LEX LOCALIS-JOURNAL OF LOCAL SELF-GOVERNMENT
ISSN:1581-5374 E-ISSN:1855-363X
VOL. 24, NO. S1 (2026)

"LEVERAGING VISUAL INFORMATION IN DECISION-MAKING TO ACHIEVE CORPORATE STRATEGIC TARGETS OF MANAGEMENT"

Aisha Faraj Alkubaisi[1]

[1]Strategic Partnership Manager

aalkubaisi512@gmail.com[1]

ABSTRACT

The study aims to explore how data visualisation techniques and methods can be leveraged to gain organisational agility and increase competitiveness through improved decision making in strategic goal achievement. This study has thus conducted a qualitative inquiry to explore the implementation of data visualisation by managers in aspire zone. The study also specifically focuses on HR function and aims to explore how this technology is being perceptive and utilised in HR function of Aspire Zone. The research methodology and design of this research employed Interpretivists research philosophy, Inductive research methods, Qualitative research approach, Semi-Structured Interviews to collect data and Coding technique (Primary and Axial Coding) for data analysis. The study concludes that data visualisation techniques and system allow managers to make efficient and effective decisions based on visualised data and real evidence. The research concluded that visualisation techniques enable managers to comprehend the complex data in simple way that is more suitable for decision making about strategic targets of organisation. And thus, it could be established that data visualisation techniques positively moderate the strategic target achievement of an organisation. It is also concluded through findings of the research that data visualisation generates competitive advantages in those organisations that consciously adopt and employee such techniques and systems. It increases the agility of decision-making process - managers are better able to respond to external environmental factors that affect business and make relevant policy and strategic changes.

Keywords: Visual Information, Decision Making, Strategic Targets, Qatar.

1. Research Background

Organizations are flooded with enormous volumes of data produced by a variety of sources, such as internal operations, market trends, and consumer interactions, in today's quickly changing business environment (Olaoye and Potter, 2024). For businesses to stay competitive and accomplish their goals, they must effectively use this data to inform strategic decision-making. In this process, data visualization—the graphical representation of data—is essential because it turns complicated facts into insights that are both visually appealing and simple to comprehend (Chandra and Dwivedi, 2022).

Strategic decision-making is the key to organizational success in the rapidly changing IT sector, where creativity and adaptability are critical (Ediae et al., 2024). Finding relevant insights in the sea of data created by user interactions, digital transactions, and technology breakthroughs has become both difficult and essential. Data visualization has become a potent ally in response to this requirement, providing a way to convert complicated data sets into understandable, captivating images that support and direct decision-making (Allioui and Mourdi, 2023).

The potential and difficulties that come with putting data visualization techniques into practice are discussed in this study. We examine the important factors and offer practical suggestions for optimizing the effectiveness of data visualization in strategic decision-making processes, from data quality assurance to tool selection and user training (Edu et al., 2022). Furthermore, this paper leveraging visual information in decision-making to achieve corporate strategic targets of management.

1.1.Problem Statement

According to Kasemsap (2015), technology has had a most significant role in data and information handling, particularly in the last couple of decades. Technology and information are essential in the operation and fulfilment of the objectives of an organisation. To support the importance of technology in companies, managers must understand the evolution of technology and its importance over the years from some points of view such as (Kasemsap, 2015): cultural change in the managers and people in charge of the operation of the companies, use of proprietary technologies and the annual increase of investment with respect to the annual IT budget. This growth rate is proportional to the degree of maturity of information technologies, which has generated a strategic differential for companies with respect to their market competition (Mosavi, 2014). Fiaz et. al. (2015) argued that due to the importance of information in business decision-making and strategic planning, the role of information technology (IT) has changed over the years. Over the years, the position of IT in the business and strategic concept has changed what has turned IT technologies into a commodity, changing its privileged position in the market to a defensive and highly competitive position (Fiaz et. al., 2015). The elements that the author describes to identify IT as a commodity are (Larson and Chang, 2016):

- High standardisation and homogenisation
- Scalability of functions
- Projection of non-proprietary applications

Similarly, Albright and Winston (2014) concluded some notable elements that identify the beginning of the commoditisation of the IT world can be the high technological offer, high capacity to satisfy particular needs without incurring additional costs and the change in the business models of the IT manufacturers. These changes have generated a radical change in the supply and demand of the markets. A clear example of this is the incursion of new web-based business models such as IaaS, SaaS, PaaS, among others (Albright and Winston, 2014).

In addition, according to Lee and Lee (2015), each change in the markets generates new opportunities and challenges, e.g., moving from an offensive position to a defensive position, which does not mean that IT technologies are no longer basic in the day-to-day operations of a company or sector. Technology goes from being a differentiator in business strategy to a basic element for good operation, which generates new rules and priorities in the business environment versus IT technologies, some elements are (Lee and Lee, 2015):

- Optimisation of expenses and IT investment amounts
- Investment in mature technologies
- Focus investment priorities on managing potential vulnerabilities (Risk Management)

According to Finch and Flenner (2017), the information to be the heart of any business generates that technology is the backbone within the business architectures. The manufacturers and integrators of technology will have to use all their experience, knowledge and creativity to look for new forms of business that allow the companies to focus their efforts on the core business, outsourcing10 an exit? What happens with confidential business information? We will have to find balance points and adapt those technologies trends to specific needs of the business, in order to ensure that the return on investment is the expected by the organisation and thus establish technology as a facilitator of compliance with business objectives (Finch and Flenner, 2017). Therefore, Janvrin, Raschke and Dilla (2014) stated that the main problem statement in this study is to investigate whether Qatari businesses and managers are using big data analytics and data visualisation to increase effectiveness of business decisions. The study aims to explore how data

visualisation is being applied by Qatari managers to gain organisational agility and increase competitiveness. This study has thus conducted a qualitative inquiry to explore implementation of data visualisation by managers in aspire zone. The study also specifically focuses on how to achieve corporate strategic targets from both functional and operation and aims to explore how this technology is being perceptive and utilised in almost each departments strategic function of Aspire Zone.

1.2.Research Aim and Objectives

The aim of this research is to analyse the effects of visual information for enhanced management decision-making on corporate strategic of the organisation function and operation. The objectives of the research include:

- To explore the concept of visualisation in enhanced decision-making
- To analyse the impacts of visualisation on the quality of management decision-making to achieve corporate strategic targets
- To provide a list of recommendations through which management decision-making can be improved.

1.3.Research Rationale

The primary reason for conducting this study is researcher's personal interest. This is because the researcher's aim is to pursue her career in the business strategy development due to which the current research will aid author in understanding the role of visualisation for enhanced decision-making. Secondly, a number of researches have been conducted on the effects of visual information for enhanced management decision-making on organisational targets. However, these researches are based on Western perspective i.e. US and Europe while limited researches available which are conducted in Gulf countries specifically Qatar. The organisational culture and external factors of Qatar and Western countries are entirely different due to which it is of immense importance to analyse the effects of visual information for enhanced management decision-making on business decisions and strategy in Qatar.

