HAL
archives-ouvertes.fr

Multi-Channel Retail Supply Chain Management: Fulfillment systems in Multi-Channel Retailing - Customer Expectations and Economic Performance

Gerald Lang

▶ To cite this version:

Gerald Lang. Multi-Channel Retail Supply Chain Management: Fulfillment systems in Multi-Channel Retailing - Customer Expectations and Economic Performance. 8th International Research Conference in Logistics and Supply Chain Management (RIRL), Sep 2010, Bordeaux, France. Strategy and Supply Chain Management, pp.1-25, 2010. <hal-00560956>

HAL Id: hal-00560956
https://hal.archives-ouvertes.fr/hal-00560956

Submitted on 31 Jan 2011

STRATEGY AND SUPPLY CHAIN MANAGEMENT

Relations among supply chain design decisions and performance in push-based contexts	**Margherita Pero** Politecnico di Milano, Milano, Italy **Tommaso Rossi** Carlo Cattaneo University – LIUC, Institute of Technology, Castellanza, Italy **Andrea Sianesi** Politecnico di Milano, Milano, Italy
Logistique inversée dans les retours de distribution entre distributeur et fournisseur au Brésil et en France	**Gisele de Lorena Diniz Chaves** Université Fédérale du Espírito Santo, Brazil **Rosane Lúcia Chicarelli Alcântara** Université Fédérale de São Carlos, Brazil **Jacques Colin** Université de la Méditerranée Aix-Marseille II, France
Developing capabilities to manage offshore operations: an exploratory study	**Vilmar Antonio Gonçalves Tondolo** Universidade do Vale do Rio dos Sinos, Brazil **Hale Kaynak** The University of Texas - Pan American, USA **Cláudia Cristina Bitencourt** Universidade do Vale do Rio dos Sinos, Brazil **Yeda Swirski de Souza** Universidade do Vale do Rio dos Sinos, Brazil
Transformability drivers – a configuration model for modular logistic processes in SME	**Frank Straube** Berlin University of Technology, Germany **Anja Steffens** Berlin University of Technology, Germany **Ouelid Ouyeder** Berlin University of Technology, Germany
Fulfillment systems in Multi-Channel Retailing - Customer Expectations and Economic Performance	**Gerald Lang** BEM Bordeaux Management School, Ecole Polytechnique PREG-CRG, France
How to compete by taking advantage of logistical collaborations? The LSP at the heart of coopetitive strategies	**François Fulconis** Université d'Avignon et des Pays de Vaucluse, CRETLOG, France **Virginie Hiesse** Université Montpellier I, ERFI, France **Gilles Paché** Université de la Méditerranée, CRETLOG, France
Bordeaux natural wines on the Japanese market: analysis of supply chain system' indolence	**Tatiana Bouzdine-Chameeva** BEM Bordeaux Management School, France **Marie Ninomiya** Faculty of Commerce, Fukuoka University, Japan
Strategy and supply chain design for the Mexican automotive sector	**Miguel Alejandro García Vidales** Facultad de Ingeniería, Universidad Autónoma de Querétaro, Mexico **Rocío Montserrat Campos García** Facultad de Ingeniería, Universidad Autónoma de Querétaro, Mexico **Ovidio González Gómez** Facultad de Ingeniería, Universidad Autónoma de Querétaro, Mexico **Eduardo Betanzo Quezada** Facultad de Ingeniería, Universidad Autónoma de Querétaro, Mexico
Towards sustainable 'take-back': A case study of retail waste collection strategies	**Maria Triantafyllou** Transportation Research Group, University of Southampton, United Kingdom **Tom Cherrett** Transportation Research Group, University of Southampton, United Kingdom

Fulfillment systems in Multi-Channel Retailing - Customer Expectations and Economic Performance

Gerald Lang
BEM Bordeaux Management School, France
Ecole Polytechnique PREG-CRG, France
gerald.lang@bem.edu

Abstract:

Increasingly, store-based retailers are opening an additional online sales channel and becoming multi-channel retailers. The integration of these different channels raises the question how to redefine the strategic marketing elements and the operations, as the two channels have different constraints and require different competences.
This multi-channel retailing has major impacts on the operations and the supply-chain management. Order fulfillment for the customers using the different sales channels is a key challenge, as customers are directly impacted from the performance of this process.

In this paper, we will highlight the different strategic elements and operational challenges to be addressed by a multi-channel retailer. In order to evaluate the match between a fulfillment system and a multi-channel business model, we propose a framework analyzing the overall performance of different fulfillment systems regarding the two dimensions customer expectations and economic performance.

Key Words: Multi-Channel, Retail, Fulfillment, Distribution

INTRODUCTION

A growing number of traditional store-based retailers are becoming multi-channel retailers by opening an additional online-channel to offer their customers multiple ways of buying and interaction. At the same time, former pure online-retailers are opening stores or physical pick-up points to allow their customers physical interaction and product pick-up.

Multi-channel retailing got primary attention principally in the field of multi-channel marketing (e.g. Wirtz, 2008). Marketing literature and scholarly research address multi-channel marketing mainly focusing on customer behavior on the one side (e.g. Venkatesan et al, 2007) and the conflicts between channels on the other side (e.g. Falk et al, 2007; Avery et al, 2009). Several authors (e.g. Schröder, 2005; Schobesberger, 2007; Heinemann 2008, 2009) analyze different multi-channel strategies and implications on a retailers' marketing mix.

Whereas operational implications of online retailing have received attention since the end of the 1990s (e.g. Turban et al, 2009; Swaminathan & Tayur, 2003), specific analysis of operational implications of multi-channel retailing remains scarce. Agatz et al (2008) reviewed the specific supply chain management issues of internet fulfillment in a multi-channel environment. They identified an important number of topics relevant for e-fulfillment, but recognized that there are only very few dedicated models on multi-channel retailing.

Multi-channel retailers with different business models are using different fulfillment systems to deliver the products to their customers: The online shop of the French retailer Fnac (cultural and electronics products), fnac.com, started its online activity completely separated from its store activity, with different warehouse locations and fulfillment organizations. They gradually integrated their logistics activities and are operating today a fully integrated warehouse, preparing deliveries for the stores as well as for the individual online customers. Tesco.com, the online shop of the major UK retailer Tesco, prepares the customer's orders exclusively in the Tesco store next to the customer (Smith & Sparks, 2009). So does monoprix.fr, the online shop of the French city-center supermarket chain Monoprix.

