The Impact of Big Data Management on E-Commerce Enterprises

Fernando Tan 01012170027

Program Studi Akuntansi, Universitas Pelita Harapan
1100 M.H. Thamrin Boulevard, Lippo Village, Tangerang, Banten 15811
*Alamat Korespondensi: ftan299@gmail.com - 08121092837

Abstract
Advancements in information and communications technology has heavily impacted enterprises. Database and data warehouse laid the foundation of data management. Data management is of one of the aspects that gained attention in the past decades. Data collection is growing exponentially, which sparked the term “big data”. Enterprises are starting to realize the importance of big data. As a result, big data management becomes a relevant research topic. E-commerce is booming sector that requires the utilization of big data. When implemented correctly, big data will make a big impact in an e-commerce enterprise’s success. Advancements in database, data warehouse, and data mining technology has been a key factor. This paper reviews how big data management impacts e-commerce enterprises in a literature review method. Tailored marketing, customer demography analysis, and predictive modeling are proven to be benefits of big data management. However, privacy remains as an important issue that challenges the implementation of big data.

Key words: database, data warehouse, data mining, big data, analytics, e-commerce, tailored marketing

Abstrak

Kata kunci: database, data warehouse, data mining, big data, analytics, e-commerce, tailored marketing

1. INTRODUCTION
The introduction explains the background for the literature review, research question, and the objective of this review.

1.1 Background
Information and communications technology have changed the way humans live. It is also changing how enterprises are operating. Enterprises have to deal with all kinds of data. Not only all kinds of data, but also a huge amount that keeps growing.[1] Data is relatively easy to obtain, which explains why data collection is growing exponentially. However, the challenge lies in the utilization of data. Data analysts are becoming more popular. In fact, McKinsey Global Institute predicts a data analyst shortage. There has been significant development in business intelligence and analytics during the past two decades.[2] Figure 1 illustrates the market for data analysts in a chart. The significance of data cannot be understated during the current era. It is restructuring the society. Businesses that can’t utilize data properly will most likely be left behind by others that are capable.[3] Organizations that realize the significance of data management won’t hesitate to invest a sum of money in an effort to advance data management and warehousing capabilities.[4]

The vast amount of data is referred as “big data”. It is all the data obtained from all kinds of resources. Big data may be stored somewhere and left as it is. However, the emergence of big data creates opportunities for enterprises to analyze what happened in the past and make predictions based off it. It is unique as it features backward-looking capabilities as well as
forward-looking. To be able to perform these analyses, there needs to be a system to gather and present data in a human-friendly interface, which is the database management software.[5] E-commerce is one of many sectors in the industry that deals with big data. It is reported to grow around 20% each year. By 2014, the business-to-consumer e-commerce has reached 1.5 trillion dollars. Given the growth, big data management is a crucial factor in determining an enterprise’s competitive position in the market. Utilizing the ever-increasing amount of data has become a basic requirement for e-commerce enterprises.[6] The ever-increasing need of managing data has attracted a growing number of researchers to discuss this matter. Business analytics was a major trend in the 2010s. IBM reported that the growth of data has become a struggle for businesses.[7] This paper aims to review several research papers regarding the impact of big data management in e-commerce enterprises.

![Figure 1. Big data analytics market size 2011-2027.][8]

1.2 Research question
In what ways does big data management impact e-commerce enterprises?

1.3 Objective
This paper examines the impact of big data management in e-commerce enterprises.

2. LITERARY REVIEW
The literary review explains the necessary keywords and theories that are required in understanding the discussion of this literature review. This part explains the database, DBMS, data mining, big data, e-commerce, and the reviewed papers.

2.1 Database and DBMS
The database is defined as “an integrated collection of information that is logically related and stored in such a way as to minimize duplication and facilitate rapid retrieval.”[1] Merriam-Webster dictionary defines database as “a usually large collection of data organized especially for rapid search and retrieval.”[9] It provides a framework for storage, access, and manipulation of raw data. The features of a database include reduced redundancy, inconsistency, improved performance, scalability, security, information integrity and accuracy. The data resource is managed by the DBMS. It provides data independence, which protects the database application from changes in hardware, operating systems, and storage devices. It also promotes data sharing that enables various applications to use the same database. The DBMS ensures security of data, because specific functions can only be performed by authorized parties. Hardware or software defects are unlikely to distort the data because the DBMS is designed to protect the database from inconsistency. Performance and ease of use are crucial features of the DBMS, because it ensures that every user is able to use and utilize the database properly.[10]