2. LITERATURE REVIEW:

2.1.Advantages of Interacting Visualisation in Management Decision-Making Process

2.1.1. Become an Agile Organisation through Timely Analysis of Information

In one form or another, interactive visualisation has existed for some time. It is much easier and faster to isolate critical information when the data is presented on a map. Similarly, there is no need to debate the usefulness of graphs and maps, which facilitate the identification of trends and patterns. However, graphical representations only provide partial visibility of the situation (García-Peñalvo and Conde, 2014). Without visualisation, which provides direct access to the underlying data, they are of limited value if the user is forced to use other tools or interfaces to obtain the specific data they need. In the same way, it can be interesting to switch easily between two visualisations depending on the specificities of a search (Wang et al., 2015). It is not necessarily obvious, for example, to immediately identify the most appropriate graph for a given set of information. Today, some organisations, eager to efficiently manage their complex datasets, are seeking advanced data visualisation tools. In this sector, the market is developing to meet the expectations of experts. Now, they have a wide range of tools at their disposal and take advantage of new solutions, innovations and mass marketing of existing products to perform their job in the best conditions, to immediately identify the most appropriate chart for a given set of information (De Mauro, Greco and Grimaldi, 2016).

2.1.2. Representative Data Visualisation Improve Decision

The visualisation of data is defined as the visual and interactive exploration and the corresponding graphic representation of data of any dimension, nature (structured and unstructured) and origin. Visualisations allow people to see things that were not previously evident. Even when the data volumes are huge, trends can be quickly and easily identified. The visualisations transmit information in a universal way and simplify the task of sharing ideas with other people (Kasemsap, 2015). It is a way to obtain quick information through visual exploration, consistent reports and flexible exchange of information. It allows a wide range of users to understand the growing amount of data in their company. It is the best way to present big data that the users of the company can understand and use it right away. Big data refers to techniques that are used to analyse very large volume of data in order to identify trends, patterns and relationships to make decisions such as using bid data to study consumer behaviour. Data visualisation makes the history of your data come alive. The data visualisation can be used for different purposes (Knaflic, 2015). Some examples may include creating and sharing meaningful reports with anyone and wherever, enable any of the organisation to visually explore and analyse all available data, optimise business processes, encourage innovation, predict and quickly identify opportunities and anticipate future trends

A human brain is simply not capable of processing the huge amounts of data that are generated or processed in a modern company. That means that executives make decisions every day without knowing all the information that is hidden among the company's data. Thanks to visualisation, the brain manages to process, absorb and interpret a large amount of information (Mosavi, 2014). The data visualisation was created to explore and analyse the data in a visual and fast way. It is designed for anyone in the company who wants to use and extract conclusions from the data regardless of their analytical capabilities: from influential people, decision makers and analysts, to statisticians and data experts. It also offers IT a simple way to protect and manage the integrity and security of data (Gupta, Goul and Dinter, 2015). The data flow will continue to increase; meanwhile, in many cases, the time and resources to interpret them will be less and less. Data visualisation will be one of the few instruments that can help us to overcome these challenges. A number of benefits of data visualisation for managerial decision-making are stated by Fiaz et al. (2016). Firstly, data visualisation allows forecasting market trends and developing the business. Secondly, data visualisation helps to unravel conclusions from the data and to discover trends in the business and in the market, which affect their results. The perceptions coming from the data can give firms competitive advantages (Fiaz et al., 2016). Thirdly, the data visualisation allows to make an "intelligent" reading of the market, to compare its general position with the tendencies of the sector, to define the most appreciated characteristics of its products and to adapt its development accordingly, to combine the information on sales with the preferences of the consumers (De Mauro, Greco and Grimaldi, 2016). Fourthly, the data visualisation allows managers to know the needs of the clients and act accordingly. Knowing customers better leads to greater efficiency in sales and marketing actions and improves the customer experience (Larson and Chang, 2016). Fifthly, data visualisation allows managers to share information quickly and make the right decisions at the right time. Lastly, data visualisation provides information that is easy to understand and exchange. Enterprise KPIs are constantly under control. Data from a variety of internal and external sources are directed towards a single shared point of information exchange. It is information obtained from the data that can give wings to innovation (Janssen, Voort and Wahyudi, 2017).

2.1.3. Effectiveness of Visual Information Approaches with Management Strategy Process

Due to the great advance that has been experimented along the last years in the technologies, more specifically in the world of the technologies of the information and the communication, the companies have had to adapt to different challenges, but there is one that has gained great importance over the last few years. This challenge is how to manipulate, manage, store, search and analyse large volumes of data. These problems are commonly addressed under the term Big Data analyses and data visualisation is one of the techniques that fall under the umbrella of big data. The purpose of big data is to address the great challenge facing the companies regarding treatment and analysis of large data repositories (Albright and Winston, 2014).

The technologies and tools offered by big data are particularly helpful for decision-making processes of companies. The effectiveness of strategic decisions increases provided that it is based on historical data as well as future trends forecasts. However, integrating and manipulating complex factors is not an easy task and not everybody can do it. The data visualisation techniques help to achieve this by manipulating a large amount of data. Therefore, data visualisation is applied to all that information that cannot be processed by traditional methods. Data visualisation is often based on a database. A database is a set of interrelated data. When talking about a relational database, reference is made to the relational data model theory, which has a strong mathematical base. The relational model is characterised very broadly by providing that all the information that must be contained in tables and the relationships between data must be explicitly represented in the same way. What is achieved with this model is to always work on related tables? Avoiding duplication of records and guaranteeing referential integrity, meaning that if a record is deleted, all related records are deleted. The great inconvenience that presents is the time necessary to handle large amounts of data, but this is achieved thanks to data visualisation techniques. On the other hand, what it achieves is while working with databases analyst can combine different types of data and in a formalised manner (Lee and Lee, 2015).

Data visualisation techniques help to analyse data for new business opportunities through improved segmentation and cross-selling of products (improvement of the strategy). Data visualisation techniques, by applying analysis and predictive modelling to customer account data and transaction history, allows managers to carry out a segmentation based on the likelihood that the client will hire complementary services or products, or contract services. Thus, Data visualisation techniques provide greater value by improving segmentation). Data visualisation techniques have also been applied by managers to analyse the consumption of the services and products of the clients; the company can optimise cross-selling strategies, refine marketing messages and provide specific offers. It is possible to predict with greater accuracy which products are the most appropriate for each client (improvement of the strategy) (Janvrin, Raschke and Dilla, 2014).