These observations suggest that a specific multi-channel business model may induce a specific, most suitable fulfillment system.

If this is the case, it should then be possible to evaluate how a fulfillment system fits a given business model.

From an operational point of view, fulfillment systems have to be mainly time- and cost-efficient. From a strategic marketing point of view, the fulfillment system has to be able to meet the customers' expectations created by the chosen business model.

We therefore propose to develop a qualitative framework to evaluate how a specific multi-channel fulfillment system matches the business model of multi-channel retailers both in terms of the expectations of their customers on the one hand and the economic performances on the other hand. This framework should serve as basis for further empirical studies.

Our paper is organized in two parts:

In the first part, we will highlight the main characteristics of multi-channel retailing and present the major elements of the retailers' strategy, the retail mix, which have to be adapted to a multi-channel retailing strategy. [1]

We then will explore the specific operational challenges to be faced when operating a multi-channel activity.

This first part will be completed with the presentation of the five major multi-channel fulfillment systems used to deliver products to the customers.

In the second part, we will propose a qualitative analysis framework in order to evaluate the overall performance of a given fulfillment system, combining the two dimensions 'customer expectations' and 'economic performance'. The parameters of the framework as well as its applications will be based on the analysis of the strategic and operational challenges developed in the first part.

Applying the analysis framework to the five major fulfillment systems leads us to discuss how each of the systems impacts the different parameters.

We conclude our paper presenting managerial implications and suggested future research avenues to provide evidence if our framework is valid for our purpose.

Methodology

Our analysis is based on the one hand on our longitudinal industry observation of retailers' practices, completed with the analysis of company information and press articles. Moreover,

---

[1] In our paper, we will concentrate on multi-channel retailers operating at least several physical stores and an online sales channel under the same brand and with the same types of products. Moreover, we focus on the distribution of physical products, as dematerialized products do not need a physical distribution. We exclude as well specific configurations (which may nonetheless be dominant in particular sectors), like delivery from manufacturers or 'complex assortments' (de Koster, 2002) with bulky items and temperature sensitive goods.

we conducted a series of interviews with French and UK senior operations managers and consultants in the retail sector. This observation allowed us to identify five major multi-channel fulfillment systems.

To be able to evaluate these fulfillment systems regarding the two dimensions 'economic performance' and 'customer expectations', we have to identify the relevant parameters to integrate into our proposed framework. To do so, we analyzed Marketing and Operations general literature and scholarly research. Exploration of the main strategy elements and operational challenges suggests number of parameters, indicating economic performance and customer expectations. We completed the identified parameters for evaluating customer expectations with dimensions from the *ServQual* and *NetQual* scales, measuring service quality perception from the customers.

These parameters of our framework will be the dependent parameters, whereas the analyzed fulfillment systems will be the independent parameters. The exploration of the strategy factors and economic performances in the first part will allow us to apply the framework to the different fulfillment models by assessing the chosen performance parameters for each of the fulfillment systems. This shall provide a global evaluation for the each of the analyzed fulfillment systems.

STRATEGY FACTORS IN MULTI-CHANNEL RETAILING

The objective of this chapter is to summarize the context of multi-channel retailing as well as the main drivers for customer expectations and economic performances, which will enable us to identify the relevant parameters to use in our proposed framework. We will first present the main characteristics of multi-channel retailing. We then will investigate how the business model of a multi-channel retailer, characterized by different elements of the retail mix, will have to be adapted to a multi-channel strategy. An exploration of the major operational challenges for a multi-channel retailer will conclude this chapter.

Multi-Channel Retailing: Characteristics & Customer Behavior

Worldwide retailing is still dominated by the traditional store retailing, as 95% of food retailing and 80% of non-food retailing is realized through physical store-based retailers (Dioux & Dupuis, 2009), and online channels still represent only a small part of the total sales of the retailers. Nevertheless, the motivation to open online sales-channels is strong due to the fact that e-commerce is realizing important annual turnover growth rates of about 30% for the

last few years, whilst most other retail forms stay stable or even decline. It is therefore interesting for a store retailer to invest in the creation of an additional online sales channel.

To implement a multi-channel strategy, retailers have to decide how to adapt their business model by adjusting the elements of the retail mix. At the same time, they have to face and resolve numerous operational challenges.

In multi-channel retailing, customers expect at least the same level of service, counsel, and information on every channel (cf. Heinemann, 2008). They expect to have identical customer loyalty programs across all channels, to be able to pay and pick up in the shop a product ordered on the web site, or to be able to return and exchange a product bought on the web in a store (Berman & Thelen, 2004). This *channel hopping*, which is a legitimate desire from a customer's point of view, may nevertheless prove to be very difficult to implement for the retailer (Vanheems, 2009).

At the same time, online shoppers transfer their perception and experiences from a physical store to the website of the same brand and vice versa. Customers tend to transpose a bad experience in one channel to the other channels of the same distributor (Heinemann, 2008). As soon as their expectations are not fulfilled, they may adapt their purchasing habits, in the worst case stop buying with this retailer at all. It is therefore vital for a multi-channel retailer to make sure that every channel always meets the same level of expectations of the customers.

Multi-Channel Retail Mix

The Retail Mix consists of the mix of variables, including geographical location, merchandising, communication, price, services, product range and the personnel, which form the overall strategic marketing components of a retailing activity. It is the right mix of all these factors which determines if a retail concept is viable and successful.

Compared to a store retailer, the online sales channel is not only a new channel, but rather a new business model, where experiences from the traditional (*brick and mortar*) store channel may not be valid any more (Heinemann, 2008). Decisive success factors in a store like store location, sales personnel and material management in the shop are not the same success factors in an online sales channel.

Retailers which decide to open an e-commerce activity beside their existing store sales channel have to make sure that the co-existence of the two sales channels is working well. They have to decide how to adapt the different elements of the retail mix to each channel,

which product strategy to chose, which prices to apply, how to maintain a consistent image across the channels or what role to assign to each channel, to name a few (cf. Berman & Evans, 2009).

We will briefly describe the major issues of some of the most important variables of the Retail Mix, assessing their relevance and importance in the store, the online channel and the multi-channel strategy.

