

# A Brief Review on Financial, Security and Business Visualization

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**Abstract-** This paper discusses very common problems in a brief on Financial, Security and Business Visualization. Past research paper was reviewed to study the effectiveness and usability of visualization among business decision makers to support the problem statement. Methods such as circular network diagram, parallel coordinates and streamgraph was proposed to be utilized for interactive visualization. Interactive visualization is commonly used into the web as an application and most importantly in interactive visualization the users are part of the data visualization process by building a story based on their selections as compared to static.

**Keywords:** Finance, Business, Security, Dynamic Visualization, Static Visualization, Interactive visualization, Decision Maker, Business, Data Visualization.

## I. INTRODUCTION

Most businesses today identify data visualization as key for decision making. This is because data visualization tools represent patterns and relationships that consist within the data. Alongside these data visualizations are easier to understand to the end user especially non-technical people for decision making purpose.

Especially for businesses in financial or securities industry, the use of data visualization is an access tools for data discovery which is eventually converted into information and the information will be further transformed into insights.

Data visualization can be divided into two categories exploring and explaining. These objectives have its own uses in the business world [1]. For instance, data exploring is useful when one is unsure on the output of data or in other words what the data can tell you. On the other hand, data explaining is the ability to distinct the information to its most basic form, this eventually provides a simpler perspective of the data. This approach is generally taken when the data can display a form of answer. Both the methods can only benefited when the visuals are appealing and illuminating to the audience.

“When financial data is presented graphically as a 3D relief map, the use of patterns, colour, positional relationships and motion contribute to the ability to see, understand and process information in a different way” [2]. For last 50 years, financial reports have been presented as columns of numbers; this has caused disability for financial and non-financial employees to understand and comprehend the possibilities for corporate growth. With the birth of data visualization businesses can now visualize financial information’s in an understandable manner; it gives credibility for effective decision making.

The same is true for stocks and trading; fund managers and investors general spend hours of research before making a decision to buy stocks. Most of their research relies on current stock value, income statements and other financial data’s of the company. Therefore it is important that the information about the stocks is provided in the most concise and visually appealing manner to promote faster analysis from the users or viewers.

Data visualization does not replace the use of traditional financial statements however complements them to provide insights. This form of representations can best allow human brains to analyze and understand the significance of the data.

## II. EXISTING WORKS

Some of the common problems found from most of the current studies on Financial, Security and Business Visualization are rooted from the form of visualization. For instance, static visualization in businesses tends to only allow users to select one type of information. Their display format generally does not give decision makers with options to evaluate. Where else, with interactive visualization, users are given a choice of which data to display and how to represent the data. Interactive visualization is commonly used on the web as an application. Most importantly in interactive visualization the users are part of the data visualization process by building a story based on their selections.

A study on Interactive Data Visualization: New Directions for Accounting Information Systems Research reveals that companies today prefers to utilize interactive visualization to present accounting information to their

stakeholders on their investor relations sites [3]. Besides, for internal employees interactive data visualization is being used for applications such as enterprise resource planning (ERP), balanced scoreboard, network security, and fraud detection systems. The study predominantly developed taxonomy to observe the current state of interactive data visualization in relation to support accounting decision making process. The results showed that the effectiveness of a given information visualization techniques does not only depends on the data and decision makers characteristics however it also looks into the decision maker's understanding of which depiction is best used for the task. In addition, the study also discovered a considerable gap between the selection of techniques for accounting data and the use of interactive information navigation for decision making. The study explains that in contrast to static data visualization, interactive data visualization enables decision makers to navigate to and select the information they wish to view for better decision making, through interactive selection and interactive visual representation.

In another study exploring on the topic of visualizing static and dynamic relations in information hierarchies explains that the visualization of relational data is within the information visualization [4]. The use of visual representations is common in many industries over many application domains. The study explains that various algorithms have been developed to display interactive graphs efficiently moving away from static graph. The primary contribution of this study is on the use of radial space-filling visual metaphor to best represent the dynamic in relational data. The results were aesthetically appealing for the viewers.

Another study on Visual Representation: Implications for Decision Making develops a framework on how visual representations are likely to affect the decision making processes for marketing managers and consumers who are involved in analysis or exposed to large amounts of data [5]. The study proposes a testable proposition that serve as schema for further research to be done. It concludes that top managements generally use interactive visualization tools to study multiple factors within the subject matter than those using static visualization. This eventually results in accurate decision making. This was only possible due to the development of visualization tools that can assist decision makers to understand rich databases of product, sales force, customer and other types of marketing information's.

### III. FINDINGS

Based on our findings of past research, an interactive visualization technique uses the cognitive fit perspective. It suggests that the effectiveness of interactive information, navigation tools and interfaces allow the users to select the preferred information representation. In other words, it relies heavily on task characteristics and decision maker characteristics such as domain specific expertise and cognitive ability to gain insights from the data.

Along with these findings, most industry players consider financial information presented in interactive visualization to be more reliable or trustworthy. Policy makers need to identify how financial reporting will be presented to influence investor perceptions and decision processes to instil assurance. The study suggests that interactive presentation of data might further affect these perceptions (as stated in Plumlee and Plumlee, 2018) [3].