Data visualisation techniques provide the right combination of services and products to improve the effectiveness and efficiency of the company's sales force, while the more personalised touch helps agents to forge closer ties with customers, which improves loyalty (improvement of the strategy). Operational Improvements: Greater capacity for visibility of the business through more detailed reports. Managers also use Data visualisation techniques to analyse web browsing and online consumption habits. They are being used to analyse Social Networks activities. They determine the social circles of customers from phone interactions and online social networks

generates a complete view of customers, identifying the role they play in their circles and their degree of influence (Finch and Flenner, 2017).

Data visualisation techniques also help in Viral Marketing (marketing that exploits social networks) to detects more influential clients, to maximise the diffusion of products and services (thus providing better knowledge of customers and the market in social networks). Data visualisation techniques help to understand trends in browsing data. They help to analyse Web browsing and online consumption habits: extract new and valuable perspectives from customers. The user is identified (location, terminal status, access services), sites and searches are monitored by word, URLs visited, browsing time, etc. Thus, they improve knowledge of the client. Data visualisation techniques also help to develop a predictive system of analysis and data crossing allowing mangers to anticipate possible problems that may arise in the future, such as a catastrophe risk forecast that would allow adjusting the pricing policy and provisioning funds for possible payments. Data visualisation techniques have also been used to improve process management. They allow the visualisation of current processes in a simplified manner and indicate opportunities for process improvement waste reduction and cost reduction (García-Peñalvo and Conde, 2014).

Overall, it can be inferred that data visualisation technique helps managers to analyse data in a variety of matters that have strategic importance for the company. Strategic management and strategic decision processes are critically based on the information. Data visualisation techniques are used to summarise the information in the most convenient manner so that managers can understand every factor that affects business and thereby developing a strategy that accounts for all factors and provides effective decision-making for the company. Thus, it can be inferred that Data visualisation techniques can be used to develop sustainable competition advantage through effective and agile decisions.

2.2.Challenges of Implementing Data Visualisation System

2.2.1. Challenges Related to the Capture and Storage of Data

The first challenge to address has to do with the accessibility of data. The distribution, replication, migration, performance, reliability and scalability.

2.2.2. Challenges Related to the Processing the Data

The processing of data ranges from the discovery of the data to its recovery, quality assurance, value addition, reuse and preservation over time. The disadvantage with traditional tools (mainly the models that work with structured data) is that they do not have the capacity to handle these processes efficiently. This means that there must be innovative techniques from the capture, representation and storage of the data to its visualisation after the analysis processes, bearing in mind that these techniques should be able to be applied at a low cost (Gupta, Goul and Dinter, 2015).

2.2.3. Challenges Related to Data Security

The security of data has two main concerns (1) Privacy, which is the most sensitive with conceptual, legal and technological implications and is defined as the right of people to control or influence what kind of information related to them can be revealed. (2) Access and Participation; the challenges, in this case, are numerous and have to do mainly with legal aspects, reputation, national security, competitiveness, secrets of industry and the lack of incentives and information structures that can be public (Mosavi, 2014).

2.2.4. Challenges Related to the Visualisation of the Data

The main objective of the visualisation of the data is the representation of knowledge for the understanding of the human being, using different mechanisms that turn out to be more intuitive

than sophisticated approaches. According to Kasemsap (2015), the main challenge facing this representation is in the large size and diversity of the data. Currently, most visualisation tools must face performance and scalability issues. This means that the techniques and technologies that have been used for years must be rethought to address these challenges in a more effective way (Kasemsap, 2015).

2.2.5. Challenges Related to Organisations

Organisations that do not set clear objectives from the beginning, simply store data that will not know how to take advantage in the future, resulting from this exercise possible frustrations and the abandonment of these technologies. On the other hand, organisations will have to increase their efforts to deal with all the cultural impact that new tools bring with respect to the privacy of the data and the distrust of the users to offer them (Wang et al., 2015).

3. METHODOLOGY

This study chose to conduct semi-structured interviews. The reason to choose semi-structured interviews is that they offer more flexibility to make follow up questions as compared to structured interviews. Structured interviews are inflexible and there is no room to make follow up questions and all participants are given a predetermined list of questions for data collection. Furthermore, unstructured interviews are highly flexible but they are also time-consuming and the participants may lose focus on the research topic because only open-ended questions are used in unstructured interviews. Therefore, semi-structured interviews are considered as the middle way between the two extremes that provide sufficient flexibility and time efficiency as highlighted by Neuman (2011). The questions in the semi-structured interview are formulated in a way to provide a complete scope of learning about the individual views, thus allowing the researcher to collect different perspective of information accordingly. The information obtained by means of semi-structured interviews has been systematically transcribed at the later stage of the research process and also has been analysed into respective themes. Each interview session lasted for 10 to 15 minutes based on which individual view on the subject has been collected.

According to Christians (2000), sampling refers to identifying a limited number of members of the target population as sample or representative of the entire population. The key principle is to select a sample that is true representative of the population. The researcher then conducts research process as based on the sample and then assumes that the results can be generalised to the entire population. Sampling is often performed because the researcher is unable to gather data from the entire population. Since the target population of this study are managers in Aspire zone Qatar and the researcher does not have the means to involve all managers, therefore, a sample was determined for the purpose of this study.

Sampling size is considered important because it affects reliability and validity of the results and conclusion derived in the study. For quantitative research, statistically, a sample of at least 30 (it can be less or more depending on the nature of the research) members is required for reliable sample size. Since this study is qualitative in nature and data collection and analysis process is significantly longer, therefore, this study adopted eight managers in Aspire Zone as sample size. The research population in the current research involved managers in Aspire Zone Qatar. The generalisation of the subject may not be easy in reference to subjective or interpretivist view of the research, hence, each individual has been asked questions on the different context of experiences and approaches that are applied in their professional activities. The selection of sample population is ensured to be free from all biases and individual opinions hence; the research population has been selected accordingly. The research sample has been selected by using non-

probability sampling technique in which convenience sampling has been specifically applied. In this respect, almost 10 HR managers working in Qatar have been selected as the sample population.

4. DATA ANALYSIS

4.1.Demographics

This study recruited managers from Aspire Zone for interviewing. There was total 10 initial recruits for the interview. After the preliminary review of the data analysis, it was decided to discard two interviews since these interviews were not complete as the managers had to leave due to some unforeseen circumstances. In order to bring rigor in the data analysis for this qualitative study, these two incomplete interviews were removed. In total, 8 interviews were included for data analysis in this research.

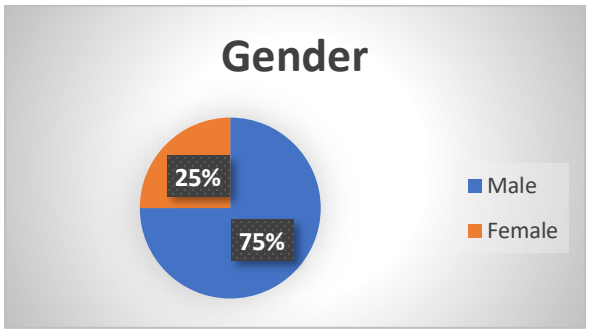


Figure 1: Gender

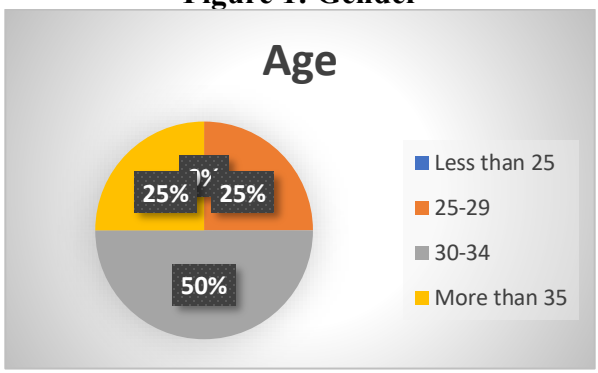


Figure 2: Age

Figure 1 represents the gender of the research participants involved in this research. Among these 8 participants, 6 (75%) were male and 2 (25%) were female. This combination brought the current research with gender neutrality among the findings. Figure 2 represents the age of the research participants involved in this research. Regarding the age group, the majority of the managers belonged to age group 30 to 34 years (50%), followed by age group over 35 to which 3 participants (38%) belonged to and one participant was between 25-29 years (12%). However, no participant aged less than 25 participated in this survey. These demographics were also in line with the current demographics of managers working in Aspire Zone.

4.2.Analysis of Close-Ended Questions

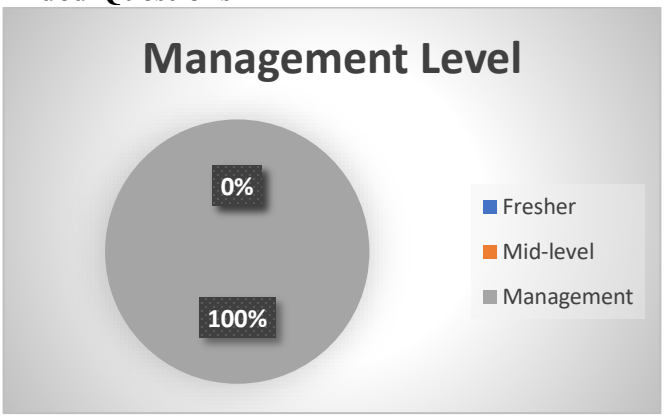


Figure 3: Management Level

Figure 3 represents that the participants involved in this research were from the Management level. None of the participants was Fresher or Mid-level.

Figure 4: Corporate Strategy

Figure 4 represents the responses of research participants who were inquired regarding the fact that the corporate strategy is affected by the global competition. All participants involved in this research showed agreement with the statement. This shows that there is a direct impact of corporate strategy on the global competition.

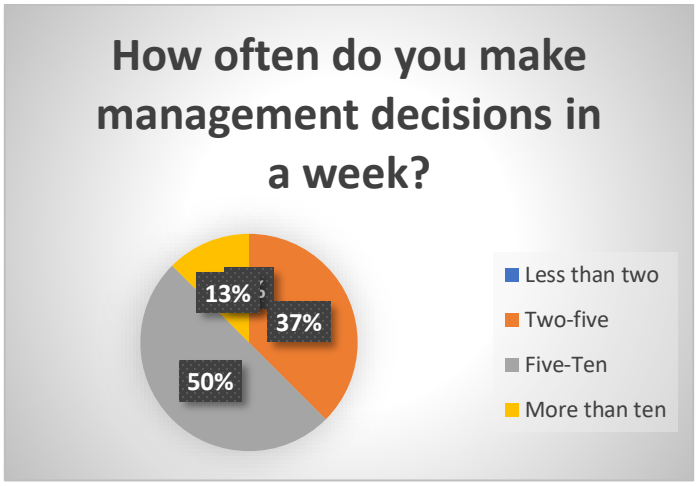


Figure 5: Frequency of Management Decisions

Figure 5 represents the responses of research participants who were inquired regarding how many management decisions do they make in a week. The majority of the participants (50%) stated that they make five to ten management decisions in a week followed by two to five (37%) decisions in a week. However, only one respondent (13%) stated that he makes more than 10 management decisions in a week. None of the participants stated that they make less than two decisions in a week which shows that the managers of Aspire Zone frequently make management decisions in a week.

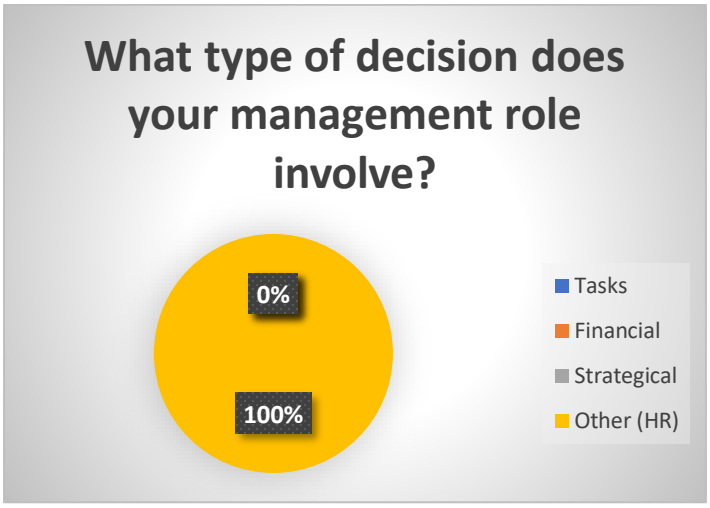


Figure 6: Decisions and Management Role

Figure 6 represents the responses of research participants who were inquired regarding the type of decisions they make in their management role. It was revealed that managers at Aspire Zone make only HR related decisions. This is because none of the managers responded that he/she make financial, strategical or task-based decisions.

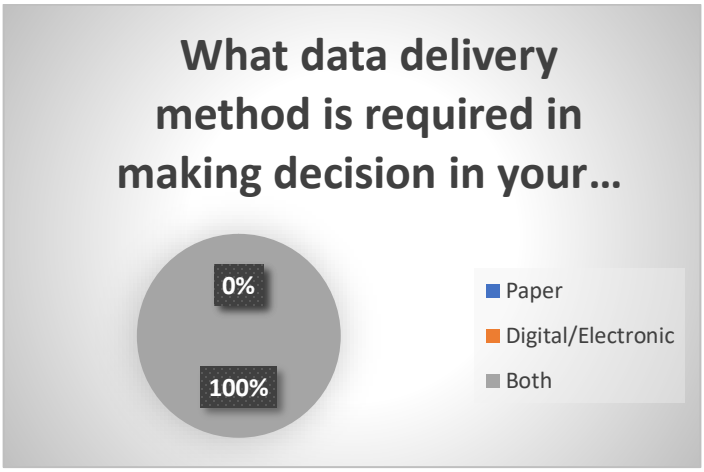


Figure 7: Delivery Method

Figure 7 represents the responses of research participants who were inquired regarding what data delivery method they use in making a decision in their management role. It was revealed that all of the managers working at Aspire Zone use both paper and digital/electronic methods for making a decision in their management role. None of the research participants stated that he/she solely utilise paper or digital/electronic method rather they use of both them in their management role.

4.3.Discussion and Objective Analysis

4.3.1. Role of Data Visualisation in Business Decision-making process

The interviews provided a variety of answers in which managers highlighted the role of data and data visualisation tools in decision-making. One of the managers emphasised the increasing role of data visualisation and stated:

"More and more often companies require their managers to make critical and importantl decisions in a short space of time, in an accelerated way and expecting an almost immediate response from them to the challenges and setbacks that arise every day. And it is not that it is impossible to satisfy this growing demand for greater operability; the really difficult thing is to do it in an effective and efficient way, minimising the possibilities of error and making the most of new business and growth opportunities. It is at this point that the importance of data visualisation tools takes on a dimension for many unusual and unexpected, making the dashboard design an ally every day more essential for a correct, effective, fast and efficient decision-making."

Similar findings were reported by García-Peñalvo and Conde (2014) who concluded that by integrating data visualisation tools in the design of dashboards we can, with a single glance, become aware of the state of the different processes that are being carried out, design in a few minutes what if scenarios , evaluate the performance of the multiple corporate activities through the relevant indicators in a few seconds and, with all this, make decisions adjusted to a reality of which, despite being constantly changing, we nevertheless possess all the necessary knowledge to reduce the risks and exponentially increase our chances of success. Another participant exemplified the ability of data visualisation in decision-making by referring to international coffee chain Starbucks and said that if a manger wants to decide to cross time information with sales, he/she can predict how many coffees will be ordered every hour depending on whether it is cold, hot, it rains or the sun rises. However, the underlying calculation and statistical results are so complicated that only experts could understand and interpret them. However, data visualisation

can make it easy even for a person who does not know statistics to understand various results such as demand increment or reductions due to weather changes.

Similar example was cited in the study of Gupta, Goul and Dinter (2015) who argued that data visualisation can be used by managers in rental companies such as Airbnb, which, after analysing the characteristics of the dwelling, environment and city of the users, can offer its clients prices adjusted to their needs. Using these examples, it can be inferred that there is enormous power provided by big data to managers in daily operations. It has vast potential to manipulate data to identify and meet needs of the consumers and enhance business operations. It helps in streamlining decision-making, which is already occurring instantly, in order to detect deficiencies, opportunities and react or anticipate market demands. Thus, it provides competitive advantage. One of the participants stated:

"*It [data visualisation] gives organisations a much deeper knowledge of the customer [their tastes, what they do and how they interact on the web, blog or social networks] to define personalised products and services. It also optimises the operating processes and reduces costs, because you can foresee failures or obsolescence of a machine*"

The statement above when analysed within conclusions of Knaflic (2015) who indicated that data has become a resource and even asset for business organisations and therefore data visualisation is a medium to exploit or utilise data as a resource. Comparing data with oil, the author analogised that similar to oil data is a valuable resource which must be extracted, refined and used in the same way. Another manager said that a new concept of evidence based management has emerged where managers make decision on the basis of rigorous data analysis techniques. The manager stated:

"*Evidence-based management is beginning to spread as a practice in management. There, big data plays a fundamental role, which is why business schools like ours consider it essential to offer this type of training for companies*"

According to Zabukovec and Jaklič (2015), to gain competitive advantage managers are now increasingly depending upon data and evidence instead of instincts and the analysis of large volumes of information serves to detect deficiencies and anticipate the market. The author mentioned that 65% of companies believe that ability to analyse data is basic to survive and even more important than their product. Within the context of decision-making, one of the managers reported that:

"*Its value is critical in decision-making and one of the most important factors in business transformation*"

Similar conclusions can be drawn by the example of multinational company Procter & Gamble (P&G) cited in Larson and Chang (2016). P&G has undertaken a radical change in culture by putting the data at the centre of their business. The company has installed two tools (Business Sphere and Decision Cockpit) that allow managers to view your financial information live through refined graphics which is a clear example of data visualisation techniques. Some 40,000 employees, from the manager to the vendor, have access to the platform, whose efficiency savings are estimated at around 790 million Euros.

4.3.2. Benefits and Applications of Data Visualisation

One of the managers highlighting benefits argued that:

"*Data visualisation provides greater access and information transparency influences the democratisation of decision-making. The more the spectrum is expanded, the higher is the*

democracy in decision-making process because every manager can understand and use data visualisation techniques."

According to Janssen, Voort and Wahyudi (2017), data visualisation also helps to take measures immediately, which facilitates the correction of errors in processes or marketing campaigns to reduce risks, improve quality and profitability. Therefore, adapting to this scenario requires understanding that there is no need to wait for monthly meetings to adopt measures. Thus, more and more managers can be involved by taking their input and make decisions accordingly. This can be fairly related to the democratisation mentioned by the interview. Another participant mentioned that a large number of documents, images, videos and audios are either archived or thrown into the wastebasket without being used. Data visualisation can use every piece of information and thus another important benefit of data visualisation is that it minimises waste of an important resource, i.e. data. The study conducted by Bačić and Fadlalla (2016) mentions various industries where data visualisation applications are being used which include telecom, banking, retailing and insurance. These companies are utilising data visualisation technique to understand consumer behaviour and are developing more personalised and specialised products and services instead of offering generic products. One of the benefits mentioned by a manager is:

"They [data visualisation technique] are being used in human resources. The big firms are using them for the selection of candidates, to know the productivity of their employees, aptitudes for future promotions and compatible profiles in case it is necessary to form an international team."

The results above match with previous results reported in section 4.1. where all of the participants indicated that they use both electronic and paper for data delivery methods. In Similar examples have been cited in Janssen, Voort and Wahyudi (2017) who highlighted that many businesses are purely digital companies such as Amazon, Google, Netflix, Spotify, Facebook or LinkedIn, whose success is based on carrying the data in their DNA from birth. However, the author also mentions that the use of data visualisation, meanwhile, is limited to two areas. Firstly, contextual marketing, which uses information such as weather information, geo-positioning and/or user receptivity that helps marketers to increase effectiveness of advertising. Furthermore, businesses also sell customer data (while complying with legal regulations) and can earn revenues from information. Therefore, it is considered to be an asset for the company. One of the managers pointed out that one of the main benefits of data visualisation for businesses is that idle data that is being stored continuously in the database can be used in analysis and utilised. The participant stated:

"*You can take advantage of the data that is stored but not used, buy it from external suppliers and even encourage the consumer to provide it, which will be easier to obtain with the millennial generation, since they are already used to managing their level of privacy in exchange of economic returns and user experience*"

Overall, it can be fairly reported that there are several and wide variety of benefits that big data and data visualisation techniques offer to managers.

