
DATA WAREHOUSE: A TOOL FOR ORGANIZATIONAL EFFICIENCY

CHINYERE, Joy Onyinyechi

Department of Office and Information Management

Faculty of Management Sciences

Rivers State University, Port Harcourt

chinyerejoy2626@gmail.com

ABSTRACT

The purpose of this paper is to provide understanding about data warehouse as a strategic tool for organizational efficiency. Technological acceptance model theory was adopted as the baseline theory for this study. The study undertook an extensive review of literature and discerned that data warehouse is a strategic tool for organizational efficiency. The paper concludes that data warehouse is a strategic tool organizations can deploy to achieve operational efficiency; and recommends that organizations should adopt the use of data warehouse to enable them make timely decisions their routine activities and operations aimed at providing satisfaction to customers, attain greater market share and become more profitable.

Keywords: Data warehouse, efficiency, customers satisfaction, profitability

INTRODUCTION

Firms increasingly leverage their knowledge base to differentiate themselves and their offerings; as knowledge becomes a catalyst for differentiation (Stewart, 2001). Thus, the survival and sustained competitiveness of contemporary business organizations requires them to become information-based and transform themselves into knowledge specialists (Drucker, 1998). This however, also requires them to be adept data collectors, data managers and data users. *Data* – raw or unprocessed descriptions or observations about states of previous, current, or emerging phenomena (De Long & Fahey, 2000, cited in Ateke & Didia, 2017) – has therefore become essential requirements in managers' efforts to navigate their firms. It is observed that rapid advances in technology have led to increase in the volume of data available to organizations. But this has also posed a challenge for some organizations, as organizing and accessing accurate, relevant and up-to-date data when the need arises becomes difficult. Organizations collect data from many external and operational sources. External data includes data from government regulations, blogs, newspaper, website and customers; while operational data include data created from business activities, including purchase and sales invoice, reports, minutes and memos. Data collected from these sources must be properly stored in a manner that allows for easy retrieval and use when they are needed. This is where data warehouse becomes essential to organizations.

A warehouse conventionally, is a space for storing goods or materials until they are needed or ready for shipment. A data warehouse therefore, describes a (physical, logical or digital) repository of data gathered by an organization from external and operational sources (Kumar & Kavita, 2019). Traditionally, data warehouse evokes disks, flash drives and magnetic tapes used to store data. However, advances in technology has provided modern data warehouse that organizations can leverage, to store large amount of data collected from various sources in a central repository that can be easily accessed and updated. As the business world witnesses rapid growth in technology; it also faces a challenge of properly managing the deluge of data that

business organizations collect. Indeed, decision-making is frequently delayed when the amount of data available to facilitate decision-making becomes overwhelming; and this often results in difficulty in translating organizational missions and attaining objectives efficiently. Hence, data warehouse is essential to organizational efficiency. It is a strategic tool required for survival and competitiveness of today's organizations.

Data warehouse is a necessity for managers, as it provides not just a space for data storage; but also enables organizations to carry out data analyses to provide information to facilitate informed decision-making for organizational efficiency. Information is a valuable organizational asset that enables informed decision-making. Yet, information is only "the patterns or trends" discerned from data which develops into knowledge and results in increased capacity to make decisions or take actions to achieve set goals (Ateke & Didia, 2017). Therefore, the need for data to be properly stored so they can be easily accessed whenever they are needed without stress or difficulty is very essential. The onus is on managers to make provisions for the storage and seamless retrieval of data stored when needed. Most organizations have warehouses for products but lack warehouse for data as a result of their lack of knowledge about the importance of data warehouse as a strategic tool for organizational efficiency.

Organizations collect or receive large amount of data regularly; which if not properly stored, becomes difficult to access when the need arises. The result will be delay in decision-making and delayed operational activities. Lack of proper data storage in an organization can lead to loss of important files, difficulty in accessing data, delay in decision making, poor decisions making, loss of customers, waste of resources, and lack of consistency. Therefore, this paper aims to provide understanding of data warehouse as a strategic tool for organizations efficiency. Prior studies have explored the concept and usage of data warehouse and the design, principles and methodologies of data warehouse. But studies on data warehouse as a strategic tool for organizational efficiency are relatively scarce. This paper aims to add to knowledge in this regard.

LITERATURE REVIEW

Theoretical Foundation

The study is anchored on the technology acceptance model (TAM) (Davis, 1985). TAM explains how individuals behave when they are presented with new technology; and identified two key factors that influence individuals' decision to adopt a new technology. The two factors are perceived usefulness and perceived ease of use. Davis (1989) defines perceived usefulness as the extent to which individuals believe that the usage of a particular system would magnify their job performance. Hence, a technology that is perceived useful is the one which users find helpful and productive (Davis, 1989). Perceived ease of use on the other hand, refers to the extent to which an individual trust that using a particular technology would be free of effort (Davis, 1989). Thus, organizations maximize the use of a particular technology when employees using the technology trust that it can assist them in carrying out their duties effectively without stress or difficulties.

