Profitability of different "click and collect" models in e-grocery: a logistics perspective

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Abstract: B2c e-commerce has become a mainstream sale channel, often merged with traditional stores in an omni-channel perspective. In this context, "Click and Collect" (C&C) is gaining importance, especially in the grocery industry, where big retailers including Auchan, Carrefour, Tesco, and Walmart have introduced it. However, despite the increasing diffusion of this model, little knowledge exists regarding its actual profitability. This paper aims to investigate this aspect by comparing the costs and investments required to implement C&C and by deriving the break-even point of different C&C configurations. More in detail, the authors analyse the "Click and Drive" (C&D) and the "Click and Store" (C&S) models. In both cases, the order is placed online and physically collected by the customer. C&D implies the customer does not get off the car while the order is loaded directly in the back of the car. Conversely, in the C&S model the customer enters the store. Due to the novelty of this phenomenon, the study has an empirical nature: 15 interviews with top grocery retailers, on-field visits, and mystery shopping activities have been performed to map existing C&C models. Collected information was inputted into a cost and investment quantification model developed by the authors. Results show that the C&D implies higher investments than C&S, especially if it uses a separate dark-store for conducting the picking activity. The profitability of the models requiring separate investments (e.g. a dark-store in C&D or a separate collection point in C&S) depends on the additional volumes such solutions can generate. This paper makes a first step into the analysis of emerging omni-channel (OC) models in the grocery industry thus contributing to the fragmented literature on the theme, while providing useful insights to retailers interested in approaching these solutions.

Keywords: Click and collect; Operational costs; Investments; Grocery; B2C e-commerce

1.Introduction

The growth of B2c e-commerce in the past few years has not reduced the importance of physical stores. Rather, online and offline distribution channels are increasingly being integrated into omni-channel (OC) models, that retailers can use both to offer more shopping opportunities to customers and to optimise supply chain performances. (Agrawal and Smith, 2015; Hübner et al., 2016). Gaining efficiency and being profitable is indeed important, especially in the grocery industry, as it is often characterised by intense competition, complex logistics and consequent low margins (Klein et al., 2004; Hübner et al., 2016). One of the most interesting OC solutions recently adopted in this industry is Click and Collect (C&C). This model implies a customer can place an order online and then pick it up from the grocery store of the retailer. C&C is being rapidly embraced by established retailers, including Auchan, Carrefour, Tesco and Walmart, as it allows providing superior service to customers while reducing the delivery burden of the merchant (Deshpande et al., 2011).

However, implementing C&C is all but easy and undoubtedly profitable. Although the costs of last mile delivery are shifted to the customer, the retailer still has many challenges to face. Among these, logistics plays a crucial role as efficient order fulfilment structures and adequate planning are required. Moreover, an understanding of the customer preferences is needed. Customers are different and their delivery needs might differ as well. Some could prefer standard home delivery, or request delivery at a specified date; some others could prefer collection at stores. The ability to provide multiple delivery options is a sharp challenge in nowadays grocery retailing landscape.

C&C is a relatively recent phenomenon, therefore little research has been so far conducted on the analysis of the possible configurations of this type of service and on the profitability of an investment in C&C. With the aim to overcome the current scarcity of information about this new but rapidly evolving model, we conducted a study of the profitability of different C&C models. The results are useful for grocery retailers interested in approaching this type of OC strategy. In the remaining sections of the paper the theoretical background, the methods and the results are discussed, while conclusions include some considerations on the limits of this paper and possible streams for future research.

2. Theoretical background

The level of competition in grocery retailing has amplified remarkably over the past decade (Klein et al., 2004; Hübner et al., 2016) and the rise of the internet as a sale channel has brought additional levers to compete. The high number of failures of internet pure players and traditional retailers in the grocery industry, however, has soon emphasised the importance of OC models, which are now starting to spread in online grocery retailing.