4.5 Barriers/Challenges to Data Visualisation

One of the participants mentioned that one of the biggest challenges is security of data which inhibits implementation of data visualisation techniques. Since these techniques ease the access to data and information, therefore the risk of being misused increases. Ensuring high level of security and company privacy becomes an important issue which create resistance among leadership as well as managers. Similar conclusions have been drawn by Gupta, Goul and Dinter (2015) who argued that there are significant issues regarding prevention of misuse of information

and data visualisation techniques. The author suggested that there is a need for managers to ensure that only relevant and authorised personnel has access to the system and there is proper check and balance to prevent misuse. Another participant pointed out challenges as:

"*Once the implementation part is over, two other problems arise. The first, govern those data and be clear about the use case*"

Similar conclusion has been drawn in the study by Mosavi (2014) who stated that appropriate data visualisation technique must be applied to process a very highly fragmented information so that managers can establish patterns and understand correlations. The author called it separating the grain from the straw, i.e. to extract the most relevant information. Furthermore, the author also recommended that data visualisation techniques are able to present same data and information in different ways and therefore it may create differences in interpretation and create confusion. Confusions may create impediments in decision-making due to partial interpretations, blocking of decisions, disconnection between departments and skewed and very expensive analyses. The study also recommended various tools that can be used to prevent these confusions. These tools can integrate data, such as Hadoop or Spark and in platforms with a broad analytical and ergonomic spectrum that present agile and attractive information, such as BigML or Dataiku, advises Carricano (2014) of EADA. One of the managers presented an interesting simile,

"*There is no point in having large highways if there is not a sufficient flow of passengers or if the benefit does not justify the investment. Neither of the best technology if the companies are unable to assess the information*"

The participant further explained that one of the challenges is lack of strategic planning regarding data visualisation system technique. Similar conclusions have been presented in the study of Kasemsap (2015) that senior leadership must clear direction, with budgets and long terms plans to implement data visualisation techniques including training for managers to use them in decision-making process. Another participant indicated one major challenge in implementation of data visualisation techniques by stating,

"An important limitation is the lack of qualified professionals that can manage data visualisation system. Companies must create a multifaceted team, where a scientist (who applies mathematical and statistical models analysis), an architect (responsible for building the system and its interrelationships with the sources, processes and business operations) and an engineering engineer are essential (responsible for the technology to work)."

Similar conclusions were drawn by Wang et al. (2015) who indicated that researchers face a crucial challenge because the subject is new and there is a need to educate not only managers, but also the students who are going to take leadership position in long term. The study recommended that adequate professional and qualified team for system management is critical for the success of data visualisation and to utilise it business operations.

4.3.3. Data Visualisation in HR and Performance Appraisal

One of the managers reported that big data and data visualisation techniques are also being used in HR activities, particularly in recruitment and selection. The participant stated:

"As in most professional fields, the value of data analyses has also had strong influence in the area of human resources management."

Similar conclusions have been drawn by Bačić and Fadlalla (2016) who concluded that businesses have been using data analysis techniques increasingly and in wide variety of ways. The study mentions a report by SAS in Europe indicated that by 2018 there will be 6400 organisations with more than 100 employees who will have implemented Big Data in their HR departments.

Since HR management is a crucial function in organisation, therefore HR is no exception to impacts of data analysis techniques and evidence based decision-making. Another manager reported within the context of data analysis in HR context that:

"*This is not a novelty if we take into account that the concept of Big Data is flitting through all the business scenarios in the world. The management, evaluation and use of large volumes of data have become a mechanism to improve the professional performance of people.*"

Since data visualisation is integral to big data analytics, therefore it will inevitably be used by HR professionals. Similarly, García-Peñalvo and Conde (2014) concluded that through the monitoring, evaluation, analysis and exchange of data related to the performance and achievement of objectives of employees, organisations and in particular their areas of human talent management, can obtain a global and detailed view of the performance of their team, its areas of improvement and its strengths. Another manager stated:

"*The application of data analysis allows making more accurate and fair decisions with employees, based on real information about their performance, as well as serving as an input to increase motivation and commitment within the organisation.*"

Albright and Winston (2014) concluded that although big data has significant potential, yet there is only limited application of data visualisation techniques in HR profession. Although most organisations have not yet entered the Big Data trend to manage the performance of their human talent, three major activities are likely to adopt big data analytics and data visualisation techniques before other activities, recruitment, employee retention and smart training. Within this context, interviewees were asked to opine about role of data analysis in decision-making of HR professionals. One of the managers stated:

"*By using a large volume of data, the human resources department can be much more analytical and strategic in its recruitment processes. Instead of navigating through hundreds of repetitive curriculums and depending on hunches and sensations, it is possible to take advantage of the real data to avoid falling into bad contracts.*"

The statement above is particularly important within the context of results presented in section 4.1 where participants indicated that they make 5 to 10 decisions every week and therefore using data visualisation is critical for the accuracy in handling large volume in data. Similarly, Lee and Lee (2015) concluded that there is significant potential for data analytics in recruitment because, this activity involves large and fragmented data. Recruiters are always finding new and innovative ways to filter down large number of applications to find most suitable candidate for the vacancy and filtering down large number of CVs is a very tiresome yet very critical activity. Data analysis can be utilised to analyse data about participants such as their presence and behaviour in social networks, online databases, records of previous jobs and applications to vacancies, configure valuable information to choose the right person for the organisation. Another manager stated that employee retention is very important for HR professional, the manager continued,

"*One of the advantages of using the data in the organisation is the possibility of understanding the reasons why employees leave or stay in the company. Tools such as satisfaction surveys, work climate evaluations, exit interviews, etc., make it possible to predict and prevent the attrition of people with their work.*"

Finch and Flenner (2017) highlighted employee recruitment has become increasingly complex, because researchers have identified a variety of multifaceted factors that affect overall employee intention to quit. Therefore, it is obvious that HR professionals need to collect data about various variables and then analyse them properly to develop effective retention strategies. Within

this context it can be fairly reported that data analysis is likely to gain important role in this aspect of employee retention strategy. By analysing these diverse data sources, it is possible to identify the specific problems that lead to increasing the turnover of people in the company and to create strategies to attack those situations, strengthen commitment, generate satisfaction and boost global and individual productivity. Within the context of employee training, managers reported that training needs analysis can be improved by using data analysis. The respondent stated:

"*The training programs aimed at harnessing the potential of employees and contribute to their professional training are needed to strengthen productive capacity in organisations, but sometimes are very expensive and do not produce the expected results.*"

Within this context, García-Peñalvo and Conde (2014) argued that data analytics is a key tool to measure the effectiveness of these professional training policies and ensure that the investments being made are smart. Human resources should focus on obtaining data to know if employees are taking advantage or not of the development opportunities that are offered to them and if they are correctly applying that knowledge in their work.