Several studies have shown the importance of perceived usefulness and perceived ease of use as predictors of behaviour. Bandura (1982) stated that perceive ease of use is similar to self-efficacy and perceived usefulness is similar to outcome beliefs; and proposed that, in any given occurrence, behaviour would be predicted by both self-efficacy and outcome believe. Schultz

and Slevin (1975) found that perceived usefulness provides a well-grounded prediction for self-predicted use of a decision model. Hence, TAM theory is vital to this study not only because of its explanation of individuals' new technology acceptance behaviour, but also because it enables accurate prediction of the use of new technology in an organization. The theory also explains that trust in the use of new technology can lead to competency, adequacy and flexibility and result in organization efficiency.

Concept of Data Warehouse

The term "data warehouse" was coined by Bill Inmon in 1990 in his book *Building the data Warehouse*. Inmon (2005) define data warehouse "as a subject-oriented, integrated, nonvolatile, and time-variant collection of data in support of management's decisions." Ralph Kimball (1996) defines it as "a copy of transaction data specifically structured for query and analysis." In the view of Kumar and Kavita (2019), data warehouse as a repository for data gathered by an organization from various operational systems, whether physical or logical. Thus, data warehouse can be seen as the collection of large amount of different data from multiple sources that is stored in central storage that can be easily accessed (Roespinoedji *et al.*, 2019; Pathak *et al.*, 2013).

Data warehouse is an information system that contains historical and commutative data from various sources and clarifies the reporting and analysis processes of the organization (Khan, n.d.). A data warehouse can be accessed directly, but it can also serve as a source for creating data marts, which partially reproduce data warehouse contents and are designed for specific enterprise departments (Malinowski & Zimányi, 2008). Data warehouses are becoming increasingly popular tools for the management of data. The most fundamental reason is its ease access to data that is needed for planning and control activities in the organization (Quass, 2000). Inmon (2005) proposed data warehouse are subject-oriented, integrated, nonvolatile, and time-variant.

Subject-orientedness of data warehouse means that a data warehouse gives information about a particular subject instead of about a company's ongoing operations. According Inmon (2005), each type of company has its own unique set of subjects. Therefore, data warehouse processes are designed to handle data with specific themes. Thus it provides easy and precise information around a particular subject by removing unnecessary information that is not needed in decision making.

Integratedness of data warehouse data are gathered from a wide range of sources into the data warehouse and is merged into a coherent whole (Inmon, 2005). *Integratedness* is the most important of all the aspects of a data warehouse. Khan (n.d) states that integration means the establishment of a common unit of measure for all similar data from dissimilar database. On non-volatility as a feature of data warehouse, Inmon (2005) proposed that operational data is regularly accessed and manipulated one record at a time; and that such "read only" data is stable in data warehouse, more data is added but data is never removed, historical data are preserved for comparison and analytics. Thus, this feature is important to organizations as it confers consistent business knowledge on managers.

The last salient characteristic of data warehouse is time variance. Time variance implies that every unit of data in a data warehouse is accurate at some point in time (Inmon, 2005). Thus,

depending on the situation, a record is time stamped. In other cases, a record has a date of transaction. But in every situation, there is some form of time taking to show the moment in time during which the record is accurate. Data collected in a data warehouse are recognized within a particular time frame that offers information from the historical point of view (Khan, n.d).

Organizational Efficiency

Bestman and Chinyere (2021) defined Organizational efficiency is the capability of organizations to avoid wasting resources (materials, energy, efforts, money, and time) in doing something or achieving a task. Kovac (2007) explained organizational efficiency as the positive result of the comparison between inputs and results obtained. In other words, efficiency focuses on the use of little inputs to produce the best output. Therefore, organization efficiency can also be seen as the capacity for organizations to produce or achieve goals with little or zero waste. Thus, the more efficient an organization is the more likely the organization will survive and flourish over a long period of time. How efficient an organization is can be seen as how well it utilizes its resources. Hence, Efficiency involves maximization of effort when working toward a goal (Bestman & Chinyere, 2021). Organizational efficiency is herein, measured in terms of timely decision-making, customer satisfaction and profitability.

