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Who is innovating? An evaluation of the extent to which retailers are meeting the technology challenge

Abstract.

To date, the diffusion of digital technologies is rapidly increasingly in the physical stores as prompt by the continuous advancements in technology and consumers' expectation of new technologies. To the authors' knowledge, the evaluation of the extent to which retailers are meeting this challenge is still at an early stage. Thus, the aim of this study is to investigate the actual level of diffusion of these technologies to understand retailers' effective response. In particular, drawing upon Rogers' Theory of Innovation Diffusion (1962), the present study is based on the direct observation of 208 stores located in Oxford Street (between Marble Arch and Tottenham Court Road tube stations), London, UK in October and November 2017. Results provide an overview of the actual innovation adoption strategies in terms of innovation diffusion and the main digital technologies adopted by different retail categories considering size and store typology. Finally, the Retailing Innovation Market framework is proposed as a combination between actual technological offer and retailer demand of innovation technology, while impact for scholars and practitioners is further discussed.

Keywords. Digital technologies; innovation diffusion theory; technology management; innovation management; technology push curve (TPC); Retailing Innovation Market (RIM).

1. Introduction

Technologies such as interactive storefront windows and in-store displays, devices for supporting contactless payments, ad hoc mobile apps and robotic companions for guiding consumer in the store are becoming largely familiar for the actual retail settings. Elicited by the continuous technology push (Pantano et al., 2017; Pantano, Priporas and Stylos, 2018) and consumers' demand of new in-

store experiences (Bertacchini et al., 2017; Dacko, 2017; Hagberg, Sundstrom and Egels-Zandén, 2016; Lee and Leonas, 2018; Pantano et al., 2017; Pantano and Viassone, 2014; Roy et al., 2017; Willems et al., 2017), retailers are trying to adopt new, attractive and exciting technologies to catch consumers and improve the retail management strategies. Thus, technologies availability and consumers' demand pave the way for a new retail setting. As such growth accelerates, a better understanding of retailers' response to the technology challenge is needed of the opportunities this new phenomenon provides (Willems et al., 2017; Pantano, Priporas, Stylos, 2018). To this end retailers like Clinique introduced in its counters on main Department stores in Europe, US and China, Apple iPad accessible by consumers to identify their skins and gets detailed and personalized recommendations accordingly (through a 90-second skin care guide), while the software systematically processes more than 180,000 product combinations to match each consumer's need and provides the emerging recommendations through a printout or email. Similarly, the large department store chain Macy's in US gave consumers with Shopkick app on their iPhone the possibility to get alerts about deals and suggestions about items to buy.

Indeed, the current studies on the importance of integrating interactive and innovative technologies within the stores mainly focus on (i) consumers' acceptance of these innovations (Perry, 2016; Rese et al., 2017; Roy et al., 2018), (ii) the best retail management strategies for their suitable integration (Demirkan and Spohrer, 2014; Hagberg, Sundstrom and Egels-Zandén, 2016; Pantano, Priporas and Dennis, 2018; Willems et al., 2017), and (iii) the role of digital technologies as a part of store atmospherics to improve the shopping experience and meet customer expectations (Kozinets et al., 2002; Puccinelli et al., 2009; Bálaquez, 2014). However, many retailers do not yet fully understand the implications of the new technology advantages, as retailers get to grips with the potential of such technologies.

Therefore, the store is evolving as well as consumer behaviour (Lemon and Verhoef, 2016) leading to an evolution of retail management (Pantano, Priporas, Stylos, 2018; Willems et al., 2017). Thus, the aim of this paper is to deeply understand the actual retailers' response to the technological

challenge in terms of technology diffusion within the offline settings, while considering the following research questions:

RQ1: To what extend are retailers meeting the technology challenge in the offline settings?

RQ2: To what extent are different types of digital technologies diffused across different categories of retailers?

RQ3: Who are the innovation adopters?

Drawing upon Rogers' Theory of Innovation Diffusion (2017), this study investigates the actual diffusion of digital technologies among different retail categories to provide a comprehensive overview of the innovation adopters in the new retail settings. To this end, the research employs a qualitative analysis based on the observation of 208 stores located in Oxford Street (between Marble Arch and Tottenham Court Road tube stops), London (UK) in October and November 2017. The paper is organized as it follows: the next section will review the innovation and technology management theories for retailing. The subsequent one will focus on the methodology of research. Subsequently, key results will be presented and discussed. Finally, the last section will focus on the impact of findings for scholars and practitioners.

