

Expediting Omni-channel Retailing at C&A Brazil: A Timely Response to the COVID19 Pandemic Powered by RFID

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Abstract: This case study features the experiences of C&A Brazil, in deploying radio frequency identification (RFID) initiative to lay the foundation for omni-channel retailing capabilities as it meets the retailing requirements of the marketplace during the Covid19 pandemic. The exploration of C&A Brazil is successful beyond even the firm's initial expectations. The significant benefits experienced by C&A Brazil after rolling out RFID in a number of stores to manage its inventory systems more efficiently include: (1) reduction in inventory inaccuracy from 20 percent down to 3 percent; (2) cutting back on customer order cancellations from 10+ percent to less than 3 percent; (3) sales growth in RFID-enabled stores reported 80 to 100 percent increase compared to stores without RFID; (4) omni-channel business operations were conducted two times faster in RFID stores versus non-RFID stores; and (5) C&A Brazil expects to break even from investments made in its RFID projects by 2022. This case study uses the qualitative research method of content analysis and the "structural model of technology" as its theoretical framework in understanding the firm's experiences.

1 INTRODUCTION

The Covid19 pandemic has introduced unprecedented challenges in the retail marketplace. Societal mandates to put customer safety first has created the intuitive directive to conduct buying and selling online as much as possible. Add that to the fact that customers are also demanding to reach retailers using different channels of distribution and sales to meet their preferred means of gaining product information and purchasing products. Customers have the longest experience walking into brick-and-mortar stores. But with the onset of the Internet, online electronic, virtual stores, and marketplaces became commonplace.

Currently, use of smartphones and global positioning systems, along with the influences of social media marketing, has powered location based mobile commerce, following the tracks of customers who are now demanding retailers to provide the ability to purchase anything, anytime, anywhere. Thus, the concept of "omni-channel retailing" emerged dissolving the boundaries separating the physical, virtual, and mobile storefronts. "...The omni-

channel concept is perceived as an evolution of the multichannel. While the multichannel implies a division between the physical and online store, in the omni-channel customers move freely between the online (PC), mobile devices, and physical store, all within a single transaction process....the journey should be smooth and should provide a seamless, unified customer experience, regardless of the channels used...." (Pioytrowicz and Cuthbertson, 2014). This case study features the radio frequency identification (RFID) initiative of C&A Brazil, a south American retailer that is part of the larger C&A umbrella firm based in Europe. What is so remarkable is the way C&A Brazil leapfrogged the journey of establishing a tight and accurate inventory management system that eventually became the foundation of its omni-channel retailing initiative during these pandemic days. This case study features the use of the "structural model of technology" as the theoretical framework for understanding C&A Brazil's deployment of RFID as the basis of its intelligent inventory system and ultimately, its omni-channel retailing efforts.

This paper is organized accordingly. Section 2

Covers the literature review that includes a discussion of the structurational model of technology, omni-channel retailing, and C&A Brazil firm background. Section 3 covers the research method. Section 4 covers the findings that include: 1) structure of legitimation; 2) structure of signification; 3) structure of domination; and 4) social consequences. Section 5 covers the conclusions.

2 LITERATURE REVIEW

2.1 Structurational Model of Technology

This study applies Orlikowski's "Structurational Model of Technology," (Orlikowski, 1992; Orlikowski and Robey, 1991) to understand how information technology (IT) interacts with organizations. This model draws on Giddens' (Giddens, 1984; Giddens, 1979; Giddens, 1976) theory of structuration, which proposed the concept of the "duality of structure," "...which refers to the notion that the structure or institutional properties of social systems are created by human action, and then serve to shape future human action" (Orlikowski and Robey, 1991, p.147). "In Giddens' theory, structure is understood to be an abstract property of social systems. Structure is not something concrete, situated in time and space, and it lacks material characteristics. Structure cannot exist apart from the human actors who enact and interpret its dimensions. Structure has only virtual existence. Interestingly, people readily allow their actions to be constrained by these shared abstractions as social structure. The ability of organizational structures to elicit compliance and conformity in the absence of material constraints attests to the power of those socially constructed abstractions. Social structure conditions by providing contextual rules and resources that allow human actors to make sense of their own acts and those of other people..." (Orlikowski and Robey, 1991, p. 147). Furthermore, Giddens specifies that human interactions are an amalgamation of structures of meaning, power, and moral frameworks enacted in what he calls "modalities of interactions: interpretive schemes, resources, and norms.

"Interpretive schemes form the core of mutual knowledge whereby an accountable universe of meaning is sustained through and in processes of interaction (Giddens, 1979, p. 83). Orlikowski and Robey (1991) translate Giddens' concept of

"interpretive scheme" within the realm of IT and explain that IT represents reality through a set of concepts of symbols embedded in it by which end users understand their world. Thus, IT is not only a medium for the construction of social reality, but also a means of institutionalizing certain "interpretive schemes" or stocks of knowledge within the organization by standardizing, sharing, and taking them for granted.

Resources are the media through which power is exercised by human actors because it is through these resources that humans can accomplish their objectives and thus, gain "domination" (Orlikowski and Robey, 1991). Therefore, the deployment of IT institutes a certain order of authority, dictating the way work will be performed, and also, resulting in the differential distribution of power in the organization. Norms are understood as organizational rules that shape "legitimate" behavior. IT is a medium for installing such norms in order to control human behavior in an organization (Orlikowski and Robey, 1991).

