Big Data Theory and Practice

Assessment 2: Technical Report (Group) Coursework

Industry: Consumer Trade

Case Study: Tesco PLC

Group Members: Onur Mutlu, Nicolas Abreu, Oliver Otchere, Ilyas Hassan, Anuja Herath and Sanika Santosh Kale

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Introduction

The introduction of digital technologies has brought a huge transformation in the retail sector (ResumeKraft, n.d.). Big data holds out among these significant innovations and is transforming the way supermarkets operate, make decisions, and interact with their customers. Reviewing the use of big data technology in the supermarket industry is the goal of this study, which focuses on Tesco, one of the top grocery merchants in the UK. Investigating the use of big data to boost operational effectiveness, boost consumer happiness, and quicken company expansion is the aim. By examining Tesco's Big Data integration plans, resolving the difficulties encountered throughout this digital transition, and assessing the outcomes of implementing such technology, this study seeks to shed light on how the UK grocery business is developing.

Project Landscape

The grocery/consumer trade industry in the United Kingdom is characterised by intense rivalry among top players striving for market share. Supermarkets are increasingly depending on big data analytics to maintain their competitive edge. Big Data enables supermarkets to examine large datasets more easily, revealing previously unknown but critical patterns, trends, and insights. This has several advantages, including personalised marketing campaigns, improved supply chain management, and improved customer service.

Tesco, the UK's largest food store, has a long history of being a leader in technology and data utilisation. The company's inventive attitude is demonstrated by its early adoption of a customer loyalty card system and its successful entry into internet retailing. Tesco is currently adopting cutting-edge technology, such as big data, real-time data analytics, and the Internet of Things, to meet changing demands and maintain its leadership position in the food retailing industry (Marr, 2016).

A large number of Tesco's creative endeavours stem from its Tesco Labs section, which is committed to investigating technologies that offer advantages to both the retailer and its customers. Tesco Labs investigates a range of technologies, including mobile applications, augmented reality, virtual reality, and linked home devices. Several initiatives are now underway in this area. Tesco also promotes innovation by holding recurring hackathons with the goal of developing fresh ideas (Marr, 2016).

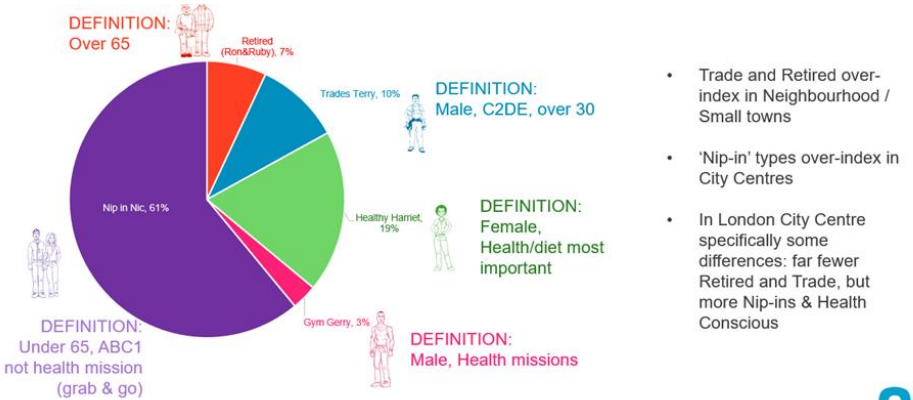
In spite of Tesco's dedication to technology, the company faces a number of significant impending problems. Developing a deeper understanding of changing consumer behaviour, streamlining supply chains and logistics, taking on new business models, and reducing food waste are some of these issues (Marr, 2016). Tesco, however, is unwavering in its conviction that real-time analytics and the abundance of external, operational, and consumer data made possible by the Internet of Things hold the key to solving these problems.

Tesco is actively pursuing this goal, concentrating on utilising Hadoop and Teradata technologies to build a strong data ecosystem (Marr, 2016). Tesco hopes to democratise data access throughout its operations by centralising data into a cloud-based data lake, providing stakeholders with up-to-date insights. Tesco also uses in-database analytics to maximise product inventories, reduce waste, and model customer behaviour patterns (Marr, 2016).

Technology Adaption

Among the many applications Big data analytics could be of support to the Grocery Retail industry we've come to see that the top 6 retailers in the UK: Tesco, Sainsbury, Asda, Morrisons, LIDL and Co-op Group (ESM, 2024) have been adopting their own club-card scheme to mine data from their loyal customer base and use this data in various forms and manners which we will come to describe in this article. Their intent ranges from delivering the most relevant range of products for their customers to adjusting their layout & offers to drive incrementality using a non-traditional approach to the usual sales metrics (NIQ,2022).