2. Theoretical background

2.1 Innovation and Technology Management for Retailing

The phenomenon of digitalization is one of the most important transformations that is currently characterizing the retail sector (Hagberg, Sundstrom and Egels-Zandén, 2016; Pantano, Priporas, Dennis, 2018; Willems et al., 2017). This phenomenon has dramatically modified business opportunities, business models, purchasing processes and forms of commerce. Indeed, the diffusion of digital technologies has affected both the way in which retailers provide consumers with new products and services and the new forms of consumption associated by the use of these digital technologies (Hagberg, Sundstrom and Egels-Zandén, 2016). For instance, the omnichannel and

smart retail settings faced new challenges that stores have to enhance the value proposition (Willem et al., 2017). At the same time, the increasing complexity and availability of technological innovations requires a constant monitor of the technological and environmental changes in order to maintain business competitiveness and profitability (Lee, Jeon and Park, 2011; Pantano et al., 2017).

The recent literature about the integration of interactive and innovative technologies in (offline) retail settings mainly focused on: (i) consumer acceptance of digital technologies based on the extension of Technology Acceptance Model (TAM), as based on the perceived ease of use, usefulness, and attitude as drivers of consumer's behavioural intention to use a certain technology such as virtual mirrors (Perry, 2016), augmented reality apps (Rese et al., 2017), and other smart retail technologies (SRT) as smart checkouts, personal shopping assistance, point-of-sale smart displays, and NFC systems (Roy et al., 2018), by adding constructs related to social influence, personality traits, and product features (Bailey et al., 2017; Chi, 2018; Kaushik and Rahaman, 2015; Perry, 2016); (ii) new management strategies for technology integration (Hagberg et al., 2016; Pantano, Priporas and Dennis, 2018; Willems et al., 2017), such as the extension of offering, new forms of pricing, the intermixing of human and digital technologies, the use of technologies to transform traditional retail management to a smart retailing (Hagberg, Sundstrom and Egels-Zandén, 2016; Pantano, Priporas and Dennis, 2018; Poncin et al., 2017; Roy et al., 2017; Vrontis, Thrassou and Amirkhanpour, 2017; Willems et al., 2017); (iii) Knowledge Push Curve (KPC) (Pantano et al., 2017; Pantano, Priporas and Stylos, 2018), which predicts the future developments of technologies for retailing by stating that the number of patents tripled every five years till 2005 and doubled every two years after 2005; and the innovation diffusion theory (Rogers, 2017) that explains when potential users decide to adopt an innovation considering their beliefs and opinion about the innovation (Agarwal, 2000), investigating consumers adoption of a new technologies rather than retailers' adoption for improving services and processes.

Despite the technological offer available and studies on innovation and technology management for retailing, the research on the level of technology diffusion in the retail industry is still at an early stage (Pantano, Priporas and Stylos, 2018).

2.2 Innovation Diffusion Theory for retailing

The spreading of a new technology in the market determines the innovation diffusion across time, it provides also a measure of consumers' innovativeness (if they can be assigned to a single adopter category) as their propensity to adopt an innovation (Goldsmith and Hofacker, 1991). Differently than TAM (Davis, 1989), the innovation diffusion theory (Rogers, 2017) is able to evaluate the actual (effective adoption of the technology in a certain market, thus it provides a clear and updated overview of how many adopters are in the market, while defining the characteristics of each adopters based on specific categories.

In particular, in 1962 Rogers proposed the Theory of Innovation Diffusion (Rogers, 2017) to explain innovation spread among users (adopters). The theory emphasizes how, why, and at what rate the innovations are adopted. To this end, the theory has been largely employed to investigate the initial adoption/diffusion of a certain innovation (Chuah et al., 2016; Hong, Lin and Hsieh, 2017). Diffusion is a process by which a new technology/innovation is promoted over time among the users in a certain social system (Rogers, 2017), consisting of an adaptive process where the individual choices change during the time according to the progress, while innovation is an idea or something that is perceived as new and subsequently adopted by users (Consoli, 2005; Rogers, 2017). Thus, the Theory of Innovation Diffusion provides a set of factors (relative advantage, compatibility, complexity, trialability, and visibility) synthetizing the process of adoption of new technologies (Agag and El-Masry, 2016a). However, this process is not instantaneous, it reflects the extent to which a certain technology/innovation is in use in a certain period of time (thus it is based on number of adopters and time), while the related profits might persist for several years before being fully completed (Teece, 2007). Accordingly, the innovation needs to be largely adopted for

the self-sustain, otherwise it fails. Indeed, among the available innovations, such as the patented ones, not all of them are suitable to be rapidly introduced by retailers (Pantano et al., 2017). For instance, few of them might require high management costs, or additional human resources or capabilities to be successfully managed, etc.

Roehrich (2004) summarized the characteristics of innovation diffusion among consumers in: newness attraction (the extent to which an innovation is perceived as attractive), creativity/originality (the extent to which an innovation is perceived as creative/original), risk attraction (the extent to which adopting an innovation involves a certain level of risk), and attention to others' opinion (the extent to which others' opinion is perceived as important for choosing to adopt a certain innovation).