Orlikowski incorporates the following components in her framework: first, the human agents, consisting of technology designers, end users, and decision makers; second, the material artifacts that constitute IT itself, and third, the institutional properties of organizations --- structural arrangements, business strategies, ideology, culture, control mechanisms, standard operating procedures, division of labor, expertise, communication patterns, and environmental pressures (Orlikowski, 1992; Orlikowski and Robey, 1991). The structurational model of technology discusses four critical issues (Orlikowski and Robey, 1991). First, IT is the product of human action, which is responsible for the creation, use, and maintenance of different forms of IT. It is only through human appropriation of action that it is able to influence human activity. Second, technology is the medium of human action. Since different forms of IT are used by organizational workers, they mediate organizational work either by facilitating it and in some ways, also constraining it. Third, organizational contexts shape human action within organizations. Human agents are influenced by the institutional properties of their setting which provide the resources, norms, and knowledge they need to work. Furthermore, IT is created and used within certain social and historical circumstances which influence the form and features of this technology.

Fourth, human agents either reinforce or transform the institutional properties of an organization when using IT. Weick (1979) characterized technology as enacted

environment whose construction is determined by an organization's structure of signification, domination, and legitimation. Any change in these structures indicates the "appropriation" and use of technology. "Structure of signification" refers to the way the concepts and procedures intrinsic in the knowledge embedded in IT directs the manner are interpreted and work is conducted in the organization (Orlikowski, 1992). "Structure of domination" refers to IT's ability to control the work of organizational members once it is deployed. "Structure of legitimation" refers to the ability of IT to sanction a particular way of conducting work and thus, propagate a set of norms about what is considered legitimate business practice. Orlikowski also incorporates the three modalities of structuration --- interpretive schemes, resources, and norms --- in her application of structures of signification, domination, and legitimation in the deployment of IT in an organization.

2.2 Omni-channel Retailing

The retailing industry was already on its way to transitioning to omni-channel retailing, but the onset of the Covid19 pandemic in March 2020 accelerated this shift. To stem the rapid spread of the virus, governments worldwide instituted formal measures mandating lockdowns and social distancing, thus, severely limiting if not stopping customer traffic to brick-and-mortar venues for products and services (Verhoef, 2021; Zeynep, 2021; Weber, 2021; Kulkarni, 2020). Online purchasing was encouraged instead resulting in an unexpected and unprecedented boon for ecommerce and more so, for omni-channel retailing.

The concept of "omni-channel retailing" has been revisited again recently especially with the onset of the 2020 Covid19 pandemic (Verhoef, 2021; Zeynep, 2021; Weber, 2021). Verhoef, Kannan, and Inman (2015) refer to omni-channel retailing as "...a business model in which different channels are integrated to provide consistency to consumers throughout their experience." Brynjolffson, Hu, and Rahman (2013) define omni-channel retailing as a business model that provides customers a seamless shopping experience on account of using integrated sales channels. Picot-Coupey, Huré, and Piveteau (2016) view omni-channel retailing as a vehicle that enables customers to move seamlessly between integrated front-end and back-end operations (involving order fulfillment and last-mile delivery options) across different connected channels. To Vanheems, omni-channel

retailing refers to "...a strategy of assembling various channels into a single distribution system promoting interchangeability and the transfer of customers between channels..." (Vanheems, 2009).

The Aberdeen Group, an IT consulting firm in the U.S., on the other hand, considers omni-channel retailing "...as a set of integrated processes and decisions that support a unified view of a brand from the perspective of product purchase, return, and exchange, irrespective of the channel (in-store, online, mobile, call center, or social)..." (The Aberdeen Group, 2012). The critical role of item-level RFID tagging has also been articulated by Bill Hardgrave, founder and former director of the RFID Research Center of the University of Arkansas (Hardgrave, 2015, 2012) : "Anywhere, anytime, any product' is the mantra of omni-channel retailing and retailers of all types are clamoring to make it happen....Customers should have a consistent and seamless experience whether they're shopping in a store, on a mobile device, on a home computer or via a catalog....But omni-channel retailing starts with operations --- in particular, those that deliver real-time, accurate inventory data efficiently and cost-effectively. If you don't know what you have, where you have it and when you have it, the great mobile or online app you created for your customers is worthless...." (Hardgrave, 2012).

Omni-channel retailing has its specific technological and business process change requirements in order to guarantee a successful customer experience. Customers expect both information (content) and business process consistency across the integrated sales channels they are using to complete a purchase transaction (Hure, Picot-Coupey, and Ackermann, 2017). Changes will have to be made in the firm's enterprisewide- and supply chain- related business processes to support an integrated suite of sales channels. A vital digital gateway supporting integrated sales channels is a connected artery linking a firm's inventory system, order management system, and warehouse management system (Zeynep, 2021). Front-end and back-end ecommerce systems operations also need to be fine tuned in order to fulfill orders accurately and on time as elements of even just a single customer transaction may require synchronizing elements of that purchase involving different sales channels (Weber, 2021; Mirsch, Lehrer and Jung (2016). Front-end operations include the website user interface that give access to the firm's electronic catalog of products, shopping cart features, and an online ordering process. For instance, a customer may use a store's physical store

for fitting an evening gown; then, this customer may also research this item online further to check out alternative colors and/or fabrics; and finally, she may use the store's mobile app to review coupons just released by the retailer that applies to this item. Then, this customer could also use the same app to place an order for this gown at a discounted price indicated in the coupon. Back-end operations involve the inventory, order management/fulfillment, and warehouse management systems. With omni-channel retailing, the firm now has to curate inventory items differently, keeping in mind the specific and differing demand levels per sales channel. With respect to outbound logistics impacting warehouse management, it would satisfy customers to have different last-mile delivery options (Kembro, Norrman, and Eriksson, 2018), that would, in turn, lead to decisions like shipping direct to customers from distribution centers or physical stores, whichever is closer to the customer (Kulkarni, 2020).