Taking Co-operative Group and their initiative on the Meal-deal for example: after sourcing data from their club-card customers they could understand better their shopper's mission when they shop using their loyalty card, using ontology to classify clusters of customers which they've created based on their profile as below:



(CO-OP P14 FTG Clusters & range guidance, slide 2, 2023)

By utilizing a NO-SQL data creating a Graph data model (Ian, 2015, Chapter 4) with Nodes (i.e. customer clusters & products) and Relationships (i.e. product bought in a meal-deal or just bought in combination w/ a meal deal) Co-op could associate each shopper to their mission and improve their product range to better serve the needs of customers such as 'Trades Terry' which is a persona created to describe a tradesman which characteristics point out to be mostly visiting their shops at working hours in working days looking for a warm meal/coffee and also food that would 'sustain' themselves for a full day of work (CO-OP P14 FTG Clusters & range guidance, slide 4, 2023). Out of this initiative Co-op partnered up with Costa Coffee bringing their Costa Coffee Machines in their shops (CO-OP Website: Instore Services, 2024).

Tesco is the top 1 grocer retailer in the UK (ESM, 2024) and their influx of sales data which is a great example which contains the 3 characteristics of big data defined by (Jules J., 2013, Section 1.1):

- Volume: and it's safe to say their volume of sales would bring a large amount of data into their database therefore enriching their insights.
- Variety: Data comes in different forms w/ the majority of their sales data being recorded in a Structured Query Language format.
- Velocity: One of the key elements of their data-base as their value in sales float up and down depending on seasons & promotional periods, stablishing an ever changing data environment.

Dunnhumby is a data analytics company which Tesco acquired the majority of the stakes since 2001 (McCawley, 2006) expanding their interest in data-driven strategies and using SQL as a key technology when structuring their customer insights in partnership w/ their new subsidiary with an incredible 80% Club card Penetration granting a robust database and 12.8m app users receiving tailored adverts and suggestions of what to buy based on their past purchases (Dunnhumby Website, 2024). Pairing their robust database mentioned above to the SQL technology Tesco could easily adjust the layout of each of their type of shops - Express, One Stop, Metro and Superstore - based on commonly bought together items.

Furthermore, the Club-card implementation has enriched the quality of their insights creating a significant advantage vs their competitors when having access to their demographics, address and even time-in-shop (when using their in-store scanner) as per agreed on their T&Cs (Tesco Official Website, 2024). This robust database will then serve to target their customers through adverts in a multitude of other platforms such as Channel 4 streaming services that has also paired up w/ Sainsbury's Nectar data and Boots data (Jackson, 2023).

"By targeting the right customer where they are spending their time with our demographic, behavioral and predictive audiences powered by rich Tesco Clubcard

data, and measuring the sales outcome of the campaign, brands can really understand the effectiveness of their media activities."

(Jackson, 2023)

So far, we have approached all the triumphs of the Grocery retailers use of Big Data, but how about their downside? Back in 2020 Tesco has suffered a data leak which has put at risk their customers 'club points' (Seal, 2020). The data-breach has later been proven to not have offered any risks to Club-card user personal information although this certainly could have hindered the adoption to the program from possible new members & causing harm to the reputation of the Retailer (Kalyvas, 2015).Proven to not have affected the reputation of the programme which counts with the support of 80% of the total Tesco shoppers (Dunnhumby Website, 2024).

Impact Analysis

The implementation of big data has significantly enhanced operational effectiveness within Tesco and the consumer trade industry in general. One way how big data has significantly improved Tesco's operations and had a positive impact. Tesco has been able to reduce waste and save money by managing its stock better. This has allowed them to avoid having too much or too little. Big data is also used by them to ensure that their refrigerators and other equipment use less energy, which benefits the environment and their bottom line. However, because big data is complex and resource-intensive, incorporating it into their current systems can be difficult. Furthermore, there's a chance that an excessive reliance on technology could lead to complications in the event of any technical failures.

Tesco's use of big data is a significant step in enhancing its operational efficiency and has been the subject of various studies. For instance, research has shown that Tesco's use of big data analytics has been instrumental in improving its supply chain and energy management, which aligns with the broader trends in retail and technology (Analytics Steps, 2020).