2.2 Data Warehouse
The data warehouse is “a specially prepared repository of data created to support decision-making.”[11] Wallace defines it as “a central data repository containing information drawn from multiple sources that can be used for analysis, intelligence gathering, and strategic planning.”[1] The warehouse is a collection of data retrieved from various databases. An enterprise’s database is the main source for the warehouse. External sources may also contribute to the data warehouse. The data warehouse focuses on the quality of the data itself. Data warehousing is a critical component of an enterprise’s data management system. During the late 1990s, data warehousing was sector in which companies were making it as a crucial strategic initiative. The idea of creating a data warehouse emerged from enterprise’s needs. It required analysts, programmers, managers, and an adequate enterprise architecture. The requirements of a data warehouse made it a major investment of companies at the time.[11]

2.3 Data Mining
As new generations of databases and data warehouse appear, new techniques in data analysis also emerge. Data mining is a result of innovations in this area. Data mining is “a type of intelligence gathering that uses statistical techniques to explore large data sets.”[4] Fayyad defines it as “the nontrivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data.”[12] It is based of traditional databases. However, it does things that a traditional database doesn’t. It can perform
data analysis and identify patterns based on the entities and relations in the database. Data mining doesn’t necessarily require a data warehouse, but the existence of the warehouse will improve data mining significantly. Although data mining is performed by a software, the human element is also an important factor. Analysts are required to interpret that the system presents. While not requiring a data warehouse, data quality is important for data mining to yield useful results. The 4 steps in data mining are data selection, data transformation, data mining, and result interpretation.[13] Figure 2 shows how data warehousing and data mining are involved in knowledge discovery.

There are three features that define big data, which is called the “three Vs”. Volume refers to the massive amounts of data collection which reach petabytes of data and beyond. Velocity is the pace at which data sources change and grow. Variety of data is also a challenge for enterprises to deal with. Usually, structured information is preferred when analyzing data. However, big data also includes semi-structured and unstructured data, which makes it a greater challenge. Figure 3 is a map that is synthesized from structured and unstructured data that provides business value.

2.5 E-Commerce
During the early years of e-commerce, it was not web-based. E-commerce was a term that explained the use of computers to communicate commerce documents. From the year 1994, the web started its involvement in commerce. At the time of writing, e-commerce refers to the online marketplace of goods and services between businesses, consumers, nonprofits, and governments. As of 2017, around 1.66 billion people purchase goods online. Online sales reached 2.3 trillion U.S. dollars, which will go up to 4.48 trillion dollars by 2021. It is gaining market share over traditional brick-and-mortar retail sales.[16]

2.6 Research Paper Comparison
This paper reviews 13 prior research papers detailed in Table 1 below. This review prioritizes research papers submitted in recent years (2012-2018). However, there are several research papers from prior years that are relevant to the literature review.

Figure 2. Data warehousing and mining roles in knowledge discovery. [12]

Figure 3. Map of London synthesized from big data based on consumer demography and preferences users. [15]