It was suggested that financial accounting visualization is best developed using interactive information visualization as compared to static visualization. This is due to the emergence and widely accepted web financial reporting and the regulatory mandate that companies should present financial reporting in XBRL format.

In another similar study on interactive data visualization highlights that interactive data visualization creates more self-independence business intelligence users [6]. It allows the users in discovering tools that allows them to explore information. Based on a survey conducted majority business users prefer interactive visualization than static visualization.

It was discovered most organizations with interactive charts and dashboards produces real time analytics making them the best choice for business users unlike static visualization that only produces streaming data.

One of the methodologies commonly used for interactive visualization is in-memory analytics. The advantage of in-memory analytics is the ability to process over 3 times the volume of data a hundred times faster. This contributes insights for businesses to predict efficiently and effectively.

### IV. PROPOSED SOLUTIONS

Every industry requires different forms of visualization to represent the specific dataset for decision making. There are many different graphical visualization methods and some of the criteria for the visualization include the use of more than one data representation view at once and active interaction between user and analyzable view [8].

This analysis will assume some data criteria before proposing the method of visualization for the selected topic. Considering the data consist of large volume, dynamic data and a variety, some of the proposed method will include circular network coordinates and streamgraph.

Fig. 1 showed the circular network diagram. It is one of the methods that can be used for dataset which consist of

high volume and variety. This method places data around a circle and it is then connected by curves according to the rate of relativeness. This method also uses line widths and colour to represents data or objects relativeness. Besides most importantly circular network diagram provides users interactive visualization. In addition, this method allows users the ability to represent aggregated data as a set of arcs between analyzed data, this is to provide analyst to get quantity information about relations between data. One of the advantages of this method will include possibility of making relative data representation which can be easily interpreted and the ability to display statistical summary and points of interest.

For instance, data visualizations can likewise be utilized to make inside and out revealing instruments that feature regions of risk presentation with the goal that those exposures can be moderated. For example, an information perception may demonstrate the organization's aggregate credit risk separated by industry, which will rapidly enable leaders to see whether the risk is moved too intensely in one part. Utilizing ongoing information, instead of obsolete concentrates, implies that the data is dependably breakthrough. Rather than agonizing over whether the numbers are exact, the capable gatherings can rather concentrate their endeavours on the most proficient method to re-adjust the risk. [7]

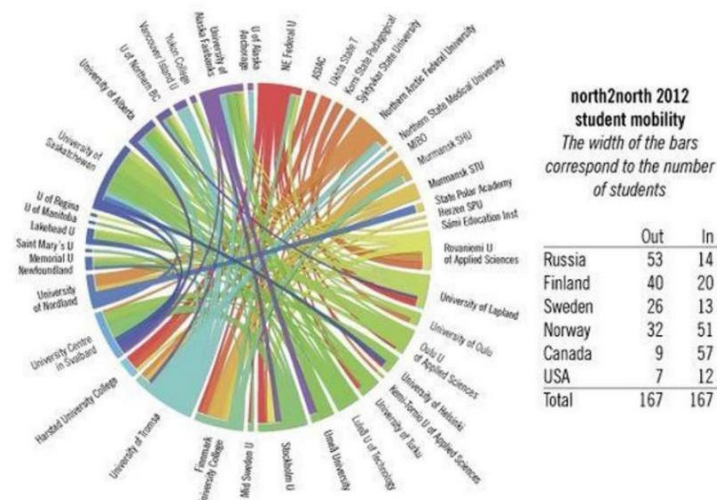


Fig. 1. Circular Network Diagram.

Secondly, parallel coordinates as showed in Fig. 2 allow visual analysis to be extended with multiple data factors for different objects. Here all data factors that needs to be examines are placed in one axis where else the corresponding values of data object in relative scale are placed on the other. One of the biggest plus of this method is the use of multi relational 3D parallel coordinates. The axes here are places in an equal format, in a circle with a focus axis in the center. A data item is shown as a series of line segment intersecting all the axes. This will allow the variables to be studied concurrently.

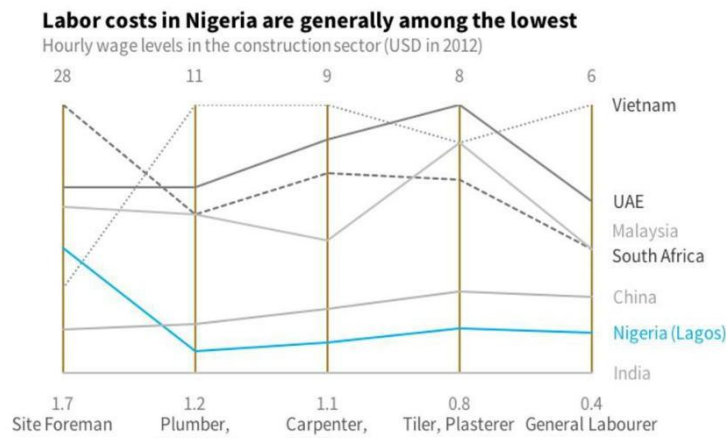


Fig. 2. Parallel Coordinates.