2.3 C&A Brazil: Firm Background

Created in 1976, C&A Brazil is part of the umbrella company called C&A, founded in 1841 by the Dutch brothers Clemens and August Brenninkmeijer in Sneek, Holland. Headquartered in Zug, Switzerland, C&A belongs to the COFRA Group. The C&A umbrella firm, which is considered one of the larger retail chains in the world, covers 24 countries in Europe, Latin America, and Asia (C&A, 2021, November 21). The first C&A Brazil store was set up in Shopping Ibirapuera in Sao Paulo. The C&A firm, as a whole, specializes in making and selling ready-to-wear quality apparel for men, women, and children. As of late, the firm has been focusing on environmentally sustainable manufacturing processes and product design. C&A Brazil has more than 280 stores in 125 cities and employs about 15,000 workers (C&A, 2021, November 21).

Even before the pandemic (March 2020), C&A headquarters in Germany had expressed its desire to pursue omni-channel retailing and consider the role of RFID item-level tagging as critical in this endeavor once the firm has achieved accurate inventory counts (Angeles, 2018, 2017, 2015a and b). The onset of the pandemic, however, has made online shopping and ecommerce initiatives not just important, but essential and critical.

3 RESEARCH METHOD

This study uses the case study approach in applying the concepts of the structurational model of technology as articulated by Orlikowski (Orlikowski, 1992; Orlikowski and Robey, 1991) in the RFID deployment at C&A Brazil to pursue omni-channel retailing in response to the retail conditions introduced by the COVID19 pandemic in Brazil.

Primary data was gathered from the transcripts of the presentations given by Vicente Neves, Senior Supply Chain Manager and Michael Bergel, Supply Chain Strategy Division Manager, C&A Modas, C&A Brazil, in the RFID Journal Live! 2021 Annual Conference in Phoenix, Arizona, USA, September 26-28, 2021 (Neves and Bergel, 2021).

Secondary data using academic journal articles, trade articles on C&A, and vendor website information were used as well. All of these materials were content analyzed using key concepts embodied in the structurational model of technology. The following are accepted definitions of the content analysis method:

“Content analysis is any research technique for making inferences by systematically and objectively identifying specified characteristics within text.” (Stone, et al., 1966, p. 5).

“Content analysis is a research technique for making replicable and valid inferences from data to their context.” (Krippendorff, 1980, p. 21).

“Content analysis is a research method that uses a set of procedures to make valid inferences from text.” (Weber, 1990, p.9).

In this study, the concepts used for content analysis were derived from the structurational model of technology. This framework forms the “context” of the content analysis method as applied to C&A Brazil's RFID system. The secondary data was analyzed within the context provided by the Orlikowski framework, which is considered the “prior theory.” “Analytical constructs operationalize what the content analyst knows about the context, specifically the network of correlations that are assumed to explain how available text are connected to the possible answers to the analyst's questions and the conditions under which these correlations could change analytical constructs ensure that an analysis of given texts models the texts' context of use...” (Krippendorff, 2004, p. 34). The following key conceptual elements of the content analysis method as stipulated by Krippendorff (2004) were used in this study: (1) body of text selected for the analysis; (2)

research question that needed to be addressed; (3) a context of analysis within which interpretations will be made; (4) analytical constructs that operationalize what the analyst knows about the context; and (5) inferences that will be arrived at to address the research question.

4 FINDINGS

4.1 C&A Brazil: Structure of Legitimation

The RFID initiative at C&A Brazil has attained a “structure of legitimation” due to a number of developments recently in the economy and retailing industry. Having “structure of legitimation,” RFID item-level tagging has been the technological means by which retailers have sanctioned a specific way of developing information systems to address certain business operations needs and propagate a set of norms about what is and what is not “professional” social practice.

What is happening now is that by item-level tagging with RFID for certain product categories, C&A Brazil is laying the foundation for omnichannel retailing. This concept is complex, bridges the linkages among the multiple channels of selling to customers, and will require the integration of the IT infrastructure pieces used for capturing, storing, and processing order transactions and creating integrated customer profiles via these different channels. This case study focuses solely on C&A Brazil’s efforts to achieve a robust inventory management system as its groundwork for taking on the challenge of linking transaction data from the various channels that would have to sit on top of an inventory system serving all these channels. The other pillar supporting the “structure of legitimation” underlining RFID item-level tagging are the initiatives of the organization called GS1, a nonprofit international organization that develops and maintains standards for supply and demand chains across industries. Firms in the retailing industry use GS 1 electronic product code or EPC global standards that govern the workings of RFID technology. For instance, RFID Gen 2 was released by GS 1 as a worldwide standard for ultra-high frequency (UHF) RFID to simplify visibility, boost read rates, and improve RFID tag performance (Swedberg, 2013).