5. Conclusions

The purpose of this study was to understand the role and benefits of data visualisation techniques and tools in business decision-making. This study concludes that in general, organisations use data visualisation systems as an important element of business intelligence systems that generate useful information from the data in order to improve the decision-making process. This is because these systems allow identifying, store, analysing and generating reports about business information. Furthermore, within the context of decision-making, the reason why data visualisation systems help in decision-making is mainly that it allows access to company data, analyse and show the results in an easy-to-understand manner without technical terms and jargon so that decision-makers have more polished and more processed information. These results in decision makers guiding the organisation's management based on evidence. With all this, it is possible to consider that the information resulting from the use of data visualisation systems is an asset for the company because benefits will be obtained from its use.

Following the issue of decision-making, this study concludes that it is possible to determine that there are systems that support different decisions depending on the area to which they belong. Thus, the strategic decisions that are in charge of the top managers will be supported by systems mainly report that allow the CEOs to have a bigger snapshot of the organisation and given that to make decisions related to price, quantity, channels of distribution, etc., that is, decisions that are related to the competitive position of the company. The high-level management such as Chief Information Officer (CIOs) in most of the organisations is looking to understand what Business Intelligence and data visualisation mean for business strategy and decision-making process. The main benefit of using data visualisation technology is that it is capable of creating a high-quality data infrastructure with greater "usability" and integration. This means that the information itself is more consistent with all areas of the company and, therefore, it can be said that the data visualisation systems transform the data into more quality information.

The study also confirms that considers that it is essential for people in charge of making decisions in an organisation, to have information systems that provide them with everything necessary to evaluate possible alternatives of action and finally choose one based on empirical data. Furthermore, the study also recognises that given the current context where companies are faced with a dynamic environment, it is necessary to use the information in order to improve the performance of the organisation. To achieve this, companies must use available data and integrate

findings into the decision-making process that allow managers to keep track of the company and its processes and establish future paths to follow. Along with this, the study confirms that data visualisation systems must be available not only to senior managers but to most employees. For example, this study confirms that data visualisation tools are very helpful in decision-making processes of HR professionals. Since HR management is a crucial function in the organisation, therefore, HR is no exception to impacts of data analysis techniques and evidence-based decision-making. Data visualisation also helps in managing teams more efficiently through the monitoring, evaluation, analysis and exchange of data related to the performance and achievement of objectives of employees, organisations and in particular their areas of human talent management, can obtain a global and detailed view of the performance of their team, its areas of improvement and its strengths. There is significant potential for data analytics in recruitment because; this activity involves large and fragmented data. Data analysis can be utilised to analyse data about participants such as their presence and behaviour in social networks, online databases, records of previous jobs and applications to vacancies, configure valuable information to choose the right person for the organisation. In addition, data analysis is likely to gain an important role in this aspect of employee retention strategy. By analysing these diverse data sources, it is possible to identify the specific problems that lead to increasing the turnover of people in the company and to create strategies to attack those situations, strengthen commitment, generate satisfaction and boost global and individual productivity.

In conclusion, data visualisation systems allow organisations to make better decisions based on data and real evidence about their performance. The fact of making better decisions implies that the company is in a better position to face the complications that may arise in a competitive environment. In other words, data visualisation systems generate competitive advantages in those organisations that take advantage of these systems for their benefit. It increases the agility of decision-making process and thus increases organisational agility. Thus, managers are better able to respond to external environmental factors that affect business and make relevant policy and strategic changes to manage risks and threats created by the external environment. Furthermore, organisational agility also helps the manager to identify opportunities in the market and exploit them to gain a competitive edge and sustain profitability and performance.

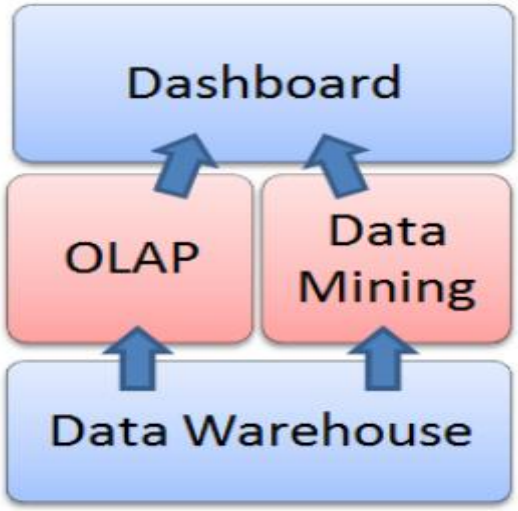
6. Recommendations

This section presents recommendations for business managers to regarding an effective data visualisation system to improve the decision-making process in a company.

- The objective of data visualisation technology is to allow the visualisation of information in a clear and concise manner. In this way, organisations can measure, monitor and direct their daily activities. However, it is important to note it is not merely a tool or a screen with graphics and performance indicators (Wang et al., 2016). The data visualisation systems and technologies must be completely designed with the aim of helping companies achieve their goals and develop their strategic plans. Specifically speaking, data visualisation technology must involve people in charge of making decisions within a company (Dutta and Bose, 2015).
- The data visualisation system must address the information needs of decision-makers, but such needs vary from one organisation to another and thus, data visualisation system must be tailored to specific needs of the company and relevant personnel. The data visualisation must be used by decision-makers to have information easy to see, remember and understand. In addition, the information presented by these systems allows the organisation

to be prepared to change its strategy since it can show information in real time about the current performance of the company (Zabukovec and Jaklič, 2015). Along with this, it helps predict possible behaviours or trends. Therefore, the benefits of this technology are the monitoring of the organisation and help in decision-making. That is, through the monitoring and analysis of information agents will be better able to make decisions. This may lead to having to adjust the organisation's strategy in order to improve its performance (Cao, Duan and Li, 2015).

- Furthermore, it is also important to note that data visualisation techniques are integrated with other data analysis technologies. The following figure illustrates the operation and the relationship between the technologies described. Be part of a database (Data Warehouse) that feeds the others with the stored information. Then continue the data analysis section (OLAP and Data Mining) whose results will be clearly exposed in the final section (Dashboard) (Janssen, Voort and Wahyudi, 2017).