At Tesco, big data has significantly increased customer happiness. Tesco can boost customer loyalty and improve the entire shopping experience by using customer data to personalize marketing campaigns and product recommendations. Utilizing analytics also guarantees improved product availability, more

successfully satisfying client expectations. It is clear from analyzing Tesco's private label (PL) pricing tactics that consumers' perceptions of price-quality connections have a big impact on their purchasing decisions. Many people continue to assume that greater costs equate to superior quality, even in the face of reduced-price points meant to entice consumers. This belief is strongly engrained due to years of established trust with national brands (NBs). Tesco's pricing strategy is not in line with consumer expectations, which implies that although the company wants to increase sales by offering competitive prices, it unintentionally makes customers less satisfied who associate price with quality *(Mooney,2019)*.

Collecting and analysing personal data has raised privacy concerns among customers. While personalisation can improve the shopping experience, having too many options can make decision-making harder for consumers.

Tesco's use of big data has fueled its business growth, providing valuable insights into market trends and customer behaviors which guide strategic decisions. This data-driven approach has given Tesco a competitive edge, enabling rapid adaptation to market changes and customer needs, thus maintaining its market leadership. However, the costs associated with setting up and maintaining big data systems are significant, and there is an ongoing need for skilled analysts and data scientists to manage these systems effectively, adding to operational expenses.

Tesco has been able to use big data to create models that predict when they might need stock, when there might be problems delivering goods, and when they might face security issues. This makes Tesco more flexible and better prepared to handle sudden changes in the market or emergencies in their operations. However, using big data also brings risks, like the 2020 incident where hackers got into Tesco’s system and stole customer loyalty points (Loyalty-program-fraud-targets, 2020). This kind of security breach can make customers lose trust in Tesco and harm its reputation. Also, the more Tesco depends on digital systems, the higher the chance of cyber-attacks and technical problems.

In academic terms, Tesco’s use of big data for risk management shows the balance between the benefits of technology and the risks it brings. The 2020 breach is an example of how relying on big data can lead to serious problems, like losing customer data (Loebnitz et al., 2020). This highlights the importance of having strong security measures and plans for dealing with these risks.

Tesco's use of big data has significantly enhanced its operations, customer relationships, and competitiveness. However, these advancements also come with drawbacks, such as the necessity for people with specialized skills, increased spending, and client data protection. Tesco should continue making investments in robust data management, modernizing its infrastructure, and educating its staff about big data to maintain the advantages and lower the dangers. Tesco's disciplined approach will help it maintain its top spot in the competitive grocery industry.

From an academic perspective, Tesco made a wise decision in moving to big data, but it has not been without challenges. According to a Harvard Business School research, Tesco's success can be attributed to its move to digital, although doing so also required significant investments in new technology and

adjustments to the company's operational procedures (Harvard Business School, 2016). This demonstrates how crucial it is to plan when implementing new technology to ensure that the business can manage any issues that may arise.

Solution Analysis

Tesco's ground-breaking utilization of Big Data analytics stands in stark contrast to Morrisons' approach, leading to their dominance in the market and operational efficiency. Tesco strategically employs Big Data through predictive analytics and optimization of their supply chain, resulting in improved customer experiences and reduced waste. By leveraging technologies like Tableau, Tesco analyses vast datasets to optimize product availability and placement, leading to significant boosts in sales and customer satisfaction (Tableau.com, 2015.). This advanced approach enables Tesco to accurately anticipate demand, ensuring better stock management and minimizing waste through efficient supply chain practices (Analytics Steps, 2017).

On the other hand, Morrisons has been slower in embracing innovative Big Data solutions, which has impacted its ability to effectively compete with Tesco. Despite remaining a major player in the UK's supermarket industry, Morrisons' adoption of technology appears to lag behind Tesco's, potentially affecting its market position and future growth prospects.

Tesco's utilization of Big Data to enhance operations, such as analyzing refrigerator data to reduce energy costs, highlights the extensive advantages of their data-driven strategy. This not only leads to financial savings but also establishes Tesco as a frontrunner in sustainability within the retail sector (Datafloq.com, 2019).

To summarize, Tesco's implementation of Big Data and analytics showcases a cutting-edge approach that surpasses Morrisons'. This technological expertise empowers Tesco to stay ahead of the competition, providing valuable insights into the transformative possibilities of Big Data in the retail industry.

Data Governance & ROI

When Signing up for programs such Club cards you are often authorizing the use of your data in accordance to the General Data Protection Regulation (GDPR) which is regulation issue by the European Union that determines the boundaries of the usage of data, setting up responsibilities and accountabilities to the company which you subscribed/signed up with ultimately aiming to protect the European user covering their rights in an harmonized data privacy law (GDPR, 2024).