Recent developments legitimized and reinforced

the practice of omnichannel retailing in Brazil. The pandemic created pressures for retailers that had brick-and-mortar presence to introduce online shopping channels via ecommerce platforms to meet the social distancing mandates that gained widespread invocation in the world. Retailers that were operating many sales channels that were not integrated (e.g., simultaneously supporting separate online and brick-and-mortar channels for example) very quickly discovered the unsustainable high costs of doing so (Roberti, 2017). Worse yet, inaccurate inventory views on account of unintegrated online and physical store channels usually meant that the retailer could not expose all of its physical store inventory to customers shopping online. Consequently, customers cannot shop online and pick up the product items from the physical stores; they also cannot use their smartphones to help them shop while they are in the physical store (Roberti, 2017). In this situation, retailers would usually withhold product information from customers because they are aware that they have inaccurate inventory counts and that the product items may not be in the physical store even if the inventory figures report that they are there. Retailers would rather risk the customer perceptions of “stockouts” rather than disappoint customers who are left with the false impression that items are in the store, even if they, in fact, are not there. Omnichannel retailing has been the “holy grail” of retailers for sometime now, even before the pandemic. Recent research results attest to the ever increasing acceptance and recognition of this initiative as a promising avenue for generating increased revenues, amplifying customer satisfaction, and enhancing the purchase experience. Though there isn’t yet a majority of retailers that have adopted this practice, the research data attests to a growing number of “converts” quickly shifting their resources and assets towards omnichannel retailing, with the recognition that accurate inventory is a prerequisite.

A recent article discussed the findings of the 2018 RFID research study by Adrian Beck, Emeritus Professor, University of Leicester, U.K. (Handley, 2021). A key finding of Professor Beck is that firms in the 10 case studies used in the research considered omnichannel retailing a standard and desirable business practice (Handley, 2021). These forward looking retailers are using their brick-and-mortar stores as fulfillment centers for online sales. Only RFID-tagged product items are available for on-line sales because the inventory accuracy benefits derived from the technology make online sales-based business processes easier to execute. These

retailers are encouraged by the following outcomes resulting from this RFID deployment: increased inventory turnover, a more accurate capture of customer orders, decreased customer complaints and returns, and optimized working capital (Handley, 2021). These retailers also used their distribution centers as fulfillment centers for online orders, with RFID tracking both inbound and outbound shipments to and from distribution centers (Handley, 2021).

The RFID study of Professor Antonio Rizzi of the Department of Engineering and Architecture, University of Parma, Italy, reinforce these findings (Swedberg, 2019). study covered a sample of 97 firms and 23,400 stores in Europe and the U.S. that deployed RFID in the period 2001 to 2018. RFID projects in the later years closer to 2018 feature the dominance of omnichannel retailing, managing product returns, and process automation (Swedberg, 2019). In 2015, there were only eight firms in the sample that used RFID for omnichannel retailing, but in 2018, that number increased to 28 firms. An uptick in the trend from there is also anticipated.

These retailers reaped benefits from reduced product processing times and product tracking times, and increased inventory accuracy counts (Swedberg, 2019). Rizzi considers the fashion and apparel industry a very appropriate industry deploying RFID in a wider scale compared to other industries due to the wide range of stock keeping units (SKUs) of product items that need to be managed, the rapid changes in customer tastes and preferences that drive the constant movement of inventory in and out of physical stores and distribution centers, and the resulting dynamic online purchases.

The most updated assessment of the state-of-affairs in omnichannel retailing was offered by Retail TouchPoints, an online publishing network for the retailing industry (Roberti, 2019). It turns out that Europe and Canada are ahead of the U.S. in terms of "BOPIS" or "buy online, pick up in-store": about 64 percent of U.K. retailers offer BOPIS to customers, followed by 50 percent in France, 43 percent in Germany, 31 percent in Australia, and 31 percent in Canada. About 2,000 international retailers were covered the research study that revealed this important finding. Mark Roberti, editor of the RFID Journal offered a possible explanation for this finding --- the physical stores in the U.S. are much bigger and thus, carry more products. The costs of this alone may prove it financially prohibitive for U.S. retailers to be doing BOPIS at the same time (Roberti, 2019).

4.2 C&A Brazil: Structure of Signification

Because of the pandemic, C&A Brazil allowed its suppliers to ship garment products ahead of schedule to their distribution centers where these were tagged. SensorMatic RFID tags and labels were used in tagging these items (Johnson Controls, 2021). Distribution center (DC workers used Zebra mobile handheld RFID readers to read the tagged items as they are prepared for packing and distribution to the stores. These RFID readers interact with fixed Zebra portal antennas installed in strategic locations in the doors, walls, and ceilings of the DCs. An example of a Zebra mobile handheld RFID reader they could be using is the MC3330xR Integrated UHF RFID Reader.