- There must be a central system. Sometimes organisations have separate information and data visualisation system for each department, which makes it difficult for managers in one department to use information in another department. Lack of access to information is a hurdle in the decision-making process. Since data visualisation aims to develop more democratic and participative decision-making process, therefore, data visualisation system must have access to collect information from all of the departments and connect them together (Bačić and Fadlalla, 2016).
- A central data visualisation system collects information from all departments and as the entire organisation works with the same system, the information generated will be uniform and consistent. In addition, the people in charge of making decisions will be able to count on the information of the different departments, the reason why the decisions that are taken will have a more solid base (Gupta, Goul and Dinter, 2015). However, this structure does not allow very deep analysis in each department, which translates into low-value creation per area. As a result of this, less effective analyses will be carried out and it is also possible that some critical variables are omitted in the analyses (Mosavi, 2014).
- In the long term, the ideal would be to consolidate all departments and get them to work together. For this, a hybrid structure should be developed, which combines both a

centralised system that gathers all the information and independent systems in each department. This will ensure that each area can create value through deeper analysis and that decision makers have concise and uniform information (Kasemsap, 2015).

7. Limitations

It is a standard practice in a social research paper to highlight limitations in the methodology and scope of the study so that the readers are able to understand how results and conclusion can be used. Within the context of this study, the main limitation is that it is based on the qualitative method and thus it lacks quantitative evidence. Lack of quantitative evidence compromises reliability and validity of results and conclusions. Furthermore, the data has been collected from one company only which means that this study has limited generalizability. The results may not be applicable to other companies and other countries due to differences in needs and organisational culture. Furthermore, the study only involved one stakeholder, i.e. managerial employees and experiences and opinions of senior leadership and technical staff have not been integrated. It is worth mentioning that opinions and experiences of owners and directors are important about usefulness, implementation and effectiveness of data visualisation tools for organisation. Furthermore, it is also important to note that this study was conducted in an organisation of Qatar and therefore may not be applicable in other countries.

8. Future Implications

Majority of the future research implications are based on the weaknesses identified in the previous section. For example, future researchers may conduct similar inquiries through quantitative research. This will help future research to be generalizable to wider population of managers. In addition, the future researcher may also endeavour to replicate this methodology in other types of organisations and other parts of the Middle East region to analyse whether results and conclusions are drawn are similar or different in different contextual settings. Furthermore, it is also recommended that more stakeholders such as owners and investors who provide funding for data visualisation system should be included in the study to understand benefits and challenges faced by this technology within the context of Qatar. Furthermore, it is also recommended to future researchers that use bigger sample by recruiting more participants such as involving CIOs or other technical staff to understand and identify strategic challenges and hurdles in the implementation of data visualisation tools and system.

REFERENCES

Albright, S. C. and Winston, W. L. (2014). *Business analytics: Data analysis and decision-making*. Cengage Learning.

Allioui, H., & Mourdi, Y. (2023). Exploring the full potentials of IoT for better financial growth and stability: A comprehensive survey. *Sensors*, 23(19), 8015.

Bačić, D. and Fadlalla, A. (2016). Business information visualisation intellectual contributions: an integrative framework of visualisation capabilities and dimensions of visual intelligence. *Decision Support Systems*, *89*, 77-86.

Cao, G., Duan, Y. and Li, G. (2015). Linking business analytics to decision-making effectiveness: a path model analysis. *IEEE Transactions on Engineering Management*, *62*(3), 384-395.

Christians, C. (2000). Ethics and Politics in Qualitative Research. In: Denzin, N. K. & Lincoln, Y. S. (eds.) *Handbook of Qualitative Research*. London: Sage Publications, 133-155.

Chandra, T.B., & Dwivedi, A.K. (2022). Data visualization: existing tools and techniques. *In Advanced data mining tools and methods for social computing* (pp. 177-217). Academic Press.

De Mauro, A., Greco, M. and Grimaldi, M. (2016). A formal definition of Big Data based on its essential features. *Library Review*, *65*(3), 122-135.

Dutta, D. and Bose, I. (2015). Managing a big data project: the case of ramco cements limited. *International Journal of Production Economics*, *165*, 293-306.

Ediae, A.A., Chikwe, C.F., & Kuteesa, K.N. (2024). Predictive analytics for proactive support in trafficking prevention and victim reintegration. *Engineering Science & Technology Journal*, 5(4), 1502-1523.

Edu, Y., Eimunjeze, J., Onah, P., Adedoyin, D., David, P. O., & Ikegwu, C. (2022). Fintech update: SEC new rules on the issuance, offering platforms and custody of digital assets-what you need to know. *Mondaq (July 6, 2022)*.

Fiaz, A. S., Asha, N., Sumathi, D. and Navaz, A. S. (2016). Data Visualisation: Enhancing Big Data More Adaptable and Valuable. *International Journal of Applied Engineering Research*, *11*(4), 2801-2804.

Finch, J. L. and Flenner, A. R. (2017). Using data visualisation to examine an academic library collection. *College and Research Libraries*, *77*(6).

García-Peñalvo, F. J. and Conde, M. Á. (2014). Using informal learning for business decision-making and knowledge management. *Journal of Business Research*, *67*(5), 686-691.

Gupta, B., Goul, M. and Dinter, B. (2015). Business Intelligence and Big Data in Higher Education: Status of a Multi-Year Model Curriculum Development Effort for Business School Undergraduates, MS Graduates and MBAs. *CAIS*, *36*, 23.

Janssen, M., Voort, H. and Wahyudi, A. (2017). Factors influencing big data decision-making quality. *Journal of Business Research*, *70*, 338-345.

Janvrin, D. J., Raschke, R. L. and Dilla, W. N. (2014). Making sense of complex data using interactive data visualisation. *Journal of Accounting Education*, *32*(4), 31-48.

Kasemsap, K. (2015). The role of data mining for business intelligence in knowledge management. *Integration of data mining in business intelligence systems*, 12-33.

Knaflic, C. N. (2015). *Storytelling with data: A data visualisation guide for business professionals*. John Wiley and Sons.

Larson, D. and Chang, V. (2016). A review and future direction of agile, business intelligence, analytics and data science. *International Journal of Information Management*, *36*(5), 700-710.

Lee, I. and Lee, K. (2015). The Internet of Things (IoT): Applications, investments and challenges for enterprises. *Business Horizons*, *58*(4), 431-440.

Mosavi, A. (2014). Decision-making software architecture; the visualisation and data mining assisted approach. *Int. J. Inf. Comput. Sci*, *3*(1), 12-26.

Neuman, W. L. (2011), *Social Research Methods: Qualitative and Quantitative Approaches*, Pearson, London.

Olaoye, F., & Potter, K. (2024). *Business Intelligence (BI) and Analytics Software: Empowering Data-Driven Decision-Making* (No. 12550). EasyChair.

Wang, H., Xu, Z., Fujita, H. and Liu, S. (2016). Towards felicitous decision-making: An overview on challenges and trends of Big Data. *Information Sciences*, *367*, 747-765.

Wang, L., Wang, G. and Alexander, C. A. (2015). Big data and visualisation: methods, challenges and technology progress. *Digital Technologies*, *1*(1), 33-38.

Zabukovec, A. and Jaklič, J. (2015). The impact of information visualisation on the quality of information in business decision-making. *International Journal of Technology and Human Interaction (IJTHI)*, *11*(2), 61-79.