Innovation adopters can be classified as (Rogers, 2017): (i) innovators, who are the technology enthusiasts believing that the new technology will lead to huge benefits; (ii) early adopters, who tend to buy the new product very early if considering the product life-cycle (the S-curve), believing that being the first to adopt the new technology will maximize their benefits; (iii) early majority, who adopts a certain new technology because it is already largely adopted, thus believing that having the new technology has become a status (or a standard); (iv) late majority, consisting of the more conservative part of the market if compared with the other groups, being quite uncomfortable towards an innovation and showing a risk-adverse attitude (they adopt the technology mainly because they are influenced by social norms and reference groups); and (v) laggards, who show negative attitude towards new technology in general, being very sceptical towards the benefits emerging from the adoption of a new technology.

However, innovation diffusion indicators might be not fully available to evaluate the diffusion of innovative strategies, practices and other innovation not related to an artefact (Nelson et al., 2014). This limit might obstruct the building of a theory around the innovation diffusion encompassing strategies and practices (Nelson et al., 2014). In particular, the studies of innovation diffusion theory in retailing, mainly focused on consumers' perspective in terms of consumers' acceptance of

a new technological product (Agag and El-Masry, 2016b; Gupta and Arora, 2017; Jahanmir and Cavadas, 2018; Kowatsch and Maass, 2010; MacVaugh and Schiavone, 2010; Natarajan, Balasubramanian and Kasilingam, 2017; Park et al., 2015), with limited attention towards the understanding of the managers' perspective industries (Kim et al., 2018; Papagiannidis et al., 2015), while only one study focused on retailers' adoption (Tsai, Lee and Wu, 2010) (Table 1). Thus, the present research aims at understanding the extent to which retailers are meeting challenge prompt by the new technology in term of effective technology adoption, by highlighting the group of retailers acting as the largest majority.

Reference	**Contents**	**Consumers/Managers perspective**
Agag and El-Masry, 2016a	Innovation Diffusion Theory (IDT) and Technology Acceptance Model (TAM) to provide a new framework describing the antecedents of customers' intention to participate in online travel community.	Consumers
Gupta and Arora, 2017	Understanding of the antecedents of consumers' adoption of mobile shopping, with emphasis on the determinants and barriers of m-shopping adoption.	Consumers
Jahanmir and Cavadas, 2018	Determinants of late adoption of digital innovations, selecting five variables: (1) attitude toward a technology; (2) negative word of mouth about the technology; (3) global brand image; (4) consumer innovativeness; (5) lead-user profile.	Consumers

Kim et al., 2018	Starting from the Technology-Organization-Environment (TOE) framework and the Innovation Diffusion Theory (IDT), the research model explaining the factors affecting the adoption of Semantic Web technology as a tool that integrate big data.	Managers
Kowatsch and Maass, 2010	Starting from the Theory of Planned Behavior, the Innovation Diffusion Theory, and the Technology Acceptance Model, the model to understands the impact of mobile recommendation agents (MRAs) on the value of product information both in online and bricks-and-mortar stores.	Consumers
MacVaugh and Schiavone, 2010	Literature review integrating the existing theoretical explanation for innovation diffusion across the disciplines of marketing, innovation and social science.	Consumers
Natarajan, Balasubramanian and Kasilingam, 2017	Starting from the analysis of the technology acceptance model (TAM) and the theory of diffusion of innovations (DOI), a new model to describes the intention to use mobile commerce applications for shopping purposes.	Consumers
Papagiannidis et al., 2015	A longitudinally study of how	Managers

	technologies and practices used in web development have diffused over time and whether the diffusion patterns are affected by the regions or the industries in which they take place.	
Park et al., 2015	Investigation of consumers' responses when faced with a new technology-driven product with which they have no previous experience, through the analysis of the factors that affect intention to use a revolutionary technology-driven product (RTP), with emphasis on the interaction of specific consumer characteristics with particular dimension of adoption when presented with a technology product for which the consumers have no preconceived use.	Consumers
Tsai, Lee and Wu, 2010	An extended Innovation Diffusion Theory to investigate the effects of innovation, organization, and supply chain integration on RFID adoption intention for retail chains in Taiwan.	Retailers

Table 1: Past studies on Innovation Diffusion Theory in retailing.

3. Methodology of Research

Due to the exploratory nature of this study, the research employs a qualitative approach, aimed at measuring the actual digital technologies diffusion derived by direct observation. In particular, the

research is based on the observation of 208 stores located in Oxford Street (between Marble Arch and Tottenham Court Road tube stations), in London, UK. London emerges as a city where consumers largely give attention to new technologies. As showed in a recent report, almost nine out of ten Londoners are happy to be monitored by digital technologies in store, considering these technologies as instruments that can improve their customer experience (Essential Retail, 2018). The same research found that London is the one city in the UK where consumers are ready to change their usual store just to take advantage of such technology (Essential Retail, 2018). Furthermore, London has been largely considered one of the main shopping capitals in the world (Centre for Retail Research, 2011; CNN Travel, 2014; Morton and Redman, 2016), acquiring the attention of scientific research in consumer behaviour (Fernie et al., 1997; Nobbs, Moore and Sheridan, 2012), while VisitLondon (the official tourist information webpage of the city) recognized Oxford Street as the main shopping destination (Official Visitor Guide 2018) and TripAdvisor consider the street as one of the main things to do (awarding the certificate of excellence based on travellers' reviews uploaded on the platform).