Product Mix

The product mix is the major variable determining the activity of a retailer. It establishes if a retailer is specialized in selected product categories or a generalist.

If a store based retailer opens an additional online channel, he has to decide which product mix he offers on this new channel. He can offer the identical product mix, a combination or part of his existing product mix or a completely different additional product mix on the new channel.

Location of the stores

A physical store's success is to a great extend influenced by its location. In order to determine if the location can attract the store's target customers, a store based retailer has to analyze socioeconomic data, transport access, mix of competitors, costs and regulation issues.

These parameters, decisive for a physical store, have generally no influence on a pure online sales channel, as access to the websites is independent from a geographical location.

In a multi-channel strategy, however, the store location remains important; the density of the store network can be an important factor for offering store pick-up, returns and after sales services in the stores for their online customers.

Pricing

The pricing policy applied in a store may take into consideration the environment of the store (socioeconomic characteristics of the geographical catchment area) and the price levels of the local competitors. Such a local pricing policy which can be applied in a store is incompatible with the global price transparency in an online channel and the exposure to price comparisons.

The pricing policy of a multi-channel retailer encounters specific difficulties: the global price transparency on the internet, the specific cost structures of the store and the online channel,

the existence of specific offers and the different means of payment render it difficult to apply a consistent pricing policy across all channels.

Especially the price transparency makes it difficult for a retailer to offer different prices for the same product on different sales channels.

Service, store pick-up and return

A multi-channel service offer can be composed of special delivery options (delivery speed, delivery timing, information on order status), the exchange policy, return policy, refunding, after sales service, payment options and consumer credits.

Multi-Channel retailers can offer either to deliver the order to the customer's home or to let the customer pick-up the order in one of the stores. This service allows the customer to pick up the order whenever he likes, even sooner than with home delivery.[2]

Allowing customers in-store return or exchange can avoid the cost and time of returning via mail. At the same time, this offers an important possibility for the retailer to create a personal contact between the client and the sales personnel to increase customer loyalty and to generate additional sales.

Personnel

The sales personnel play a decisive role in stores. They welcome clients, provide counsel and advice and can influence sales. Their behavior and attitude contribute in an important way to the atmosphere and ambiance of the store and its concept.

This important parameter in a store is irrelevant in a pure online channel, except for telephone hotline contacts or the delivery service personnel.

In a multi-channel strategy, however, the store personnel have to be able to orient and counsel the client using different channels. It is very important for the client not to perceive any differences or barriers between the channels.

Operational Challenges of Multi-Channel Retailing

In general, the operational organization of a retailer is mainly focused on efficient store replenishment, lowering costs and shortening the product turnover time.

---

[2] In case of unavailable items, the retailer can chose to send the missing items directly to the customer and only reserve the available items in the store for pick-up. In this case, the customer experience will be negative, as the customer's decision to pick up his order in the store can't be fulfilled.

To offer an online channel to its customers, a retailer has to be able to manage its operations in a very different way from its physical store activity. E-fulfillment may be considered as one of the most expensive and critical operations of Internet retailers (de Koster, 2002), logistics and stock management becoming core competencies (Benghozi, 2001). Keeping stock of a high number of different references, making it available, picking and packing, sending and delivering quickly at a low cost are the numerous constraints to respect.

In the following, we will present and discuss the main operational issues, which are decisive for the overall performance of the multi-channel retailing.

Product Availability

Product availability is one of the most important parameters for customer satisfaction (Browne, 2009). A store customer usually can compare the products present in the store. Availability is indicated through the simple presence of a product in the store shelve. A customer can ask the sales personnel if there is any stock of the product or when it will be available again.

An online client needs to have all this information indicated on the website together with the product information. The online channel offers the possibility to display the remaining stock of a chosen product, or even, in a multi-channel context, the remaining stock and the location of the store where the product is available for testing, purchasing or withdrawal.

Displaying the availability of products or the delay of their replacement is an important marketing tool impacting the sales and influencing customer satisfaction.

Stock keeping

Stores usually receive deliveries either directly from the manufacturer or from one or several logistics platforms with either warehousing or cross-docking function.

As online orders may consist of different products, composing the orders from different warehouse locations may prove to be difficult and inefficient in terms of cost and delivery time. A central warehouse and fulfillment center may therefore, at a first view, be more adapted to the online channel.

However, multi-channel retailers may as well pick the items for an online order directly in the stores.

For an online order, the retailer has some flexibility where from he delivers the products to his customers, as he can use multiple stock locations and therefore offer a wider product range than the one contained in a single warehouse, as multiple channels may share their

inventories. In-store inventories can therefore be available for online customers' orders (Agatz et al, 2008).

Centralizing stock allows easier monitoring of the stock levels for different products. If a retailer is serving its online clients (totally or partially) from stock in the stores, the overall stock level on these different locations is difficult to monitor. This is the same problem for multi-channel retailers who offer the possibility to their customers to order online and withdraw the product in a nearby store.

As information on product availability is a crucial parameter for the customers buying decision, the accuracy of the stock level information is very important.

Order taking and fulfillment

In an online channel, the customer enters the type and number of products he wants to acquire and enters the payment information (usually done by credit cards), the online channel therefore becomes a self-service channel (Falk et al, 2007). All this information entered by the customer triggers the order preparation and fulfillment process.

Retailers once delivering their stores from centralized distribution centers (often with complete boxes or pallets) have to re-think the way orders are prepared, as their organizations are not designed for small individual customers' orders. They must therefore be reorganized to treat these orders (de Koster, 2002), implementing a process of single item picking and packing.

As mentioned above, another option for the retailer is to pick the items in the stores, where the products are available on the shelves, and to prepare the order in the shops.

Furthermore, orders may be consolidated from multiple stock locations (for example from a warehouse and a store), which needs a specific process. The more complex the fulfilment process is organized, the more difficult it becomes to respect the quality and efficiency of this process.

Delivery to the customer

Besides the availability of the product, the different delivery options for a product are an important parameter for the online channel client. Different delivery service levels offered like delivery in 24 hours, delivery to a pick-up point, national post service etc. are becoming a product differentiation factor of the retailer.

Delivery to the customers' homes, which is a distinctive element of an online channel, implies to deal with cost and organizational issues. The usually small transactions have to be managed and delivered in an efficient way, while respecting the promised delivery timing.