Figure 4. Tracking ad campaign effectiveness in e-commerce websites. [17]
<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Objective</th>
<th>Conclusion</th>
</tr>
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<tbody>
<tr>
<td>Lloyd, Alyson Cheshire, James Squires, Martin Longley, Paul Singleton, Alex (2018)</td>
<td>Quantitative</td>
<td>To provide an overview of the provenance of loyalty card data and the utility of these data in population research.</td>
<td>Loyalty card data offer an untapped opportunity for researchers to analyze societal and geographical questions in an entirely new way.</td>
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<tr>
<td>Alexiou, Alexandros Riddlesden, Dean Singleton, Alex Longley, Paul Cheshire, James (2018)</td>
<td>Quantitative</td>
<td>To explore some aspects of online retail behavior, particularly on the nature and impact that Internet user behavior is having on retail centers nationally.</td>
<td>The analysis of the geography of online retail provides unique insights into the apparent diversity of population groups with regards to online shopping, and to the role and future of town centers at the national scale. Certainly, one of the most influencing factors is the behavioral component: whether to use the Internet for a given activity.</td>
</tr>
<tr>
<td>Pridmore, Jason Hämäläinen, Lalu Elias (2017)</td>
<td>Qualitative</td>
<td>1. Contextualize analytical concerns regarding segmentation practices that include people and technologies with particular attention given to the promises of algorithms and big data. 2. Summarize the historical development of segmentation and its ongoing potentials and implementation issues. 3. Drawing on empirical interviews with a small number of segmentation practitioners and segmentation research.</td>
<td>Narratives of consumer empowerment and participation are limited alongside the slow and incremental adaptation to highly valued trends by most companies in practice.</td>
</tr>
<tr>
<td>Basens, Bart Bapna, Ravi Marsden, James Vanthienen, Jan Leon Zhao, J. (2016)</td>
<td>Qualitative</td>
<td>Exploring the technical and managerial issues of business transformation resulting from the insightful adoption and innovative applications of data sciences in business.</td>
<td>Many of the issues in big data may not be new, but there is an evolving positive view of big data and business analytics that is resulting in real business transformations.</td>
</tr>
<tr>
<td>Akter, Shahriar Wamba, Samuel Fosso (2016)</td>
<td>Quantitative</td>
<td>1. Identify definitional perspectives of big data analytics 2. Distinguish the characteristics of big data within e-commerce 3. Explore the types of big data within e-commerce 4. Illustrate the business value of big data in e-commerce 5. Provide guidelines for tackling the challenges of big data application within e-commerce.</td>
<td>1. Big data analytics (BDA) has emerged as the new frontier of innovation and competition in the wide spectrum of the e-commerce landscape due to the challenges and opportunities created by the information revolution. 2. In addition, the study reflects that once BDA and its scope are well defined; distinctive characteristics and types of big data are well understood; and challenges are properly addressed, the BDA application will maximize business value through facilitating the pervasive usage and speedy delivery of insights across organizations.</td>
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<tr>
<td>Einav, Liran Levin, Jonathan (2014)</td>
<td>Qualitative</td>
<td>Outline some of the challenges in accessing and making use of big data.</td>
<td>1. Big data will not substitute for common sense, economic theory, or the need for careful research designs. Rather, it will complement them. 2. Over the next decades big data will change the landscape of economic policy and research.</td>
</tr>
<tr>
<td>Mundie, Craig (2014)</td>
<td>Qualitative</td>
<td>Describe the importance of privacy by focusing on how data is used, rather than how it is collected.</td>
<td>Policymakers should shift their focus toward controlling the use of data, rather than just its collection.</td>
</tr>
<tr>
<td>Varian, Hal R (2014)</td>
<td>Quantitative</td>
<td>Describe the tools needed for manipulating and analyzing big data such as machine learning to boost effectiveness in modeling complex relationships.</td>
<td>Since computers are now involved in many economic transactions, big data will only get bigger. Data manipulation tools and techniques developed for small datasets will become increasingly inadequate to deal with new problems. Researchers in machine learning have developed ways to deal with large datasets and economists interested in dealing with such data would be well advised to invest these techniques.</td>
</tr>
<tr>
<td>Pascal, Brian (2014)</td>
<td>Qualitative</td>
<td>To examine the effect modern technology has had on privacy, each showing how a relatively small, understandable set of technologies came together in ways that the law failed to foresee or accommodate.</td>
<td>Change is especially prevalent in the world of privacy arising from rapid advances in communications technology, computer science, engineering, and mathematics. It is the job of the attorney to ensure that the law keeps up with reality.</td>
</tr>
<tr>
<td>Chen, Hsinchun Chiang, Roger H L Storey, Veda C (2012)</td>
<td>Qualitative</td>
<td>Describe how big data shapes business intelligence and analytics and how it significantly impacts businesses.</td>
<td>E-commerce, politics, healthcare, science and technology, security, and public safety benefit greatly from the developments in big data analytics. Further developments will augment the benefits of big data.</td>
</tr>
<tr>
<td>Banks, David L Said, Yasmin H (2006)</td>
<td>Qualitative</td>
<td>Examine contributions that statisticians are making to help change the business world, especially through the development and application of data mining methods.</td>
<td>Inevitably, electronic commerce has raised and is raising fresh research problems in a very wide range of statistical areas. The challenges appear in CRM, information retrieval, market segmentation, pricing, and security.</td>
</tr>
<tr>
<td>Boyd, E Andrew Bilegan, Ioana C (2003)</td>
<td>Qualitative</td>
<td>Trace the history of revenue management to illustrate a successful e-commerce model of dynamic, automated sales</td>
<td>History of revenue management illustrates a successful e-commerce model of dynamic and automated sales enabled by revenue management systems. It can provide a wide-ranging model for managing inventory against market demand. There is a potential to provide great benefits.</td>
</tr>
<tr>
<td>Cooper, Brian L Watson, Hugh J Wixom, Barbara H Goodhue, Dale L (2000)</td>
<td>Quantitative</td>
<td>Describe FAC’s transformation and emphasize the IT that was essential to its success.</td>
<td>Managers who plan to use technology to support changes that are designed to significantly improve organizational performance. In addition, they raise interesting questions about how IT can be used to gain competitive advantage.</td>
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**Table 1.** Comparison of research papers
The research papers that are reviewed examines ways in which big data impacts enterprises. There are 3 main topics throughout the reviewed papers. The topics are demography analysis, predictive modeling, and market segmentation. There is another major topic that discusses the main drawback of big data management and utilization, which is privacy. Lloyd, Alexiou, and Chen provides analysis regarding the beneficial impact that big data has on analyzing geodemography. Generally, these papers discuss how traditional retail stores can utilize big data to help them build an e-commerce department. In addition, these papers also discuss how demography analysis takes part in segmenting the market. Pridmore, Banks, Cooper and Wamba discussed how market segmentation can improve vastly along with big data. Big data can be utilized create detailed market segmentation. Enterprises can target marketing to an individual based on the data obtained from the individual’s behavior on the internet. Basens, Einav, Varian, and Boyd explained how big data influences decision making. Predictive models create opportunities that isn’t possible without big data. Decisions can be previewed to analyze how it impacts stakeholders. These papers also discuss the different methods that can be used to create these models. Mundie and Pascal wrote on how privacy is a serious matter regarding big data management. Consumers aren’t aware where and who collects private data. These 2 papers explained it in detail. However, the majority of the reviewed papers also wrote about it less detailed. It shows how privacy has become a major issue in big data.

