment of lead time shoppers.

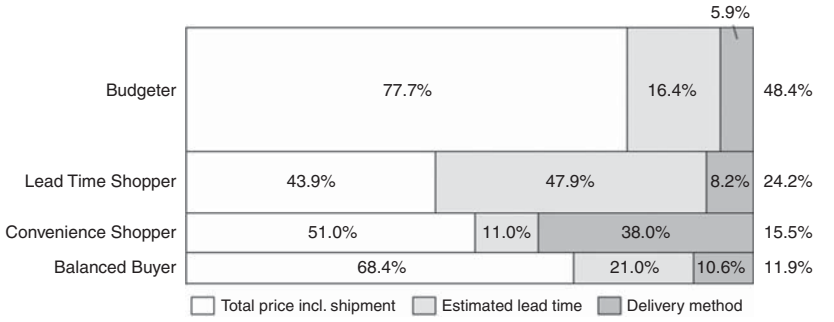

Figure 3.
Segment size and attribute importance per segment

Scenario	Aggregate average	Budgeter	Lead time shopper	Convenience shopper	Balanced buyer
Delivery today	4.70	2.33	10.79	2.98	3.09
Delivery tomorrow	4.23	2.00	9.58	2.45	2.59
Delivery in 2 days	2.89	1.00	6.37	0.91	1.14
Standard (delivery in 3–4 days)	–	–	–	–	–
Delivery in 5 days	−4.37	−2.91	−9.94	−4.31	−4.13
Delivery in 6 days	−2.90	−1.84	−6.55	−2.67	−2.59
Delivery in 7 days	−2.55	−1.44	−5.26	−2.07	−2.02
Average of absolute values	3.61	1.92	8.08	2.57	2.59

Note: Absolute values in US$ per day of lead time

Table VIII.
Comparison of the monetary value of lead time per day for identified segment groups

Table IX shows the monetary value of convenience by segment. We find that the segment group of convenience shoppers places considerably higher importance on the delivery of the ordered goods. In monetary terms, the convenience shopper segment is willing to pay a maximum of $37.62 for a standard home delivery compared to needing to travel to a local electronics store to pick up the item. Balanced buyers also report values above the aggregate average. Interestingly, lead time shoppers are the only segment group that may prefer pick-up over home delivery in certain scenarios. Despite the moderate segment size of an average of 15.5 percent of the overall sample, convenience buyers make a strong case for omni-channel retailers to offer a diversified choice of delivery methods with a focus on home delivery.

Conclusion

Our results indicate that on average, lead time is a critical factor for consumers when selecting an omni-channel retailer, while convenience is of minor importance. However, the empirical findings suggest that there are distinct types of consumers who place differing importance on the considered attributes. According to their attribute preferences, we identified these segments as budgeters, lead time shoppers, convenience shoppers, and balanced buyers. We next discuss the theoretical and managerial implications of our results and provide directions for further research.

Theoretical implications

This study contributes to the previous academic studies in the field by proffering the CBC analysis for modeling the decision process that consumers experience when selecting between omni-channel retailers with differing B2C e-fulfillment offerings in online buying. In particular, it renders new detailed insights to omni-channel strategic planning frameworks' last mile distribution parameters, such as the delivery time and delivery mode (Hübner *et al.*, 2016). From the empirical findings of our study, several theoretical implications were derived.

First, referring to the attribute importance assessment when purchasing online, the predominant role of price is smaller than previously thought. Comparing this study's empirical results to a recent US American online market experiment, which was published by comScore (2015), the order of the attribute importance is identical, listing price at the top, followed by delivery time and delivery method. However, our study suggests considerably more weight for lead time (24.2 vs 7.0 percent) and moderately more preference for convenience (10.8 vs 4.0 percent) at the cost of price-related factors (65.0 vs 89.0 percent). These results may be driven by differences in the research design, whereas CBC is acknowledged to more accurately capture the true preference of customers than the direct questioning of factor preference (Green and Srinivasan, 1990). For academia, this calls for a gradual shift in the literature of omni-channel planning from a major focus on costs to a more service-oriented perspective based on actual consumers' behavior.