In particular, data have been collected through the participant observation of each store located in Oxford Street (2.5 km) and related notes taken during each store visit about the technologies available. The direct observation, considered a non-intrusive qualitative research method that allows the researcher to understand different phenomena and the associated behaviours (Bonoma, 1985; Grove and Fisk, 1992), allowed the researcher to have a clear idea of what happens inside the store and how the available technologies (if any) are used by consumers. Indeed, the observation method is largely used in descriptive researches as it involves recording the behavioral patterns of people, objects, and events in a systematic way to obtain information about the phenomenon of interest (Aiello et al., 2018; Malhotra, 2007). This method further allows achieving insights and onsite data not available through other methods (Lai, Lui and Hon, 2014).

The researcher observed directly the available technologies to understand their functions and possible interactions with consumers (Grbich, 1998; Savage, 2000). To ensure the correct recording

of data and to limit the collection bias, the researcher visited each store with a research protocol based on product typology, location, size of the store (small, medium, large), number and typology of technologies (Table 2). All the stores of the analysis belong to national and international chains.

Research protocol
Store name
Address
Store typology (Accessories; Beauty, Health & Pharmacy; Department Store; Electronics; Entertainment; Fashion; Fashion & Accessories; Fashion & Homeware; Fashion/Footwear; Fast Fashion; Footwear; Footwear & Accessories; Jewellery; Legwear & Beachwear; Souvenirs; Sports & Footwear; Sunglasses; Sweets; Telecommunications; Toys; Underwear; Watches
Store size (small, medium, large)
Presence of digital technologies (1= yes; 0= no)
Number of digital technologies
Digital technologies typology

Table 2. Research protocol used during the direct observation of the stores.

Observations were made in October and November 2017, and each observation lasted 25 minutes, while the researcher entered the store as typical customer. This time might be considered sufficient to understand the technology without arousing any suspicious about spending time in the store without making any purchase (Lai, Lui and Hon, 2014).

Data for each store were systematically tabulated through an Excel file that further allowed the comparison among the different stores. A descriptive analysis was further conducted to show the diffusion of digital technologies among stores accordingly with size and typology.

Table 3 summarizes all the digital technologies considered for data collection, related to the five main categories identified by Pantano et al. (2017): (i) info/product display technologies; (ii)

shopping experience technologies; (iii) information search technologies; (iv) payment technologies; and (v) others.

Category	**Digital technology**	**Description**
Info/Product display technologies	Virtual catalogue	A virtual book or magazine containing details and pictures of items currently being offered by the retailer.
	Digital wallpaper	A digital image (usually displayed in large screens) representing an iconic product of the retailer.
	Digital signage	A digital sign boards, billboards and similar display devices used for displaying visual information (commonly used to advertise products or services as they can offer more animations to entice consumers).
Shopping experience technologies	Virtual mirror	A device that displays user's face/body on a screen as a "real" mirror.
	Virtual fitting room	A simulation of trying clothes, enabling consumers to virtual try on clothes to check one or more size, fit or style.
	Augmented reality	An interactive reality-based display environment that integrates digital information with the user's environment in real time.

	3D printing	The process of making three dimensional solid objects from a digital file.
	(mobile) App	A type of software designed to run on a mobile device like a smartphone. Usually are individual software units providing functions such as access to additional digital contents, sharing online information, interact with other consumers, etc.
	Tablet	A wireless touchscreen computer that is larger than a smartphone but smaller that a laptop.
Information search technologies	QR code (Quick Response code)	A pattern of black and white squares that can be read by the camera of a smartphone to get more information about the product.
Payment technologies (only for the payment process)	Self-checkout payment system	A checkout where customers scan, pack and pay for their goods in a store without being served by a sales assistant.
Others	Click and collect	An e-commerce system where customers order goods online and pick them up in a specific collection place in the store.
	Vending machine	An electronic machine used to disperse a product to a consumer after a certain amount of money has been put into the machine.
	Intelligent self-service kiosk	A free-standing physical structure

		providing a service. (i.e. searching, choosing and paying the product).

Table 3: Digital technology typologies.

4. Key results and discussion

The first analysis identified the main digital technologies adopted across different retail categories as shown in Table 4.