3. METHODOLOGY
This paper is written as a literature review. It is defined as “a combination of analysis, synthesis, and summary.” CQ University defines it as “an evaluative report of information found in the literature related to a selected area of study.” [28] The goal of this review is to research papers regarding the impact of big data management in e-commerce enterprises, specifically about approaching big data, tailored marketing, and the predictive feature of big data. Therefore, several research papers regarding the topic will be collected and analyzed. The analysis of the research papers will outline the ideas and evaluate how they converge and differ. [29] This paper is based on chapter 4 of “Introduction to Information Systems” by Patricia Wallace which discussed mainly about database and data warehouse. Other necessary literatures were retrieved from JSTOR digital library and Google search. The keywords used to search literatures were a combination of “database”, “data warehouse”, “enterprise”, “big data”, “data management”, “e-commerce”, and “tailored marketing”. Afterwards, the papers were pre-reviewed to determine if it fits the theme of the literature review.

4. LITERATURE REVIEW
4.1 Big Data Analytics
Electronic commerce is a revolution in the world of business. Enterprises can perform better customer management, marketing strategies, and efficient operations. It is possible with the use of advanced data mining tools. The significant impact of big data increased interest in the academic and e-commerce industry. It is proven that e-commerce firms that utilize big data analytics have a 5-6% higher productivity than their competitors. In 2014, 91% of Fortune 1000 companies invested in big data analytics. BDA provides benefits that firms need, but haven’t been able to discover before, such as tailored marketing and predicting consumer behavior. Everything that a customer or a potential customer does on the internet is recorded. A search in any search engine such as Google or Bing are recorded. Clicks in Amazon or eBay are also recorded. What is read on online newspapers or videos are captured and logged. Tools such as Google Analytics provide a detailed record of a user’s activity and reveal patterns regarding their browsing and purchasing behavior. Through an extensive record of user clicks, enterprises can offer tailored promotions to every single user. If a customer buys a book on Amazon, Amazon may suggest other books that previous customers also view or buy. That is possible through big data analytics. Applications that support big data analytics in e-commerce and market intelligence include recommender systems, social media monitoring and analysis, crowd-sourcing systems, etc. Data characteristic in e-commerce environments are structured web-based, user-generated content, rich network information, and unstructured informal customer opinions. There are several common methods used such as association rule mining, database segmentation and clustering, graph mining, text and web analytics, and sentiment and affect analysis.