The MC3330xR Integrated UHF RFID Reader which is light to carry but has a sizeable touchscreen for good visibility and a keypad. This mobile RFID reader is the "brain" of C&A's RFID system in that it interrogates the RFID tags and labels and in so doing, transmit and receive radio waves from these tags. The fixed portal antennas, though, act as an intermediary between the mobile RFID readers and RFID tags and labels. In order for the RFID reader to communicate with the RFID tags and labels, though, these fixed portal antennas need to convert the mobile RFID reader signals into radio frequency or RF waves that the RFID tags eventually receive. These fixed portal antennas receive their power from the mobile RFID readers, then, as a result are able to generate a radio frequency (RF) field. This field is what enables RF signals to be transmitted to the tags. Zebra Technologies also offers a wide variety of fixed portal antennas. An example is the Zebra RAIN RFID AN440 RFID antenna capable of covering a large area in the firm's physical facility. This specific model is capable of high-speed radio frequency signal conversion to enable fast and accurate data capture. This antenna could be mounted in the ceilings and walls of warehouses or distribution centers. Its power can help create superior read zones around stockroom shelves, warehouse doorways, and dock platforms. There are usually the areas where cases and pallets of products are rapidly moved in and out of a facility.

When the packed garments are delivered to the stores, sales staff use the mobile handheld RFID readers to read the tags on these newly arrived items. Product information embedded in the tags is, then, forwarded by RFID readers to SensorMatic's TRUEVUE intelligent inventory software that

primarily supports C&A Brazil's back-end store systems. This software updates the inventory file for the day to account for the newly arrived garment items in the backroom. This software also interacts with an application written by the in-house programmers of firm for inventory allocation. After unboxing the garments and putting them on shelves or hanging them on hangers, the sales staff read the RFID tags again to account for items now on display and available for sale. SensorMatic also has a point-of-sale software used in the sales counters of the physical stores, and this is connected as well to the TRUEVUE intelligent inventory software. Tagged items brought by customers to the sales counters are read by the RFID-enabled POS hardware that accompanies the POS software such as the AdvanPay 120 RFID POS system --- this is an "all-in-one" RFID reader and antenna configuration that uses advanced tag isolation technology.

In 2022, C&A will extend RFID deployment in two areas: theft detection in the retail storefront and use of RFID in fitting rooms (Neves, and Bergel, 2021, September 26-28). The theft detection will be achieved using SensorMatic's Electronic Article Surveillance System (EAS).

When the pandemic hit in March 2020, the state of affairs in C&A Brazil was not ideal for surviving the challenges faced by the retailing industry worldwide. The firm's inventory statistics were definitely inaccurate; the store chain's inefficiencies resulted in frequent customer order cancellations; customers complained about not finding items they wanted. The dominant customer perception was that C&A Brazil could not handle its frequent product stockouts. Meanwhile, within the retail stores, staff perceptions were that they, indeed, had the products but just couldn't find them during the picking process in time for customer inspection and checkouts.

The pandemic also forced many brick-and-mortar stores to close many of their branches. C&A Brazil was put in a similar position. The firm's inevitable option in a situation like that was to ramp up its ecommerce deployment which it launched way back in 2014, using VTEX as its platform provider (Gheorghia, 2021). Transforming itself into a digital firm had its challenges for C&A Brazil. They needed an ecommerce platform that would help them manage about 150,000 stock keeping units (SKUs) of products from different suppliers and 10 subsidiary brands, which they should be able to include in one catalog to support the online store. It

was important to be able to associate SKUs of newly introduced product items to those of existing products as a key part of tracking items available for sale. The VTEX platform allowed the firm to define software rules that covered different product categories, brands, and products to facilitate associating SKUs of new products with those of existing product lines (Gheorghia, 2021). Furthermore, VTEX enabled C&A Brazil to customize its online catalog and assemble product categories into "clusters" to facilitate easy management.

The VTEX platform has long-term advantages such as allowing C&A Brazil to expand its product offerings and accommodating more suppliers and product categories. This is critical in an online store where the customer expectation is for it to clearly outstrip the ability of the physical storefronts to sell a wider range of products. The VTEX platform also allows for having different payment and logistics options that can be offered in the same online store.

Another layer in C&A Brazil's omni-channel IT infrastructure was the adoption of the Centric Product Lifecycle Management software. The firm thought this software was important especially during its omni-channel retailing initiative as it needed a tool for managing the complexities of omni-channel-based business processes. C&A Brazil wanted to expand product lines offered online and increase the number of suppliers it dealt with. Its existing software tools were too limited in scope and functionality in order to support the firm's more ambitious and expansive short-term goals --- all directed towards omni-channel retailing. "...The pandemic not only greatly increased our digital channel sales and made it much more relevant, but it also accelerated the digital transformation of the company as a whole. And, with that, we needed more assortments, more new models; it was in this context that we decided to leverage PLM," explains Joao Souza, Head of Sourcing for the Women's Department of C&A Brazil (Centricsoftware.com, 2021). Furthermore, he said, "Our product development was very centered around each designer and emails with suppliers but no real strategic organization." (Centricsoftware.com, 2021). The Centric PLM software will greatly complement and enhance the firm's ecommerce and omni-channel retailing initiatives in a number of ways.

4.3 C&A Brazil: Structure of Domination

“Structure of domination” refers to RFID’s ability to control the work of organizational members once it is deployed. RFID systems exerts this control through its built-in assumptions, features, and standardized procedures, which impose the way work is done within the specific context of the business application where they are applied (Orlikowski, 1992). The RFID system in C&A Brazil’s inventory system undergirding their omni-channel retailing initiative required the training of all store staff members who would be interacting with the technology in order to introduce them to the new ways their work would change. Due to the changes in work brought on by the pandemic, store staff members were trained in the use of the RFID systems 100 percent online --- an unprecedented experience in the firm (Neves and Bergel, 2021). A total of 500 staff members were trained within 600 online meetings (Neves and Bergel, 2021). After gaining experience using RFID-tagged product items in the store, C&A Brazil experienced significant improvement in store staff morale on account of the rewards of doubling their sales performance and benefiting from locating product items in the store in “speed record time” using mobile RFID readers (Johnson Controls, 2021). C&A Brazil’s future plans include the following.

First, RFID will be deployed in all other C&A Brazil stores for a full RFID rollout by the second quarter of 2022.

Second, the firm will deploy other SensorMatic Software Suite features to support loss prevention in the physical storefronts. This will involve using features of SensorMatic’s Electronic Article Surveillance (EAS) systems that track products selected and purchased by customers in the stores and keep them secure by providing the store staff item-level visibility into the whereabouts of these items. This module will help C&A Brazil understand how customers move in and out of the store; which entrances and exits they use the most; and the times, days, and routes within the store with the highest traffic. The system will also identify which product items are statistically most likely at risk for theft and help the store add layers of product protection/security.

Hardware components for detection of the RFID EAS system such as the “RFID Only Door-Max” or the “RFID Overhead 360” could be

installed in doorways or overhead. Both can be configured to identify vulnerable store areas with electronic product code (EPC) item-level loss event reports. Store associates could be alerted using its color LED lights and audible indicators when a potential loss event situation is occurring.

Third, the firm will enable self-checkout procedures that can naturally be supported by RFID tracking capabilities at the sales counters to speed up the exit process for customers.

Fourth, the firm will install RFID readers in fitting rooms in order to collect more data on customer behavior and choices of product items which can be later analyzed for better decision making (Neves and Bergel, 2021).

C&A Brazil will use other advanced features of the SensorMatic software suite and one of them is designed to be used in the fitting rooms, to enable integrated RFID tracking in the storefront floor, fitting rooms, and point-of-sale zones. Called “TrueVue Fitting Room 360 degrees,” this module will enable C&A Brazil to capture more detailed data on customer behavior in the fitting room to allow it to track which apparel items are selected together and which accessories are chosen to

go with these apparel items. While the usual information sought is on which apparel pieces sell, tracking data on apparel items that are not purchased but are selected and left behind in the fitting rooms is also very informative and could lead to unexpected insights. Data analytics answers could lead to ideas that sales consultants on the floor could use to cross-sell and/or up-sell product items, and also provide a personalized, memorable customer experience.

4.4 C&A Brazil: Social Consequences

4.4.1 Social Structure and Social Consequences of IT

In looking at the “social structure and social consequences of IT,” the structural model of technology investigates how the IT, in this case, the RFID system, is implemented, assimilated, and adopted by the end users, and the consequences of usage (Orlikowski and Robey, 1991). IT, once again, acts as a medium of human action, and human action is also shaped by the use of IT. The end users’ behavior at C&A Brazil in the process of using the RFID system is mediated by interpretive schemes, resources, and norms perceived to be embedded in the technology. Since the RFID system is a medium of human action at C&A Brazil, it will shape the end

users' behavior in the firm, resulting in facilitating certain outcomes and constraining others. In C&A Brazil's earnest attempt to meet the new requirements imposed upon the store due to the Covid19 pandemic, it renewed its focus on ecommerce and more seriously pursued omni-channel retailing founded upon a strong inventory system that was accurate. This was the right approach as omni-channel retailing demands tighter control over a firm's inventories across its different sales channels in order to work. C&A Brazil initiated their RFID pilot project in 2020 and covered their 10 best stores within a four-month period (Neves and Bergel, 2021).

First, they started with one store and after one month, when the pilot was over in that location, C&A Brazil proceeded to deploy pilots in nine other stores. To accommodate the requirements of the pilot projects, C&A Brazil required the "test" stores to tag product items after store hours so as not to disturb normal store operations during business hours (Neves and Bergel, 2021).

C&A Brazil made one significant change on account of the pursuing omni-channel retailing and rationalizing the business operations of the physical stores (that were not shut down during the pandemic) and its ecommerce online site (Neves and Bergel, 2021; Johnson Controls, 2021). They took what used to be the "safety margin" for products sold online off and offered all inventories in the physical stores, their sales grew by 50 percent overnight (Johnson Controls, 2021). This meant that customers who went to the physical stores had access to all of the firm's inventory. This resulted in higher customer satisfaction because they always found what they were looking for.

Also observed was the time it took sales reps to process an order which was cut in half because of RFID's ability to help them locate precisely where the products were in the store (Johnson Controls, 2021). With RFID deployed in the stores, C&A Brazil was able to ensure that whatever product was sold to a customer, it would, in fact, be in the store and be located and allocated for that customer (Johnson Controls, 2021).

Another significant change made was to use C&A Brazil's distribution centers as RFID tagging staging areas for imported product items. Spaces within DCs were needed because a number of C&A Brazil physical stores needed to be closed on account of the pandemic. The staff initially had to contend with poor WIFI reception in the DC staging areas; eventually, they solved this problem.

Suppliers of imported products were allowed to deliver the products ahead of the usual delivery times in order to accommodate the increased amount of time needed to prepare the products during the time of the pandemic (Neves and Bergel, 2021). Table 1 summarizes the benefits experienced during the pilot projects:

Table 1: Benefits from pilots for RFID stores.

Benefits for stores with RFID from pilot projects
65% sales growth in stores VS non-RFID stores
5+ p.p. increase in Omnipresence VS non-RFID stores
50% faster in-store processes VS non-RFID stores
1,000 in one day for one store ---1 st time in chain's history
50+% increase inventory visibility on digital channels VS non-RFID stores

Source: Neves and Bergel, 2021

4.4.2 Action and Social Consequences of IT

The "action and social consequences of IT" discussion refers to the current and future changes needed in terms of "action initiatives" to more clearly delineate the path towards a more fully developed omni-channel retailing efforts. The future action initiatives, though, in the case of C&A Brazil are consequences of the benefits they experienced from the RFID pilot projects conducted in the 10 stores. The following are the more notable improvements that caught the attention of top management and the store staff. First, the 10 pilot stores experienced a 65 percent or greater sales growth compared to the non-RFID stores. In fact, for the first time in firm's history, certain stores processed as many as 1,000 orders per day. Omni-channel sales growth was estimated to have increased from 80 to 100 percent compared to sales figures reported by stores that did not tag product items. Second, store business processes related to selling product items increased in speed by 50 percent. Third, inventory visibility increased by 50 percent in their online store and other digital channels. Fourth, product inventory inaccuracy decreased from 20 percent and above to less than 3 percent in stores that used RFID. Fifth, order cancellations due to product stockouts decreased from 10 percent and higher to less than 3 percent since the time product items were RFID tagged (Neves and Bergel, 2021). Table 2 summarizes the benefits experienced after the formal roll-out of RFID following the pilot projects:

Table 2: Benefits from rollout for RFID stores.

Benefits from actual RFID Rollout
Reduction in inventory inaccuracy: from 20%+ to <3%
Reduction in order cancellations: from 10+% to <3%
Omni-channel sales growth: 80% to 100% in RFID stores VS non-RFID store
Omni-channel sales operations: 2X faster in RFID stores VS non-RFID stores
ROI: breakeven expected in 2022 (year 2)

Source: Neves and Bergel, 2021

5 CONCLUSIONS

The structural model of technology has provided a useful theoretical framework for understanding C&A Brazil's approach to stretch their capabilities and step up to the plate in meeting the demands of omnichannel retailing at an appropriate time. Having the support of RFID vendor SensorMatic that provided a one-stop shop for key RFID system modules was critically needed to power up a comprehensive solution to C&A Brazil's physical storefront and digital e-commerce presence. It was also key to the firm's unanticipated success attained within such a short period of time.

C&A Brazil faced the same challenges that the retailing industry confronted during the pandemic but reacted rapidly and launched their RFID pilot project immediately. The firm has always intended to attain full omnichannel retailing capabilities within the long term --- but had to leapfrog the process by tackling their inventory inaccuracy problems in all stores in order to meet customer demand and to lay the "right foundation" for managing inventories under the new conditions in the marketplace.

REFERENCES

- Angeles, R. (2018). "American Apparel's Journey Towards Accurate Inventory Management: Prelude to Omnichannel Retailing," Proceedings of the 11th IADIS International Conference Information Systems, Lisbon, Portugal, April 14-16, 2018
- Angeles, R. (2017). "Marks & Spencer's and Lululemon Athletica: Two narratives on RFID-enabled omnichannel retailing," Proceedings of the European Decision Sciences Institute 8th Annual Conference, Granada, Spain, May 29-June 1, 2017.
- Angeles, R. (2015a). "Marks & Spencer's RFID Initiative: Laying the Foundation for Omnichannel Retailing," Proceedings of the 12th Conference of the Italian Chapter of the Association for Information Systems (ITAIS), October 9-10, 2015, Rome, Italy.
- Angeles, R. (2015b). "Information Technology Infrastructure Support for Omnichannel Retailing," Proceedings of the 45th Atlantic Schools of Business Conference, September 25-27, 2015, Wu Centre, University of New Brunswick Fredericton.
- AtlasRFIDStore.com (2021, November 5). *The Beginner's Guide to RFID Systems*. https://www.atlasrfidstore.com/rfid-beginners-guide/?utm_feeditemid=&utm_device=c&utm_term=&utm_source=google&utm_medium=cpc&utm_campaign=05++_Dynamic+RLSA++US/CA/MX&hsa_cam=12242908997&hsa_grp=121872031401&hsa_mt=b&hsa_src=g&hsa_ad=511847789752&hsa_acc=4442410237&hsa_net=adwords&hsa_kw=&hsa_tgt=aud1207860637367:dsa19959388920&hsa_ver=3&gclid=CjwKCAiAv_KMBhAzEiwAsrX1KbYheuGseClZCHK5sH_Wen9fvNkpUTmpCpzJ5xP5Kt75SJKLCEBoCz6AQAvD_BwE
- Brynjolfsson, E., Hu, Y., & Rahman, M. (2013). Competing in the Age of Omnichannel Retailing. *MIT Sloan Management Review*, 54(4), June, 23-29.
- C&A, (2021, November 21). *About C&A: caring for generations*. <https://sustainability.c-and-a.com/uk/en/sustainability-report/2019/about-ca/>
- C&A, (2021, November 5). C&A completes modernisation of first 200 stores in Europe. <https://www.canda.com/uk/en/corporate/company/newsroom/press-releases/2021/ca-completes-modernisation-of-first-200-stores-across-europe/>
- Centricsoftware.com. (2021, January 27). *C&A Selects Centric PLM as their Strategic Foundation for Digital Innovation*. <https://www.centricsoftware.com/in-the-press/ca-selects-centric-plm-as-their-strategic-foundation-for-digital-innovation/>
- Gheorghia, S. (2021, May 3). *C&A: Fashion retail ecommerce at its finest*. <https://vtex.com/en/blog/customer-stories/ca-fashion-retail-ecommerce-at-its-finest/>
- Giddens, A. (1984). *The Constitution of Society: Outline of the Theory of Structure*. University of California Press, Berkeley.
- Giddens, A. (1979). *Central Problems in Social Theory: Action, Structure and Contradiction in Social Analysis*. University of California Press, Berkeley.
- Giddens, A. (1976). *New Rules of Sociological Method*. Basic Books, New York.
- Handley, R. (2021, August 19). ECR Retail Loss Group Issues Report on RFID in Retailing. *RFID Journal*.
- Hardgrave, B. (2015, April 5). Get Hip to BOPIS. *RFID Journal*, <http://www.rfidjournal.com/articles/view?12911>
- Hardgrave, B. (2012, December 18). You can't do it without RFID. *RFID Journal*, <http://www.rfidjournal.com/articles/view?10247>
- Johnson Controls. (2021, November 15). C&A RFID Project Sensormatic by Johnson Controls. <https://www.sensormatic.com/resources/cs/2021/c-a-videocase-study#:~:text=C%26A%2C%20with%20more%20than%20280,some%20of%20the%20brand's%20stores.>
- Huré, E., Picot-Copey, K. & Ackermann, C.L. (2017). Understanding omni-channel shopping value: A

- mixed-method study. *Journal of Retailing and Consumer*, 39, 314–330.
- Kembro, J.H., Norrman, A. & Eriksson, E. (2018). Adapting warehouse operations and design to omni-channel logistics: A literature review and research agenda. *International Journal of Physical Distribution & Logistics Management* 48(9), 890–912.
- Krippendorff, K.(2004). *Content Analysis: An Introduction to Its Methodology*. Sage Publications, Thousand Oaks, California.
- Krippendorff, K. (1980). *Content Analysis: An Introduction to Its Methodology*. Sage Publications, Beverly Hills, California.
- Kulkarni, Y. (2020). COVID-19 Has Revealed Retailing's Omnichannel Future. *Mass Market Retailers*, 37 (10), 18.
- Neves, V., & Bergel, M. (2021, September 26-28). *C&A Enhances Inventory Visibility to Boost Omni-channel Capability*. RFID Journal Live! 2021, Phoenix, Arizona.
- Mirsch, T., Lehrer, C. & Jung, R. (2016). Transitioning to an omnichannel approach: A Dynamic Capability perspective. in *Thirty Seventh International Conference on Information Systems*, Dublin, December 11–14,1–12.
- Orlikowski, W.J. (1992). The Duality of Technology: Rethinking The Concept of Technology in Organizations. *Organization Science*, 3(3), August, 398-427.
- Orlikowski, W.J., & Robey, D. (1991). Information Technology and the Structuring of Organizations. *Information Systems Research*, 2(2), 143-169.
- Picot-Coupey, K., Huré, E. & Piveteau, L. (2016). Channel design to enrich customers' shopping experiences: Synchronizing clicks with bricks in an omni-channel perspective—the direct optic case. *International Journal of Retail & Distribution Management*, 44(3), 336–368.
- Pioytrowicz, W., & Cuthbertson, R. (2014). Introduction to the Special Issue Information Technology in Retail: Toward Omni-channel Retailing. *MIS Quarterly*, 18(4), Summer, 5-15.
- Roberti, M. (2019, January 13). The State of Omni-channel Retailing. *RFID Journal*.
- Roberti, M. (2017, September 22). E-Commerce is not the Answer. *RFID Journal*.
- Stone, P.J., Dunphy, D.C., Smith, M.S., and Ogilvie, D. M. (1966). *The General Inquirer: A Computer Approach to Content Analysis*. MIT Press, Cambridge.
- Swedberg, C. (2019, January 4). RFID Enters Early Majority Phase in Retail. *RFID Journal*. The Aberdeen Group (2012). *The 2012 omni-channel retail experience*.www.stores.org/assets/whitepapers/EpicorThe2012OmniChannelRetailExperience.pdf
- Vanheems, R. (2009). Multichannel retailing: Why do multichannel customers deserve special attention. *Decision Marketing*, 55, 41-52.
- Verhoef, P.C. (2021). Omni-channel retailing: some reflections. *Journal of Strategic Marketing*, 29 (7), 608-617.
- Weber, R.P. (1990). *Basic Content Analysis, 2nd Edition*. Sage Publications, Newbury Park, California.
- Weber, A. (2021). Responding to supply chain disruptions caused by the COVID-19 pandemic: A Black Swan event for omnichannel retailers. *Journal Transport and Supply Chain Management*, 15, 1-16.
- Weick, K. (1979). *The Social Psychology of Organizing*. Addison-Wesley, Reading, Massachusetts.
- Zeynep, B. (2021). Omni-channel Trends in Covid-19 Pandemic. *Journal of International Trade, Logistics and Law*, 7 (1), 97-104.