For instance, building 3D information perception spaces, organizations can make an instinctive domain that enables information researchers to get a handle on and examine more information streams in the meantime, watch information focuses from various measurements, recognize already inaccessible conditions and control information by normally moving articles, zooming, and concentrating on more granulated zones. Besides, these apparatuses enable us to extend the abilities of information perception by making communitarian 3D conditions for groups. Subsequently, new innovation helps separate more significant bits of knowledge from a similar volume of information.

Thirdly, Streamgraph method is a form of stacked area graph which displaces in the central axis which results in flowing and organic shape. This method showcases the trends for different sets of events, quantity of its occurrences and its relative rates and etc. The primary objective of this method is to represents time series while showing the sum. This method can only work with one data dimension, so it does not support data variety criterion however it does support a large dataset typically normal in the financial industry.

## V. APPLICATIONS

Newly developed applications of interactive analytics and visualization tools help organizations to transform raw data into reporting format which has interactive functions connected to it. It will significantly help the organization to identify the current business situation and also helps to predict or forecast the future for the company in an easy processing manner.

Fig. 3 showed the visual data-exploration. Interactive visual analytics is more than just visualization. It can rather be seen as an integral approach to decision-making, combining visualization, human factors and data analysis. As an application, the capability to combine the strength of human with the electronic data processing Visual analytics will be the most important information with the visualization technology. And without prejudice, the visualization becomes the medium of a semi-automated analytical process, where humans and machines cooperate using their respective distinct capabilities for the most effective results.

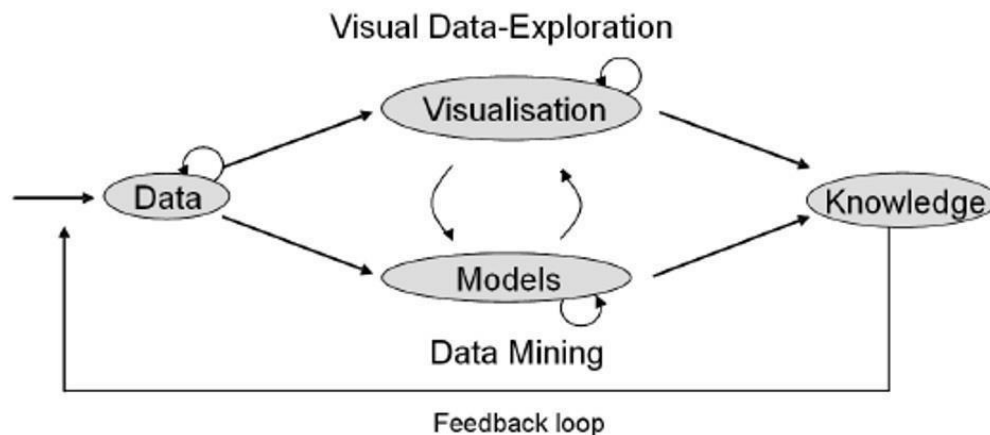


Fig. 3. Visual Data-Exploration

It is seen that tight integration of visual and automatic data analysis methods with database technology for a scalable interactive decision has resulted in multiple successful outcomes.

This is done by prioritizing the domains requirements. Visual analytics is an application oriented and discipline driven visualization making the information easy to be comprehended by businesses. It includes numerous domains in fields such as Engineering, Financial Analysis, Socio-economic and Public Safety & Security.

The ability to develop fast visualization by using the application tools and also providing intelligent access to the wealth of complex information are the main strength of the visualization application. Most of the visualization tools have features to integrate with multiple source of the database and data type. This has impacted decision makers and analysts in various industries to make things visible to analyse [9].

Dashboards, web analytics and mobile visualization are the main key characteristic for business intelligence and analytics technology. It shows that the existence of new visualization frameworks and technology with the likes of Power BI, Tableau, Qlik View and SAS Visual Analytics create new breakthroughs in identifying how data can be represented in a much more understandable manner. Through these interactive visualization software's, the conversions made from distorted raw data play an imperative role in establishing connectivity between the data and industry decision-makers through meaningful patterns & trends [10].

## VI. CONCLUSIONS

From this studies the findings we got suggesting that interactive visualization techniques are a good fit for complex tasks, high volume and variety of data. Alongside, domain expertise and cognitive ability of the users are important in order for the interactive visualization to be effective for decision process.

The requirement for interactive visualization of financial data in all major industries is imperative in the context of data analytics. It is deemed as a powerful tool for understanding and organizing large volumes of data flowing between and within organizations asynchronously.

Apart from the above suggested methods of visualization, there are many other methods that can be used by decision makers to display their data according to domain needs and cognitive abilities. Studies suggest that interactive visualization research at present is best developed in the financial and accounting area. This is a result of the emergence and wide acceptance of web financial reporting. However, many areas can be further explored in this particular topic as the judgement processes and decisions of investors using an XBRL facilitated interactive software can evaluate multiple companies at the same time. Additionally, multidimensional (3D) visualization should be further explored as it provides analysis from a different perspectives as well as allowing users to interact with the charts more effectively [8].

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