Cost and complexity of online orders fulfilment are among the biggest challenges affecting the design of an OC business model in the grocery sector (Aspray et al., 2013; Hübner et al., 2016). This is mainly due to the last mile delivery, given that many products are perishable, and require special delivery conditions. Also, a single order is usually made of several items that need to be picked rapidly, due to short delivery windows. Moreover, limited margins and volumes hardly justify the effort needed to accomplish home delivery. In this context, new delivery methods are being adopted. Among these, C&C is receiving increasing attention. It consists in the online order of a product which is then collected at the store by the consumer. C&C is used in Europe, especially in UK where 67% of consumers used it at least once to pick up goods (The Guardian, 2014). However, also France and Germany are fertile markets for e-grocery and especially for the C&C concept (Saskia et al., 2015). Moreover, other extra-European regions, e.g. Canada, Thailand or South Africa are starting to deploy it (Deloitte, 2015).

Current literature about C&C, and OC in general, is rather scarce. However, one of the most debated points regards the importance of logistics. The appropriateness of infrastructures and logistics management, commonly considered crucial for e-commerce (Ramanathan et al., 2014), become even more important in an OC context. More specifically, Hübner et al. (2015) pointed out that retailers operating multiple channels have to make a very important decision, i.e. whether to manage warehouses in a separated or integrated way across channels. An integrated approach can bring advantages for inventory pooling (Chiang and Monahan, 2005; Schneider and Klabjan, 2013; Bhatnagar and Syam, 2014; Hübner et al., 2015), and generally enables the offering of larger assortment (Zhang et al., 2010). However, it requires aligned picking processes for both store and home deliveries (Lang and Bressolles, 2013), solutions for capacity management (Xie et al., 2014) and real-time inventory control, which is hard to accomplish within the store. In addition, opting for an OC approach can have an impact also on city logistics. Home deliveries in e-commerce transactions indeed tend to increase the number of freight movements. However, if online customers' demand is satisfied from retail store inventories, rather than a distribution centre, as it can be the case in an OC context, the freight movements should reduce and this generally has an impact on costs (Savelsbergh, and Van Woensel, 2016).

Given all these considerations, the authors conclude that OC logistics management is increasingly being considered an important issue although it is still recent as a specific research area. Hübner et al. (2015) are among the first to identify and describe the different logistics system configurations supporting OC retailing. And this is the main investigated area in the field.

It is important to note the current predominance of qualitative methodologies to describe OC delivery processes. More specifically, for what concerns C&C, an adequate cost analysis is missing in the literature. The only costs, which have partly been investigated for the C&C concept, are the ones related to the picking process, which is considered among the most important cost drivers in the grocery industry (Kämäräinen et al., 2001) and one of the primary areas to work on in order to gain efficiency.

3. Research questions

With the increasing competition in the grocery industry, many authors believe retailers should start considering new ways to innovate their offer to the customers, rather than eroding margins through disruptive price wars. Investing in C&C models can be a way to increase customers' comfort and resolve their time pressure issues as orders can be collected at their convenience, e.g. on the way back from work (Deshpande et al., 2011). Analysing costs and investments of C&C is therefore useful for retailers interested in evaluating its adoption and covers a topic which is not exhaustively investigated in literature yet.

Given the gaps identified in current literature, our aim is to contribute to the extant literature on OC retailing in the grocery industry by proposing a model that assesses the profitability of various C&C concepts. More specifically, this study intends to answer the following Research Questions (RQs):

- RQ 1: How can C&C processes be modelled?

- RQ 2: What costs and investments characterise each of the identified C&C models?

- RQ 3: Are these models profitable? Under which conditions?

4. Methods

4.1 Methodological phases

The paper has an empirical approach. The core of the research is represented by a cost and investment estimation model, which was developed by following a two-step methodology:

Step 1: identification of the possible C&C configurations. The main purpose of this phase was to understand how the purchasing process in the C&C model can be structured. In this phase, we have initially relied on a preliminary investigation of available literature that we have complemented by observing models currently used

by grocers. We have therefore used both secondary information and performed mystery shopping activities to carefully understand the processes underlying each C&C model.