4.2 Customer Demography Analysis
Big data can be crucial in customer relation management. If an enterprise can identify and analyze patterns of customers through big data analysis, it is more probable that it will have a high customer retention. A common example of doing so is a customer loyalty card. Retailers offer these cards to collect consumption behavior data. The cards enable enterprises to offer rewards to their customers to encourage repeat shopping behavior.
Loyalty cards can provide rich data about consumption patterns, demographic information, population characteristics, and neighborhood type. Basens explained that companies can utilize customer demography data to offer detailed information to their customers based on location. E-commerce enterprises use e-coupons and location services to attract people into buying their goods. Location services use big data to analyze and understand customers’ needs and interest based on their location. Retailers that also offer an e-commerce website may benefit from this method. Alexiou explains how London retailers can utilize internet user geography in London through Internet User Classification (IUC). The provided geodemographic data helps retailers to evaluate which retail centers are prone to online consumption. That can help retailers to practice new retail strategies that coincide with the geodemographic data IUC provides.

In the end, retailers can study the behavior of internet shoppers in relation to their physical stores. The study concludes that the decisions for consumers to shop through the internet is influenced by age and socioeconomic status. However, Lloyd states that data quality and uncertainty is a challenge to overcome. There are certain issues and bias that may distort data analysis and yield ineffective results.

4.3 Tailored Marketing
Marketing has always been dependent on customer data. The data is translated to provide business value by using it effectively to engage customers. Tailored marketing starts with market segmentation. Segmentation was introduced as an alternative to mass marketing. The essence of market segmentation is to breakdown a heterogeneous market, into smaller homogenous markets. As a result, firms can adapt their marketing strategies to different types of customers.

Gathering customer information can help enterprises analyze preferences and profiles. Customer types can be identified from the analysis. As a result, target marketing efforts are more effective through big data analysis. Big data analysis also enables firms to manage their product lines and discover the profitability of each product and each customer. If a customer is deemed not profitable, the company may shift them to products that don’t require high costs to maintain. Customers who happen to be profitable will be shifted to highly profitable products, even if it requires high costs. In addition, tailored marketing will result in higher customer retention, because the company understands the need of each segment of the market they are serving. Tailored marketing has proven to be a key revenue stream for e-commerce enterprises. The use of recommender systems can successfully match marketing efforts with customer interests. As a wide array of information such as cookies and purchase histories are available, advertisers may target an individual to buy a certain product. This method also reduces overhead costs and time, thus making tailored marketing an efficient and profitable method. Beyond advertising, tailored marketing also involves other aspects of customer experience such as contact, billing, retention, and holiday e-cards. To effectively perform these tasks, data mining is crucial to meet the specific interests of each customer.

4.4 Predictive Modeling
Companies use big data to track business processes and outcomes. The data that is collected will be utilized to build predictive models that will help in decision making. It has improved efficiency, since it can preview the possible outcomes of a decision. In recent years, predictive modeling was a key factor in the development of products and services. Google does it in their search engine to predict how relevant the web pages that they suggest are. Apple also does it in their operating system to predict what a user is going to type in context. That can also apply to e-commerce firms. Amazon and Netflix recommend their users by using predictive models built based on their consumer data. Such applications are possible due to the ability to convert big unstructured data into predictive models automatically and in real-time.

Varian explained that machine learning advancements has helped data scientists and analysts to predict outcomes based on changes in variables. It is hard to conclude causations in predictive models, as it only measures correlation. However, predictive models may help estimate causal impacts, although often not accurate. Boyd also states that big data can be utilized to forecast revenues and customer demand. Historical data can be crucial in predicting customer demand. However, demand models can be inaccurate. Big data analytics help companies to enhance their demand models and synthesize the “best” demand model. The research took an airline that sells online tickets as an example. It is possible to predict the origin and destination of a passenger, while offering the optimal price that a customer is willing to pay based on the demand model. This method will be beneficial for companies to manage their financials and predict their revenues from the demand models. In addition, it will also help companies to attract new customers and retain them.

Data mining is a tool that can empower a sales force. Clients can be impressed by sales forces who understand their needs. Furthermore, data mining is useful to identify recurring patterns that will likely repeat in the future. Therefore, a properly managed big data warehouse is hugely beneficial in empowering sales force and retaining customers.
The ability to create predictive models ultimately help enterprises in their decision-making process. Enterprises want their business processes to be optimized and adaptive to new challenges, opportunities, and regulations. To do so, businesses require comprehensive big data analysis techniques. If successful, the automation of such processes based on big data can significantly increase the agility of an enterprise.

