Big Data in fashion: transforming the retail sector

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The potential impact and usefulness of analysing different types of data is rather apparent and obvious in numerically driven fields such as finance or insurance where companies have been early and enthusiastic adopters of Big Data. Although the fashion industry traditionally has relied heavily on intuition and creativity for direction in designing, buying and merchandising, it has also been playing around with Big Data for a few years now, with New Gen Apps (2017) asserting that the fashion industry can use Big Data for a number of different purposes, including market identification, trend analysis, understanding the consumer, converting high ticket purchases, lifting new designers, measuring influencers' impact and improving cross-selling. While previous research has identified numerous beneficial opportunities related to the application of Big Data, this paper focusses specifically on how Big Data can be exploited by fashion retailers in practice. At a time when the highly volatile economic conditions are threatening the survival of fashion retailers, Big Data can potentially provide a much-needed competitive edge which can improve profitability and the chances of survival.

Discovering and developing trends is the lifeline of the fashion industry, and in the past, historical sales alone have been the determinant of trend popularity. But looking at historical sales is insufficient, as consumers increasingly expect and demand highly personalised shopping experiences. According to Alton (2018), Big Data analytics on purchasing behaviour from past seasons can help ascertain which fashion qualities or elements shoppers may respond favourably to in the future. For example, researchers from Penn State analysed 6,629 runway reviews of 816 designers from Style.com (now, www.farfetch. com/uk/) to identify a network of influence among major designers (Swayne, 2014). The same approach can redefine the way retailers source their merchandise via aiding the identification of designers who are popular with consumers but not yet signed to major brands. Trend forecasting giants such as Edited (https://edited.com/) and WGSN (www. wgsn.com/en/) have also disrupted fashion retail in recent years with advanced Big Data analytics applications. However, as Silva et al. (2019) demonstrate using several examples from the fashion industry, trend forecasting in fashion retail can offer further benefits via the incorporation of Google Trends as a tool for complementing existing efforts. Google Trends predicts the present or very near future and may be the next buzzword in Big Data analytics in fashion.

Zara (www.zara.com/) mines Big Data daily to analyse and understand consumer demands, which are then translated into tangible designs, thus enabling Zara to

remain at the forefront in terms of catering to consumer expectations and demand for the latest fashion trends. Moreover, consumers want the latest designs from catwalks to be available in store instantly. This fast fashion trend was initially supported by the first wave of Big Data analytics, which helped meet the demands in terms of enabling fashion companies to get the right pricing, stock, discounting, colours, and sizing (Murray, 2016). However, fast fashion was in the beginning mainly associated with companies such as H&M and Zara, producing 10,000-15,000 new items per year. Today, the second machine age is enabling agile retail companies to produce 50,000-100,000 new items per year via efficient Big Data analytics. As Brownlow et al. (2015) assert, ASOS, a British online retail giant, profits by using Big Data and its extensive product range to predict trends and give customers what they demand, while Topshop is making use of freely accessible Big Data from fashion blogs and social media in its predictive analytics to determine emerging trends.
The US-based online retailer Stitch Fix employs 75 data scientists and exploits Big Data analytics on consumer style profiles to send shoppers a box of five items selected by an algorithm (Murray, 2016). Big Data is so powerful that for some retailers, fashion weeks are no longer the key source of fashion trends. For example, online clothing retailers such as Lesara (www.lesara.com/) plan their product lines via the use of Big Data analytics to identify consumer trends instead of relying on their designers going to fashion weeks. H&M is breaking with its long-standing practice of stocking stores around the globe with the same assortment of merchandise through the exploitation of both artificial intelligence (AI) and Big Data (Chaudhuri, 2018). Insights from Big Data analytics totally revamped H&M's fashion offering in its Stockholm O¨ stermalm store, which now gives prominence to female consumers and higher priced items, including floral skirts in pastel colours as opposed to basics for men, women and children (Chaudhuri, 2018).

However, as Silva et al. (2019) note, trend forecasting with Big Data is not without its inherent problems. For example, there are concerns over the loss of creativity in fashion because most retailers rely on similar trends. This is where other Big Data technologies could complement trend forecasts in a way similar to what IBM's Cognitive Prints does, by aiding fashion designers by ensuring that their designs are novel via the analysis of vast amounts of image data looking for similarities (Kovacevic, 2018).

Returns and excess inventory continue to be a serious financial challenge for the fashion industry. Big Data analytics can not only help minimise returns and improve purchase rates (for example, 35 per cent of German online shoppers aborted potential purchases because of concerns about fit) (Thomasson, 2013) but also improve purchasing and manufacturing decisions via data-driven insights into return/refund data. One example of how Big Data can reduce costly returns is through a technology such as Fits.me, which exploited data analytics to allow consumers to visualise clothes on different body shapes when purchasing brands such as Adidas and Hugo Boss (Thomasson, 2013). However, this service is no longer available direct to retailers. Similarly, an application such as EyeFitU (www.eyefitu. com/) exploits Big Data analytics to match user measurements against sizing charts from thousands of brands and filters online shopping results down to the items most likely to fit (Palmer, 2016).