Second, this study calculated customers' monetary value of lead time at an aggregated average of $3.61 per day in the online electronics industry, ranging from $0.91 to $10.79 among the identified segments. These values are considerably higher than Dinlersoz and Li's (2006) and Hsiao's (2009) findings of $1.84 and $0.53 per day of delivery lead time,

Scenario	Aggregate average	Budgeter	Lead time shopper	Convenience shopper	Balanced buyer
Standard home delivery vs pick-up	8.94	4.84	4.32	37.62	9.07
Time-window-based home delivery vs pick-up	4.94	2.64	−3.90	33.84	7.83

Note: Absolute values in US$

Table IX. Comparison of the monetary value of convenience for identified segment groups

respectively, in the online book retailing market. This finding leads to the insight that the monetary value of lead time in online retailing may be higher than previously supposed. Moreover, as books are assumed to generally cost less than electronics, the absolute monetary value of lead time increases with a product's RBP to a certain maximum threshold value.

Third, this study estimated the value of convenience in online shopping at an aggregated average value of personal travel time of $10.62 per hour. However, comparable literature is scarce. Extending beyond the consumer segment, a relatively recent US American study found that the WTP for savings in travel time varies between $7.32 and $29.31 per hour (Hensher and Greene, 2011). Hence, this study's empirical findings are generally in line with the existing body of literature and call for further research to validate our findings across other price and product segments. Nevertheless, it can be concluded that consumers generally associate lower value with convenience in their e-fulfillment experience, when ordering low-priced products.

Finally, this study identified four segment groups of consumers with different preferences. This amplifies the current literature on consumer behavior and is new to the context of omni-channel retailing. While the segments of price-sensitive budgeters, balanced buyers, and convenience-oriented consumers are known from prior research, i.e. Rohm and Swaminathan (2004), the large proportion of lead time shoppers that are, on average, 24.2 percent of the sample, represents new insight into the segmentation of customers. Overall, the derived typologies extend the current understanding of consumers' channel choices. Accordingly, consumer behavior regarding channel choice can to a great extent be predicted with reference to their assigned segment group, i.e. convenience shoppers likely choose fulfillment options requiring home delivery, while others would consider pick-up options depending on price and timely availability as a possible channel choice. Not only do the findings state clear preferences for price sensibility as well as valuation of lead time and convenience, but also are the segmentation groups supported by demographic and endogenous characteristics, which indicates that these typologies can also be found in other segments of omni-channel retailing.

Managerial implications

Our empirical findings suggest that the understanding of consumer behavior is essential for omni-channel retailers to decide on their fulfilment strategy. The results provide practitioners with real dollar values for customers' perception of time and convenience. Using the aforementioned omni-channel strategic planning frameworks and provided good knowledge of supply chain costs (e.g. related to warehouse footprints, inventory deployment, and transportation times), the derived benchmarks support managers when designing and configuring their omni-channel strategies. Managers can test their fulfillment costs against this study's findings or use the presented methodology to validate the valuation of the attributes in their respective product segment. Therefore, key supply chain-related questions can be answered: Do customers' preferences and WTP support the offering of BOPS or same day delivery? Is the reduction of one day in lead time profitable for the business given the higher costs of increased local inventories or LSPs express shipments? Is the offering of – logistically expensive – time-based delivery windows a true competitive advantage?

Overall, total price incl. shipment is the most important of the investigated e-fulfillment criteria from a customer's perspective. The price is often seen as an order qualifier as it should be managers' primary concern to keep costs of all channels and e-fulfillment options offered low. This especially holds for omni-channel retailers whose customers are mainly budgeters and balanced buyers. Nevertheless, this study's attribute importance scores and latent class segmentation indicate that omni-channel retailers need to consider the trade-off between price and lead time in the design of e-fulfillment strategies.