The costs of the home delivery can be totally or partially paid by the customer. This becomes an important parameter of choice for the client, as no direct delivery costs appear in the store channel. On the other hand, the costs of delivery can be used as a marketing tool for special offers ("your next order free of charge") or minimum order amounts ("delivery free of charge for every order above 100 Euros").

Delivery becomes therefore a service parameter, a price parameter and a promotional parameter.

Reverse logistic

Store customers can usually see, touch and try the goods before purchasing. Returns are limited and very often linked to an exchange of the product, where the returned product is put back into the shelves. Defect products are reimbursed.

As online customers cannot see, touch and try the products, online retailers usually offer good conditions for the customer to return the products they don't like (due to legal and regulatory obligations, but as well as part of their customer service offer).

Return handling must be quick in the eyes of the customers, either to get a product exchange or to get reimbursed and the customer account re-credited. The process must as well be efficient as it is a very manual process and impacts the stock management of the returned products (Min et al, 2006).

A physical store channel can be an easy way in the customer's eyes to return the products.

MULTI-CHANNEL FULFILLMENT SYSTEMS

To operate the multi-channel strategy, retailers have to set up a fulfillment system to deliver products to the customers. This fulfillment system, organizing the process from order intake to delivery to the customer, has to match the business model and to reply to the operational challenges. Industry players are using different fulfillment systems, and several authors suggest typologies of fulfillment schemes, focusing on the locus of order preparation (de Koster, 2002; Durand, 2008).

Multi-channel retailing *per se* intends to offer the clients the choice where and how to order and where and how to get the products delivered.

The major choice for the client is to shop in the store or shop online. If shopping online, the client can furthermore opt for delivery at home or pick up his products in one of the retailer's stores.

The retailer has to set up a fulfillment system able to respect the client's choice of the delivery mode, either by creating a new logistics infrastructure, or using the existing one, by adapting the existing processes.

In order to be able to analyze the fulfillment systems from a customer expectation's perspective, we decided to distinguish the fulfillment systems by the delivery option chosen by the customer:

Clients may either choose the direct home delivery for their purchases completed on the online channel or choose to pick up their purchased items in a physical store of the retailer. This in-store pick-up is a delivery option only multi-channel retailers can offer and which may be chosen to 30-40% of the customers at some multi-channel retailers (Berman & Thelen, 2004).

A client going into a store in order to buy a product, searches, compares, picks the product out of the shelve and pays the product. Single-channel store shoppers may therefore not be affected by the multi-channel fulfillment organization.

1. Direct Home Delivery

Direct home delivery can be completed either by the retailer's own delivery organization, a delivery logistics provider or via an external pick-up point network[3]. Before entering in this 'delivery pipeline', products have to be picked, prepared, packed and expedited, which can be done either in a central warehouse or distribution center, in a store, or in multiple locations (central warehouse and one or more stores).

---

[3] We consider a delivery via an external pick-up-point network (usually neighborhood shops linked to a network which offers the retreat of parcels for the clients of different retailers) like a home delivery, as the fulfillment process is quite identical, with a delivery of (sometimes pre-sorted) parcels to the pick-up point network's injection hub. Although this is influencing the ease of access, this way of delivery cannot provide a contact with the retailer as in his own store.

1.1 Direct Delivery from central warehouse

Picking, preparation and packing of ordered items can be done from a central warehouse stocking the products (Figure 1.1). This central warehouse can either be a purpose-built entity to serve exclusively the online channel or the existing warehouse for the store operations (in which case the processes in the warehouse have to be adapted).
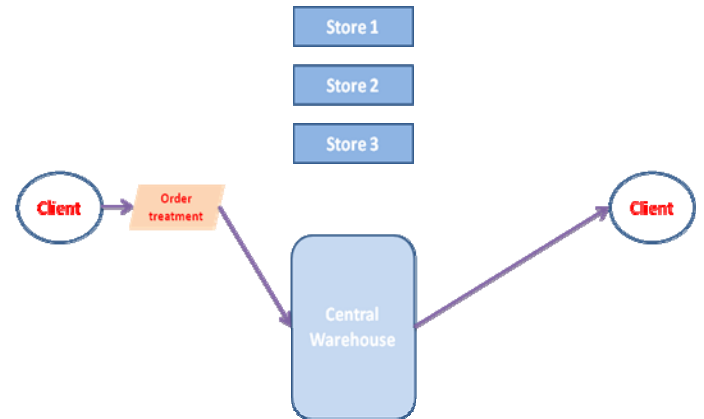
Figure 1.1: Direct delivery from central warehouse

1.2 Direct Delivery from a store

Picking, preparation and packing of the ordered items can be done inside a physical store out of the shelves. In this case, operators pick the products into a specific order preparation cart from the shelves and then pack and send the completed order to the customer (Figure 1.2).
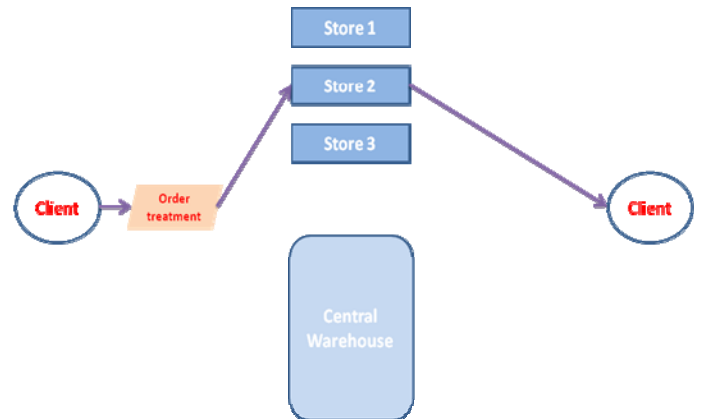
Figure 1.2: Direct delivery from a store

1.3 Direct Delivery after multi-stock consolidation

If the desired articles of an order are not available in one place, picking of the ordered items has to be done in a central warehouse as well as inside a physical store from the shelves. The picked items have then to be consolidated, prepared and packed in one site (Figure 1.3). In some cases, the multichannel
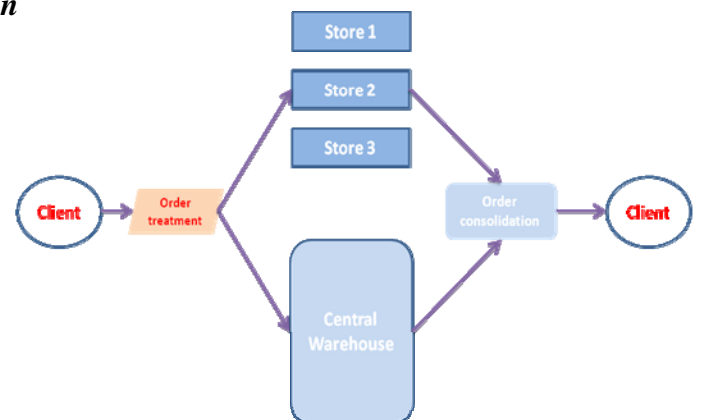
Figure 1.3: Direct delivery after multi-stock consolidation

retailer may opt for sending the order in two different parcels, to avoid the costs and delay of the consolidation.

2 Client Pick-up in the store

A customer ordering online may choose to pick up his products in one of the retailer's stores. In this case, products have to be picked, prepared, packed and kept ready for pick-up in the store.

2.1 Direct in-store order preparation

If all the products of the customer's order are available in the store chosen by the customer to pick-up, the picking, preparation and packing of the order can be done immediately in the store (Figure 2.1).
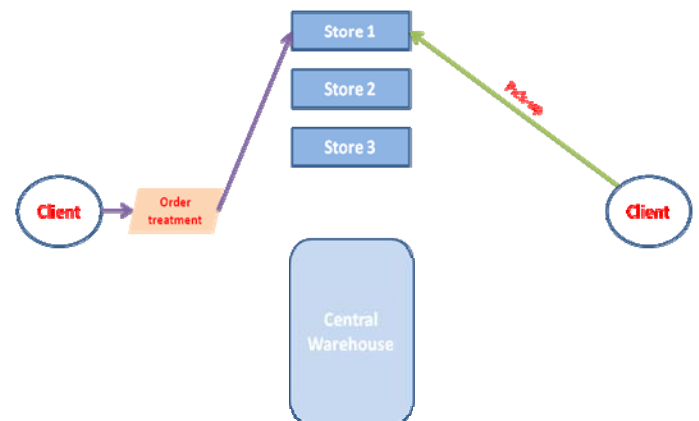

Figure 2.1: Direct in-store order-preparation

2.2 In-store order consolidation from multiple stocks

If some of the products of the customer's order are not available in the store chosen by the customer for pick-up, the unavailable items must be ordered from the central warehouse (or other stores) to complete the order. The preparation and packing of the order can be done only after consolidation of all items in the store (Figure 2.2).

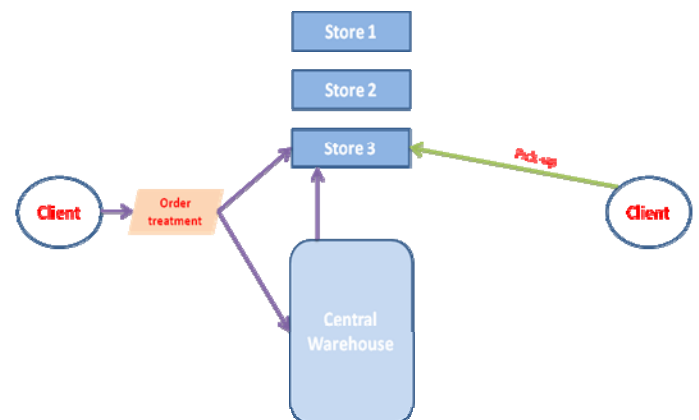(A specific case of this in-store order consolidation can be a complete order

Figure 2.2: In-store order consolidation from multiple stocks

preparation in a central warehouse sent to the store only to be picked up by the customer, without further adding any product in the store).

THE ANALYSIS FRAMEWORK

In this part, we will first determine the parameters to integrate in our proposed framework. We then will apply this framework to the five abovementioned fulfillment systems and discuss the results. We will conclude this part discussing the limitations of the framework, suggestions for further research and managerial implications.

Customer expectations and economic performance

Having analyzed the main strategy factors and operational challenges, and identified the five major fulfillment systems, we now have to determine the parameters to include into our proposed framework in order to evaluate these fulfillment systems.

The different fulfillment systems lead to different levels of complexity, of costs and of product availability and therefore different levels of customer satisfaction and economic performance.

To explore how a fulfillment system fits a given business model, we have to evaluate the overall performance of the different multi-channel fulfillment systems, combining the two angles of analysis: On the one hand, we analyze to which extend a given fulfillment system is able to meet the customer expectations. On the other hand, we analyze the economic performance of each model.

In our proposed framework, we will confront the different fulfillment systems to several parameters which are relevant for the customer expectations and the economic performance. The fulfillment systems may be considered as the independent variables of our analysis, whereas the different parameters of our framework represent the dependent variables.

The identification of these parameters results from the exploration of the main strategy elements and operational challenges.

Concerning the economic performances of fulfillment, we propose to assess different dimensions of the overall fulfillment efficiency, combining widely used indicators to describe logistics and fulfillment performances (e.g. in Agatz et al, 2008):

- *Stock efficiency* (indicating reliable sales forecasts and optimized product replenishment to reduce stock-risk, capability of monitoring stock levels across different stock locations and the capability of balancing stock between different locations)

- *Picking efficiency* (indicating efficient organization of stock and picking zones for picking and order preparation)

- *Delivery cost efficiency* (indicating the total cost of delivery from the stock(s) to the customers' home or to the desired store for pick-up)

- *Channel organization efficiency* (indicating the information exchange between sales channels and real time availability of data)

- *Fulfillment infrastructure costs* (indicating the necessary investments, rents or outsourcing costs for the fulfillment infrastructure)

- *Return handling efficiency* (indicating the speed and quality of the return handling process, from product reception to exchange or reimbursement for the client)

Analysis in the first part of this paper suggests three parameters indicating the customer expectations:

- *Product availability* (indicating the availability of the desired products)

- *Speed of delivery* (indicating the time between the order placement and the reception of the products by the customers)

- *Ease of access and return of products* (indicating the ease for a client either to get the products delivered/to pick them up or to return/exchange the products received)

In order to assess more precisely how a fulfillment system corresponds to the customer expectations, we completed these parameters with parameters from the *ServQual* framework, developed by Parasuraman et al (1988) to measure service quality. Nevertheless, this traditional service quality may not be applicable in an online environment (Parasuraman et al, 2005). Bressolles (2006) developed the *NetQual* framework to specifically assess electronic service quality.

As multi-channel retailing provides both 'traditional' and 'online' service experiences, we have to combine these two approaches in order to identify all the relevant dimensions to customer expectations and retain only those which may be directly impacted by the fulfilment model. Therefore, we selected the following dimensions out of the *ServQual* and *NetQual* scales for our analysis:

- *Quality and quantity of information* (*NetQual*) (indicating the availability and correctness of the information provided in terms of product availability, stock level, delivery times etc. either on the website or in the stores)

- *Reliability and respect of commitments* (*ServQual & NetQual*) (indicating the ability to deliver the products in terms of quantity, price, description and timing)

- *Offer* (*NetQual*) (indicating the lengths and the width of the product range available on the different channels)

- *Assurance* (*ServQual*) (indicating the competence and friendliness of the personnel usually in the store for buying, pick-up and exchange transactions of the client).

We did not retain those dimensions having only an indirect link with the fulfillment systems. These elements constitute the analysis framework we propose to analyze the overall performance of specific fulfillment systems.

Application of the Analysis Framework

We are now able to apply this proposed framework to the five identified fulfillment systems according to our objective to evaluate the fit between a multi-channel retailer's business model and a specific fulfillment system.

To be able to analyze each of the abovementioned fulfillment systems, we will explore the sensitivity of each of the parameters regarding the main characteristics of the different fulfillment systems.[4] We apply numerical scores to each parameter, depending if the efficiency of this parameter is high (2), medium (1) or low (0). This qualitative evaluation, based on the discussion of the different elements of the retail mix and the operational challenges, aims to compare the relative efficiency of one parameter in different fulfillment systems. We do not intend to provide an absolute performance test.

Quality and Quantity of Information

Customers expect correct information, especially on pricing and delivery costs of the different channels, but as well on other parameters like product availability, speed of delivery and product characteristics. The retailer's challenge is always to have the right information available on every channel.

---

[4] Each of the above identified parameters expressing customer expectations and economic performance of a specific fulfillment system has multiple implications on other parameters. It is to retain that these parameters may be interdependent (e.g. the width of the product offer impacts the product availability, the picking efficiency and the fulfillment infrastructure costs).

Using a centralized stock provides the highest chance to have the right information available (score: 2), whereas an order preparation from stores induces the problem of obtaining the right information on the store stock level (score: 1). If the order preparation has to be completed on several stock locations (central warehouse and stores), it is very difficult to obtain correct information and the quality of information may be low (score: 0).

Reliability and Respect of commitments

Customers expect retailers to keep their promises, especially in terms of delivery time and delivery service. Central warehouse order preparation should facilitate this, as the quality of information is high and the fulfillment process can be optimized (score: 2). Order preparation in the stores suffers from difficulties in keeping a real-time stock level of all the products. Therefore, store preparation may guarantee only a medium level of reliability and respect of commitments (score: 1), whereas multi-stock order preparation may only provide a low level (score: 0).

Offer

Customers expect to find the offer they expect on every channel, a large or narrow product range with the appropriate depth of assortment. The retailer has to make sure to be able to offer the products customers expect on every channel.

Order fulfillment at a central warehouse or from multiple stocks should be capable to provide the entire range of the products (both score: 2), order preparation at the store is limited to the only product assortment in stock at the store (score: 0).

Product availability

The customer expects that the products he intends to buy are available in the channel he desires to use.

A central warehouse order preparation may provide only a medium level of product availability (score: 1) compared to the other options, as the availability depends on the stock keeping and forecasting precision of this single warehouse. Stores can only guarantee a low level of product availability because of the small number of stock for every referenced product and the continuous buying from customers in the store (score: 0).

Multi-stock order preparation may use the stock of different entities (stores and central warehouse) and therefore guarantee a very high level of product availability (score: 2), especially in case of a high number of articles per customer order.

Speed of delivery

Customers usually expect a rapid delivery of the products they bought and to be informed about the delivery timing. Retailers therefore have to implement a fast and reliable delivery process, which may imply an external delivery service provider.

A central warehouse usually needs to bridge the distance to the final customer, which may be long and therefore time-consuming. A medium level of speed of delivery may therefore be guaranteed (score: 1). As stores are closer to the final customer, the speed of delivery can be high when orders are prepared in the store (score: 2). Orders prepared from multiple stock locations need a long time to be consolidated and can therefore only provide a low relative delivery speed (score: 0).

Ease of access and return of products

Customers expect easy access to the retailer to either pick up the products ordered or to return or exchange a product in case of dissatisfaction.

Home delivery from a central warehouse may make returns and exchange difficult for customers (score: 0), who have to use a postal service for returning the products (except in the case the retailer owns a quite dense network of stores and the store channel is fully integrated to handle returns and exchange from the online channel). Order preparation in the store is usually done in the store closest to the customer. This store is therefore easy to access for the customer (score: 2). Multi-stock preparation can only provide a medium level of ease of access and return (score: 1). Although the customer can return a product to the closest store, exchange can be impossible if the products to be exchanged are only available at another stock location.

Assurance

The customers expect competent and friendly personnel in the store for buying, picking up their orders, return or exchange. The same expectation may apply for the personnel on telephone customer hotlines or the delivery personnel. These functions being very often outsourced (especially the latter), retailers have to focus on their own sales personnel and make sure they provide the level of assurance the customer is expecting by providing the same information to all channels. The assurance of the personnel can only be provided in the case of order pick-up of the customer in the stores (score: 2; other option scores: 0).

Stock efficiency

For the retailer, the efficiency of stock management is crucial for numerous reasons. Stock keeping and monitoring of stock levels, balancing between different stock locations and the forecasting of sales and product reorders influence the availability of the products and therefore the sales. Efficient stock handling is as well an important cost element.

Central stock management can provide a high level of efficiency (score: 2), whereas a store can only provide a medium efficiency (score: 1) because of the low number of products per article and the continuous stock movement due to customers purchases out of the shelves. The handling of multiple stocks in the fulfillment process is the least efficient (score: 0).

Picking efficiency

The picking of products out of stock to prepare the customer's order is the key process of the overall fulfillment process, representing a very important part of the warehouse operating costs. This process is nevertheless transparent to the customer.