Waste from overproduction is another profitability killer for fashion companies, but Big Data can offer a solution by providing more accurate demand forecasts, which in turn would enable firms to find a healthy middle ground for production (Alton, 2018). Big Data analytics can reduce excess inventory and thereby eliminate the need to

offload excess inventory to discount retailers such as TKMaxx, which not only affects the firms' bottom lines but could also dilute their brands with serious consequences in the long run (Costa, 2016). As Greene (2018) points out, Big Data analytics can enable jettisoning of superfluous stock via streamlining product lifecycles. An illustrative example is the case of H&M, which is trying to reduce its markdowns by switching to Big Data analytics and algorithms to analyse store receipts, returns and loyalty-card data instead of relying on designers (Chaudhuri, 2018).

In the age of social media and Big Data, consumers are increasingly relating fashion to their online or offline experiences. Before Big Data became the next big thing, smartphones used to be at the forefront of consumer experience in fashion, but in the past few years, Big Data has become a huge game-changer. Given the ever-increasing competition within the fashion industry because of factors such as fast fashion, companies are actively searching for innovative ways to analyse and enhance the consumer experience and differentiate themselves from other brands. Given the easy access to information, the pricing of fashion items has a significant impact on consumer experiences both online and offline. For example, H&M uses Big Data analytics on currency fluctuations and raw material costs to ensure their fashion is priced right (Chaudhuri, 2018).

Big Data presents a niche opportunity for brands willing to explore and actively engage with it. One example is Macy's, which uses Big Data-based trend forecasts by gathering and analysing data on shopping behaviour on social media, the company's website and store transactions to improve the consumer shopping experience by targeted discounting of products based on tweets. Another example is the luxury fashion brand Montblanc which collaborated with RetailNext by deploying video analytics in-store to map where consumers spent most of their time and used this information to place both product lines and staff, leading to a 20 per cent increase in sales (Jain et al., 2018).

In addition, there is evidence of Big Data being used to alter the traditional consumer experience in relation to fashion runways. To this end, Tory Burch delivered an all new consumer experience when she turned the runway show into a retail store (www.runway. toryburch.com) in real time. Radio-frequency identification, Wi-Fi analytics and Beacon analysis are other examples of Big Data-related technologies that can help improve the consumer experience. Euclid Analytics uses location analytics through Wi-Fi signals on smartphones to monitor consumer traffic in shops and enables a more personalised service the moment a consumer steps in store (Murray, 2016). Another way Big Data enables consumer engagement in fashion is via the design of clothing. Today, fashion designs can be easily outsourced to designers across the globe with Big Data helping brands to manage the feedback and iteration process instead of having to follow the traditional high cost in-house design process (Greene, 2018).

The online and offline channels place increased emphasis on analysing and enhancing consumer engagement. Big Data aids in the analysis and understanding of how the consumer engages with brands, which is vital for enhancing brand equity and brand communications (Greene, 2018). Big Data analytics can be crucial for the ability of luxury brands to identify, connect, understand and build long-term engagement with their consumers, especially given that 85 per cent of luxury brand sales come from consumers registered in their databases (Jain et al. (2018). Data analytics on consumer shopping behaviour can help improve the management and design of stores to help improve consumer engagement and experience (Murray, 2016).

Through Big Data analytics, Burberry found that more consumers engaged with their website than with their offline retail stores around the globe (Jain et al., 2018). Chaudhuri (2018) notes that the fashion retailer GAP (www.gap.co.uk/) monitors consumer preferences through Big Data analytics via Google Analytics (www.google.com/analytics/).

Fashion marketing has evolved over the years and its complexity has increased following the emergence of Big Data in the fashion industry. Opinion mining of likes, shares and comments on Facebook, Instagram and Pinterest is now used to gauge consumer reactions to products and marketing campaigns (Greene, 2018). Burberry is an example of a brand that has exploited Big Data to map its market, identify the importance of millennial consumers for its top line and to revamp its marketing department (Jain et al., 2018). Personalisation is a key factor for firms operating in the fashion industry. Big Data has the potential to help fashion companies to both identify and understand consumer needs and wants and tailor promotions and special offers more effectively (Greene, 2018). Marketing automation software can allow brands to create highly personalised email campaigns (Greene, 2018), and the importance of personalisation is even greater today since the enactment of General Data Protection Regulation (GDPR), which could otherwise result in many consumers opting out of marketing campaigns which are not personalised to their needs.

As Kovacevic (2018) notes, pattern recognition in combination with Big Data can be useful to help brands protect their brand integrity via improved quality control and reductions in the dissemination of counterfeits. For example, Amazon relies on Big Data-based machine learning as part of its brand registry program to remove counterfeit products from its website, while the Chinese e-commerce company Alibaba, in partnership with fashion brands such as Louis Vuitton and Swarovski, has set up a Big Data Anti-Counterfeiting Alliance combining technology and Big Data to fight counterfeits. Marr (2017, 2018a) notes Burberry's efforts at fighting counterfeits by exploiting Big Data image recognition technology provided by Entrupy (www.entrupy.com/) to spot a counterfeit with 98 per cent accuracy.

The supply chain is a key ingredient that can make or break any given fashion brand. Big Data has the capability of shortening supply chains and enabling retailers to obtain a competitive advantage (Brownlow et al., 2015). Brownlow et al. (2015) note how Zara exploits real-time sales statistics, blog posts and social media data to rush emerging trends to market. They capitalised on a dress by Beyonce, on the opening night of her world tour. Big Data analytics allowed Zara to design, manufacture and profit from this positive social media buzz before the end of Beyonce's tour (Brownlow et al., 2015). Marr (2018b) finds evidence of H&M using insights from Big Data and AI to create more flexible and faster supply chains.

Figure 1 summarises how companies appear to be exploiting Big Data to the advantage of their brands. Accordingly, we have uncovered trend forecasting, reducing wastage via returns and excess inventory, analysing and enhancing consumer experience, engagement and marketing campaigns, better quality control and less counterfeits and shortening supply chains to be the most prominent applications. Overall, we find evidence indicating that brands such as Zara, Burberry, LVMH, Swarovski, H&M, Lesara, ASOS, Adidas, Hugo Boss, Macy's, Montblanc, Tory Burch, GAP and Ralph Lauren all have jumped on the Big Data bandwagon and appear to be using advanced analytics to their advantage.

Figure 1. Fashion retail's use of Big Data.

However, realising the potential of Big Data is easier said than done. The successful implementation and roll-out of Big Data in the fashion industry is likely to be hindered by several challenges (Figure 2), which should be carefully considered by fashion industry managers and practitioners considering the adoption and implementation of Big Data analytics. First and foremost, the enactment of GDPR is a major concern for fashion companies who wish to exploit Big Data in their day-to-day operations. The new data protection regulations not only hinder how one can use the available data but could also result in companies losing the free access they have had to rich consumer data. This ties in with ethics and privacy concerns relating to Big Data and data mining that have been problematic since its inception. Secondly, fashion graduates may lack the technical competence required to make sense of Big Data. This challenge could be turned into an opportunity as it encourages collaboration between fashion industry experts and data scientists, but finding the right balance between data science and industry expertise and know-how could be difficult.

Figure 2. Big challenges for Big Data in fashion retail.

Thirdly, there is an ever-increasing need for fashion graduates to be more data-savvy. This can only be achieved via the incorporation of statistics, machine learning and other data sciences subjects within the fashion degree curriculum. While it may not be necessary to delve into the theoretical side of data science, what is perhaps more important is to equip and enable fashion students to make sense of Big Data via the application of data science techniques. To this end, the Fashion Business School at London College of Fashion seeks to produce data savvy fashion management graduates by introducing students undertaking its courses to statistical data analysis and the basics of machine learning. While a step in the right direction, it would be useful to introduce more data science techniques so that graduates have a more all-rounded appreciation of the importance and usefulness of Big Data analytics in fashion.

Fourth, access to fashion data is rare. In comparison with other industries, it is difficult to gain access to micro-level fashion data and this hinders research and development. Thus, the industry should consider making its data more available. Finally, as more fashion brands begin to embrace Big Data, it is imperative that they understand the importance of both AI and human resources. An example is the use of Big Data analytics and AI by H&M, which used the algorithm suggesting the retailer promote reindeer sweaters in January based on increasing sales in the run-up to Christmas – a terribly flawed insight which would have been fairly obvious to a human.

In conclusion, Big Data is here to stay and can potentially provide great benefits to fashion retailers. However, the fashion industry has a long way to go to make the most of Big Data in their day-to-day operations. It is encouraging to see companies such as EDITED, WGSN, SAP, Fashion Innovation Agency at London College of Fashion,

Isobar and Holition take the lead to develop solutions for applying Big Data analytics in fashion. In the future, more fashion brands should seek to collaborate with these firms to learn how to best exploit Big Data to gain a competitive edge. For an industry with a long and proud history of being at the forefront of creating leading trends with the latest in fashion designs, the time has come to get fashionable with data.

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