In the 2020 Tesco data breach (Seal, 2020) a huge concern has been raised as for the Personal Financial Information of their Clubcard users: Could Tesco Customers have had their credit card details leaked? The answer is no as per mentioned article only their club card points have been exposed to the hackers use. Although according to (Kalyvas, 2015, Section 2.2) the protection of the business data is integral to its reputation and by not protecting Customer Lists many could have been targeted with fake Tesco e-mail promotions which could have links to an unprotected URL with a similar domain to Tescos (i.e www.tesc0.com) misleading customers to add their credit/debit card information in the hope of grabbing a good Clubcard bargain leading to huge disappointment and financial losses. Still in (Kalyvas, 2015) investing in the data protection is crucial to avoid future financial losses that may occur from data breaches which would directly impact your annual revenue.

In terms of Return on Investment, it's safe to say since Tesco started investing in Big Data acquiring the majority of Dunnhumby in 2001 they've seen their Revenue doubling in size in 6 years from £20.9B in 2021 to £42.6B in 2007 (StockAnalysis, 2024). Tesco has been leading the market in terms of data-farming and actionable insights execution for the past years being the pioneer on the Club card scheme that offers exclusive deals to the customers that have shared their data with Tesco.

Future implications:

Tesco's 2023 annual report (Tesco PLC) states that utilizing data analytics has positive ramifications for the company's future. Tesco hopes to boost customer experiences and encourage enduring loyalty by utilizing consumer insights to provide tailored services and incentives. Additionally, according to industry analysts at McKinsey & Company (McKinsey & Company, 2022), Tesco can stay competitive in the market by using creative uses of big data, like supply chain optimization and product development.

Potential Issues:

Regulating organizations like as the Information Commissioner's Office (ICO, 2023) have brought attention to privacy problems related to Tesco's data initiatives. According to a Deloitte study, increased data collecting may result in regulator scrutiny and a decline in consumer trust (Deloitte, 2022). Furthermore, as cybersecurity assessments from companies like Kaspersky (Kaspersky, 2023) show, data security concerns present serious difficulties that call for strong steps to protect consumer information.

Conclusion

Throughout this report, our exploration into the application of big data in the consumer trade industry, using Tesco as a case study, has provided important new insights into the significant potential of digital technology. The results highlight the critical role that big data plays in transforming established business models and improving customer relations and operational efficiency in the industry.

Tesco acts as a prime example of the significant advantages that can come from using big data analytics strategically. This includes innovations that not only strengthen market position but also build consumer loyalty and trust, such as tailored customer service, focused marketing campaigns, and optimised inventory management.

Although there are many advantages to digital innovations, our study also identifies and mentions some of challenges that come with digital advancements in the consumer trade industry. One of which being “Data breaches”, such as the one experienced by Tesco in 2020, alerts us to the potential risks inherent in managing vast amounts of consumer data. These and other occurrences highlight the importance of implementing strict data security measures and strong governance frameworks to adequately protect consumer information.

In summary, Tesco is a perfect example of how big data may be used to refine and redefine the boundaries of consumer trade, but it also acts as a warning about the risks involved in integrating technology in this way. In the future, businesses operating in the consumer trade sector will have to maintain a healthy balance between security and innovation. Navigating the future of consumer trade will require not only embracing technological improvements but also strengthening cybersecurity safeguards. By taking a balanced approach, the industry will be able to continue benefiting from big data without compromising consumer confidence or data integrity.

References

ResumeKraft. (n.d.). Transforming Retail with Technology: The Future Shopping Experience. Retrieved March 27, 2024, from https://resumekraft.com/web-stories/transforming-retail-with-technology-the-future-shopping-experience/

Marr, B. (2016, November 17). Big Data At Tesco: Real Time Analytics At The UK Grocery Retail Giant. Forbes. Retrieved from https://www.forbes.com/sites/bernardmarr/2016/11/17/big-data-at-tesco-real-time-analytics-at-the-uk-grocery-retail-giant

Ian Robinson, Jim Webber, Emil Eifrem (2015) *Graph Databases,* 2nd Edition Chapter 4. O'Reilly Media, Inc.

Jules J. Berman, (2013) *Principles and practice of big data : preparing, sharing, and analyzing complex information*, 2nd Edition Section 1.1, Morgan Kaufmann Publishers.