A central warehouse can be organized in a way to optimize the picking process by planning and reducing the way picking operators have to go during the process (score: 2). Depending on the volumes and the type of articles, it is possible to split the stock for whole cartons or open cartons picking or separate zones for stocking and picking. This optimization cannot be provided in a store or in multiple stock sites (scores: 0). Stores' layouts and product locations are planned to make the customer spend the maximum time in the store and not to optimize the picking (de Koster, 2002).

Delivery cost efficiency

Customers expect to pay the lowest extra cost possible for the delivery of their online orders and the retailer has to reduce the overall cost of the delivery.

Delivery of orders prepared in a central warehouse has always to include the transport to the customer's home and therefore only achieve a medium efficiency (score: 1) compared to the delivery from a store (score: 2), where the distance to the final customer is short. Pick-up by the customer from the store where the order was prepared is the less costly way of delivery for the retailer. Any delivery from an order prepared in multiple stock locations (for home delivery or to a store for pick-up) is least efficient (score: 0), as the consolidation process of the order implies multiple costs of handling and transportation.

Channel organization efficiency

As stated above, customers want to be able to use different channels simultaneously. A retailer has therefore to manage all the channels in an integrated manner.

Preparing orders for home delivery from a central warehouse is the simplest and most efficient organization (score: 2). Order preparation in the store involves the online and the store channel in the fulfillment process, therefore adding a level of complexity (score: 1). Multi-stock preparation adds further complexity, being therefore the most difficult solution to achieve an efficient channel organization (score: 0).

Fulfillment infrastructure costs

The fulfillment process may generate important investment costs, when a specific site is built as the stock and the distribution center, or if the design and the organization of an existing facility have to be modified. Renting or outsourcing this infrastructure generates additional costs as well.

A central warehouse order preparation generates a high infrastructure cost (score: 0), whereas the store preparation generates the lowest additional infrastructure costs (score: 2). Order preparation from multiple stocks may generate medium additional infrastructure costs (score: 1) to organize the consolidation of the orders.

Return handling efficiency

Customers expect their returns to be processed quickly, to receive an exchange product or to get reimbursed the purchasing price. The retailer must therefore provide a quick and efficient return handling process.

A central warehouse enables creation of optimized return processing (score: 2) to check the returns, repack and restock them and send the exchange items to the customers. Multi-stock fulfillment can only provide a lower rate of return efficiency (score: 1), as the returned items arrive in different locations and the exchange items may only be available on different stock locations. For a store it is very difficult to offer an optimized return process (score: 0), especially when returned products are not part of the store's product offer.

We can therefore summarize the impacts of the different fulfillment systems on the different parameters as follows (Figure 3):

Figure 3: The Analysis Framework

Fulfillment system	Home Delivery			Customer Store Pick-up	
	1.1 Prepared in central warehouse	1.2 Prepared in store	1.3 Prepared in multiple stocks	2.1 Prepared in store	2.2 Prepared in multiple stocks
Customer Expectations					
Quality and quantity of information	High (2)	Medium (1)	Low (0)	Medium (1)	Low (0)
Reliability and respect of commitments	High (2)	Medium (1)	Low (0)	Medium (1)	Low (0)
Offer	Medium (1)	Low (0)	High (2)	Low (0)	High (2)
Product availability	Medium (1)	Low (0)	High (2)	Low (0)	High (2)
Speed of delivery	Medium (1)	High (2)	Low (0)	High (2)	Low (0)
Ease of access and return of products	Low (0)	High (2)	Medium (1)	High (2)	Medium (1)
Assurance	Low (0)	Low (0)	Low (0)	High (2)	High (2)
Economic performance					
Stock efficiency	High (2)	Medium (1)	Low (0)	Medium (1)	Low (0)
Picking efficiency	High (2)	Low (0)	Low (0)	Low (0)	Low (0)
Delivery cost efficiency	Medium (1)	High (2)	Low (0)	High (2)	Low (0)
Channel organization efficiency	High (2)	Medium (1)	Low (0)	Medium (1)	Low (0)
Fulfillment infrastructure costs efficiency	Low (0)	High (2)	Medium (1)	High (2)	Medium (1)
Return handling efficiency	High (2)	Low (0)	Medium (1)	Low (0)	Medium (1)
Total Score Customer expectations	7	6	5	8	7
Total Score Economic performance	9	6	2	6	2
Total	16	12	7	14	9

This indicates several results:

- Home delivery from a central warehouse (System 1.1) is the fulfillment system best meeting the combination of the two dimensions customer expectations and economic performance, providing a total score of 16. This system provides the highest score in economic performance (9) and the second highest score in customer expectations (7).

- Customer pick-up after preparation in the store (system 2.1) provides the highest score in customer expectation (8) and a medium score in economic performance (6). The overall performance of this system is second best (total score of 14).

- Home delivery after store preparation (system 1.2) provides medium scores in customer expectations (6) and economic performance (6), ranking third best in the overall score (12).

 - Any fulfillment system implying the order preparation out of multiple stocks appears to be less efficient: If the order is picked up by the customer (system 2.2), the total score is 9, if the

order is delivered at home (system 1.3), the total score is only 7. In terms of economic performance, these two systems provide the lowest score (2).

- Economic performances of order preparation in the store or from multiple stocks are identical for both home delivery or in-store pick up by the customer. The difference in customer expectations (difference of 2) results from the possibility to have a personal contact with the customer, therefore responding to the customer expectation of 'Assurance', which can only be provided in a store.

DISCUSSION, MANAGERIAL IMPLICATIONS AND RESEARCH AVENUES

The qualitative analysis of the different fulfillment systems and their impact on customer expectations and economic performance reveals that different fulfillment systems can provide high overall performance levels in terms of customer expectations and economic performance.

The framework shows that orders for home delivery prepared in a central warehouse present only a slightly higher overall performance than an order prepared in a store for customer store-pick-up.

A retailer has to assess the importance of each of the analyzed parameters for his specific retail mix and to optimize the trade-offs between channel fulfillment synergies and specific needs on different channels. Depending on the product mix between food and non-food products, the width of product assortment and the characteristics of the existing store network, specific solutions may be more appropriate than others to fit with a specific business model.

Whereas proximity to customers is best achieved through a store network, stores add complexity on different levels in the fulfillment process which affect timing, costs and reliability.