For retailers with a significant customer share of lead time shoppers, a responsive supply chain requiring higher inventories and decentralized warehouses (Gallino and Moreno, 2014) may be considered to yield a competitive advantage with shorter lead times (Stalk, 1988). The high variation in the monetary value of lead time among the identified segments justifies the existence of very different e-fulfillment strategies in the context of lead times. Nevertheless, the identified trade-offs require a decision between low price and low lead times for omni-channel retailers to make a sustainable business case (Boyer and Hult, 2005). Regarding convenience in omni-channel retailing, practitioners may profit from the findings that BOPS may be attractive to customers from urban areas, whose distance to the next local electronics store is short, while this is an unlikely option for customers from rural areas.

Another interesting conclusion can be drawn for managers from our behavioral-based approach: Letting the customer control the last mile according to his or her preferences of lead time and delivery method, automatically adjusts their expectations. Therefore, omni-channel retailers need to establish close collaborations with LSPs to offer customers a wide range of reliable services. However, this need may simply be the very beginning as, in contrast, omni-channel retailers' strategic network design and higher number of upstream SCM processes, such as procurement and warehousing, have very significant effects on the total price incl. shipment, lead times, and the options offered to bridge the last mile. In particular, retailers with decentralized operations, high shares of own inventory and multiple channels should strive to further reduce lead times by leveraging the synergies of their upstream SCM processes and their distributed network. Assuming sophisticated inventory visibility, orders for lead time sensitive customers should be fulfilled from local stores, while others could be managed from a central warehouse. In contrast, it is suggested that pure online retailers should strive to yield a competitive advantage by pooling inventory wherever possible to achieve low prices with reasonable lead times. In a nutshell, there is not just one optimal omni-channel retail model for every company, business sector and customer (Laseter *et al.*, 2006; Hübner *et al.*, 2016). Still, the model and findings of this study may help managers from various omni-channel retail segments to validate and improve their supply chain activities based on their customers' valuation of time and convenience. Ideally, each target group is addressed with a tailored and profitable omni-channel strategy.

Limitations and future research

Despite a thorough research design, this study may be subject to several limitations. First, there can be other attributes than the investigated omni-channel e-fulfillment factors, such as information quality, return options or online shop ratings, which can render consumers utility when making their retailer choice online and, thus, influence the selection of omni-channel retailers and associated importance with price, time, and convenience. It would be interesting to see more research on other factors in omni-channel retailer selection. Next, the empirical findings of this study were conducted in a single context, i.e., the online electronics retailing market. However, the results cannot necessarily be generalized to the omni-channel shopping of other product and price categories. This requires further research in other price categories, countries, and market segments, e.g., the online purchasing of clothes or groceries, aiming for further generalization in omni-channel retailing. Furthermore, the experimental design assumed total prices incl. shipment and did not consider the impacts of different shipping pricing approaches, such as cost shifting or dynamic pricing. In addition, the experimental design neglected CDPs and only considered BOPS as a delivery method option due to the limited number of options in the CBC design. As the number of such lockers is growing rapidly worldwide, this should be subject to future research. Finally, a major assumption of this

study was that the online purchase is a single transaction of buying one specific item. However, consumers could also buy multiple products simultaneously in one purchase or combine their shopping in "brick-and-mortars" with other activities (e.g. travel to work), which could considerably change the CBCs' derived utilities and obtained monetary values of lead time and convenience. In addition, the role of membership programs (e.g. Amazon Prime) can ultimately alter the consumer's preferences.

Future studies can extend this research by examining the WTP for shorter lead times. In addition, the investigation of the role and opportunities of same day delivery requires more research, particularly with respect to the link to the product category. Finally, to validate this study's findings, future research could analyze real data from omni-channel retailers regarding their customers' e-fulfillment choices in the buying process and derive monetary values of lead time and delivery convenience from the service possibilities offered. This finding, in turn, could be matched against the associated supply chain costs of these services to obtain more precise managerial implications.

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