4.5 Privacy

Ever since the internet became a phenomenon, privacy was always an issue. People were concerned about who were able to collect and store their personal data and what to do with it. In the era of big data, the issue is becoming more prominent. With high velocity and volumes of data collection, it seems that consumers have no knowledge about who collect and store personal data. It is not debate whether big data provides meaningful insight for e-commerce enterprises. On the other hand, consumers are struck with a “privacy paradox.” Consumers want to use free online tools and software, but they also demand their privacy to be protected. Consumers are sharing more and more personal data as e-commerce gains its market share, enterprises have to be careful about their customer’s privacy.

It is urgent to protect consumer privacy in the era of big data both technologically and legally. Although there are regulations regarding personal data privacy, it is considered obsolete because of the emergence of big data. Part of it is caused by passive data collection using sensors that even customers aren’t aware of. Efforts to restrict personal data collection faces controversies, because data is a very valuable asset. Enterprises value data highly. Applying tight regulations on data collection could potentially harm the society as it takes away a valuable resource. For e-commerce enterprises, data privacy regulations are considered anti-productive because it limits their resources for growth. However, as the debate on consumer data privacy gets bigger, corporations still have the power to influence regulators. Consumers have limited economic power to sue enterprises in respect to their privacy. Pascal wrote “when technology interacts with the law, the law will always lag behind”. The pace at which big data grows is unmatched by regulators, as they need more time to discuss and enforce law.

Figure 5 summarizes the main talking points of the review. This review examines 4 talking points, which are customer demography analysis, predictive modeling, customer segmentation, and privacy. The first 3 points are the beneficial impacts of big data management on e-commerce enterprises, while privacy focuses on the negative impact of big data management. A successful management of these ideas should improve the overall position of an enterprise. Figure 6 explains ways in which big data management has impacted e-commerce enterprises. Enterprises can utilize big data to understand customer demography. Loyalty cards is a useful tool to help map their customers. The end goal is to market products in an efficient manner to customers. Tailored marketing benefits from big data management as it helps enterprises segment the market and yield higher customer satisfaction. Predicting future events is also a benefit of proper big data utilization. Enterprises can build predictive models to support decision making. However, there is an issue that hinders the beneficial impact of big data. Privacy issues has caused personal data leaks and obsolete regulations. Lawmakers have to adapt quickly and prevent these issues so big data’s potential can be fulfilled without sacrificing customer privacy.
1. **Customer demography analysis**

- Using loyalty cards to identify customer demography and shopping behavior.
- Offer personalized deals to customers based on location.
- Setting different retailing strategies depending on geodemography of customers and retail centers.
- Reliable data is essential to minimize uncertainty in analyzing customer demography from big data.

2. **Tailored marketing**

- Segmenting markets based on customer data to effectively engage with customers.
- Analyze customer profiles and preferences, shifting them to appropriate product lines to maximize profits.
- Key revenue stream for e-commerce enterprises by matching marketing efforts with customer interests.
- Maximize profit by reducing overhead costs and time.

3. **Predictive modeling**

- Build predictive models based on data collected from business processes.
- Forecasting revenues and customer demand, thus improving financial management and customer retention.
- Optimizing and automating business processes to improve enterprise agility and adaptation.

4. **Privacy**

- Concerns about who collects and stores personal data.
- The “privacy paradox” is a challenge for consumers who demand data protection but want free software and great experience.
- It is urgent to revisit data protection regulations in the era of big data.
- Law will always be a step behind technology advancements.

Figure 5. Summary of review on the impact of big data management on e-commerce enterprises.
5. CONCLUSION
5.1 Conclusion
This literature review suggests that the impact of big data on e-commerce enterprises is highly beneficial. There are three main areas that this paper reviews. E-commerce enterprises can analyze the geodemography of customers. With this strategy, enterprises adapt their strategy based on location. Big data also helps in segmenting markets properly and efficiently. A proper market segmentation will eventually develop tailored marketing which would increase customer retention and reduce overhead costs. Lastly, enterprises can predict the outcomes of a particular decision. Predictive models are built based on customer behavior, which helps the company’s decision making. However, there are serious issues regarding the impact of big data. Since personal data is collected in vast amounts, customers don’t know who, where, and when their data are stored. Concerns of privacy degradation are ever increasing. Regulators must adapt and focus on how data is used to avoid personal data exploitations.

5.2 Further research
The topic big data is a relatively new topic. However, it is actively developing. There are numerous research papers that discuss big data in different aspects. This literature review is limited to examining a few talking points of big data. Additionally, this paper only reviews one issue in privacy. Further research is needed to elaborate the talking points of this review.

Figure 6. Impact of big data management and its relations.
BIBLIOGRAPHY:


