



**UHASSELT**

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## Faculty of Business Economics

Master of Management

### **Master's thesis**

#### **Information presentation in auditing: a literature review**

#### **Adarsh Kumar**

Thesis presented in fulfillment of the requirements for the degree of Master of Management, specialization Business Process Management

#### **SUPERVISOR :**

Prof. dr. Mieke JANS



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## **Abstract**

Auditors mostly require a company's financial statements accounts, and business processes to assess their performance. The financial statements can be presented in either graphs or tables, and the business processes can be displayed in either diagrams or texts. However, no such rules describe the most appropriate (between graphs and tables and between diagrams and texts) format to display the accounting data used by the auditors for auditing purposes. This study aims to find the most appropriate presentation format between graphical and tabular and between diagram and narrative formats in an auditing context. Based on the literature review of previous research, five factors have been determined that can affect the auditor's performance while using different presentation formats (graphs, tables, diagrams, and texts). Taking these factors into consideration, the most appropriate format between graphs and tables and between diagrams and narrative is determined. Results of the study state that both graphical and tabular presentation format is suitable for experienced auditors, and inexperienced auditors performed better with graphs. Furthermore, multivariate graphs are suitable for multivariate accounting data. Additionally, graphs and diagrams with integrated texts should be placed as close as possible because this design of presentation format enhances the auditors' performance. A tabular format is best suitable for high-complexity symbolic tasks, and for low-complexity symbolic tasks, both graphical and tabular formats are equally good. Additionally, the graphical presentation format is more suitable for high-complex spatial tasks, and both graphs and tables are equally effective for low-complexity spatial tasks. To find the most appropriate format between diagrams and tables, the results of the literature study state that both diagrams and textual formats are equally effective and efficient for presenting a company's business process. Additionally, business process diagrams should be presented to the auditors for the evaluation of the company's internal control system, and the Internal control questionnaire (ICQ) format is best suitable than the textual format for documenting the strength and weaknesses of the company's internal control.

## **Key words**

Information presentation, audit, presentation format, audit documentation method, cognitive fit.

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**Chapter – 1**  
**Introduction**

## **1. Introduction**

Advancement in information technology allows companies to present accounting information in various formats to auditors for auditing purposes. This accounting information can be presented in audio, visual, graphical, tabular, diagrammatical and textual formats. According to theory of cognitive fit, the performance of the auditors and decision-makers increases when the presentation format of the task matches the task type (Vessey, 1991). Hence, presenting the accounting information in an appropriate format is very necessary as it can affect the auditor's performance (Vessey, 1991). In addition, information presentation could be a costly and time-taking activity. Therefore it is essential to know which presentation format should be used to present the accounting information to the auditors and decision-makers.

Auditors mainly use financial statement accounts and company's business processes to assess their performance. These financial statements accounts are generally presented in either tabular or graphical format, and the business processes can be presented in either flowchart diagram or textual narrative format. However, there are no set rules which describe the reliable format to display the accounting data and business process to be used by the auditors (Meyer, 2000, as cited in Speier, 2006). Some studies state that tabular presentation of accounting data is more effective and efficient than the graphical presentation format of the same. At the same time, some studies suggest that graphical presentation format of accounting information help enhance the effectiveness and efficiency of auditors and decision-makers performance. It is also true for presenting the companies' business process. Some studies favour the diagrammatical format, while others suggest that textual narrative is more effective and efficient.

Anderson and Reckors (1992), in their study, find that for a task which requires a comparison of accounting data, auditors using a graphical presentation format were more effective and efficient than the auditors who used a tabular presentation of the same. Another study done by Stock and Watson (1984) also advocates that for ratio analysis, financial information presented in graphical display are more effective than tabular display. On the other hand, a study by Benbasat and Dexter (1985) states that for tasks requiring determining specific data values, the tabular presentation of accounting data is more suitable than the graphical presentation format. Similarly, there are also mixed results regarding the presentation of companies' business processes. For instance, Gadh et al. (1993) in his studies find that individuals often get uninspired by the diagrammatic presentation format of business process and prefer the textual narrative format of the same. On the other hand, Carnaghan (2006) states that business processes presented in visual format have advantages over textual format, but combining both formats might be more effective than the presentation format presented separately. Another study done by Boritz et al. (2012) founds that auditors using textual presentation format of business processes are more efficient than the diagrammatical presentation format of the business processes. However, they also noted that both the presentation format were equally accurate.

The findings of the previous studies are inconclusive and often contradictory to each other due to the lack of external factors taken into account, for instance, the task environment, experience of the

subject, and design of the presentation format used in the experiment. This study aims to find the best presentation format between graphs and tables and between diagrams and texts which would help to enhance the performance of auditors and decision-makers.

In this study, based on the literature review of twenty-four articles, three factors have been determined that can affect the performance of the auditors and decision-makers using graphical and tabular presentation format, namely, "auditor's experience", "task type and task complexity" and "design of the presentation format". Additionally, two factors have also been determined that might affect the auditor's performance using the diagram and textual format, which are "in preparing the company's business process, and "in documenting and evaluating the internal controls of a business process".

The result of this study states that the factors mentioned above are essential and should be considered while presenting accounting information to auditors and decision-makers. Findings of this study suggests that experienced auditors should receive the financial information either in tabular or graphical presentation format, as they perform equally well in using both formats, and inexperienced decision-makers should be provided with a graphical presentation format of the same. It was also noted that for complex multivariate accounting data, a multidimensional graphical presentation format should be provided to the auditors as this presentation format enhances their performance. In addition to the above it was also noted that designing the accounting information presented in diagrams and graphs in such a way that the texts associated with it presented as close as possible help decrease information load to the auditors which in turn enhances their performance.

Results of this study also concludes that for high-complex symbolic tasks, auditors should use a tabular presentation format of accounting data, and for low-complex symbolic tasks, a graphical presentation format of accounting data should be provided to the auditors. Moreover, for high-complexity spatial tasks, a graphical presentation format of the financial information enhances the performance of the auditors and for low-complexity spatial tasks, either a tabular or graphical presentation format of accounting data can be used by the auditors and decision-makers. For presenting the company's business process, both the diagram and narrative format are equally effective and efficient, and for documenting and assessing the strength and weaknesses of clients' internal controls, auditors should use the Internal control questionnaire format.

The upcoming section of this paper is organized as follows. Chapter two illustrates a brief background which includes the definition of audit, big data, theory of cognitive fit and types of information presentation formats. In chapter three, methodology of the research is discussed. Furthermore, chapter four consists of detailed literature review based on previous literatures. Lastly, chapter five illustrates the conclusion, limitations and scope of future research.

**Chapter -2**  
**Background**

## 2. Background

### 2.1 Audit

The term "Audit" is often defined as an independent inspection or review (Gantz, 2013). It is generally applied to various fields but is primarily used to investigate an organization's financial statements or accounts (Gantz, 2013). Westland (2020) defines an audit in an accounting context as an independent inspection of an organization's records to ascertain how far the financial and non-financial information is true and reliable. The main objective of a financial statement audit is to provide the users with an opinion of the audit firm on whether other financial disclosures by the client are fair and under the given financial reporting framework (Johnson et al., 2019). This assurance by the audit firms enhances the user's confidence in the given financial statements (Johnson et al., 2019)

### 2.2 Cognitive fit theory

According to theory of cognitive fit, when the presentation of the problem and the problem-solving task match, the problem solver or decision maker formulates a mental diagram of the problem-solving process that emphasizes the same type of information (Strong & Portz, 2003; Vessey, 1991). This match of mental representation of the problem-solving process with the problem representation format and the task type results in a cognitive fit, which ultimately enhances the effectiveness and efficiency of the performance of the decision-makers (Strong & Portz, 2003; Vessey, 1991). Figure 1. illustrates the cognitive fit model adapted from Strong and Portz (2003). The given figure shows that problem-solving is an outcome of the relationship between decision-making tasks, problem presentation and the mental representation of decision-makers (Strong & Portz, 2003; Vessey, 1991). Also, the arrows that link to the elements represent the cognitive processes, and the mental representation is formulated by the user based on the characteristics of both problem representation and decision-making tasks (Strong & Portz, 2003; Vessey, 1991).

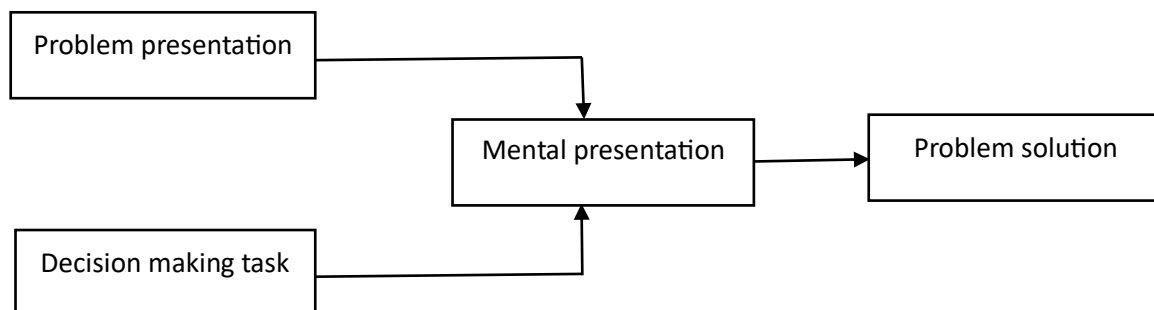


Fig 1: Model of cognitive fit (Source; Strong & Portz, (2003))

On the other hand, when the information in the problem representation does not match with the task, similar processes cannot be used to both act on the problem and solve the problem; as a result, the mental representation will have to be transformed (Strong & Portz, 2003; Vessey, 1991). Hence, there will be an extra effort to make a cognitive fit between presentation format, task type and mental representations, which ultimately affects the performance of decision-makers in terms of efficiency and effectiveness (Strong & Portz, 2003; Vessey, 1991).

### **2.3 Information presentation**

Information presentation is an everyday activity in a business by which the information cues are presented to the relevant users in a specific presentation format within the organization (Kelton et al., 2010). Modern information technology is used to present information within the firm and can transform spatial and non-spatial data into multidimensional visuals that represent an analogy or the metaphor of the problem space (Dull & Tegarden, 1999). Moreover, with the increase in communication technology presentation of information in an organization is easy and standard setters are encouraging companies to take advantage of these technologies to present the information, which can ultimately help the users and decision-makers (Kelton et al., 2010).

### **2.4 Information presentation format**

Accounting information is provided to the users and decision-makers in various ways, for instance, in audio, video, narrative, diagrammatic, tabular, and graphical formats (Kelton & Yang, 2008; Kelton et al., 2010). The choice of information presentation format is essential to the decision-makers as it might affect their performance (Volmer, 1992). This section briefly introduces some common presentation formats used in the accounting context.

#### **2.4.1 Flow chart diagram**

A flow chart diagram is a visual presentation of the sequence of steps generally used to present an organization's business processes and internal controls (Chapin, 2003). Flow charts contain words and nonverbal symbols and focus on processes and the company's controls related to the flow of documents (Mock & Willingham, 1983, as cited in Bierstakers, 2001). Most organizations usually prepare their internal control and business processes using flow charts with sequential structures (Bierstaker & Brody, 2001). This sequential structure of the flowchart diagram helps business analysts and accounting professionals to get an overview of the client's internal controls and business processes during the evaluation of internal controls and helps improve their performance (Bierstaker & Brody, 2001). Although, it also helps business analysts develop a mental representation that focuses on the relationship between the components rather than on independent components, which ultimately enhances their performance (O'Donnell & Perkins, 2011).

#### **2.4.2 Textual presentation format**

In textual presentation format, data is presented in texts, sentences and paragraphs (Bierstaker & Thibodeau, 2006). This presentation format is very flexible and provides an open-ended approach towards financial documentation (Bierstaker & Thibodeau, 2006). Financial documents presented in textual format could be customized to reflect the client's financial report in a detailed manner and could be less expensive to prepare (Bierstaker & Wright, 2004). According to Larkin and Simon (1987, as cited in Dunn & Gerard, 2001), the textual presentation format generally contains more detailed information of any financial report, so when the quantity of information is more critical, the textual presentation format is more suitable.

#### **2.4.3 Graphical presentation format**

Graphical presentation format displays data in a visual format using bars, lines, charts and plots (Kelton et al., 2010). It is mostly used to represent spatial problems since they provide clear relationships between the data and allow the decision-maker to view the information as an integrated unit (Kelton et al., 2010). Graphical presentation format improves judgement by facilitating the user's clear understanding of the data and minimizing cognitive efforts to integrate the data in decision-making (Wright & William, 1995). Furthermore, there are many benefits of using a graphical presentation format, for instance, information presented in the graphics is more effectively and efficiently organized, trends and patterns are easily recognizable, visual graphics requires less time to read and analyze than any other format of information presentations (Volmer, 1992). However, the effectiveness and efficiency of the graphical presentation format also depend on the proper construction of graphs (Kelton et al., 2010).

#### **2.4.4 Tabular presentation format**

In tabular presentation format, discrete data values are presented in a combination of horizontal rows and vertical columns (Vessey, 1991). It is often considered as a symbolic data presentation format since they present information which is symbolic in nature (Vessey, 1991). They are used by auditors or decision-makers as the format is very familiar to them, and they can easily refer to the data value for making any decision (So & Smith, 2004). It is mostly used for symbolic tasks, which are easy to process and require precise estimates (So & Smith, 2004).

#### **2.4.5 Questionnaire presentation format**

The questionnaire format is generally used to present the internal control of an organization (Bierstaker & Thibodeau, 2006). It is mostly prepared by the experts of the company to draw the attention of auditors to the strengths and weaknesses of internal control system of a company (Bierstaker & Thibodeau, 2006).

## **Chapter – 3**

### **Methodology**



### **3. Methodology**

This study mainly focuses on information presentation and its aspects in the audit field. To collect the relevant literature key, words like "Information presentation", "Audit AND Information presentation", "Impact of information presentation in auditing", and "Effect of information presentation in auditing" is used in the database of the Web of Science, IEEEXplore, Science direct, PubMed, and uhasselt online library. The results that appeared after hitting the above keywords were assessed whether articles were peer-reviewed, and if they were published in a journal. Additionally, backward referencing is done to get the relevant articles from different research papers. Before including the articles as a part of the literature review, these research articles are screened by reading through the abstract, introduction, methodology, results and conclusion. Research articles cited by the maximum number of authors and which came to their findings by conducting an experimental procedure are given priority. If the selected papers discussed the information presentation and their effect in the auditing context, they would be chosen to include in this study. After applying the above mentioned conditions, 24 research articles are considered for inclusion in this literature review.

**Table 1.**

Review of research articles

SI no.	Citation (Year)	Comparison of presentation format	Factors effecting the presentation format	Findings
1.	Dickson et al. (1986)	Graphical and tabular	Task type and task complexity	Tabular presentation is suitable for low level complex task and for moderate level and high-level complex tasks graphical presentation format is beneficial.
2.	Blocher et al. (1986)	Graphical and tabular	Task type and task complexity	Graphical presentation format is more suitable for low complexity tasks and tabular presentation format is more suitable for high complexity level tasks.
3.	Kaplan (1988)	Graphical and tabular	Task type and task complexity	Both graphical and tabular presentation format were equally accurate for a moderately complex analytical review task (prediction of revenue account balance).
4.	Davis (1989)	Graphical and tabular	Task type and task complexity	Tabular presentation format is more suitable for both high and low complexity level task.
5.	Desanctis and Jarvenpaa (1989)	Tabular, graphical, and graphical with tabular format	Task type and task complexity	For high complex forecasting task, graphical with tabular

				presentation format is best suitable
6.	Volmer (1992)	Graphical and tabular	Task type and task complexity	For high complexity analytical review task, both tabular and graphical presentation format is equally good in terms of accuracy, however compared with tabular format, graphical presentation is more efficient.
7.	Schulz and Booth (1995)	Graphical and tabular format	Task type and task complexity	Both the graphical and tabular format were equally accurate for a moderately complex analytical review task (sales account balance prediction task). However, graphical presentation format was more efficient than the tabular format.
8.	Wright (1995)	Tabular and graphical format	Task type and task complexity	For high complex task (evaluation of loan collectability) graphical format is best suitable and, for
9.	Dull and Tegarden (1999)	Two-dimensional graph and multidimensional graph	Design of presentation format	For presenting multiple variables of accounting data, multidimensional graphical presentation format enhances decision-makers performance by reducing the information load.

10.	Bierstaker and Brody (2001)	Narrative alone and narrative with flowchart	For evaluating and documenting of organizations' internal control	For documenting the internal control, both narrative and narrative with flowchart are equally good
11.	Dunn and Gerard (2001)	Diagram (Entity Relationship diagram) and narrative format (Backus-Naur form)	For representation of business process	For search & recognition and inference task both diagram and textual format are equally effective.
12.	Speier et al. (2003)	Graphical and tabular format	Task type and task complexity	For tasks which are symbolic in nature (simple and complex), tabular presentation format is suitable and for tasks which are spatial in nature (simple and complex), graphical presentation format is best suitable.
13.	Strong and Portz (2003)	Graphical and tabular format	Proficiency in accounting knowledge	For bankruptcy prediction tasks, highly proficient auditors perform equally well with both graphical and tabular presentations format when presented separately. In contrast, less experienced or inexperienced auditors get benefit from the graphical presentation format of accounting data.
14.	So and Smith (2004)	Tabular alone, tables along with graphs and tables with Chernoff faces	Task type and task complexity	For a bankruptcy prediction task with high level information complexity tabular alone format is best suitable and with low level

			information complexity all the presentation format performed equally good.
15. Speier (2006)	Graphical and tabular	Task type and task complexity	For complex symbolic, complex spatial and for simple spatial tasks, graphical presentation format is suitable and for simple symbolic format tabular presentation format was more reliable.
16. Bierstaker and Thibodeau, (2006)	Narrative and internal control questionnaire	For evaluating and documenting of organizations' internal control	For documenting missing internal control of a business process questionnaire format yields better results than narrative format.
17. Bierstaker et al. (2009)	Flow chart and narrative (with or without internal control matrix)	For evaluating and documenting of organizations' internal control	For evaluation of internal control, business processes should be presented in flow chart diagram provided with blank internal control matrix yields better results than narrative format.
18. Anderson and Mueller (2011)	Graphical and tabular presentation format	Experience with presentation format	For analytical procedure task, auditors having experience with presentation formats perform well with tabular presentation format. Whereas inexperienced students perform better with graphical presentation format for the same task.

19. Volkov and Laing (2012)	Graphical and tabular (colored)  Graphical and tabular (monochrome)	Task type and task complexity	Both graphical and tabular presentation format (color and monochrome) were equally good in terms of accuracy for both high and low complexity tasks. However, monochrome format of presentations was more efficient than colored format.
20. Boritz et al. (2012)	Diagram (BPMN) and textual format	For representation of business process	For evaluation of internal control of procurement to pay process, both BPMN and textual format were equally effective. However, subjects using textual format were more efficient.
21. Tang et al. (2014)	Graphical with tabular and tabular alone format (with high or low level of interactivity feature)	Task type and task complexity	In analytical review task for both high and low complexity questions, graphical along with tabular presentation format having high level of interactivity outperforms the tabular alone format.
22. Hirsch et al. (2015)	Tabular alone format and tabular along with graphical presentation format	Proficiency in accounting knowledge	For performance evaluation task, experienced auditors performed better with tabular together with graphical presentation format and inexperienced students perform equally good with tabular alone and tabular format

			presented with additional graphs.
23. Sithole (2016)	Graphs (diagrams)with integrated texts vs Graphs (diagrams) with separated texts	Design of presentation format	Auditors perform well with graphs integrated with textual format written as close as possible.
24. Ritchi et al. (2020)	Diagram (BPMN) and textual format	For representation of business process	For search and recognition and partially for inference task both BPMN and textual format of business processes were equally effective. Also, for the recall and problem-solving task textual format of business process is more effective.

**Chapter -4**  
**Literature Review**



#### **4. literature review**

In this section, a literature review of twenty-four research papers is done and three factors which can affect decision-maker performance while using graphical and tabular presentations are determined. Additionally, two factors are determined that can affect decision-makers performance while using diagrammatic and tabular presentation formats. Based on these factors, the most appropriate format is determined between graphical and tabular and between diagram and textual presentation formats, which would help enhance auditors' and decision-makers' performance.

##### **4.1 Graphical and tabular presentation format**

Modern auditing process uses large sets of data to evaluate the financial data of a company to have an effective audit and to reduce the risk of material misstatement (Yoon et al., 2015, as cited in Rose et al., 2017). As a result, auditors and managers are confronted with an abundance of data sets which can cause information overload, and at the same time, they also experience pressure to deliver effective and efficient performance (Hirsch et al., 2015). Hirsch et al. (2015) also state that presenting this large amount of data in a proper visualization format can help minimize information overload and improve auditor's and managers' decision-making quality (Hirsch et al., 2015).

The Accounting information can be presented to the users in various formats, for instance, audio, video, textual, diagrammatical, tabular, and graphical (Kelton & Yang, 2008, as cited in Kelton et al., 2010). Traditionally, companies present their financial statements in tabular format as it is easy to present numerical information to the users (Volmer, 1992). However, with the increase in developments in information technology, accounting information can also be presented in the form of graphical displays, which could be an alternative to the tabular format (Davis 1989, as cited in Strong & Portz, 2003). Volmer (1992) in his study argued that with the continuous increase of numerical data in financial reports, users are not comfortable with the increase in the extensive series of numbers and tables. Due to this reason, most companies are switching to the graphical presentation format to present this information (Volmer, 1992). To overcome this situation, Sias (1970, as cited in Volmer, 1992) states that the graphical presentation format could be an alternative as it can be easily understood.

Vessey 1991, through his studies, also confirms that with the advancement in hardware and software technology, the presentation of accounting data in the graphical format is becoming a reliable alternative to the tabular presentation format. It is always said that the information presented in the form of a picture or graphical format is always superior to the other type of format (Vessey, 1991). However, research in this field to verify the statement has not been very successful (Vessey, 1991).

Given that availability of information technology allows us to easily present the accounting information in different format but the main concern is which format is effective and useful for auditors and decision makers (Strong & Portz, 2003). For instance, whether the graphical or pictorial format increases the effectiveness of the auditors and decision makers, or the more traditional tabular presentation is useful for them (Strong & Portz, 2003). Moreover, finding the most effective presentation format of financial information for auditors, decision-makers, managers, and investors is a concern to accounting studies (Desanctis & Jarvenpaa, 1989).

The results in finding the most superior presentation format between graphical and tabular are inconclusive as some researchers argue that graphical presentation format is superior while other studies claim that the tabular format is superior, and few studies still can't find any differences (Vessey, 1991). To determine whether a graphical or tabular presentation format of financial information is most suitable, a review of previous literature is done in this section, and based on these previous studies, variables are determined that can affect the accuracy and efficiency of the auditors using these two types of presentation format.

#### **4.1.1 Experience of auditors**

With the development of information technology for presenting accounting information, in addition to tables, graphs have become an alternate option to present accounting information (Davis 1989, as cited in Strong & Portz, 2003). Currently, the main concern for the user of this accounting information is knowing which presentation format is better for making effective judgements (Strong & Portz, 2003).

Researchers use cognitive fit theory to determine the effectiveness of tabular and graphical presentation formats for various task types, and consistent with the theory, they assume that tabular presentation format is more effective for symbolic tasks and graphical presentation format is more accurate for spatial tasks (Anderson & Mueller, 2011; Strong & Portz, 2003; Vessey, 1991). However, not every result supports the above assumptions, and they are often conflicting in nature (Strong & Portz, 2003). Anderson and Mueller state that the inconsistency in these studies is due to the lack of methodology used by them. An example of such methodology is the use of accounting students and experienced practitioners. In addition, Goodhue and Thompson (1995, as cited in Strong, 2003) also state that the experience of the decision-makers in the accounting domain can also affect their performance while using different presentation formats. Hence, it is quite important to determine whether proficiency in accounting knowledge and prior experience with the presentation format of decision-makers affect their performance in using the presentation formats.

Several studies examine the interaction of the proficiency of auditors with presentation format in the application of auditing judgement and discover that accounting knowledge or individual experience in the accounting domain does matter (Hirsch et al., 2015; Strong & Portz, 2003). These studies report that experienced auditors perform better with tabular and graphical presentation formats of the accounting data in comparison with inexperienced individuals who get benefit from the graphical presentation format of accounting data (Anderson & Mueller, 2011; Hirsch et al., 2015; Strong & Portz, 2003).

Strong and Portz (2003) experimented with eighty-seven undergraduate students having high and low accounting knowledge and found that individuals having high accounting knowledge performed equally well with both tabular and graphical presentation formats, whereas the individuals having low accounting knowledge performed better with the graphical presentation format. On the other hand, Hirsch et al. (2015) used managers and students as the subjects for their experiments, and they discovered that managers' performance was not good when they were provided with the

accounting data only in tabular presentation format. However, their performance was enhanced when the data were presented in tabular along with graphs (Hirsch et al., 2015).

In a study to evaluate whether the interaction of the experience of decision makers and presentation format affects the quality of judgement of decision makers, Strong & Portz (2003) provided every subject with five consecutive years of financial data of twenty firms in graphical format or in tabular format and asked them to predict the bankruptcy of these firms in the sixth year. The tabular format of the financial data used by Strong & Portz (2003) consisted of financial ratios in the form of numeric and percentages, and the same information was provided in the graphical format with the help of line and bar graphs. The number of correct predictions was measured as decision accuracy. It was found that individuals having high knowledge in accounting performed equally good with both tables and graphs, and those with less accounting knowledge performed well with the graphical presentation format (Strong & Portz, 2003).

Hirsch et al. (2015) extended the study of Strong and Portz (2003) by including managers and university students as subjects to compare their performance while using the graphical and tabular presentation format of financial information. Unlike Strong and Portz (2003), who chooses a bankruptcy prediction task, Hirsch et al. (2015) choose a performance evaluation task. For the task, participants have to evaluate eight business units of a fictitious company based on the four accounts, and using this accounting information, the managers and the students have to determine the best and the worst business unit (Hirsch et al., 2015). In contrast with Strong and Portz (2003), Hirsch et al. (2015) presented the accounting information to the subjects either in tabular only or tabular in addition to graphs (bar graphs). Hirsch et al. (2015) use decision quality and decision confidence as the dependent variables to measure the subjects' performance. The decision quality was measured as the accuracy of decisions made by the subjects in choosing the best and the worst business units and is measured as the deviation from the right answer (Hirsch et al., 2015).

Additionally, Hirsch et al. (2015) measured decision confidence by asking the managers and students to rate their decision confidence using a five-point Likert scale where the number 5 represents the statement "I am very, very confident about the decision" and number 1 represents the "not at all confident". After the experiment, Hirsch et al. (2015) concluded that the managers performed poorly when provided only with the tabular format. However, their performance enhanced when the information was presented with both the format, i.e., tabular format along with graphical presentation format. On the other hand, students subjects performed equally well in both cases (i.e., with the only tabular format and with tabular and graphical format together) (Hirsch et al., 2015). Hirsch et al. (2015) also conclude that experienced professionals were more confident than students in the performance evaluation task; hence the results prove that the experience of the individual matters, and it not only enhances performance but also increases decision confidence.

The results of the above studies done by Strong and Portz (2003) and Hirsch et al. (2015) show that the accounting knowledge of an individual does impact the accuracy of judgement made by the decision-makers. However, they have not considered whether proficiency in using graphs and tables could also impact the quality of judgement made by the decision-makers. To figure out whether proficiency in using graphical and tabular formats influences the judgement made by the decision-

makers, Anderson and Mueller (2005) conducted a study in an auditing context to determine whether auditors who have some experience with the graphical and tabular format would perform better than the students who have little or no experience with these presentation formats. For the experiment, eighty experienced auditors from globally recognized accounting firm and one hundred thirty accounting students were selected as participants, and these participants were given previous sales data and data related to the five activity variables in the form of tabular formats and graphical presentations formats (Anderson & Mueller, 2005).

The participants had to assess the correlation between the given sales figures and the five activity variables based on the observations of twenty-seven time periods, and in the next step, based on the level of activity variables having the highest correlation value, the participants then predicted the sales for the current period (Anderson & Mueller, 2005). Accuracy in assessing correlation and accuracy in the prediction of sales were the dependent variables to measure the performance of the participants. The accuracy in assessing the correlation was measured as the difference between factual correlation and correlation assessed by the subject. Also, the accuracy in sales prediction was measured as the difference between the normative sales value and the sales value predicted by the participants (Anderson & Mueller, 2011). Ultimately, after the completion of the experiment, Anderson and Mueller (2011) concluded that for correlation assessment, students performed better than the experienced auditors when both were using the graphical format of presentations; however, experienced professionals performed better than the students for the same task when both were using tabular presentation format. Anderson and Mueller (2011) also discovered that for the prediction of sales tasks, experienced and non-experienced professionals performed equally well with graphical presentation format.

The results of the study conducted by Anderson and Mueller (2011) clearly show that prior experience with the format of presentation doesn't affect the performance of the subjects as it was noted that the students who did not have any prior experience with the presentation format performed equally well in the sales prediction task and was better than the auditors in correlations assessment tasks.

The findings of the above studies provide consistent evidence that individuals' proficiency in accounting knowledge does affect the quality of judgement made by them, as it was seen that experienced professionals performed better with tabular and graphical presentation formats whereas the use of graphical format enhanced the inexperienced individual's performance. However, it was also noted that experience with presentation format does not affect the performance of the auditors.

Strong et al. (2003) conducted a study to determine whether the decision-makers accounting knowledge affects their ability to use different presentation formats (graphical and tabular) during a decision-making task. Their research included a sample size of eighty-seven accounting students, of which forty-five were grouped as high accounting knowledge subjects and another forty-two were grouped as low accounting knowledge subjects. Students who have taken accounting courses for more than twelve hours were considered as high accounting knowledge subjects, and those who have taken less than 12 hours of accounting courses were considered as low accounting knowledge subjects. The sample size selected by the authors was quite appropriate as the high sample size

might eliminate the selection bias or any other unintentional bias. However, experienced professionals or auditors would have used it instead of students who completed more than twelve hours of accounting courses. This might enrich the experiment and would have a better result.

Every participant was provided with five years of financial data of twenty fictitious companies, either in the form of a graphical or tabular presentation format. Participants have to predict bankruptcy in the sixth year. The tabular presentation format contains the financial data in the form of numbers and percentages, and the graphical contains the same data in the form of line and bar graphs. It shows that the data used in the study were very appropriate and concise.

The findings of Strong et al. (2003) state that decision-makers with a high level of accounting knowledge perform well with both the tabular and graphical presentation format as the accounting knowledge helps them overcome the mismatch between the spatial task and the tabular presentation format. In addition, the authors also find that the performance of subjects having a low level of accounting knowledge is enhanced by using a graphical presentation format. The findings of Strong et al. (2003) support that decision-makers with a low level of accounting knowledge should be provided with a graphical presentation format as it enhances their understanding towards the task and ultimately improves their performance. In contrast, subjects with a high level of accounting can use both the presentation format and can deliver an effective performance. The conclusion provided by Strong et al. (2003) is very reasonable and could be used for academic and practical purposes.

In a similar study, Hirsh et al. (2015) tried to find out whether the proficiency of decision-makers affects their performance while using different presentation formats. From the results of their experiment, they found that accounting proficiency does impact the performance of decision-makers while using the graphical and tabular display. Their results show that managers perform poorly in performance evaluation tasks when the data is provided in tabular format only; however, they performed better for the same task when the data were presented in both tabular and graphical format (Hirsch et al., 2015). On the other hand, they also concluded that student participants who don't have prior work experience in the accounting domain perform better with a tabular-only format as well as tabular and graphical presentation format.

The results of their experiments provide strong proof that experienced decision-makers should be provided with both tabular and graphical presentation formats of data to have better decision-making performance. They used sixty-five experienced managers and fifty-five students as participants for their experiment. Comparing students with experienced managers who got some work experience enhances the genuity of the study. In addition, Hirish et al. (2015) presented the accounting information of 8 Business units of a company either in the tabular display or tabular display together with bar graphs and asked them to evaluate the business units which perform the best. The data presented by the authors were quite detailed and reliable for the tasks as they were manipulated by the authors themselves. Hirsh et al. (2015) also provide some monetary incentives which motivate the participants to perform the experiment more accurately.

In another study, Anderson and Mueller (2011) examine whether the experience of the auditors with presentation format (graphical or tabular) affects their performance. They used eighty-two senior auditors and 130 accounting students as their subjects for the study. The inclusion of experienced

participants is always better when comparing them with inexperienced students, and this makes the study more reliable. Anderson and Mueller (2011) presented the historical sales data and data related to the other five activity variables in the form of bar graphs and tabular format and asked the participants to assess the correlation of sales dollars and units of the five variables. The two presentation formats consisted of twenty-seven observation points which were sufficient for assessing the correlation and predicting the current sales, which confirms that the data presented here were appropriate and were for the study.

Lastly, Anderson and Mueller (2011) conclude that experienced auditors perform well in tabular format and not graphical presentation format, whereas inexperienced students perform well with graphical presentation format. This might be due to the experienced professionals being more comfortable with the tabular format, and the students might be more exposed to graphs. The conclusion drawn by the authors supports that experienced professionals should be provided with a tabular format for better performance.

#### **4.1.2 Task type and task complexity**

The study in display formats to present accounting information lead to the widespread belief that there is not only one optimal format to present the accounting information (Speier, 2006). However, the effectiveness of the presentation format is also related to the type of task performed (Speier, 2006). Auditors and decision-makers can choose a variety of information presentation formats, for instance, graphs, tables, three-dimensional displays, color variations and many more (Speier, 2006). Hence, it is important to understand whether the type of task is an important factor to be considered, which can affect the performance of the auditors or decision-makers using different presentation formats. In this section, a brief review of the study made by previous authors is done to determine the effect of task type on the decision maker's performance who uses graphical and tabular display format.

Blocher et al. (1986), in their study, try to determine whether the task complexity variable affects the auditors' performance using graphical and tabular presentation formats. For their research, fifty-one internal auditors were used as subjects divided into two groups, and both groups received data either in the form of tables or graphs (Blocher et al., 1986). Both the tabular and graphical presentation format group completed seventy low-complexity level tasks followed by seventy high-level complexity level tasks (Blocher et al., 1986). The complexity of the case was based on the increasing number of expense categories of the invoice; for instance, for low complexity case, five expense categories, namely, labour, transportations, overheads, telephone, and miscellaneous, were present and for high complexity category four additional categories namely, materials, supplies, duplicating, processing, and printing were included (Blocher et al., 1986). After the experiment, Blocher et al. (1986) found that for low-complexity tasks, participants using the graphical display were more accurate than the participants using the tabular display, and for the high-complexity tasks subjects using the tabular presentation format performed well than the subjects using the graphical presentation format. Based on these results, Blocher et al. (1986) concluded that there is a significant effect of complexity of task and presentation format on the decision made by the auditors.

In align to study made by Blocher et al. (1986), Dickson et al. (1986) also try to find the affect of task complexity on the performance of decision-makers using graphical and tabular presentation formats. In comparison with Blocher et al. (1986), Dickson et al. (1986) used a large number of participants, and instead of conducting one experiment, they conducted three independent experiments with varying degrees of task complexity (Dickson et al., 1986). Similar to Blocher et al. (1986), Dickson et al. (1986) also manage the complexity of task by increasing the number of variables used in the task. For instance, for a low-complex task, subjects have to process only one variable at a time whereas, for tasks with higher complexity, subjects need to process two or more variables to reach the decision (Dickson et al., 1986). For their first experiment, Dickson et al. (1986) presented a case where a business firm needed a loan. In addition, Dickson et al. (1986) also provided the financial statements related to the business either in tabular or graphical display to the participants and asked to evaluate the loan qualification of the firm, loan amount to be sanctioned and loan riskiness using one variable at a time to make the decision. Results of this low-complex task experiment state that students using the tabular presentation format were more accurate and had better decision quality than subjects using the graphical presentation format (Dickson et al., 1986). For their second experiment, Dickson et al. (1986) asked three hundred twenty subjects to make a demand forecast of three products of a chemical manufacturer. The subjects received 30 months of demand histories of three products either in tabular or graphical presentation format, and they had to make a forecast for the next three months (Dickson et al., 1986). The complexity of this task was relatively higher than the previous one, as the participants had to process two variables at the same time to make the decision (Dickson et al., 1986). Dickson et al. (1986) find that for this moderately complex task, participants using a graphical presentation format perform well compared to participants using the tabular format.

Lastly, for the third experiment, Dickson et al. (1986) used three hundred sixty-three students to decide on a task requiring more than two variables to process, considering it a high-level, complex task. In this task, the subjects were provided with a case related to a firm that produces software who had contracted a research firm to survey users of their product (Dickson et al., 1986). The report generated by the research firm is presented to the subjects in tabular and graphical format, indicating the survey and the subjects' need to evaluate the quality of the report (Dickson et al., 1986). After the experiment, Dickson et al. (1986) concluded that the participants using the graphical presentation format of the report resulted in better performance than the subjects with the tabular presentation format.

Overall, the three studies by Dickson et al. (1986) conclude that task complexity significantly impacts the decision-makers' performance using the tabular and graphical presentation format. Their results state that for low-complexity tasks, a tabular display format could enhance the performance of the decision-makers (Dickson et al., 1986). For moderate and high-complexity level tasks, a graphical presentation format could yield better performance for the auditors and decision-makers (Dickson et al., 1986).

Similar to the task performed by Dickson et al. (1986), Desanctis & Jarvenpaa (1989) also performed a highly complex forecasting task and found that using a graphical presentation along with tables outperforms the tabular alone and graphical alone presentation format. In contrast with Dickson et

al. (1986), Desanctis and Jarvenpaa (1989) used quite a smaller number of subjects and presented the income statement data in three different formats, namely, graphical with tabular format, graphical alone format and tabular alone format. Desanctis and Jarvenpaa (1989) provided the past sixteen years of the income statement of five fictitious companies to the subjects and asked them to make a forecast of five variables, namely, net income, revenues, expenses, cost of sales and earnings per share (EPS) for the next three consecutive years. Based on the results of the experiment, Desanctis and Jarvenpaa (1989) concluded that subjects using graphical along with tabular presentation format were more accurate than graphical alone and tabular alone format.

Similar to the above studies done by Blocher et al. (1986) and Dickson et al. (1986), Davis (1989) also experimented with thirty MBA students to find the affect of the complexity of tasks on decision-makers judgement using the graphical and tabular presentation format. Davis (1989) presented four types of presentation formats: line chart, pie chart, bar graph and tabular presentation format, to the subjects to answer five questions with different levels of complexity. The complexity of the questions was based on the number of steps to be performed to answer the question (Davis, 1989) For instance, questions involving more steps to answer were considered as high complex and questions which used a less number of steps to respond were regarded as low complexity level questions (Davis, 1989). After completion of the experiment, Davis (1989) concluded that the subject with the tabular presentation format answered more questions correctly than the subjects using the graphical presentation format. Based on this result, Davis (1989) suggests that the tabular display format is more appropriate for low-level and high-level complexity tasks.

The results of Davis (1989) advocated using a tabular presentation format for both high and low-level complex tasks. However, the study by Volmer (1992) contradicted this result as his study found that for high-complexity tasks, graphical presentation yielded better results in terms of overall performance. Similar to Davis (1989), Volmer (1992) also experimented with twenty – five undergraduate accounting students, and these students were provided with five-year historical financial data of a company either in the form of a graphical or tabular presentation format. Based on the given financial information, subjects answered seventeen questions related to the state of bankruptcy of a company in at most twenty minutes, making this task highly complex (Volmer 1992). Moreover, the results of the experiment conducted by Volmer (1992) were quite different from the result of Davis (1988), as Volmer suggested that both graphical and tabular presentation format is equally good in terms of accuracy, but student using visual presentation format were faster than the students with tabular presentation format. Hence, based on his results, Volmer (1992) suggested that the graphs are more appropriate for highly complex accounting tasks.

Volkov and Laing (2012) extended the study of Davis (1989) by introducing color presentation in graphical and tabular formats. Volkov and Laing (2012) try to determine whether the colored presentation format of graphs and tables would enhance decision-makers' performance while performing tasks with varying complexity. In contrast with Davis (1989), Volkov and Laing (2012) use three presentations format, namely, bar charts, line charts and tables in both monochrome and color format. For their experiment, Volkov and Laing (2012) created two treatment groups having fifteen student participants in each group. Participants in the first group received historical time series data of a company's profit over eleven years in three colored presentation formats (line



graphs, bar charts and tables), and the second group received the same data in three monochrome presentation formats (line graph, bar chart and tables) (Volkov & Laing, 2012). The subjects answered five questions related to the data presented, and the complexity level of these questions was similar to the study of Davis (1989). Results of the study made by Volkov and Laing (2012) indicate that graphical and tabular presentation formats are equally suitable to present accounting information regardless of the complexity level of the task. Volkov and Laing (2012) also state that the use of a color display format does not enhance the effectiveness of the decision-makers. However, participants using color presentation format were relatively slow compared to the participants who use monochrome presentation format.

The findings of Volkov and Laing (2012) support the use of the monochrome graphical and tabular presentation format for both high- and low-level complex tasks. Similar to the experiment by Volkov and Laing (2012), Tang et al. (2014) also experimented to determine the effect of interactive graphical and tabular presentation formats and task complexity on the accuracy of decision-makers. Additionally, Tang et al. (2014) uses interactive features in the presentation formats, for instance, filter controls, sorting, hyperlinks, and list boxes. For the experiment, Tang et al. (2014) used one hundred fifty-seven undergraduate accounting students to perform three high-complex and four low-complex tasks. Participants were split into four treatment groups. In the first and second treatment groups, participants receive a graphical along with a tabular presentation format and a high or low number of interactive features (Tang et al., 2014). Similarly, participants in the third and fourth groups receive a tabular-only format with a high or low number of interactive features (Tang et al., 2014). Every participant receives three companies' income statements for the past three years, either in tabular alone or tabular with graphical formats, and based on this data, they must answer the high-complex and low-complex questions (Tang et al., 2014). The use of information cues manages the complexity of the questions, for instance, tasks for low-complexity question requires one information cue, and the question with high complexity requires more than one information cues to answer the question (Tang et al., 2014). Based on the experiment's results, Tang et al. (2014) concluded that subjects using graphical and tabular presentation together with high interactivity features result in better decision accuracy and confidence for both high and complex tasks.

In another experiment with one hundred seventeen experienced bank auditors, Wright (1995) tries to determine the impact of task complexity on the performance of the auditors in loan assessment tasks. The auditors were provided with the accounting information of the microcomputer vendor in tabular and graphical presentation format and asked to perform four types of tasks, namely, evaluation of loan collectability (most complex task), assessment of the relative trend of an attribute of the borrower (moderate complex task) and relative attribute status judgments (low complex task) (Wright, 1995). The high-complex task requires several accounting variables to make the judgement, the moderate complexity task requires few accounting variables and low-complexity tasks require one or two accounting variables to make the judgement (Wright, 1995). The results of Wright (1995) show that for a loan assessment task, the graphical presentation format is more suitable for high-complex tasks and intermediate and low-complex tasks, tables could be helpful.

Wright (1995) uses a loan assessment task to identify the impact of task complexity on presentation format on decision makers' accuracy and found that tabular is not suitable for high-complexity tasks.

However, research by So and Smith (2004) finds that the tabular alone presentation format is most suitable when performing a bankruptcy prediction task. In contrast with Wright (1995), So and Smith (2004) used accounting students as their subject for the study and provided them with twenty real company's five-year accounting data consisting of four accounting ratios (profitability, gearing, working capital and liquidity), presented in three presentations formats namely, tabular format along with bar graphs, tabular format along with Chernoff faces and tabular alone format. Based on this information, the subjects must predict the bankruptcy of the given companies; moreover, in this study, the complexity of information is managed instead of managing the task complexity (So & Smith, 2004).

The extent of internal consistency measured in the information complexity refers to the sum of the total number of contradictions among the four ratios in a particular year and the number of trend reversals across the years (So & Smith, 2004). In particular, the level of information complexity of twenty cases in this study is the measure of internal consistency and is measured by the "information complexity score" (So & Smith, 2004). Based on this measurement of information complexity, out of twenty cases, ten high and ten low levels of information complexity are declared (So & Smith, 2004). After the experiment, conducted in a set environment, So and Smith (2004) found that for low levels of information complexity, there were no differences in the subjects' performance as all of the subjects performed equally well with all three presentation formats. However, for high-level information complexity, the tabular alone format results in greater accuracy than the other format (So & Smith, 2004). Hence, based on the results of their study, So & Smith (2004) suggests that for high information complexity for bankruptcy prediction task, a tabular alone format is most suitable.

Speier et al. (2003) experimented with one hundred forty-six undergraduate students to find the affect of task complexity on the decision-makers' performance using the tabular and graphical presentation format. Unlike the above authors, Speier et al. (2003) uses four different types of tasks: simple symbolic tasks, simple spatial tasks, complex symbolic and complex spatial tasks. The symbolic tasks were presented in tabular format, whereas the spatial tasks were represented in graphical format, thus matching the cognitive fit theory (Speier et al., 2003). Capacity planning task were considered as simple task and in simple symbolic tasks, subjects were required to extract numerical data by using simple calculations, whereas in simple spatial tasks, subjects needed to figure out the trends from given data (Speier et al., 2003).

These simple tasks require the use of two- eight information cues with one-four calculations (Speier et al., 2003). Speier et al. (2003) use facility location tasks and aggregate planning tasks for complex spatial and complex symbolic tasks. In the facility location task, participants needed to rank the order of the location options from least to high cost. Also, for the aggregate planning task, the participants determined the production levels of four different types of products using twenty information cues (Speier et al., 2003). Speier et al. (2003) finds that for simple and complex symbolic tasks, tabular display format enhances the accuracy and efficiency of the decision-makers, and for complex and simple spatial tasks, graphical display format helps the decision-makers to make effective judgments. The results of Speier et al. (2003) confirm the theory of cognitive fit between task type (spatial and symbolic), task complexity (simple and complex) and the presentation format (tabular and graphical).

In addition to the task complexity factor, Speier et al. (2003) also try to determine whether the interruptions while performing the tasks would impact the decision-makers performance using the two presentation formats. To test this, four interruptive tasks (two symbolic tasks and two spatial tasks) were introduced during the start of every type of task (Speier et al.2003). However, it was found that for both simple tasks (simple symbolic and simple spatial), the occurrence of interruptions helps decision-makers to make more effective and efficient judgments. But for both complex tasks (complex spatial and complex symbolic) the occurrence of interruptions decreases the effectiveness and efficiency of the decision-makers. The results may be due to when performing simple tasks, the interruption tasks increase the focus of the decision maker to perform the task, and they are more likely to fast in finishing the task. However, for complex tasks, these interruptive tasks increase the decision-makers cognitive load, affecting their performance.

Speier (2006) conducted a similar study with one hundred thirty-six accounting students that performed four tasks: simple symbolic, complex symbolic, simple spatial, and complex spatial tasks. In the study, the task complexity was based on the number of information cues used, the increase in the task processing steps and the number of interdependencies between information processing steps (Speier, 2006). For simple symbolic tasks, data were presented in a tabular format, and subjects were asked to obtain specific data regarding available capacity or work schedules on a specific machine (Speier, 2006). Similarly, for simple spatial tasks, data were presented in bar graphs and required participants to determine trends and patterns in the given data (Speier, 2006). Additionally, two complex tasks were also provided to the students, namely, the facility location task (complex symbolic task) and the aggregate planning task (complex spatial task) (Speier, 2006). For the facility location task assessment, the cost associated with six warehouses was provided in tabular format and with the use of thirty information cues, students were asked to determine which warehouse needed to be developed (Speier, 2006). Similarly, for the aggregate planning task, current data of a product of a paint company is provided to the students in bar graphs and by using 27 information cues, they were asked to predict the required amount of product to be produced in coming months (Speier, 2006). The result of Speier (2006) states that graphical presentation is suitable for complex spatial tasks, Complex symbolic tasks and simple spatial tasks. However, the tabular presentation format is more suitable for simple symbolic tasks (Speier, 2006).

The study made by Speier (2006) included high and low-complex tasks. However, in 1988, Kaplan (1988) experimented with 69 experienced auditors performing a moderate-level complex task. Kaplan (1988) presented a company's seven-year historical revenue account balance data to the subjects either in tabular or graphical presentation format and asked them to predict the current year's account balance for three separate cases. Using seven-year historical revenue account balance data relates to using seven information cues to perform the tasks, which is considered moderately complex (Kaplan, 1988). After the experiment, Kaplan (1988) suggested that both the presentation format (graphical and tabular) is effective in predicting the current revenue account balance task (a moderately complex task).

In another study, similar to Kaplan (1988), Schulz and Booth (1995), also experimented with experienced auditors provided with either graphical or tabular data presentation format to perform a moderately complex analytical review task. The finding of the study by Schulz and Booth (1995)

were very similar to the findings of Kaplan (1988), as they both concluded that both graphical and tabular presentation format is equally good in terms of accuracy when performing a moderately complex analytical review task. In addition, Schulz and Booth (1995) also found that the subjects using the graphical display were more efficient than those using the tabular display format. In contrast with the study of Kaplan (1988), Schulz and Booth (1995) use a smaller number of subjects, of about thirty - three practicing auditors from a big six firm. The subjects were provided with the previous five years of actual and budgeted monthly sales data in addition to current year budgeted sales data in either graphs or in tables, and the subjects needed to predict current year-end sales account balance (Schulz & Booth, 1995). Although the participants had to answer two questions using five information cues, this task was a moderately complex task (Schulz & Booth 1995). Lastly, at the end of the experiment, Schulz and Booth (1995) observed that both graphical and tabular presentation format is equally good in accuracy. However, auditors using a graphical presentation format took less amount of time to complete the given analytical procedure task (Schulz & Booth, 1995).

Based on the review of studies mentioned above, there is consistent evidence that task complexity is an essential factor to consider as it can affect the performance of auditors and decision-makers using the different presentation formats. It is worth highlighting that the complexity of task was managed by the number of information cues and processing steps to be used for making a decision, as using more information cues and processing steps to perform a task is said to be a more complex task. At the same time, using a smaller number of information cues and processing steps to perform a task is considered a low-complex task.

The above literature shows that task complexity, task type and presentation format are interrelated. As it is observed from the above studies, for high-complexity spatial tasks, a graphical presentation format is most suitable, and for high-complexity symbolic tasks, a tabular presentation format enhances the performance of auditors and decision-makers. Thus, supporting the theory of cognitive fit. Specifically, for analytical review tasks (symbolic tasks), which use a large number of information cues or processing steps, a tabular presentation format is most suitable. However, for low-complexity analytical review tasks, both tabular and graphical presentation formats are equally good. It is because expecting a precise value from a graphical presentation when using a high number of variables might have more chances of committing an error. However, when the variables are less, then using a graphical presentation format can lead to a better judgement.

In addition, for bankruptcy prediction, forecasting of financial statement, and evaluation of loan collectability tasks which are spatial in nature and uses large numbers of information cues or processing steps to reach the judgement, a graphical presentation format is best suitable. This is due to the cognitive fit between the task type and the display formats. Also, for spatial tasks with fewer information cues and processing steps, both graphical and tabular presentation format is good for making judgements.

### **4.1.3 Design of presentation format**

Accounting information systems are advancing with the increase in information technologies (Dull & Tegarden, 1999). Nowadays, accounting systems use big data, which provides an abundance of information to the auditors and the decision-makers to make judgments (Dull & Tegarden, 1999). This large amount of data and its increasing complexity often overwhelms the auditors and decision-makers (Dull & Tegarden, 1999). However, carefully redesigning the accounting data can overcome the information overload experienced by the auditors, and additionally, it can also improve the understanding of complex concepts in accounting (Sithole, 2016).

Using the conventional format of a graph having more than one variable leads to a complex presentation of data, which can ultimately affect the performance of the auditors and decision-makers (Dull & Tegarden, 1999). To overcome this situation, Dull and Tegarden (1999) suggested that using a multidimensional presentation format for data having a greater number of variables can improve the performance of the decision-maker (Dull & Tegarden, 1999). In addition, it is also observed that the graphs and diagrams used as supporting material are presented separately from the texts associated with them (Sithole, 2016). This presentation format design divides the decision-maker's attention and creates an unnecessary information load (Sithole, 2016). However, redesigning the information presented by bringing the text closer the graphs or diagram can minimize this unnecessary load and enhance the decision-makers performance (Sithole, 2016).

Previous research has focused on the accuracy and efficiency of text in comparison with graphical and tabular presentation formats in different contexts. Additionally, the design of the presentation format is generally overlooked, and more research needs to be done in this area. This section presents a brief review of the study made by Dull & Tegarden (1999) and Sithole (2016), who talk about the effective design of presentation format in an accounting context.

Dull and Tegarden (1999) raised the concern that auditors and decision-makers often encounter information overload due to the large amount of complex accounting information presented to them for decision-making purposes. Using traditional two-dimensional graphs to represent various functions could make the graphs more complex to analyze (Dull & Tegarden, 1999). However, based on an experimental study, Dull and Tegarden (1999) suggested that the use of graphs designed in multidimensional format can improve the performance quality of decision-makers.

Dull and Tegarden (1999) experimented with one hundred and twenty-four senior business students already familiar with financial statements to investigate whether multidimensional graphs, compared to two-dimensional graphs, would be more effective for accounting decision-making tasks. For the experiment, Dull and Tegarden (1999) developed three graphs. For the first graph, a two-dimensional graph was used to demonstrate three functions: wealth, momentum, and impulse within momentum accounting (Dull & Tegarden, 1999). The market value of a company in a specified time is defined as "wealth", the rate of change of wealth were defined as "momentum" and the rate of change of momentum was defined as "impulse" (Dull & Tegarden, 1999). In the two-dimensional graph, the x-axis displays months, the y-axis displays the dollars, and the three lines presented

within the graph represent the three functions (wealth, momentum, and impulse) (Dull & Tegarden, 1999).

For the second graph, an additional z-axis is introduced, which represents the momentum, although the x-coordinate and the y-coordinate were maintained with month and wealth, respectively (Dull & Tegarden, 1999). However, an additional dimensional color of the line at any point on the line was introduced to present the company's impulse (Dull & Tegarden, 1999). In addition, the third and the final visualization were similar to the second visualization with the difference that it could be rotated by the subjects 360 degrees vertically and 180 degrees horizontally to view the relation of data from different perspectives (Dull & Tegarden, 1999). Every subject receives either of the three visualization formats, and they need to predict the wealth of the companies for the 101st, 110th, and 120th month. Although, after completing the experiment, Dull and Tegarden (1999) concluded that the multidimensional visual presentation (3-d graphs) results in better decision performance for the subjects compared to the subjects using two-dimensional graphs. However, Dull and Tegarden (1999) also noted that subjects who performed with multidimensional visualization were slower in performing the given task than those who performed with two-dimensional graphs. The result of the study made by Dull and Tegarden (1999) shows that the presentation format's design affects the decision-makers accuracy, which ultimately affects their performance. The findings also confirm that using a multivariate presentation format enhances decision-makers accuracy and reduces the unnecessary information load, which affects their performance (Dull & Tegarden, 1999).

Sithole (2016) raised another very general problem in the design of accounting information presentation. According to Sithole (2016), in accounting practices, it is very common to use the graphical and tabular presentation format along with texts that describe them, written above, below or on either side. Such design of presentation format requires processing some tasks while keeping some information in their working memory, which increases the information load (Sithole, 2016). As a result, decision-makers find difficulty in understanding the information, which ultimately results in poor decision quality (Sithole, 2016). However, in accordance with cognitive load theory, which suggests that the redesigning of instructional material format to optimize the understanding of complex tasks should also consider the user's working memory (Sithole, 2016). Based on a result of his study, Sithole (2016) suggests that carefully redesigning the information material, for instance, bringing the texts close to the graphs or diagrams, can help the decision makers to focus more on the information and would their performance. This finding of Sithole (2016) shows that the design of the information presentation format affects the decision-makers' performance.

To reach the above results and test whether the presentation format design affects the decision makers' performance, Sithole (2016) conducted a study with ninety-one postgraduate students having accounting as a part of their course. Half of these subjects receive accounting equations, which include debit and credit rules in diagrams and associated the description texts written separately, and the remaining subjects receive similar information with the texts written close to the diagram (Sithole, 2016). Sithole (2016) conducted the study in two phases: the learning and the test. In the learning phase, the participants read the information material given in fifteen minutes of time and in the test phase, the participants were asked to answer twenty recall and eleven transfer questions (Sithole, 2016). For recall tasks, subjects have to retrieve the information they have learnt

from the information materials provided, and for the transfer task, they need to implement what they have learned during the instruction to a new problem-solving case (Sithole, 2016).

After completion of the experiment Sithole (2016) concluded that the group that received the diagram with the associated texts written closely to the diagram performed better and reported less mental effort than the group that received the same information having the descriptive texts written separately. Hence, the study by Sithole (2016) suggests that the integrated format of text presented close to the diagrams results in effective decision-making, and accounting firms should use it to enhance the auditors effectiveness in decision making process.

Based on the results of the study made by Dull and Tegarden (1999) and Sithole (2016), it is clear that the design of the presentation format does affect the decision-makers' performance. The above two studies confirm that the design of the presentation format is one of the most important factors to be considered while presenting accounting information to decision-makers. Selecting the correct design of information presentation can reduce the information load and enhance the overall performance of the decision-makers. For presenting complex accounting information having multiple functions or variables, a multidimensional graphical format must be used as it reduces the complexity of the information and helps enhance the decision-makers' performance. Additionally, presenting the accounting data and the text description associated with it as closely as possible would help decision-makers focus on the information and make better decision judgments.

## **4.2 Diagram and textual presentation format**

### **4.2.1 In documenting and evaluating internal control of an organization**

Evaluating a organizations' internal control system is always a part of financial statement audits (Bierstaker & Thibodeau, 2006). It is mainly done to examine to what extent an organization's internal controls can detect and prevent fraud and error within the system, which also helps enhance audit performance (Bierstaker & Brody, 2001). Additionally, in united states of america the Sarbanes-Oxley Act requires publicly traded organizations to assess their effectiveness of internal control systems or else they might lose access of us capital market (Bierstaker et al., 2009). In their study, Boritz et al. (2012) also confirm that SOX mandates the management of organizations to assess their internal controls over financial reporting. To have a better audit performance and to comply with Sarbanes-Oxley Act, auditors and managers prefer to assess the organization's business process to test the effectiveness of a firm's internal controls over financial reporting (IAASB 2006, as cited in Boritz et al., 2012).

Several studies have been conducted to determine whether a narrative or flowchart diagram of internal control documentation helps auditors to evaluate the missing controls. Bierstaker and Brody (2001) experimented with seventy experienced internal auditors to determine whether the documentation of internal control in the form of narratives with flow charts would yield better performance compared with the narrative-alone format. However, they figured out that documentation format does not affect the performance of the auditors. Moreover, in another experiment, Bierstaker and Thibodeau (2006) compared the documentation of internal controls in the questionnaire and narrative format, and they concluded that the auditors performed better with

the internal controls documented in questionnaire format. Lastly, Bierstaker et al. (2009) conducted a study to determine whether the business process presented in a textual and diagrammatic format, along with the presence or absence of a client-prepared internal control matrix, helps or hinders an auditor's ability to point out the missing controls. After experimenting, Bierstaker et al. (2009) concluded that the auditors identified more number of missing internal controls when provided with a business process flow chart with a blank internal control matrix.

Bierstaker & Brody (2001) used seventy experienced internal auditors to determine whether the documenting the internal controls in narrative alone format or the flowchart description with the narrative format would enhance the auditor's performance in evaluating the strength and weaknesses of the internal control of a hypothetical company. Bierstakers and Broody (2001) gave the auditors a narrative description of auditees accounting procedure of sales and collection cycles. The subjects were require to evaluate the strength and weaknesses of the controls of sales and collection cycle and document them either in textual or flowchart along with textual format (Bierstaker & Brody, 2001). After completing the experiment, Bierstaker and Brody (2001) found no effect on the performance of the auditors using the two documentation formats. However, Bierstaker and Broody (2001) noted that highly experienced participants perform better than those with less experience in auditing.

Results of Bierstaker & Brody (2001) state that in documenting the internal control of a company both the narrative alone and narrative with flowcharts format are equally good. To extend the study of Bierstaker and Brody (2001), Bierstaker & Thibodeau (2006) compared the questionnaire with the narrative documentation format of the company's internal control. Bierstaker and Thibodeau (2006) experimented with seventy-three experienced auditors from a internationally recognised company. Similar to Bierstaker and Brody (2001), Bierstaker & Thibodeau (2006) choose a hypothetical client to evaluate its accounting procedure and controls of sales and collection cycle. Every auditor was provided with documents that describe the company's accounting procedure and control for the sales and collection cycles (Bierstakers & Thibodeau, 2006). In addition, Bierstakers and Thibodeau (2006) created a questionnaire based on a generic internal control questionnaire (ICQ) for sales and collection cycles. The auditors were randomly asked to document the internal controls' weaknesses in textual format or to complete the ICQ (Bierstakers & Thibodeau, 2006). Auditors who received the narrative format were asked to prepare a textual format of identified weaknesses, and the auditors who received the questionnaire format were asked to complete an internal control questionnaire (Bierstaker & Thibodeau, 2006). After completing the study, Bierstaker & Thibodeau (2006) concluded that the participants who used the questionnaire format to document internal control performed better than the participants using the narrative format.

Bierstaker et al. (2009) conducted a study to determine whether the business process flowcharts or narrative format of the business process enhances auditors' performance in evaluating the internal control weaknesses. Bierstaker et al. (2009) used a large sample size of three hundred and ninety-five experienced auditors for their study. These subjects were provided with set of business processes, including the goods receiving process, production process, shipping process and data recording process (Bierstaker et al., 2009). These business processes were presented in a flowchart and in narrative formats with the addition of a blank or client-prepared internal control matrix



(Bierstaker et al., 2009). The subjects have identified the missing internal controls using either of the presentation formats. After completing the study, Bierstaker et al. (2009) concluded that auditors who use business process flow charts with blank internal control matrices perform better than auditors using other combinations of presentation formats.

The findings of the above studies provide a mixed response for the use of documentation and evaluation of internal control in narrative, diagrammatic and questionnaire format. As seen from the above study by Bierstaker & Brody (2001), the narrative alone and the narrative with diagrammatic presentation format for documenting the company's internal control were equally good and reliable. Additionally, a study by Bierstaker and Thibodeau (2006) finds that in documenting a company's internal control using a narrative or internal control questionnaire format, the internal control questionnaire helps the auditor more in comparison with the narrative format. Lastly, the findings of the study done by Bierstaker et al. (2009) states that auditors perform better when provided with a diagrammatic presentation format of business processes with a blank internal control matrix to evaluate internal controls of business processes.

A study by Bierstaker & Brody (2001) and Bierstaker & Thibodeau (2006) uses seventy and seventy-three experienced auditors, respectively, to evaluate and document the internal controls of a fictitious company. Bierstaker & Brody (2001) presented a description of the sales and collection cycle to the auditors and asked them to evaluate the strength and weaknesses of the sales and collection cycle system. The subjects were asked to document the strengths and weakness of the internal controls in either narrative alone or narrative with flowchart format (Bierstakers and Body, 2001). On the other hand, Bierstaker and Thibodeau (2006) presented the narrative description sales and collection cycle to the auditors and asked the auditors to document the missing controls in either narrative or questionnaire format. The sample size and the task used by both researchers were appropriate. However, using real company data instead of fictitious data might have enhanced the results. Moreover, the conclusion made by Bierstaker and Brody (2001) favoured both the narrative alone and the diagram with a narrative format, as no differences in the performance of the auditors were observed. This conclusion statement is relevant for academic and practical purposes, as not using diagrams could yield less cognitive load to the auditors and save time and money. Furthermore, Bierstaker and Thibodeau's (2006) results favour using internal control questionnaires instead of the narrative format for documenting the missing controls. However, using an internal controls questionnaire for documenting and evaluating internal controls would be an alternate option, and it could be economical and saves time.

The third study, conducted by Bierstaker et al. (2009), uses three hundred ninety-five experienced auditors from working in major accounting firms. The auditors were provided with a set document of business processes in either diagram or narrative format in addition to with or without internal control matrices. They were asked to determine the missing controls of a fictitious company's production and shipping process. Here, the sample size is large, which indicates that diverse subjects have also been used. The task used here is quite relevant to the study. However, using data from a real company would have shown better results. The findings of Bierstaker et al. (2009) could be

used for practical purposes as they state that the auditors' performance could be enhanced by providing them business process flow charts with blank internal control matrix.

The finding of the above studies shows that evaluating and documenting internal control of a business process is an important factor to consider, as it can affect an auditor's performance. It is noted that for evaluation of internal control of the business process, auditors should be given business process flow charts with blank internal control matrices for better performance. When the cost of the presentation format is vital, then the presentation of the business process should be done in narrative format. Additionally, to document the strengths and weaknesses of internal controls, auditors should use the internal controls questionnaire format as this format helps them find more strengths and weaknesses for the given accounting procedure.

#### **4.2.2 For representation of organization's business process**

Analysis of clients' business processes is a prime activity of auditors' assessment of the client's internal controls (Boritz et al., 2012). These business processes can be described in textual or visual diagrams, such as business processes model notation (BPMN), flowchart diagram, and written narrative format (Ritchi et al., 2020). However, the choice of the presentation format does matter, as it can affect the performance of both the audit professionals and the novices (Boritz et al., 2012). Additionally, creating and evaluating business process documents could take time and may be a costly activity (Boritz et al., 2012).

Previously, a study by Bierstaker et al. (2009) concludes that auditors perform better with business process flowcharts in identifying missing controls than when they are not using the flowchart (Boritz et al., 2012). In addition to the above, Dunn and Gerard (2001) states that for search, recognition and for inference tasks, auditors find the visual representation format effective and efficient (Ritchi et al., 2020). In another study, Carnaghan (2006) states that diagrammatic representations of the business process have some advantages over narrative format. However, a combination of business process diagrams and a narrative format might be better for auditors to assess internal controls (Ritchi et al., 2020). In contradiction to the above studies, Gadh et al. (1993) find that some professional auditors are not comfortable with diagrammatic format and would like to have simple textual documentation of business processes (Boritz et al., 2012).

The above studies show a mixed response against using diagrammatic and textual presentation formats of business processes. Some studies support the diagrammatic presentation of the business process format, and others support textual narrative representation. However, knowing the best presentation format to present the business process is vital to enhance the auditors' performance. This section illustrates a review of the work of Boritz et al. (2012), Ritchi et al. (2020), and Dunn & Gerard (2001), and the results of their studies are considered as the appropriate presentation format for the presentation of a business process.

Boritz et al. (2012) experimented with one hundred thirty-nine accounting students to determine whether the diagrammatic or narrative format of the business process would enhance their performance while evaluating a company's internal controls. The subjects were provided with the

documentation of procurement to pay process of a fictitious convenience store either in textual narrative or Business process model notation (BPMN) diagrams, and they were asked to evaluate the control weaknesses (Boritz et al., 2012). These subjects must answer twenty-four multiple-choice questions in seventy-five minutes using either of the two presentation formats (Boritz et al., 2012). Boritz et al. (2012) measured the students' accuracy, efficiency and average of both efficiency and accuracy. The accuracy was determined as the percentage of right answers obtained by the participants, on the other hand, efficiency was determined by the time taken to answer all the questions, and lastly, the average performance was measured as the average of both accuracy and efficiency (Boritz et al., 2012). After the experiment, Boritz et al. (2012) concluded that both participant groups using diagrams and texts were equally accurate; however, subjects using textual format were more efficient, increasing their weightage average performance for the task.

Similar to the study conducted by Boritz et al. (2012), Ritchi et al. (2020) also experimented to find whether the diagrammatic presentation or textual narrative format of the business process would enhance the auditor's performance. Ritchi et al. (2020) extended the study of Boritz et al. (2012) by introducing eighty-three experience participants and eighty-four non-experienced students. In contrast with Boritz et al. (2012), Ritchi et al. (2020) use four types of tasks: search and recognition, inference, problem-solving, and recall. For the experiment, every participant received two business processes: the procurement to pay process and the good handling process, either in the form of BPMN or narrative were presented to the subjects and were asked to perform the four tasks (Ritchi et al., 2020). In search and recognition tasks, participants have to scan and locate a piece of information; for inference tasks, subjects were asked to integrate previous insights into the process description to answer the questions (Ritchi et al., 2020). Also, for the problem-solving task, participants had to assess the risk of a specific case; lastly, for the recall task, participants were asked to complete the missing word for the narrative description of the process (Boritz et al., 2012). After the experiment, Ritchi et al. (2020) found that, for search and recognition and partially for inference tasks, both experienced auditors and students were effective using the BPMN diagram. Furthermore, for recall tasks (for both experts and students) and partially for problem-solving tasks (only in the case of experts), a business process in textual format provides better results than the BPMN models (Ritchi et al., 2020).

Boritz et al. (2012) and Ritchi et al. (2020) compared BPMN diagrammatic and narrative presentation formats to determine whether the diagrammatic or narrative format is more suitable for auditors to enhance their performance. Moreover, a study made by Dunn and Gerard (2001) compared entity-relationship model (diagrammatic) with Backus-Naur Form (narrative) format to determine the best presentation format. Dunn and Gerard (2001) experimented with forty-six experienced auditors, and every auditor was provided with documentation of a fictitious company's revenue cycle and acquisition cycle. The participants performed three types of tasks: search, recognition and inference tasks for the revenue and acquisition cycle using either documentation format (Dunn & Gerard, 2001). The results of Dunn and Gerard (2001) supported the results of Boritz et al. (2012). Dunn and Gerard (2001) concluded that there were no differences in terms of accuracy for auditors using the two presentation formats; this result is similar to the result of Boritz et al.(2012). In addition,

Dunn and Gerard (2001) also concluded that the ER (diagrammatic) format enhances the efficiency of the auditors.

The study done by Boritz et al. (2012) and Dunn and Gerard (2001) confirm that display type of the business process does not affect the accuracy of the auditor. However, the efficiency of the auditor can be enhanced by using a narrative format. In comparison, Ritchi et al. (2020) show that the use of the BPMN depends on the type of task opted by the auditors. However, the results of the above studies state that for search and recognition and for inference tasks, the diagrammatic format of business process is more suitable and for evaluation of internal control, problem-solving task, and recall tasks, the business process presented in narrative format is more suitable for auditors (Boritz et al., 2012; Dunn & Gerard, 2001; Ritchi et al., 2020).

Based on the results of the above studies, it is evident that the type of presentation format of the business process doesn't affect the accuracy of auditors. However, it is observed that there is a mixed response to the efficiency of the presentation format, as results of Dunn and Gerard (2001) confirm that the diagrammatical format of the business process is more efficient than the narrative format. Whereas, Boritz et al. (2012) find that the textual presentation format is more efficient than the diagrammatical format. In addition, the results of the study done by Ritchi et al. (2020) confirm that both display formats business process are accurate and efficient for different task types. Hence, referring to the above studies, either the diagrammatic or textual presentation format can be used to present the company's business process, as both presentation formats are equally effective and efficient.

## **Chapter 5**

### **Conclusion, limitation and future research**

## 5. Conclusion

Modern auditing process requires a large amount of accounting data. Auditors mainly use organizations' financial statement accounts and organizations' business processes to evaluate their performance. Companies provide accounting data sets in graphs, tables, texts, and diagrams to auditors and decision-makers for audit purposes. Presenting the data could be a costly and time-consuming activity. However, it is important to know what type of data format should be provided to the auditors to enhance their performance. Not selecting the right presentation format might affect the quality of judgement. Hence the right format must be presented to the auditors for the auditing purpose. There is always a debate about whether auditors should use modern graphics or or rather, they should stick to the conventional tabular or textual presentation format while auditing. This study aims to identify the most appropriate format between graphs and tables for presenting financial statement accounts and between diagrams and texts for presenting organizations' business processes. In this research, using previous literature, various factors have been determined that can affect the performance of the auditors while using different presentation formats (graphs, tables, diagrams, and texts). Considering these factors, the most appropriate format between graphical or tabular presentation and diagram or textual the best presentation format is suggested.

This research points out a possible solution to the dilemma of using different presentation formats (between graphs and tables and between diagrams and texts). Based on the literature review, it is suggested that auditors with relevant experience in auditing should be provided with the company's financial statements either in graphical or tabular presentation format, as auditors were equally effective in using both formats. In addition, inexperienced decision-makers should be provided with a graphical presentation format of financial statements to enhance their performance. Moreover, for presenting complex multivariate accounting data to the auditors, instead of using two-dimensional graphs, a multidimensional graph should be used. Additionally, diagrams with text descriptions should be integrated as closely as possible so that the auditors and decision-makers can clearly understand the information, which ultimately enhances their effectiveness and efficiency. The results of this study also suggests that for high-complexity symbolic tasks, auditors should use a tabular presentation format of accounting data; for high-complexity spatial tasks, they should use a graphical presentation format of the accounting data. At the same, for the low-complex symbolic task, a graphical presentation format of accounting data should be used, and for low-complexity spatial tasks, either a graphical or tabular presentation format of financial information can be used.

The finding of this study also provides evidence that both BPMN diagrams and textual narrative format are equally good for the presentation of the company's business processes. In addition, business process diagrams should be provided to the auditors to evaluate the organization's internal control system. Lastly, the internal control questionnaire format is better than the textual format for documenting the strength and weaknesses of a company's internal control.

### **Limitations and future research**

This study aims to find the most appropriate format for presenting financial statement accounts and the company's business processes between graphs and tables and diagrams and texts. Based on a literature review of the previous relevant studies, five variables have been identified that can impact the auditor's performance using different presentation formats (graphical, tabular, diagrammatical, and textual). This study is limited to four types of presentation formats. However, apart from the presentation format discussed in this study, another presentation format could also be compared, and more factors that affect the performance of auditors can be identified by reading more research articles. Another presentation format could be interactive dashboards, schematic faces, and colored versions of graphical and tabular presentation formats can also be discussed as part of future work. In this study, limited research is done on the factors "task interruption" and "design of presentation format", which also affects the performance of the auditors and decision-makers. However, a detailed discussion of these factors could be a part of future work.

## Bibliography

- Anderson, J. C. and P.M.J. Reckers. 1992. "An Empirical Investigation of the Effects of Presentation Format and Personality on Auditor's Judgment in Applying Analytical Procedures." *Advances in Accounting*. (10): 19-43.
- Anderson, J. C., & Mueller, J. M. (2011). The Effects Of Experience And Data Presentation Format On An Auditing Judgment. *Journal of Applied Business Research (JABR)*, 21(1). <https://doi.org/10.19030/jabr.v21i1.1500>
- Benbasat, I., & Dexter, A. S. (1985). An Experimental Evaluation of Graphical and Color-Enhanced Information Presentation. *Management Science*, 31(11), 1348-1364. <https://doi.org/10.1287/mnsc.31.11.1348>
- Benbasat, I., Dexter, A.S., 1985. An investigation of color and graphical information presentation under varying time constraints. *MIS Quarterly* 19 (1), 59-83.
- Bierstaker, J. L., & Brody, R. G. (2001). Presentation format, relevant experience and task performance. *Managerial Auditing Journal*, 16(3), 124-129. <https://doi.org/10.1108/02686900110385560>
- Bierstaker, J. L., Hunton, J. E., & Thibodeau, J. C. (2009). Do Client-Prepared Internal Control Documentation and Business Process Flowcharts Help or Hinder an Auditor's Ability to Identify Missing Controls? *AUDITING: A Journal of Practice & Theory*, 28(1), 79-94. <https://doi.org/10.2308/aud.2009.28.1.79>
- Blocher, E., Moffie, R. P., & Zmud, R. W. (1986). Report format and task complexity: Interaction in risk judgments. *Accounting, Organizations and Society*, 11(6), 457-470. [https://doi.org/10.1016/0361-3682\(86\)90030-9](https://doi.org/10.1016/0361-3682(86)90030-9)
- Boritz, J. E., Borthick, A. F., & Presslee, A. (2012). The Effect of Business Process Representation Type on Assessment of Business and Control Risks: Diagrams versus Narratives. *Issues in Accounting Education*, 27(4), 895-915. <https://doi.org/10.2308/iace-50144>
- Carnaghan, C. 2006. Business process modeling approaches in the context of process level audit risk assessment: An analysis and comparison. *International Journal of Accounting Information Systems* 7 (2): 170-204.
- Chapin, N. (2003). Flowchart. In *Encyclopedia of computer science* (pp. 714-716).
- Davis, L. R. (1989). Report format and the decision maker's task: An experimental investigation. *Accounting, Organizations and Society*, 14(5-6), 495-508. [https://doi.org/10.1016/0361-3682\(89\)90014-7](https://doi.org/10.1016/0361-3682(89)90014-7)
- Desanctis, G., & Jarvenpaa, S. L. (1989). Graphical presentation of accounting data for financial forecasting: An experimental investigation. *Accounting, Organizations and Society*, 14(5-6), 509-525. [https://doi.org/10.1016/0361-3682\(89\)90015-9](https://doi.org/10.1016/0361-3682(89)90015-9)



- Dickson, G. W., DeSanctis, G., & McBride, D. J. (1986). Understanding the effectiveness of computer graphics for decision support: A cumulative experimental approach. *Communications of the ACM*, 29(1), 40–47. <https://doi.org/10.1145/5465.5469>
- Dull, R. B., & Tegarden, D. P. (1999). A comparison of three visual representations of complex multidimensional accounting information. *Journal of Information Systems*, 13(2), 117-131.
- Dunn, C. L., & Gerard, G. J. (2001). Auditor efficiency and effectiveness with diagrammatic and linguistic conceptual model representations. *International Journal of Accounting Information Systems*, 2(4), 223–248. [https://doi.org/10.1016/S1467-0895\(01\)00022-7](https://doi.org/10.1016/S1467-0895(01)00022-7)
- Gadh, V. M., R. Krishnan, and J. M. Peters. 1993. Modeling internal controls and their evaluation. *Auditing: A Journal of Practice & Theory* 12 (Supplement): 113–137.
- Gantz, S. D. (2013). *The basics of IT audit: purposes, processes, and practical information*. Elsevier.
- Goodhue, D. L. and R. L. Thompson, "Task-technology fit and individual performance," *MIS Quarterly*, Vol. 19, pp. 213-237, 1995.
- Hirsch, B., Seubert, A., & Sohn, M. (2015). Visualisation of data in management accounting reports: How supplementary graphs improve every-day management judgments. *Journal of Applied Accounting Research*, 16(2), 221–239. <https://doi.org/10.1108/JAAR-08-2012-0059>
- International Auditing and Assurance Standards Board (IAASB). 2006. *Understanding the Entity and Its Environment and Assessing the Risks of Material Misstatement (and related appendices)*. ISA 315. New York, NY: International Federation of Accountants.
- Johnson, R. N., Wiley, L. D., Moroney, R., Campbell, F., & Hamilton, J. (2019). *Auditing: A Practical Approach with Data Analytics*. John Wiley & Sons.
- Kaplan, A. S., & Yang, Y. W. (2008). The impact of corporate governance on Internet financial reporting. *Journal of accounting and Public Policy*, 27(1), 62-87.
- Kaplan, S. E. (1988). An Examination Of The Effect Of Presentation Format On Audi. *Accounting Horizons*, 2(3), 90.
- Kelton, A. S., Pennington, R. R., & Tuttle, B. M. (2010). The Effects of Information Presentation Format on Judgment and Decision Making: A Review of the Information Systems Research. *Journal of Information Systems*, 24(2), 79–105. <https://doi.org/10.2308/jis.2010.24.2.79>
- Lloyd Bierstaker, J., & Thibodeau, J. C. (2006). The effect of format and experience on internal control evaluation. *Managerial Auditing Journal*, 21(9), 877–891. <https://doi.org/10.1108/02686900610704984>
- Mock, T. J., & Willingham, J. J. (1983). An Improved Method of Documenting and Evaluating A System of Internal Accounting Controls. *Auditing: A Journal of Practice & Theory*, 2(2).
- O'Donnell, E., & Perkins, J. D. (2011). Assessing Risk with Analytical Procedures: Do Systems-Thinking Tools Help Auditors Focus on Diagnostic Patterns? *AUDITING: A Journal of Practice & Theory*, 30(4), 273–283. <https://doi.org/10.2308/ajpt-10148>

- Ritchi, H., Jans, M., Mendling, J., & Reijers, H. A. (2020). The Influence of Business Process Representation on Performance of Different Task Types. *Journal of Information Systems*, 34(1), 167–194. <https://doi.org/10.2308/isys-52385>
- Rose, A. M., Rose, J. M., Sanderson, K.-A., & Thibodeau, J. C. (2017). When Should Audit Firms Introduce Analyses of Big Data Into the Audit Process? *Journal of Information Systems*, 31(3), 81–99. <https://doi.org/10.2308/isys-51837>
- Schulz, A. K. D., & Booth, P. (1995). THE EFFECTS OF PRESENTATION FORMAT ON THE EFFECTIVENESS AND EFFICIENCY OF AUDITORS 'ANALYTICAL REVIEW JUDGMENTS. *Accounting & Finance*, 35(1), 107-131.
- Sias, C. P. (1970) Financial communication with graphics, *Management Accounting*, 51 (10), April, 40-47.
- Sithole, S. (2016). The Effects of Presentation Formats on Understanding Financial Accounting: An Experimental Study. *Australasian Accounting, Business and Finance Journal*, 10(2), 76–92. <https://doi.org/10.14453/aabfj.v10i2.5>
- So, S., & Smith, M. (2004). Multivariate decision accuracy and the presentation of accounting information. *Accounting Forum*, 28(3), 283–305. <https://doi.org/10.1016/j.accfor.2004.07.005>
- Speier, C. (2006). The influence of information presentation formats on complex task decision-making performance. *International Journal of Human-Computer Studies*, 64(11), 1115–1131. <https://doi.org/10.1016/j.ijhcs.2006.06.007>
- Speier, C., Vessey, I., & Valacich, J. S. (2003). The Effects of Interruptions, Task Complexity, and Information Presentation on Computer-Supported Decision-Making Performance. *Decision Sciences*, 34(4), 771–797. <https://doi.org/10.1111/j.1540-5414.2003.02292.x>
- Stock, D., & Watson, C. J. (1984). Human judgment accuracy, multidimensional graphics, and humans versus models. *Journal of Accounting Research*, 192-206.
- Strong, J. M., & Portz, K. (2003). A Further Investigation Of Tables Versus Graphs For Decision-Making: Does Accounting Knowledge Make A Difference? *Review of Business Information Systems (RBIS)*, 7(2), 39–48. <https://doi.org/10.19030/rbis.v7i2.4533>
- Tang, F., Hess, T. J., Valacich, J. S., & Sweeney, J. T. (2014). The Effects of Visualization and Interactivity on Calibration in Financial Decision-Making. *Behavioral Research in Accounting*, 26(1), 25–58. <https://doi.org/10.2308/bria-50589>
- Vessey, I. (1991). Cognitive Fit: A Theory-Based Analysis of the Graphs Versus Tables Literature. *Decision Sciences*, 22(2), 219–240. <https://doi.org/10.1111/j.1540-5915.1991.tb00344.x>
- Volkov, A., & Laing, G. (2012). Assessing the value of graphical presentations in financial reports. *Australasian Accounting, Business and Finance Journal*, 6(3), 85-108.
- Volmer, F. G. (1992). Effect of graphical presentations on insights into a company's financial position: An innovative educational approach to communicating financial information in financial reporting. *Accounting Education*, 1(2), 151–170. <https://doi.org/10.1080/09639289200000025>

Westland, J. C. (2020). *Audit Analytics: Data Science for the Accounting Profession*. Springer International Publishing. <https://doi.org/10.1007/978-3-030-49091-1>

Wright, W. F. (1995). Superior loan collectibility judgments given graphical displays. *Auditing*, 14(2), 144.

Yoon, K., L. Hoogduin, and L. Zhang. 2015. Big Data as complementary audit evidence. *Accounting Horizons* 29 (2): 431–438. doi:10. 2308/acch-51076