James R. Kalyvas (2015) *Big data: a business and legal guide*, Section 2.3, CRC Press, Boca Raton, Florida.

CO-OP Official Website*. In Store Services*. Online&Available at:https://www.coop.co.uk/in-store-services [accessed 15/03/2024]

McKinsey & Company (2024. Available from https://www.mckinsey.com/ [Accessed 22 April 2024].

Information Commissioner's Office (ICO). (2024). *Ico.org.uk*. Available from https://ico.org.uk/ [Accessed 22 April 2024].

Annual Report 2023. (2023). *Tescoplc.com*. Available from https://www.tescoplc.com/investors/reports-results-and-presentations/annual-report-2023 [Accessed 22 April 2024].

CO-OP. *P14 FTG Clusters & range guidance*. Online&Available at: https://www.dropbox.com/scl/fi/b4vaa66wuqqmopqsp7hps/FTG-Shoppers-2.pptx?rlkey=64gk66pb31r082b1hywiei9ty&dl=0 [accessed 15/03/2024]

NIQ, 2022. *The value of incrementality: Seeing the full assortment picture*. Online&Available at: https://nielseniq.com/global/en/insights/education/2022/the-value-of-incrementality-seeing-the-full-assortment-picture/ [accessed 15/03/2024]

ESM, 2024. *Top 10 Supermarket Retail Chains In The UK.* Online&Available at: https://www.esmmagazine.com/retail/top-10-supermarket-chains-in-the-uk-231802 [accessed 15/03/2024]

Dunnhumby Official Website. *Tesco Media insight platform*. Online&Available at: https://www.dunnhumby.com/tesco-media-insight-platform/ [accessed 18/03/2024]

Ian McCawley (2006) Marketing Week. *Dunnhumby – a department of Tesco?* Online&Available at: https://www.marketingweek.com/dunnhumby-a-department-of-tesco/ [accessed 17/03/2024]

Beau Jackson (2023). *Channel 4 adds Tesco Clubcard data to customer targeting offer,* 2023*.* Online&Available at: https://www.campaignlive.co.uk/article/channel-4-adds-tesco-clubcard-data-customer-targeting-offer/1847121 [accessed 17/03/2024]

Tesco Official Website. *Club Card Terms and conditions.* Online&Available at: https://www.tesco.com/groceries/en-GB/zone/clubcard-terms-and-conditions [accessed 17/03/24]

Seals, Tara (2020) Threadpost Website. *Loyalty Cards Targeted in Tesco Clubcard Attack*. Online&Available at: https://threatpost.com/tesco-clubcard-account-takeovers/153430/ [accessed 17/03/24]

Stock Analysis (2024). *Tesco PLC Details.* https://stockanalysis.com/quote/lon/TSCO/revenue/ [accessed 18/03/24]

Analytics Steps. (2017). How Tesco uses Big Data and Analytics. Online and Available at: https://www.analyticssteps.com (accessed 25/03/24)

Datafloq.com. (2019). Tesco and Big Data Analytics, a Recipe for Success? Online and available at: from https://www.datafloq.com (accessed 25/03/24)

Tableau.com. (2015). Tesco increases sales with supply chain data in Tableau. Online and Available at : https://www.tableau.com (accessed 25/03/24)

GDPR Official Website. Online&Available at: https://gdpr-info.eu/ [accessed 18/03/24]

Loebnitz, N., Zielke, S., & Grunert, K. G. (2020). Consumers' brand decision: a matter of social risk. *International Journal of Retail and Distribution Management*, *48*(6), 575–589. https://doi.org/10.1108/IJRDM-02-2019-0062 accessed 05/03/2024]

Mooney, S. (n.d.). (2019) An Investigation Into Attitudes of TESCO Customers in South Dublin Towards Private-Label Brands. https://esource.dbs.ie/bitstream/10788/3676/1/mba_mooney_s_2019.pdf [accessed 05/03/2024]

loyalty-program-fraud-targets-600000-tesco-shopper-accounts. (n.d.).(2020) https://www.bitdefender.co.uk/blog/hotforsecurity/loyalty-program-fraud-targets-600000-tesco-shopper-accounts/ accessed [20/04/2024]

tesco-a-digital-transformation. (n.d.).(2016) https://d3.harvard.edu/platform-rctom/submission/tesco-a-digital-transformation/ accessed [20/04/2024]

5-ways-tesco-uses-big-data-analytics. (n.d.).(2020) https://www.analyticssteps.com/blogs/5-ways-tesco-uses-big-data-analytics accesssed [20/04/2024]