Multi-stock consolidation seems to be always by far the less efficient model, regarding the customer expectations and the economic performance. This corresponds to the three initially mentioned multi-channel retailers: Fnac abandoned the multi-stock preparation and completely integrated their fulfillment for the different channels, and neither Tesco nor Monoprix apply a multi-stock solution, whilst optimizing the in-store order preparation.

Our proposed framework could prove useful for multi-channel retailers in various ways: It provides a tool to evaluate the chosen fulfillment system and therefore identifying improvement potentials on specific parameters.

It could also provide helpful to measure customer satisfaction. Moreover, it should clearly be useful in anticipating the needs for fulfillment systems when planning to implement a multi-channel strategy.

The proposed qualitative framework should be further validated by conducting supplementary empirical analysis, although it may be difficult to compare economic performances and customer expectations of different fulfillment systems in a same company. Another difficulty may be to isolate the impacts of the supply chain from other impacts (marketing, pricing, product policy etc.).

A limitation of our framework is the fact that it does not assess the interdependencies between the different dependent parameters, but only focuses on one major impact at a time.

A first step to further back this framework could be to conduct a dynamic analysis through a simulation, testing values for the different parameters of the analysis framework.

Research could aim to find evidence if there is an 'optimum' fulfillment system for every multi-channel retailer. Such an optimal model could be defined depending on different independent variables like product assortment, average number of items per shopping basket, value of products, product characteristics, degree of channel integration etc. This would also include an analysis of the trade-off between cost- and customer service level optimization.

Such a research could as well reveal that there is no optimum model, but just a set of independent and non stabilized models evolving quickly as the retailers' strategy mix evolves.

ACKNOWLEDGEMENT

REFERENCES

Agatz N., Fleischmann M., van Nunen J. (2008), E-fulfillment and Multi-Channel Distribution – A Review, *European Journal of Operational Research*, 187, pp. 339-356.

Avery J., Steenburgh T.J., Deighton J., Caravella M. (2009), *Adding Bricks to Clicks: The Contingencies Driving Cannibalization and Complementarity in Multichannel Retailing*, Harvard Business School, Working Paper 07-043, February 2009.

Benghozi P.-J. (2001), Relations interentreprises et nouveaux modèles d'affaires, *Revue économique*, Vol. 52, No. hors série, pp. 165-190.

Berman B., Evans J.R. (2010), *Retail Management – A Strategic Approach*, 11th edition, Pearson Prentice Hall (11th edition).

Berman B., Thelen S. (2004), A Guide to Developing and Managing a Well-Integrated Multi-Channel Retail Strategy, *International Journal of Retail & Distribution Management*, Vol.32, N°3, pp. 147-156.

Bressolles G., (2006), La qualité de service électronique: NetQu@l Proposition d'une échelle de mesure appliqué aux sites marchands et effets modérateurs, *Recherche et Applications en Marketing*, Septembre 2006; Vol. 21, N°3, pp. 19-45.

Brown J. (2009), How Satisfied are French Consumers with Online Customer Experience? – Executive Summary, Forrester Research, Mai 2008.

De Koster R. (2002), The Logistics behind the Enter Click, *in* Klose A., Speranza M.G., van Wassenhove L.N. (Eds.), *Quantitative Approaches to Distribution Logistics & Supply Chain Management*, Springer, Berlin, pp. 131-148.

Dioux J. / Dupuis M. (2009), *La Distribution – Stratégies des Réseaux et Management des Enseignes*, Pearson Education France, Paris (2e édition).

Durand B. (2008), *Les modèles logistiques du "B to C" en France*, 7e journée nantaise de recherche sur le e-marketing, 2008.

Falk T., Schepers J., Hammerschmidt M., Bauer H. (2007), Identifying Cross-Channel Dissynergies for Multichannel Service Providers, *Journal of Service Research*, Vol. 10, N°2, pp. 143-160.

Heinemann G. (2008), *Multi-Channel-Handel – Erfolgsfaktoren und Best Practices*, Gabler, Wiesbaden (2. Auflage).

Heinemann G. (2009), Verkauf auf allen Kanälen – Multi-Channel-Systeme erfolgsorientiert ausrichten, *Marketing Review St. Gallen*, 4-2009, pp. 46-51.

Min H., Ko H.J., Ko C.S. (2006), A Genetic Algorithm Approach to Developing the Multi-Echelon Reverse Logistics Network for Product Returns, *Omega*, N°34, pp. 56-69.

Parasuraman A., Zeithaml V.A., Berry L.L. (1988), SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality, *Journal of Retailing*, Vol. 64, N°1, pp. 12-40.

Parasuraman A., Zeithaml V.A, Malhotra A. (2005), E-S-Qual: A Multi-Item Scale for Assessing Electronic Service Quality. *Journal of Service Research*, Vol. 7, N°3, pp. 213-233.

Schobesberger A. (2007), *Multichannel-Retailing im Einzelhandel – Entwicklung, Motivation, Einflussfaktoren*, VDM Verlag Dr. Müller, Saarbrücken.

Schröder H. (2005), *Multichannel-Retailing – Marketing in Mehrkanalsystemen des Einzelhandels*, Springer, Berlin & Heidelberg.

Smith D., Sparks L. (2009), Tesco's supply chain management, *in* Fernie J., Sparks L. (Eds.), *Logistics & Retail Management – Emerging issues and new challenges in the retail supply chain*, Kogan Page, London & Philadelphia (3rd edition), pp.143-171.

Swaminathan J.M., Tayur S.R. (2003), Models for Supply Chains in E-Business, *Management Science*, Vol. 49, N°10, pp. 1387-1406.

Turban E., Lee J.K., King D., Liang T. (2009), *Electronic Commerce*, Pearson Prentice Hall (6th edition).

Vanheems R. (2009), Distribution Multicanal – Pourquoi les clients mixtes doivent faire l'objet d'une attention particulière ?, *Décisions Marketing*, N°55, pp. 41-52.

Venkatesan R., Kumar V., Ravishanker N. (2007), Multichannel Shopping: Causes and Consequences, *Journal of Marketing*, Vol. 71, pp. 114-132.

Wirtz B. (2008) *Multi-Channel Marketing – Grundlagen-Instrumente-Prozesse*, Gabler, Wiesbaden.