Step 2: Quantification of the costs and investments of the identified C&C models. In this phase, we have created a model that receives some data as inputs and returns the operating and capital expenditures associated to each alternative, as well as the expected revenues. In order to build the model, it was also necessary to design surfaces, assets and infrastructures by means of a software (warehouse planner was used in this case). The information used to accomplish this step came from interviews with 15 top grocery retailers and on-field visits to some of their stores/warehouses.

4.2 **Model architecture**

The model architecture includes four building blocks, i.e. (i) the inputs required to run the model, (ii) the contextual data, (iii) the engine for the computation of the profitability of each model, and the (iv) final interface that shows the results. First, the input data are related to demand level, average order value, investments in infrastructure, technology, marketing, and maintenance costs, picking and delivery costs. Second, contextual data mainly refer to energy consumption of machinery and building, times required to conduct each activity, warehousing, picking and transport design features (e.g. picking routing policy, storage area, truck capacity). Third, the section containing the computation algorithms allows the calculation of the different types of costs and investments, which are eventually shown in the output section. The model follows an Activity-Based Costing (ABC) approach, meaning that, for each C&C configuration, processes are divided into phases, and phases are then split into individual activities.

Figure 1 proposes a synthetic representation of the model design and provides the formula to calculate picking costs in one of the models, as an example. Picking costs are calculated by multiplying the number of pickers by their annual salary. The number of pickers is determined by considering the time needed to pick an order, the total available working hours and the numnber of orders. Picking time of each order is calculated as follows:

Set-up time + travel time + retrieval time

Where (i) the set up time of a tour is the time needed to get the picking list and box, (ii) the travel time is the ratio of the expected travel distance (derived according to Caron et al., 1998) to the speed of a picker and (iii) the retrieval time is calculated by considering the time to pick a single piece, the number of pieces to pick per line, the number of lines per tour and the time to read, check the list and reach the correct picking location. According to the ABC method, the picking costs are then summed up to the costs related to any other activity until the total operational expenditures are derived.

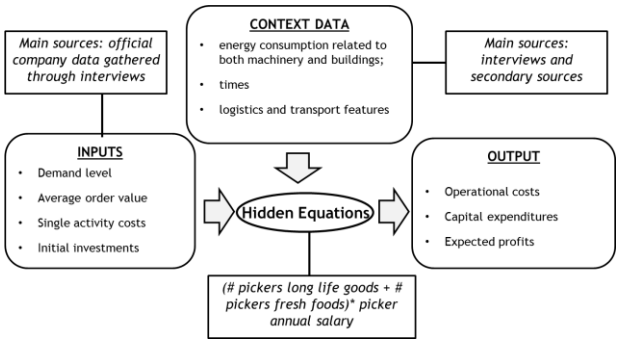


Figure 1 – Model design

In a similar way, initial investments for each C&C model are identified. As shown in the picture, the main references for both inputs and context data are interviews with grocery retailers and, in some cases (e.g. energy consumption and cost, maintenance cost), secondary sources (e.g, company annual reports). Please also consider that the times required to perform various activities are an average of the duration of the same activity performed in different moments during the working day. In case of picking activity, the average time also includes stock-out management. This means that whenever an item ordered by a customer is not available for picking, the customer gets notified and receives a proposal for substitution of the lacking item. This, of course, lenghtens the picking process.

5. Results

5.1 C&C models

This paragraph aims to provide an answer to our RQ1: "How can C&C processes be modelled?"

During the research, two main models for implementing a C&C initiative were identified, which mainly differ by how (i)order pick-up is conducted and (ii) the picking activity is performed:

-**Click and Drive** (C&D): once the order has been issued online, customers can collect products while staying in their car, since dedicated staff loads the order in the back of the vehicle. Orders are usually collected by a customer at a dedicated collection point (e.g. a dark-store or a different structure located outside the store). Within this model two alternatives are therefore considered, the C&D with dark-store (i.e. a warehouse purposely used only for the C&C service where the picking is also performed) and the C&D without dark-store. In both cases three main actors are involved, namely the customer, the picker and an employee in charge of loading the order in the car.

-**Click and Store** (C&S): customers have to collect orders on their own by getting out of their car. The collection point can be located inside the store or nearby, i.e. at a couple of km from the store. In the latter case items are picked from the store shelves and then delivered to the separated collection point. Similarly to the previous case, two alternatives are considered, namely the C&S inside the store and the C&S outside the store. When the pick-up point is located within the store, three actors are

involved, namely the customer, the picker and the employee that eventually handles the order to the customer. When the collection point is nearby the store a fourth actor, the driver, is involved. He is in charge of carrying the order from the store to the pick-up point. In both cases the picking happens within the store.

5.2 Relevant costs and investments

In general, the type of collection point for both models does not affect significantly the service perceived by the costumers. However, this does affect the costs borne by the retailer. In the rest of the paragraph, the main investments and operational costs associated to the various C&C alternatives are described. The authors wish to clarify that the following definitions of investments and operational costs are adopted in this work:

-Investments are those expenses, typically occurring at the beginning of a project, that the retailer faces in order to create value for more than one future financial year;

-Operational costs are conversely required to run the business daily and can be product-dependent (e.g. production costs, picking, delivery) or referred to the activity in a broader sense (e.g. administrative and general expenses)

The rest of the paragraph addresses RQ2, by identifying relevant costs and investments of the considered C&C models.

As far as the **C&D** configuration is concerned, the following elements have to be taken into account:

-**Initial investments in infrastructures**: in the C&D configuration, initial infrastructure investments refer mainly to the need to create a parking area with canopy to receive the customers. When a dark-store is present these investments are much higher as also the dark-store needs to be bought or rented.

-**Investments in other assets:** in case of the dark-store concept, assets such as refrigerating rooms need to be purchased to guarantee a broad range of products. Additional investments include finger-wearable mobile communication devices for the pickers, carts, shelves, gravity flow racking system, informative system to manage the warehouse, digital terminals (these are placed at the entrance of the dark-store and are used by customers to communicate their order code). When the dark-store is not present, we assume there is no need to buy fridge or refrigerators, since the ones already present in the store warehouse can be used. Conversely, carts, hand-held finger-wearable mobile devices, shelves to store the part of the order picked before the customer arrives (composed by long-life goods), informative systems for data retrieval and order communication, digital terminals need to be bought also when the dark-store is not used. Among intangible investments, we have the one in marketing in order to advertise the C&C initiative, which holds both in the case with and without the dark-store.

-**Picking costs:** the picking process performed inside the dark-store is more efficient, therefore cheaper, than the picking process within the store. Picking is generally split into two parallel phases; one picker picks long-life goods arranging them in the shipment area, while another picker picks fresh and frozen goods leaving them inside the refrigerating rooms. At the end, an employee assembles the order taking perishable products (fruits a vegetables, fresh goods and frozen goods) at first and long life goods at a later stage. Then, the employee delivers the order in the car of the customer. Note that the assumption that different types of products (i.e. fresh and long-life ones) are picked separately in advance allows reducing possible congestion effects or queues. All product categories are picked before the customer arrives and fresh ones are left waiting in appropriate temperature-controlled spaces. When the customer arrives it only takes a few seconds to assembly the complete order.

-**Other costs:** this category includes, among others, energy consumption and maintenance costs. It is relevant only in presence of a dark-store, since these costs are not specific for C&C when the picking process is performed directly in the store.

Coming to the **C&S** model, we can make the following considerations

-**Initial investments in infrastructures**: In case of C&S outside the store, collection happens at an independent building, which obviously implies higher investment for facilities.

-**Investments in other assets:** For C&S outside the store, investments to purchase fridges and refrigerators are needed. This is because, in order to account for the time needed to ship the orders from the store to the collection point, orders are sent well in advance with respect to the time the customer arrives. Additional investments in vans with refrigerated rooms are needed. Instead, if the pick-up is inside the store, relevant investments solely include cart, shelves, informative system to manage the warehouse, retrieve data and communicate orders. Marketing investments are present in both cases.

-Picking costs: Picking costs in both configurations are similar to the case of C&D without dark-store, since the picking activity is performed in the store.

- **Delivery costs:** additional transport costs to carry the order from the store to the nearby collection point arise in the C&S outside the store configuration.

-Other costs: energy consumption and maintenance costs have to be taken into consideration in case the collection point is in a separate structure outside the store.

5.3 Profitability of the C&C models

The present section answers RQ3 concerning the models' profitability.

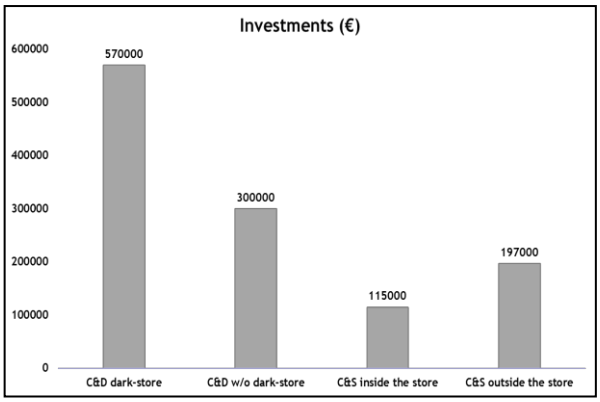


Figure 2 - Investments

As it can be observed in **Figure 2**, the model requiring the highest investment is the C&D and, more specifically, the one with the dark-store, as it needs new infrastructure. C&D without dark-store and C&S outside the store follow, as they need respectively a parking area and digital terminals to communicate the order (C&D) and a separate collection point (C&S). The model requiring lowest investment level is the C&S inside the store because it can be started mainly using already existing assets.

Figure 3 displays operational costs associated to the different models.

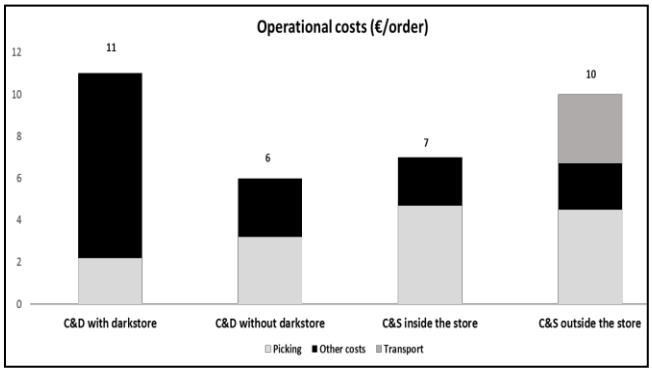


Figure 3 – Operational costs

As it can be noted from the picture above, the model with the dark-store is also the one with higher operational expenses, despite gaining efficiency in the picking phase. Higher operational expenses are due to consumptions and plant maintenance, higher level of personnel required, rental costs.

In order to allow the reader to better interpret the economics so far displayed, the following **Table 1** summarises some of the data used to feed the model

Item	Average value
order value	58.7 €
#pieces/order	30
picking time long-life goods	302 sec
picking time fresh goods	177 sec
annual personnel cost	28700 €/employee

Table 1 – Main data

By considering investments and operational costs, together with expected revenues, a break-even analysis can be performed for each model. Revenues are calculated based on a certain demand level, which (i) varies according to the characteristics of each model, and (ii) grows over the years, as it typically happens when a new service is launched.

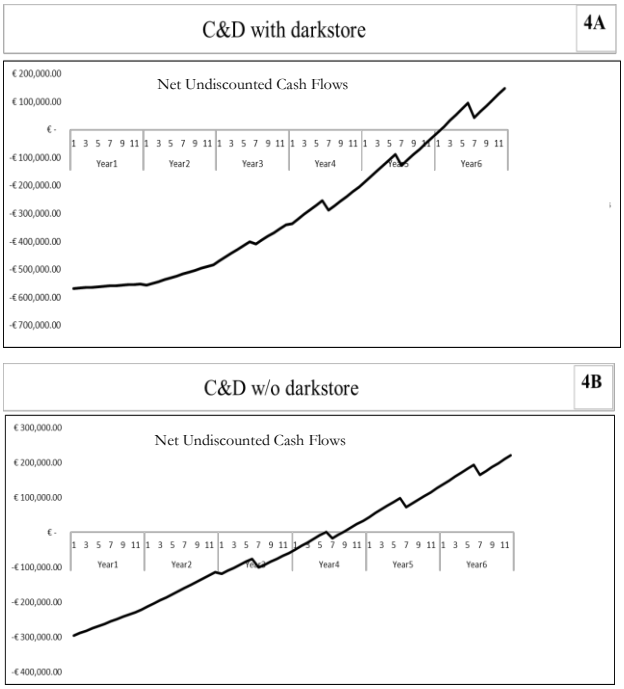
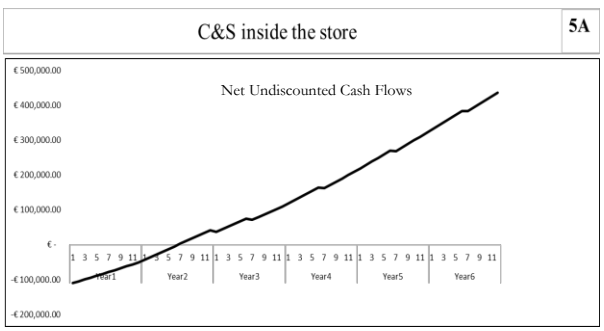


Figure 4 – C&D Break-even analysis

Starting with the C&D model (**Figure 4**), the version without the dark-store (4 B) reaches the break-even point, calculated by considering undiscounted net cash flows, around one year earlier (in year 4) than in the case with the dark-store (4 A). However, the monthly contribution margin in the model with the dark-store is higher at the end of the sixth year signalling that the dark-store is eventually more profitable. The demand level used in the C&D with dark-store is almost 3.000 orders per month, obtained as the average data collected from interviews with retailers currently adopting this solution. For the subsequent years we have hypothesised decreasing demand growth rates that range between 25% and 5% (as we assume the demand will grow slower as the market reaches maturity). In the case without the dark-store, the demand level for the C&C service was assumed to be less than 1.000 orders per month, i.e. one third with respect to case of the dark-store. The demand level was hypothesised again considering some real cases taken from the empirical analysis.



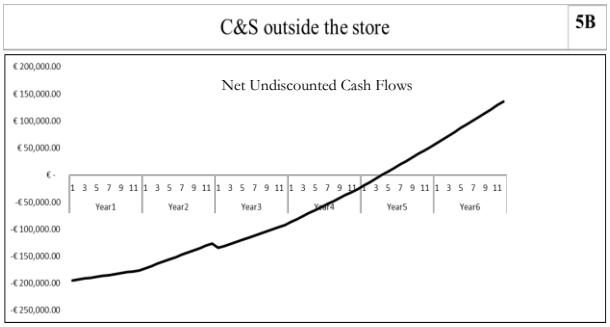


Figure 5 – C&S Break-even analysis

Coming to the **C&S** (see Figure 4), the breakeven point is again reached within the sixth year for both models. When the collection point is inside the store the model becomes profitable earlier, i.e. by the middle of the second year, as lower investments are required. In the C&S configuration, the demand level is assumed to be the same, both in case the collection point is inside and outside the store. The authors hypothesise almost 1.000 orders per month on average are fulfilled with these models, as derived through the company interviews.