Decision-making is the process by which individuals, groups or organizations reach conclusions about what future actions to carry out to achieve a given objective using available resources and based on available alternatives (Schoemaker & Russo, 2014). Timeliness on the other hand expresses the to respond to stimuli within a time frame allocated (Andreadakis & Levis, 1987). Therefore, timely decision can be defined as a resolution or conclusion about specific actions within the time frame allotted. Timely decision involves providing information for decision makers at the right time. Decision making is vital to any organizations, as managers make decision at every point in time in carrying out daily activities.

Customer satisfaction is customers' feeling of excitement that comes from comparing a product's perceived performance to expected performance (Ndubuisi & Nwankwo, 2019). Anisor *et al.* (2010) states that customer satisfaction is the state of mind customers have about a brand and its products when their expectations are met or exceeded. Customer satisfaction can also be defined as the happiness or excitement customers derive products meet or exceed their expectation. Kotler and Keller (2016) suggests that customer satisfaction is vital to a business since satisfied customers are expected to remain loyal, patronize the firm and also spread positive-word-of-mouth about the firm and its product.

Profitability explains the ability of an investment to earn a return from its use. Profitability can also be defined as the capacity of a business to yield financial gain (Evans, 2020; Tulsian, 2014). It measures how efficiently, an organization uses its resources to produce profit or return on investment (Evans, 2020). Profitability analysis is considered one of the best techniques to measure productivity of capital employed and operational efficiency (Tulsian, 2014). Profitability is a necessity for any organizations that wants to survive in the long run or have an edge over competitors. Profitability as a measure of organizational efficiency involves minimizing or avoiding waste in all possible ways in producing a result or achieving a goal.

Data Warehouse and Organizational Efficiency

Data warehouses provide information for timely decision-making that facilitates organizational efficiency. A data warehouse is a dynamic storage system in which data are structured in a way that it can be located easily. Aside ensuring that information stored are easily accessible to the organization, data stored in a data warehouse are presented in a timely manner. In other words data warehouse easily covert raw data into practical information within minutes to assist decision-making. Therefore, data warehouse enhance quick decision-making. Pathak *et al.* (2013) provides that data warehouse saves time of business users by quickly generating reports that guides informed decision-making. The data warehouse are decision support systems when they coordinate data into a repository from which clients can run reports and perform data examination (Roespinoedji et al., 2019).

Data warehouses encourage consistency in organizations as it ensures that data presentations in the organization are uniform. Also information stored in a data warehouse is for the organization at all times. Hence, organizations that make use of data warehouse are consistent because the data collected from various source are stored in a central repository that are represented uniformly. Organizations must be consistent if they must gain the trust of their publics. Lack of data consistency in the organization can result in delays or inconsistency in the organization's communications, and also lead to wrong decision making. Malinowski and Zimanyi (2008) state that a data warehouse produces quality information that is always available, even when access to sources is denied temporarily for technical or organizational reasons. Data warehouse provide consistent view of customers and items across all departments in the organizations and markets that facilitate customer relationships (Kumar & Kavita, 2019).

Furthermore, data warehouse make provisions for changes to be made in the storage system. Thus aside from storing data, data warehouses ensure that changes can be made to data stored in other to handle inevitable changes that may occur at any time, and which may cause damage to data stored in the system (Pathak *et al.*, 2013). Hence, the storage system allows organizations to effect changes to stored data without difficulty. Data warehouse analysis queries do not affect the management of transactions, the reliability of which is necessary for enterprises to work effectively at an operational level (Malinowski & Zimanyi, 2008).

The use of data warehouse enables organizations to save cost and quickly access information needed for effective decision-making. Sakaguchi and Frolick (1997) states that data warehouses enable organizations to benchmark performance with end goals. Data warehouse also decreases cost, promote value added activities and enhance overall productivity (Zeng *et al.*, 2003). Data warehouse according to Kumar and Kavita (2019), provide consistent view of the organization's customers and facilitate customer relationship. Customer satisfaction increase patronage for the organization. Hence, the use of data warehouse allows organizations to respond swiftly to customers' needs and complaints; and thereby, deliver improved customer satisfaction. Furthermore, data warehouse enables organizations to react speedily to competitors and market conditions are a critical to their success and survival (Prem & Karnan, 2013). Therefore, organizations can rely on data warehouses to enable make timely decisions and take actions that could lead efficiency in operations.

CONCLUSION AND RECOMMENDATIONS

Data warehouse has evolved over time and in today's business world, data warehouses have become a necessity for organizations that seek operational efficiency and effectiveness. This paper explored the concept of data warehouse, and probed its role in organizational efficiency. Based on the reports, arguments and convictions of prior studies and scholars, the paper concludes that data warehouse is a strategic tool organizations can deploy to achieve operational efficiency; and recommends that organizations should adopt the use of data warehouse to enable them make timely decisions their routine activities and operations aimed at providing satisfaction to customers, attain greater market share and become more profitable.

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