Store typology	Innovative digital technology
Accessories	n.a.
Beauty, Health & Pharmacy	Self-checkout payment system; digital wallpaper; tablet; electronic scales
Department Store	Digital wallpaper; digital signage; tablet; click and collect
Electronics	Digital wallpaper; digital signage; tablet
Entertainment	Digital wallpaper
Fashion	Digital wallpaper; click and collect
Fashion & Accessories	n.a.
Followed by the	Digital wallpaper
Fashion/Footwear	Click and collect
Fast Fashion	Self-checkout payment system; click and collect; digital wallpaper; digital signage; home delivery
Footwear	Digital wallpaper; tablet; click and collect
Footwear & Accessories	n.a.
Jewellery	Digital wallpaper

Legwear & Beachwear	Digital wallpaper
Souvenirs	n.a.
Sports & Footwear	Digital wallpaper
Sunglasses	Digital wallpaper
Sweets	n.a.
Telecommunications	Digital wallpaper; digital signage; tablet
Toys	Digital signage
Underwear	Digital wallpaper
Watches	Tablet

Table 4: Typology of digital technologies utilized across different retail categories.

The most diffused technology across the retail categories is the digital wallpaper, followed by tablets, digital signage and click and collect, while self-checkout payment systems are still scarcely available within the points of sale.

The subsequent analysis evaluated the number of digital technologies adopted by each category of retailers according to the store size (Figure 1).

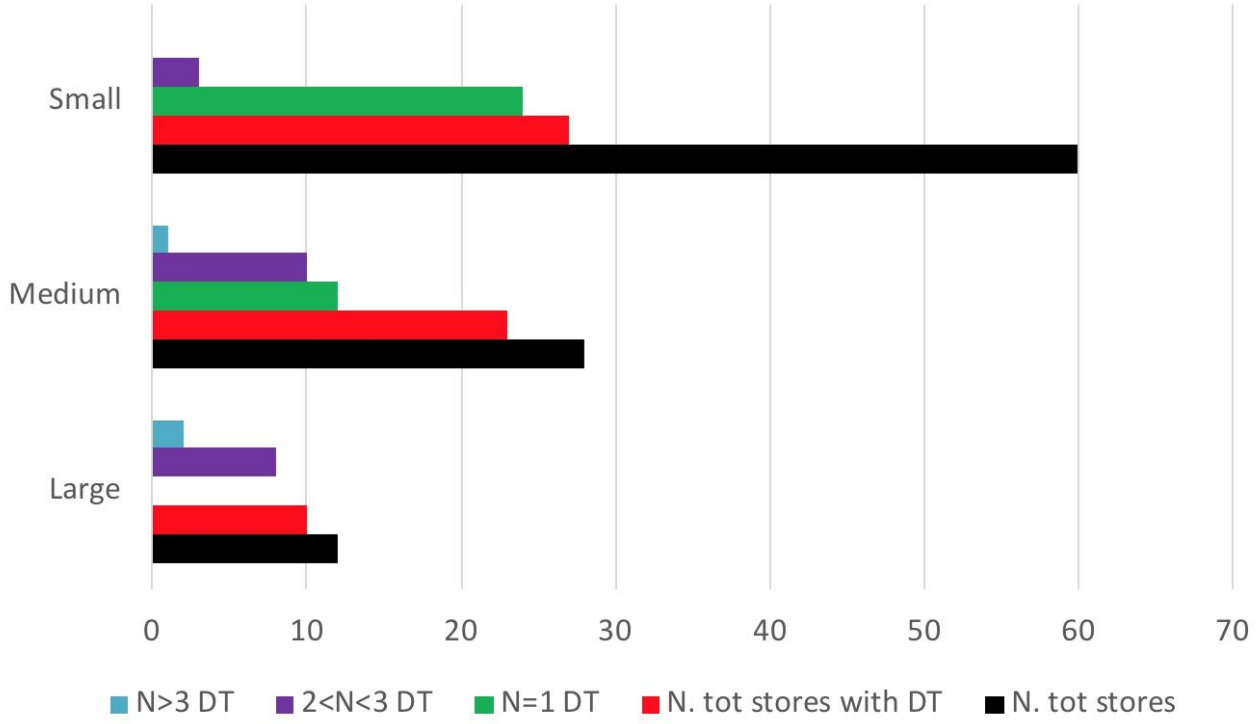

Figure 1. Digital technology diffusion according to the store size.

Results shows that only a limited number of medium and large stores has more than three different types of digital technology, emphasizing the extent to which the number of adopted digital technologies increases with the increase of the store size. Indeed, none of the small store has three different types of technologies, and none of large store has only one type of digital technology. Moreover, the large majority of large stores has at least two different types of new technologies, while about the half of the small stores has at least one digital technology. According to Rogers' (2017) typology of adopters, retailers managing large sized stores are early adopters, while the ones managing medium sized stores are large majority, and the ones managing small stores are late majority. In other words, these results show the extent to which the large stores seem to be more willing to adopt new technologies if compared with the others. Similarly, the small stores seem to be the last to adopt a new technology, maybe because of the pressure of competitors' adoption.

The analysis further focused on the number of technologies for store typology, classifying in watches, underwear, toys, telecommunications, sweets, sunglasses, sports and footwear, souvenirs, legwear and footwear, jewellery, footwear and accessories, fast fashion, fashion/footwear, fashion and homeware, fashion and accessories, fashion, entertainment, electronics, department stores, health and pharmacy, and accessories (Figure 2).

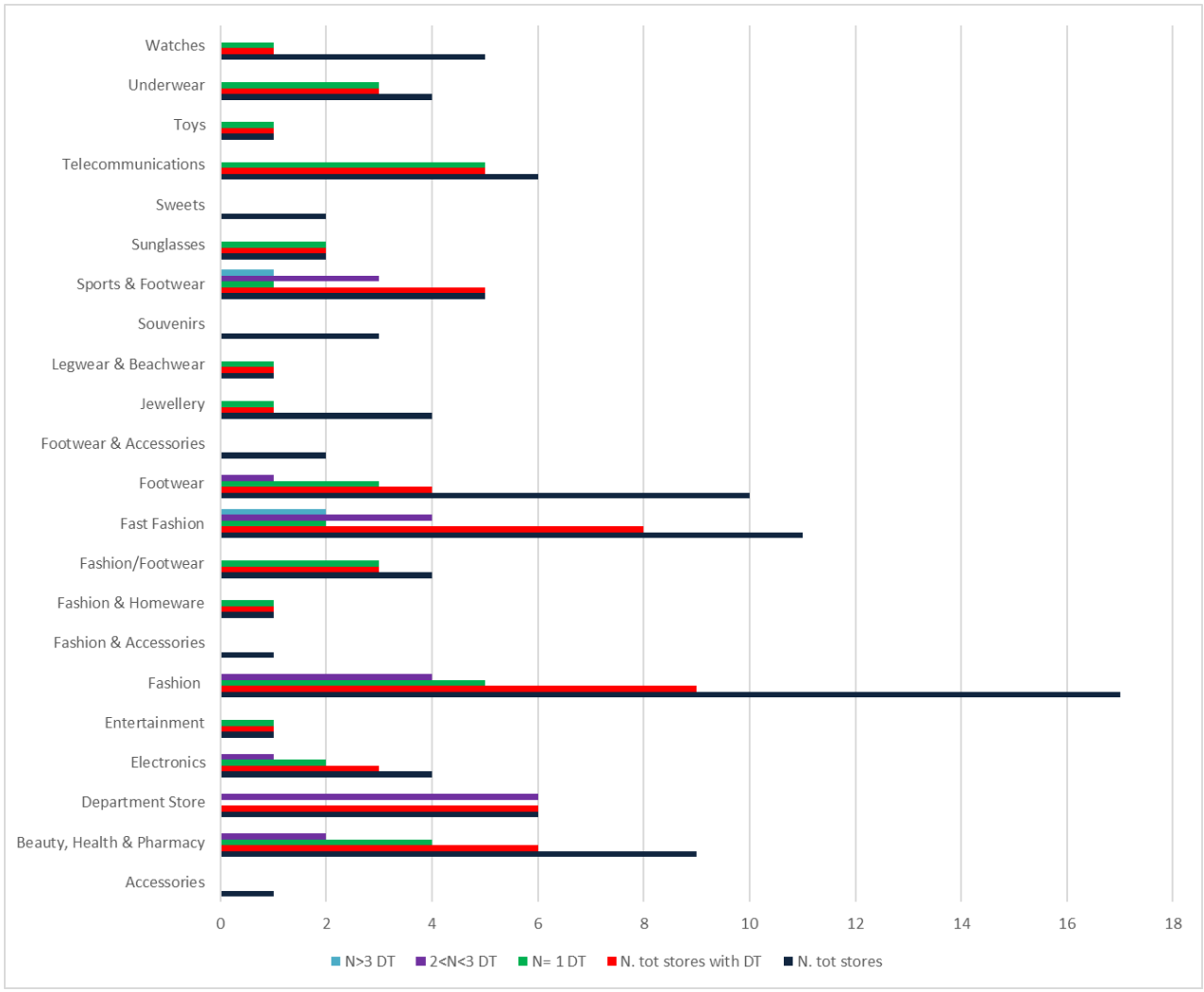

Figure 2. Digital technology diffusion according to the store typology.

The result emerging from this analysis shows the absence of digital technologies in stores devoted to sweets, souvenirs or accessories (including only accessories, fashion and accessories, and footwear and accessories). According to Rogers' classification (2017), they are the laggards, by

considering the introduction of new digital technologies not beneficial for their business. In opposite, the stores selling footwear, fashion, electronics, department stores and, beauty, health and pharmacy introduced at least two different types of digital technology. Thus, they seem to be the early adopters, believing that the adoption of those technologies would largely increase their benefits. The other typologies of store (legwear and beachwear, underwear, telecommunications, fashion/footwear, fashion and homeware and, entertainment) have only one digital technology, thus they represent the early majority, adopting a certain new technology due to the previous adoption among competitors. Similarly, watches, toys, sunglasses and jewellery stores have only one digital technology, however this technology is not located in a central position in the store and is has a limited size (scarcely able to catch immediately the attention of visitors), while the other stores adopting only one technology usually chose a bigger technology (concerning the size) that they located close to the main entrance or the areas with the main consumers' flow. For these reasons, they are the late majority, who consists of the more conservative part of the market. Finally, fast fashion, sports and footwear are the only two store typologies that introduced more than three digital technologies. They seem to be the one type of store that could be classified as innovators, thus they are the technology enthusiasts believing that the new technology will lead to new benefits.

5. Conclusions and future research directions

The aim of this research was to investigate the actual level of innovation diffusion among retailers to understand the extent to which they are effectively meeting the new technologies challenge. Drawing upon Rogers Innovation Diffusion Theory (2017), results demonstrate that very few stores have more than three different types of digital technology, while the number of adopted digital technologies increases with the increase of the store size. Similarly, following Rogers' adopters classification (2017), retailers specialized in sweets, souvenirs, and accessories (including fashion and accessories, and footwear and accessories) are the laggards. In opposite, retailers specialized in

watches, toys, sunglasses, and jewellery are late majority. Legwear and beachwear, underwear, telecommunications, fashion/footwear, fashion and homeware and entertainment are the early majority; footwear, fashion, electronics, department stores, beauty and health and pharmacy are the early adopters; while only the fast fashion retailers and sports and footwear are acting as innovators. If combining the results of the diffusion among size and product typology, large retailers specialized in fast fashion or sports are the innovation adopters, representing the limited number of retailers who are the technology enthusiast according to Rogers (1962). Therefore, findings provide an overview of the extent to which retailers are meeting the technology challenge by emphasizing who is actually meeting (innovators, early adopters and early majority) and who is not (late majority and laggards) (Figure 3). Figure 3 shows how the analysed retailers are distributed across Roger's curve (the normal distribution of innovation adopters categories as innovators, early adopters, early majority, late majority and laggards), synthetizing the extent to which retailers are meeting the technological challenge. This analysis allows also understanding retailers who will be technology enthusiast versus the one less willing to adopt new technologies for their points of sale.

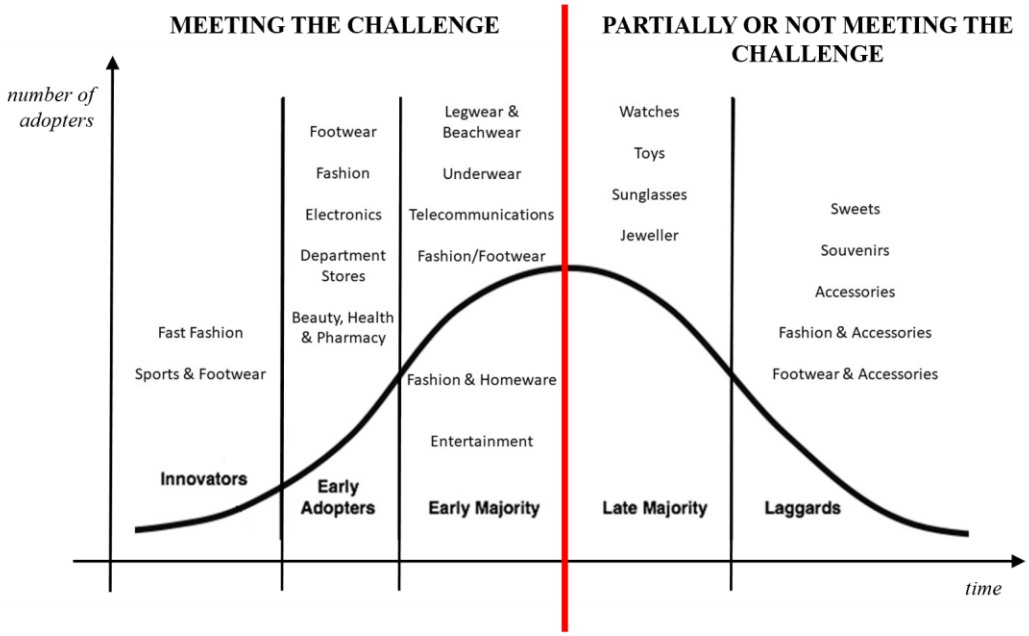

Figure 3. Overview of the retailers actually meeting the technology challenge (innovators, early adopters and early majority) and who is not (late majority and laggards) according to the Innovation Diffusion Theory (Rogers, 2017).

First, our paper further contributes to the understanding of innovation management by extending the previous studies (Gupta and Arora, 2017; Kowatsch and Maass, 2010; Natarajan, Balasubramanian and Kasilingam, 2017; Park et al., 2015) with the new focus on retailers' perspective able to figure out the extent to which retailers are effectively innovating. Secondly, it adds new knowledge to the innovation diffusion theory previously focused on (i) consumers (Agag and El-Masry, 2016a; Gupta and Arora, 2017; Jahanmir and Cavadas, 2018; Kowatsch and Maass, 2010; MacVaugh and Schiavone, 2010; Natarajan, Balasubramanian and Kasilingam,2017; Park et al., 2015), (ii) retailers' adoption of web technologies (Kim et al., 2018; Papagiannidis et al., 2015), and (iii) improvement of supply chain through new technologies (Tsai, Lee and Wu, 2010), with new insights on how innovative technologies are effectively diffused among retailers in the physical points of sale, with emphasis on retailers' size and product typology.

Finally, our paper contributes to the discussion on the importance of integrating interactive and innovative technologies within the stores (Perry, 2016; Rese et al., 2017; Roy et al., 2018; Demirkan and Spohrer, 2014; Hagberg, Sundstrom and Egels-Zandén, 2016; Pantano et al, 2018; Willems et al., 2017), with new evidence on the actual diffusion, by highlighting the extent to which there is still a number of retailers refractory to the introduction of technologies. Therefore, our findings describe the actual retailers' demand of innovation (new technologies) in terms of (1) info/product display technologies, (2) shopping experience technologies, (3) information search technologies, (4) payment technologies, and (5) other technologies.

Finally, among the different retailers a certain number of them introduced specific innovative technologies within their stores, which they selected among the available ones in terms of

Info/product display technologies, shopping experience technologies, information search technologies, and payment technologies. The combination of our results with the actual offer of innovation provides a synthesis of the actual innovative scenario in retail sector, highlighting both the retailers' demand in terms of who are the retailers more willing to innovation (demand of innovation), and the actual technology availability (offer of innovation). In other words, since the encounter of new offer and new demand defines a new market structure that impacts on firms' performance creating opportunities to be more attractive and competitive (Hackl et al., 2014), it is possible to define the Retailing Innovation Market (RIM) (Figure 4).

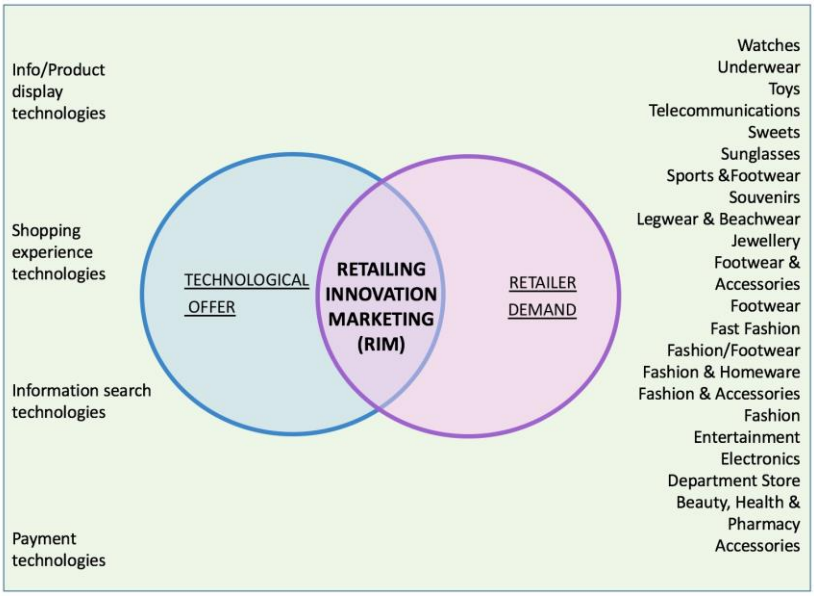

Figure 4: Retailing Innovation Market (RIM).

From a practical perspective, the paper highlights the extent to which retailers are actually replying to the technological challenge by shedding light on the actual diffusion of digital technologies among a sample of 208 retailers on one of the busiest shopping streets in Europe. Findings would help retailers to understand competitors' orientation towards the adoption (or not) of digital

technologies to improve retail management. Finally, our findings also provide a clear overview of the most diffused digital typologies, and the extent to which they are linked with the store size.

Despite the results, this research encounters some limitations. The first is related to the evaluation of digital technology diffusion among certain categories of store as grocery. Since Oxford Street does not offer any grocery, its evaluation is not included in the present study. Therefore, future research might consider also other categories to offer a more comprehensive overview of the actual innovation diffusion, and compare and contrast among different retailers operating in different cities or different areas, such the shopping centres and the anchor stores. For more generalizable results, the research can be further extended to different European cities to evaluate the diffusion at country level. Secondly, our study focuses only on the actual adoption of technologies within the physical point of sale, by not taking into account the reasons behind the choice, thus future studies might collect interviews with store and retail managers for a better understanding of why some stores are less innovators than others, this would also help identifying retailers innovation orientation.

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