6. **Discussion and Conclusion**

The present paper has showed a cost and investment analysis of four specific C&C models with the main aim to contribute to the fragmented literature in this field, given the rising interest that this type of OC process is producing in the grocery industry. More specifically, three research questions were addressed. RQ1 was tackled in section 5.1, where four C&C models were introduced. Two models can be classified as C&D, as they do not require the customer to get out of the car in the collection process. They differ because in one case the dark-store is present, while in the other, order picking and fulfilment are performed within the existing store. The remaining two models belong to the C&S category, as they imply the customer needs to get out of the car when collecting the order. In one case the collection point is within the store, while in the other case it is in a different location, a few km away from the store.

RQ2 aimed at identifying relevant costs and investment of each C&C model and the answer is provided in section 5.2, where initial investments in infrastructure and other assets, picking and general expenses are identified as the main investment and cost categories included in the model. Last, section 5.3 provided an answer to our RQ3, related to the models'profitability. By comparing the economic performances of these models, some considerations can be drawn:

-**All the four models can achieve the break-even point**, given the demand levels, which are based on real and current data and the hypothesised growth rates, derived by collecting opinions from the grocers recently adopting these solutions. In this regard, it is important to specify that different demand levels have been used for each model because every solution has its own capacity (e.g. the C&D with darkstore has highest capacity). Knowing these structural differences, retailers should opt for the model that they are best able to manage and that mostly fits with their expected demand volumes

-**The C&S inside the store is the one reaching the break-even earliest** among the selected alternatives. Moreover, it shows similar contribution margins to the C&D without dark-store while requiring lower initial investment with consequent shorter payback time. The contribution margin, on the other hand is not high due to two reasons: i) the picking costs are the highest ones and ii) the capacity (i.e. maximum number of orders that can be fulfilled) is low.

-The C&D with dark-store is the best performing, with the highest contribution margin at the end of the sixth year, although it is not the first to break-even. Moreover, the C&D with dark-store displays the highest amount of both investments and operating expenses. Nonetheless, this model is also the one with the potential to satisfy much higher demand volumes and consequent revenues. In addition, this model allows gaining efficiency in the picking phase with respect to other configurations.

-**The C&D without dark-store**, despite requiring higher investments than the C&S in the store, **is an interesting solution** because it provides the same service level of the C&D with dark-store (and higher than C&S) while lowering the risks and initial investments with respect to the use of the dark-store

-**The C&S outside the store** reaches the break-even in year five. This model provides a **good service level**, thus resulting in a high level of **customer loyalty**. This is one reason why a firm could opt for this model, despite it is the one performing worst, in terms of contribution margins, among the alternatives.

As the reader might have noticed, in evaluating the profitability of the various models, this paper does not take into consideration consumer behaviour issues (e.g. the fact that some categories of consumers might not trust a blind C&C purchase process where they cannot check integrity and quality of products before buying). The reason for this omission is that this is not relevant to our case since our calculations are based on real data collected from retailers. Actual data already reflect consumer behaviour, therefore we do not need to incorporate related hypotheses in our study. Beside this, it must be acknowledged that the majority of retailers currently offering C&D or C&S solutions allows customers to check some categories of products (generally perishable ones) and decide whether they still want to keep or discard them.

To conclude, it is important to note that the obtained results assume that the demand levels for each model grow moderately (i.e. between 5% and 25% with respect to the first year). Starting from this base case, future studies could try to explore if and how the profitability of these models change, by assuming alternative growth rates for the demand. It is indeed reasonable to expect an increase in the use of the C&C service in the upcoming years, however it is hard to univocally quantify it.

References

Agrawal, N. and Smith, S.A. (2015). Retail Supply Chain Management: Quantitative Models and Empirical Studies, Springer, Boston, MA.

Aspray, W., Royer, G. and Ocepek, M.G. (2013). Anatomy of a dot-com failure: the case of online grocer Webvan. In Aspray, W., Royer, G. and Ocepek, M.G. (Eds), *Food in the Internet Age*, pp. 25-35, Springer, Boston, MA.

Bhatnagar A, and Syam S.S. (2014), Allocating a hybrid retailer's assortment across retail stores: Bricks-and-mortar vs online, *Journal of Business Research*, Vol. 67, No.6, pp.1293–1302.

Caron, F., Marchet, G., and Perego, A. (1998). Routing policies and COI-based storage policies in picker-to-part systems, *International Journal of Production Research*, Vol. 36, No.3, pp.713-732.

Chiang K.W., and Monahan, G.E. (2005). Managing inventories in a two-echelon dual-channel supply chain, *European Journal of Operational Research*, Vol.162, No. 2, pp. 325–341.

Deloitte (2015), Click and Collect booms in Europe [online], available at: http://bit.ly/1wd4Lmz (accessed 03 January 2017)

Deshpande, D., Khanna, K., Singh, N. and Roshan, R. (2011). Emerging Multichannel Customer Experiences in Grocery Retail, WIPRO Technologies [report].

Hübner, A., Holzapfel, A. and Kuhn, H. (2015), Operations management in multi-channel retailing: an exploratory study, *Operations Management Research*, Vol.8, No.3, pp.84-100.

Hübner, A., Kuhn, H., and Wollenburg, J. (2016). Last mile fulfilment and distribution in omni-channel grocery retailing, *International Journal of Retail & Distribution Management*, Vol. 44, Issue 3, pp. 228 – 247.

Kämäräinen, V., Småros, J., Holmström, J., and Jaakola, T. (2001). Cost-effectiveness in the e-grocery business, *International Journal of Retail & Distribution Management*, Vol. 29 Issue 1, pp. 41-48.

Klein, S., Mueller-Lankenau, C., and Wehmeyer, K. (2004). Developing A Framework For Multi Channel Strategies . An Analysis Of Cases From The Grocery Retail Industry. *BLED Proceedings. 9*.

Lang, G. and Bressolles, G. (2013), Economic performance and customer expectation in e-fulfillment systems: a multi-channel retailer perspective, *Supply Chain Forum: An International Journal*, Vol. 14 No. 1, pp. 16-26.

Ramanathan, R., George, J. & Ramanathan, U. (2014), The role of logistics in E-commerce transactions: An exploratory study of customer feedback and risk in *Supply Chain Strategies, Issues and Models*, pp. 221-233, Springer London.

Saskia, S., Mareï, N., and Blanquart, C. (2016). Innovations in e-grocery and Logistics Solutions for Cities, *Transportation Research Procedia*, Vol. 12, pp. 825-835.

Savelsbergh, M., and Van Woensel, T., (2016). 50th Anniversary Invited Article-city Logistics: Challenges and Opportunities. *Transportation Science*, Vol.50, No.2, pp. 579–590.

Schneider F, and Klabjan, D. (2013), Inventory control in multi-channel retailing, *European Journal of Operational Research*, Vol. 227, No.1, pp.101–111.

The Guardian (2014). Click and collect shoppers predicted to pick up £6.5bn of goods by 2019 [online], available at http://bit.ly/1s6bnau (accessed 03 April 2017).

Xie,W., Jiang,Z., Zhao,Y., and Hong, J.(2014). Capacity planning and allocation with multi-channel distribution, *International Journal of Production Economics*, Vol. 147 No. 1, pp. 108-116.

Zhang, J., Farris, P.W., Irvin, J.W., Kushwaha, T. Steenburgh, T.J. , and Weitz, B.A. (2010). Crafting Integrated Multi-channel Retailing Strategies, *Journal of Interactive Marketing*, Vol.24, pp. 168-180.