Digital Reporting Formats and Users of Financial Reports: Decision Quality, Perceptions and Cognitive Information Processing in the Context of Recognition versus Disclosure

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Erlane K. Ghani

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Massey University
COLLEGE OF BUSINESS
Kaupapa Whai Pakihi

SCHOOL OF ACCOUNTANCY
Private Bag 11 222
Palmerston North
New Zealand
T 64 6 356 9099
F 64 6 350 5617
www-accountancy.massey.ac.nz

CANDIDATE'S DECLARATION

This is to certify that the research carried out for my doctoral thesis entitled: *"Digital Reporting Formats and Users of Financial Reports: Decision Quality, Perceptions and Cognitive Information Processing in the Context of Recognition versus Disclosure"* in the School of Accountancy, Massey University, Palmerston North Campus, New Zealand has not previously been accepted in substance for any degree and is not being concurrently submitted for any other degree. This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by footnotes giving explicit references. A list of references is appended. . .

Signed: _____ (candidate)
(Erlane K. Ghani)

Date: 1/8/08

Massey University
COLLEGE OF BUSINESS
Kaupapa Whai Pakihi

SCHOOL OF ACCOUNTANCY
Private Bag 11 222
Palmerston North
New Zealand
T 64 6 356 9099
F 64 6 350 5617
www-accountancy.massey.ac.nz

MEMORANDUM

TO: Doctoral Research Committee

FROM: Erlane K Ghani and Professor Fawzi Laswad

DATE: 1 August 2008

SUBJECT: Supervisor and Candidate Declaration

"Digital Reporting Formats and Users of Financial Reports: Decision Quality, Perceptions and Cognitive Information Processing in the Context of Recognition versus Disclosure"

We verify that:

i. Reference to work other than that of the candidate, has been appropriately acknowledged;
ii. Research practice, ethical and genetic technology policies have been complied with as appropriate.

Erlane K. Ghani

F. Laswad

Professor Fawzi Laswad

Massey University
COLLEGE OF BUSINESS
Kaupapa Whai Pakihi

SCHOOL OF ACCOUNTANCY
Private Bag 11 222
Palmerston North
New Zealand
T 64 6 356 9099
F 64 6 350 5617
www-accountancy.massey.ac.nz

MEMORANDUM

TO: Doctoral Research Committee

FROM: Professor Fawzi Laswad

DATE: 1 August 2008

SUBJECT: Supervisor's Declaration

I confirm that Erlane K. Ghani has pursued the doctoral course in accordance with Massey University's doctoral regulations.

F. Laswad

Professor Fawzi Laswad

ABSTRACT

The evolvement of digital reporting has changed the way financial information is prepared and disseminated (Debreceny and Gray, 2001). Previous research has shown that digital reporting has increased, particularly in the last five years, and this usage is characterised by greater volumes of business and financial information over that traditionally provided in print-based mode (Smith, 2003). The new opportunities and benefits offered by digital reporting are matched by challenges and implications not only for the preparers and auditors but also for users. It is expected that in the near future, financial reporting will move entirely from the primarily print-based mode to digital-based mode as the primary information dissemination channel (Oyelere et al., 2003; Fisher et al., 2004).

Research in the area of digital reporting has been conducted in the past decade. Within this research, a considerable number of issues have been raised. These issues relate to various parties, such as policy makers, preparers, auditors, system designers and users. While several research questions and hypotheses concerning these parties have been posed and investigated, most of the research questions and hypotheses have been formed from a preparers' perspective, leaving the examination of issues from a users' perspective largely unexplored.

This study focuses on users. It examines the effect of presentation formats on decision makers' performance in relation to decision quality, perceptions and cognitive information processing in the digital reporting environment. It aims to extend the digital reporting literature.

This study extends the existing body of knowledge on digital reporting environment in several ways. First, this study examines the effect of presentation formats on the quality of users' decision making. This study follows Kleinmuntz and Schkade (1993) who described 'decision quality' in the context of two cost-benefit dimensions in relation to decision makers' cognitive processes, namely decision accuracy and cognitive effort. Decision accuracy reflects the ability of a strategy to produce an accurate outcome while cognitive effort reflects the total cognitive expenditure incurred in completing a task. Second, this study examines users' perceptions of three digital presentation formats: PDF, HTML and XBRL. This study compares subjects' perceptions of usefulness and ease of use of the three presentation formats with their actual outcome. It also includes examining whether perceptions are an important factor in influencing preferred presentation format. Finally, this study examines whether digital presentation formats address the concern over functional fixation in the accounting context of 'recognition versus disclosure' in the reporting of financial information.

This study used public accounting practitioners in New Zealand as participants. Sixty two subjects participated in the experiment, which involves an experiment exercise and a post experiment questionnaire.

The results indicate that presentation formats impact on decision accuracy. This finding is consistent with previous studies conducted using non-digital presentation formats such as tabular and graphical in the psychology and information systems literature (Stock and Watson, 1984; Dickson et al., 1986; Iselin, 1988; DeSanctis and Jarvenpaa, 1989; Mackay and Villareal, 1987; Hard and Vanacek, 1991; Stone and Schkade, 1991; Anderson and Kaplan, 1992; Bricker and Nehmer, 1995; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Almer et al., 2003). The results, however, indicate that presentation formats do not impact decision makers' cognitive effort. These findings suggest that preparers, standard-setters and regulatory bodies should recognise that presentation format impacts on users' decision making processes and select appropriate formats that lead to improvement in decision making.

Additionally, the results indicate that users' perceptions of the usefulness and ease of use of the reporting technologies are similar across the three presentation formats. The results also show that users' perceptions do not necessary correspond to actual performance. Users' perceptions are found to influence their preferred presentation format. The findings of this study provide useful insights on users' perceptions, performances and preferences of the digital presentation formats. Such results provide a holistic and comprehensive view of the importance of perceptions and the effect of presentation formats on decision makers' performance. This is particularly relevant since if more advanced forms of digital reporting are to be encouraged, then there is also the need for users to be made more aware of the benefits to be gained from the different forms of presentation.

Finally, the results show that of the four recognised stages of information processing (i.e. acquisition, evaluation, weighting and judging information), functional fixation is found to only exist at the judgment stage. However, the effect of presentation format is only significant at information evaluation stage. The results indicate that the interaction between presentation formats and placement of information does not affect decision makers' information processing. This suggests that presentation formats do not solve the concern about recognition versus disclosure (functional fixation) in information processing stages. These findings are not consistent with Hodge et al. (2004) but are consistent with Luft and Shields (2001) who suggest functional fixation could not be alleviated because the accounting itself would affect the allocation of people's attention.

This study extends the literature on presentation format by examining the quality of decision making arising from the use of different presentation formats in a digital reporting environment. It provides evidence that users' perceptions of ease of use of a presentation format do not necessarily correspond to their actual performance (cognitive effort) once a particular task has been performed. This study also provides evidence that the acceptance of a technology is highly dependent on the perceptions of that technology. Therefore, limited knowledge and appreciation of the capabilities of a technology may have the undesired effect of deterring use of the technology although it may improve performance.

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2008

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"While much research has been conducted concerning accounting content of financial statements, limited research has been conducted in the area of presentation. One reason the research has been limited is because many of the technologies currently available to present financial statements were not available until recently".

Dull et al., 2003; p. 185.

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

Accounting preparers use presentation formats to disseminate accounting information because presentation formats are impervious to many human information processing limitations (Stock and Watson, 1984; Frownfelter-Lohrke, 1998). The role of presentation formats as aids for decision-makers has been supported in a variety of tasks such as to influence affective responses (Rose, 2002) or to improve reporting transparency (Hodge et al., 2004). Presentation formats are particularly beneficial in environments where decision tasks involve large amounts of information requiring extensive cognitive effort. In such environments, demands on information integration are indeed high and decision quality typically reduces because decision-makers are prone to becoming overwhelmed with processing demands, and therefore make wrong judgments (Hwang and Lin, 1999).

To cope with an increasing amount of information, decision-makers need to rely on other aids such as presentation formats to assist in their decision-making tasks. The changing environment from hard-copy traditional reporting to digital reporting has seen presentation formats evolve from tabular and graphical to more sophisticated formats such as Portable Document Format (PDF) and Extensible Business Reporting Language (XBRL). Research has been conducted to examine whether the way information is presented could influence decision-making (Stock and Watson, 1984; Dickson et al., 1986; Mackay and Villareal, 1987; Iselin, 1988; Vessey, 1991; Hard and Vanecek, 1991; Stone and Schkade, 1991; Anderson and Kaplan, 1992; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Almer et al., 2003; Dull et al., 2003; Baldwin et al., 2004; Hodge et al., 2004; So and Smith, 2004). These studies provide conflicting results with some showing that relying on inappropriate

presentation formats would result in incorrect decision outcomes (Stock and Watson, 1984; Hard and Vanecek, 1991; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Hodge, 2001; Hodge et al., 2004). Others have shown no significant relationship between presentation formats and decision outcomes (Bricker and Nehmer, 1995; Dull et al., 2003; So and Smith, 2004).

Decision-makers in high load situations are prone to relying on technology that would assist them in processing huge amounts of information (Roberts, 2002). Since presentation formats are closely linked to information content, decision-makers often choose the presentation formats that are perceived to be the most beneficial to them (Frownfelter-Lohrke, 1998). As various presentation formats catering for a variety of tasks are becoming more widely available, it is important to understand their impact on the decision-making process (Maines, 1995).

One could, however, pose the question: do presentation formats improve the performance of decision-makers, or is it perhaps just a way to promote one presentation format over another? Such question is consistent to Locke and Lowe (2007) arguing that the benefits of certain presentation formats (such as XBRL) have been overstated and "hyped" by enthusiastic parties. A number of studies have examined the effect of presentation formats on users' performance. However, the need to investigate this area to further examine the effect of presentation formats on decision-makers is motivated in this study for four reasons.

First, although studies on presentation formats have been conducted in various bodies of literature, the findings from presentation format studies are mixed. The inconsistent findings merit further investigation. Further, the evolvement of digital presentation formats leads to the provision for further research opportunities on the effect of presentation formats on decision-makers.

Secondly, most of the studies examining the link between presentation formats and decision-makers were conducted in the US. Similarly, studies examining digital reporting

and decision-makers were also conducted in the US. Although studies have suggested that decision-makers' behaviour would not be affected by geographical factor (Libby et al., 2002), it would be interesting to examine the link of presentation format, digital reporting and decision-makers in a different setting such as New Zealand. An examination of the linkages would contribute to the literature on human behaviour outside the US.

Thirdly, previous studies (such as Maines and McDaniel, 2000; Hodge et al., 2004) have shown that decision-makers often incur functional fixation when firms are given choices on the adoption of alternative accounting models. Most of the studies examining this area often used prominent items such as stock option compensation or employee pension benefit which are often discussed and debated by various relevant accounting bodies. Studies using a less prominent item such as investment property are sparse. The recent debate on fair value model versus cost model of IAS 40: Accounting for Investment Property in the light of the implementation of the International Financial Reporting Standards (IFRS) in New Zealand has intrigue an issue of whether such choices could also lead to functional fixation on decision-makers and if so, whether digital presentation formats could help to alleviate the functional fixation.

Finally, studies examining decision-makers often used students as proxy to actual decision-makers, due to the students' availability to participate (Libby et al., 2002). Studies have shown that using students as proxy for real decision-makers often raises the issue of external validity (Stedry, 1960; Birnberg and Nath, 1967; Anderson, 1988; Vera-Munoz et al., 2002). Of consequence, examining the effect of presentation formats on real decision-makers is warranted.

Therefore, and underpinning the argument that presentation formats affect users' performance, the aim of this study is to investigate the effect of presentation formats on real decision-makers' performance in a digital environment. Specifically, this study investigates presentation formats on decision-makers': (a) decision quality; (b) perceptions; and (c) cognitive information processing in the context of recognition versus disclosure.

1.2 LIMITATIONS OF PRIOR RESEARCH AND SIGNIFICANT RESEARCH OPPORTUNITIES

Research on the impact of presentation formats has been conducted in various disciplines. The consumer literature examines the effect of presentation formats on consumers' behaviour (Betmann and Kakkar, 1977; Betmann and Zins, 1979; Biehal and Chakravarti, 1982). Consumers appear to process information in ways congruent with the presentation formats, processing information as it is structured without rearranging it (Betmann and Kakkar, 1977). Presentation formats together with learning goals would increase the decision-makers' performance (Biehal and Chakravarti, 1982).

The psychology literature examines presentation formats in an attempt to understand why certain presentation formats provide different outcomes. This literature indicates that the way information is presented affects a person's way of thinking and of processing information (Lusk and Kersnik, 1979; Schkade and Kleinmuntz, 1994). Therefore, when decision-makers capture the information according to how it was presented, affective responses are created and consequently influence the outcome of the decision-making process. The literature also reports that presentation formats affect search behaviour and personality and cognitive style which operate as moderating factors affecting the effectiveness of presentation formats on decision-makers' behaviour (Lusk and Kersnik, 1979).

Studies in the information systems literature attempt to provide empirical evidence on whether one presentation format outperforms another in influencing decision-makers' performance (Moriarity, 1979; Lucas, 1981; Stock and Watson, 1984; Benbasat and Dexter, 1985; Dickson et al., 1986; Remus, 1987; Jarvenpaa, 1989; Umanath et al., 1990; Vessey and Galletta, 1991; Hard and Vanecek, 1991; Ricchiute, 1992; Umanath and Vessey, 1994; Bricker and Nehmer, 1995; Clements and Wolfe, 1998; Tuttle and Kershaw, 1998; Dull and Tegarden, 1999; Clements and Wolfe, 2000; Rose, 2002; Speier et al., 2003; So and Smith, 2004). Most of these studies found that presentation formats do affect decision-makers' performance. Furthermore, the effect of presentation formats on decision-makers is greater

when the presentation formats match the task to be performed (Vessey, 1991; Umanath and Vessey, 1994). They also found work experience and familiarity with presentation format to be moderating factors that influence the effectiveness of presentation formats. Others found that presentation formats do not affect decision performance (Bricker and Nehmer, 1995).

In summary, most of the studies found at least some effect of presentation formats on decision-makers' behaviour. However, one limitation in these works of literature is that their focus was more on specific presentation formats, such as tabular, graphical, pictures, brand or matrix, which if incorporated into an accounting report would represent only a small segment of such a report.

The advancement of the digital environment has seen the emergence of digital reporting literature. Digital reporting has been extensively researched in the past decade (e.g., Lymer and Tallberg, 1997; Ashbaugh et al., 1999; Lymer, 1999; Anderson, 2000; Oyelere et al., 2003; Smith, 2003; Fisher et al., 2004; Hodge and Pronk, 2006). This literature examines a range of issues including the factors that lead public and private organisations to adopt digital reporting (Ashbaugh et al., 1999; Craven and Marston, 1999; Deller et al., 1999; Anderson, 2000; Allam and Lymer, 2003; Oyelere et al., 2003; Laswad et al., 2005), and the extent of information provided digitally (Allam and Lymer, 2003; Smith, 2003; Fisher et al., 2004). Notably, these studies have mainly focused on preparers' perspectives.

More recently, a number of studies have focused on users' perspectives (Hodge, 2001; Hodge et al. 2002; Beattie and Pratt, 2001; 2003; Hodge et al. 2002; Dull et al., 2003; Hodge et al., 2004; Hodge and Pronk, 2006). These studies examine users' information needs, presentation format preferences and decision-making perspectives. The findings of these studies are analogous to those in the traditional reporting environment and other works of literature: decision-makers demand a variety of information items, have different preferences for presentation formats, and presentation formats have differing effects on decision-makers' performance.

The emergence of XBRL as a presentation format in recent years poses an interesting question on the need to have an extensive number of presentation formats in disseminating financial information, and whether presentation formats have an effect on decision-makers and if they do, whether such effect are analogous with findings reported in other works of literature. The US Securities Exchange Commission (SEC) in adopting the XBRL Voluntary Financial Program on the Edgar Systems, noted the importance of researching presentation formats in the digital reporting paradigm in order to assess the potential benefits from presentation formats (SEC, 2005). Debreceny and Gray (2001) and Wu and Vasarhelyi (2004) have called for more experimental studies to examine the potential impact of presentation formats in the digital reporting environment on decision-making.

Abdolmohammadi et al. (2002) suggest that there is a need to examine the impact of presentation formats on decision-makers' decision quality (efficiency and effectiveness) in order to provide empirical evidence on the effect of presentation formats on decision quality. 3 (2004) suggest that there is a need to examine the impact of XBRL format in enhancing decision-makers' performance since the main objective of the preparation of corporate reports is to promote transparency of financial reporting (Hodge, 2001; Beattie and Pratt, 2003; Hodge et al., 2004; Hodge and Pronk, 2006). There has also been a call for more studies that examine the impact of digital presentation formats on decision-making performance and in particular decision quality (Debreceny and Gray, 2001; Wu and Vasarhelyi, 2004). Examining such an issue would address the limitations in previous studies which have focused on the smaller scale presentation formats that represent only a small section of the financial report.

Studies in the information systems literature have suggested that the success of a technology such as presentation formats is likely to depend on internal factors such as perceptions, which is a primary input to decision-making (Beach and Mitchell, 1978; Abelson and Levi, 1985; Davis, 1989; Adams et al., 1992). These studies propose that users often share similar views on the usefulness and ease of use of technologies that have a similar function and that acceptance of a technology is highly dependent on their

perceptions of that technology (Adams et al., 1992; Beach and Mitchell, 1978; Davis, 1989).

Similarly, studies in the psychology literature indicate that adoption of a technology is a function of a variety of factors, one factor being perceptions (Rogers, 1983). Of consequence, limited knowledge and appreciation of the capabilities of a technology would have the undesired effect of deterring engagement with a technology that actually improves performance. Ironically, perceptions have not been extensively explored in the presentation format literature. One reason could be that researchers tend to place more focus on examining the effect of presentation formats on decision-making, and ignore the concept that the success of presentation formats may rely on perceptions. Exploring this area would enhance the understanding of users' perceptions of presentation formats.

One of the issues debated in the behavioural decision literature is whether placement of information gives rise to functional fixation. Functional fixation exists when decision-makers fail to adjust for differences arising from the adoption of different accounting methods (Libby et al., 2002). Most of the studies found the existence of functional fixation in situations where firms are given alternatives in placing an information item in the financial statement (that is recognised in the body of the financial statement or alternatively disclosed in the notes to the accounts)[1]. Of consequence, such alternative accounting treatment influences decision-makers' cognitive information processing which eventually leads to poor decision outcomes (Wilkins and Zimmer, 1983; Harper et al., 1987, 1991; Sami and Schwartz, 1992; Hirst and Hopkins, 1998; Lipe, 1998; Maines and McDaniel, 2000). However, these studies often used information items such as stock option compensation or employee pension benefits which are often discussed and debated by various relevant accounting bodies making these information items more apparent to decision-makers. The behavioural decision literature, however, has not thoroughly explored less eminent information items, such as investment property (Yungmann, 1999; Praditsmanont, 2002), which raises the interesting question of whether similar results would emerge in different settings.

[1] In the context of this study, such alternative placement of information is referred to as "recognition versus disclosure".

Recent studies propose potential solutions to alleviate the effect of functional fixation in recognition versus disclosure situations. These studies use external and internal inputs such as presentation formats and learning of information to identify potential solutions to alleviate functional fixation in decision-makers' cognitive processing (Luft and Shield, 2001; Hodge et al., 2002; 2004). These studies provide mixed results. Hodge et al. (2002; 2004) found presentation formats to be a potential solution for functional fixation. Learning of information, on the other hand has been found to be a non-probable solution (Luft and Shield, 2001). Therefore, to suggest conclusive evidence is non-plausible since similar studies are yet to be undertaken.

In summary, given that presentation formats in the digital reporting environment are more sophisticated compared to those in the traditional reporting environment, it could be expected that digital presentation formats would be able to affect decision-makers' decision quality by assisting them in achieving greater decision accuracy with less cognitive effort. It could also be expected that decision-makers would perceive the digital presentation formats as equally useful and easy to use. However, because of human information processing limitations, it may not be expected that digital presentation formats could alleviate the effect of placement of information on cognitive information processing.

1.3 PRESENTATION FORMATS

Studies examining the effect of presentation formats on decision-makers' performance normally involve comparison between two or more presentation formats (Stone and Sckhade, 1994; Umanath and Vessey, 1994; Dull et al., 2003; Speier et al., 2003; Hodge et al. 2004). The types of presentation format vary significantly from graphs, tables, linguistic and numeric presentations, to formats such as hyperlink, PDF and HTML. Early studies, such as Moriarity (1979) focus on examining the effect of two-dimensional graphics on decision processes. Subsequent studies focus on either graphs versus tables (Dickson et al., 1986; Vessey, 1991; Vessey and Galletta, 1991; Frownfelter-Lohrke, 1998), or a combination of graphs and tables (Frownfelter-Lohrke, 1998). A few studies concentrate on pictorial presentations (Stock and Watson, 1984; Umanath and Vessey, 1994), linguistic

and numeric representations (Stone and Schkade, 1991), different scaling methodologies (Stone and Schkade, 1994), and hyperlink presentations (Ramarapu et al., 1997; Hodge, 2001; Dull et al., 2003).

This study focuses on the impact of digital presentation formats on decision-makers' performance. In the context of this study, digital presentation format is a format used to present financial information digitally to the decision-makers. Three digital presentation formats are used: PDF, HTML and XBRL. These presentation formats are chosen because of their wider availability and use in the dissemination of financial information. In this study, the presentation of the financial information in using the three presentation formats as viewed by the decision-makers is depending on the mediating software used to access the presentation formats. The following provides descriptions of the presentation formats used in the context of this study.

1.3.1 Portable Document Format (PDF)

Portable Document Format (PDF) is a presentation format that allows decision-makers to view and read electronic documents, either on or off line. It preserves all formatting in a document, regardless of the platform used to read it. PDF complements the traditional print-based form approach. It is identical to print-based forms when viewed on screen and when printed. PDF is easily accessible and provides document security since it is a proprietary format. Proprietary format means that the document cannot be simply altered without authorisation. It has special access rights and can be digitally signed. PDF files can only be accessed and viewed using Acrobat Reader™.

PDF evolved in the early stage of digital reporting. When it was first introduced, its features were restricted to only viewing documents. It was non-searchable and non-copyable[2] (Dull et al., 2003). As it evolved, PDF allowed hypertext links as well as key word searches. Interactive hypertext links have made PDF files easier to navigate. PDF allows links out to web pages in specific places within the file and links in the document

[2] Non-copyable refers to the inability of the presentation format to allow a reader/ user to copy and paste content to another file.

(Beattie and Pratt, 2003). PDF contains information on content and structure, and makes them accessible with the help of screen readers. The search capability of Acrobat Reader™ was developed at a later stage to allow for key word searches which may improve decision-makers' data searching (Baldwin et al., 2003). It also allows users to copy and paste to another file although the content is not modifiable.

1.3.2 Hypertext Mark-up Language (HTML)

Hypertext Mark-up Language (HTML) is a presentation format that allows decision-makers to read documents, either online or offline. HTML comes from the mark-up language family. HTML is created based on Standard Generalized Mark-up Language (SGML). The purpose of SGML is to describe the general structure of various kinds of documents (Wu and Vasarhelyi, 2004).

HTML is designed specifically to structure a document. To convert the information from the traditional reporting model to HTML format may require significant effort in terms of design and layout. The preparer needs to structure the document by defining and labelling the document with a set of elements with HTML tags. Most documents have common elements such as titles, paragraphs and footnotes. HTML tags describe the document, and the appearance of the document is not essential as HTML focuses on structuring the document. This was done on purpose so that the structure of the document could be separated from the appearance when necessary. A user could change the appearance of the document without significant tinkering (Debreceny and Gray, 2001).

In its early stage, HTML documents could only be accessed and viewed using Internet Explorer™ or Netscape™. A document could be viewed directly in the browser as it supports hyper-linking into and out of the specific places within the file. Changes to the content could not be made when viewing the document on screen. A user who accesses HTML documents could copy to other software such as Microsoft Word™ before making changes and reformatting the document in different ways to fit different purposes. The

arrangement of the information may not be the same as the original document when copied to other software.

1.3.3 Extensible Business Reporting Language (XBRL)

Extensible Business Reporting Language (XBRL) was initially known as Extensible Financial Reporting Mark-up Language (XFRML). It was later changed to XBRL because it was decided that corporate reporting encompasses not only financial reporting but also a broader range of reports (Wu and Vasarhelyi, 2004). XBRL is a presentation format involving interactive data which allow variety of functions ranging from reading to analysing data (Wu and Vasarhelyi, 2004). In the context of this study, XBRL is a standard based format to present information that allows users to access and view by decision-makers for investment decision task.

Similar to HTML, XBRL comes from the mark-up language family (Wu and Vasarhelyi, 2004). The mark-up language in XBRL is used to format and structure the data in a document and provides an explanation of the meaning of the data. Mark-up language provides tags to the data items. The tags function in two ways. First, they provide information on how the data should be formatted and presented to the decision-makers. These tags define and label the document with a set of elements, such as the titles, paragraphs and footnotes. Secondly, it provides the meaning and function of the data items, or what the data item represents.

An XBRL document can be assessed with XBRL friendly software (XBRL, 2004). How the information is presented depends on the software used to access the document. For example: a user who wants to make an investment decision can download XBRL documents using Excel 2003™ relating to two firms directly from the Internet without the need to copy the files. The information for the two firms would be presented in the form of rows and columns. The user would be able to select, copy and paste the relevant information items in order to perform various analytical tasks without the need to re-key the information items (Baldwin et al., 2003).

In summary, each of the presentation formats discussed above has its own unique features. It is apparent that as the digital environment evolves, digital presentation formats become more advanced and sophisticated. However, whether the advancement of the idiosyncrasies of each of the presentation formats is of benefit to their users has not been extensively examined, and this lack of empirical evidence undermines claims by various accounting bodies and systems designers about the benefits of each digital presentation format.

1.4 RESEARCH HYPOTHESES

To achieve the objectives of this study, 12 research hypotheses were developed. These hypotheses were developed based upon reviewing literature from various disciplines. Table 1.1 presents the research hypotheses tested in this study.

The first objective aims to examine the effect of digital presentation formats on decision-makers' decision quality. Two hypotheses were developed for objective 1 and these are presented as *H1* and *H2*.

The second objective aims to examine decision-makers' perceptions of digital presentation formats. This objective also examines the link between perceptions and actual performance and the link between perceptions and preference. Six hypotheses were developed for objective 2 and these are presented as *H3, H4, H5, H6, H7* and *H8*.

The last objective aims to examine the effect of digital presentation formats on cognitive information processing which includes information acquisition, evaluation, weighting and investment decision in the context of recognition versus disclosure. Four hypotheses were developed for objective 3 and these are presented as *H9, H10, H11* and *H12*. The research hypotheses were tested and the results were analysed to achieve the objectives in this study.

Table 1.1
List of research hypotheses in this study.

Hypothesis	Proposition
	Objective 1: To examine the effect of digital presentation formats on decision quality.
H1	*There is no significant effect difference on decision-makers' decision accuracy between digital presentation formats.*
H2	*There is no significant effect difference on decision-makers' cognitive effort between digital presentation formats.*
	Objective 2: To examine users' perceptions of the usefulness and ease of use of different presentation formats.
H3	*There are no significant differences in users' perceptions of the usefulness of digital presentation formats.*
H4	*There are no significant differences in users' perceptions of the ease of use of digital presentation formats.*
H5	*There are no significant differences between users' perceived usefulness of a digital reporting format and the decision accuracy by using such format.*
H6	*There are no significant difference between users' perceived ease of use of a digital reporting format and their cognitive effort required for completion of a decision-making task by using such format.*
H7	*There is no association between users' perceptions of the usefulness of digital presentation formats and their preference of presentation format.*
H8	*There is no association between users' perceptions of the ease of use of digital presentation formats and their preference of presentation format.*
	Objective 3: To examine the effect of presentation formats on cognitive information processing in the context of recognition versus disclosure.
H9	*The digital presentation formats do not impact upon decision-makers' information acquisition in recognition versus disclosure situations.*
H10	*The digital presentation formats do not impact upon decision-makers' information evaluation in recognition versus disclosure situations.*
H11	*There is no significant difference in the effect of digital presentation formats on decision-makers' information weighting in recognition versus disclosure situations.*
H12	*There is no significant difference in the effect of digital presentation formats on decision-makers' judgment in investment decisions in recognition versus disclosure situations.*

1.5 RESEARCH IMPLEMENTATION

To address the objectives mentioned in Section 1.1, the approach followed is that developed by Hodge et al. (2002; 2004) who studied the link between presentation formats and cognitive information processing in a situation where an information item is recordable at either recognition or disclosure. This study also incorporates an approach developed by Davis (1989) and this is assimilated with Hodge et al.'s approach to form the research instrument. The present study is based in a New Zealand setting using New Zealand public accounting practitioners.

The research implementation was divided into four stages:

Stage 1 - All the available articles on decision-making and presentation formats in various research works of literature were listed using the database search program *EBSCOHOST*. The main purpose of this stage was to review the previous work done and to analyse the nature of presentation formats used in such studies.

Stage 2 – The main objectives of this study (as mentioned in Section 1.1) are to examine whether: (i) digital presentation formats impact on decision quality; (ii) decision-makers perceive presentation formats differently; and (iii) digital presentation formats affect cognitive information processing in the context of recognition versus disclosure. Once again, other research closely related to the objectives was identified using the database search program *EBSCOHOST*. The main interest here was a review of the methodologies employed, the findings, as well as the implications.

Stage 3 - The data for this study were obtained through an experiment exercise undertaken by participants and the completion of a post experiment questionnaire. Sixty-two public accounting practitioners participated in this study. The researcher travelled throughout New Zealand over a five month period to conduct the experiment and gather the research data.

Stage 4 – The data were collected from the participants and analysed. General Linear and Logistic Regression Models were used to test the effect of presentation formats on decision quality and cognitive information processing. Logistic Regression Models, Chi-Square and T-Tests were used to examine the link between presentation formats and perceptions. All data analysis was carried out using Statistical Package for the Social Sciences (*SPSS*).

1.6 MAIN EMPIRICAL FINDINGS

The first objective of this study is to assess whether digital presentation formats affect decision quality. The results indicate that presentation formats in the digital reporting environment do affect decision-makers' decision quality. Decision quality is defined in the context of human cognitive processes with the specific focus on the cost benefit dimensions of decision accuracy and cognitive effort. The results show that presentation formats affect decision accuracy. This finding is consistent with previous studies in the information systems literature (Stock and Watson, 1984; Dickson et al., 1986; Mackay and Villareal, 1987; Iselin, 1988; DeSanctis and Jarvenpaa, 1989; Hard and Vanecek, 1991; Stone and Schkade, 1991; Anderson and Kaplan, 1992; Bricker and Nehmer, 1995; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Almer et al., 2003; Baldwin et al., 2004; Hodge et al., 2004). However, the results of this study indicate that presentation formats do not affect cognitive effort. The results are consistent with the findings from Dull et al. (2003) and So and Smith (2004).

These findings indicate that digital presentation formats could assist decision-makers in improving decision accuracy although it may not assist in reducing cognitive effort.

The second objective of this study is to assess whether decision-makers perceive the digital reporting formats in a similar way. The results in this study show that decision-makers perceive the presentation formats homogenously. The results are consistent with the views and findings of previous studies by Beach and Mitchell (1978), Davis (1989) and Adams et al. (1992). The results also show that the participants' perceptions are similar to their actual performance outcomes on decision accuracy but not on cognitive effort, which is consistent

with results reported in the information systems literature (Wright, 1975; Beach and Mitchell, 1978; Abelson and Levi, 1985; Sproull and Kiesier, 1986; Davis, 1989; Kleinmuntz and Schkade, 1993; Schkade and Kleinmuntz, 1994). The results also indicate that participants' perceptions influence their preference for a particular presentation format. These results are consistent with those reported by Moore and Benbasat (1991).

These findings indicate that perceptions: (i) on usefulness and ease of use are homogenous across digital presentation formats; (ii) may not necessarily be consistent with actual performance outcomes; and (iii) determine the success of digital presentation formats usage.

The third objective of this study is to assess whether digital presentation formats affect cognitive information processing in recognition versus disclosure situations. The results of this study indicate that functional fixation is apparent when it comes to making a decision (judgment stage). This finding is consistent with previous studies suggesting placement of information (recognition versus disclosure) influences decision-makers' decisions (Harper et al., 1987, 1991; Bernard and Schipper, 1994; Hopkins, 1996; Hirst and Hopkins, 1998; Maines and McDaniel, 2000). The effect of presentation formats on cognitive information processing is significant when decision-makers are evaluating information. However, the results show that presentation formats do not alleviate functional fixation caused by placement of information in any of the cognitive information processing stages. The results are consistent with the findings of Luft and Shield (2001), but contradict Hodge et al. (2002; 2004).

These findings do not support the claim that digital presentation formats could be a potential solution for functional fixation in a recognition versus disclosure situation involving less well-known information items and contexts.

1.7 SUMMARY OUTLINE OF THE THESIS

At the outset, it is necessary to review the conceptual and theoretical underpinnings of decision-making in an attempt to identify the issues that led to the importance of presentation formats in decision-making. Chapter Two presents this review. The review covers the decision-making process and the existence of external and internal factors that could influence this process. Basically, the influencing factors may have positive or negative effects because of human information processing limitations. Consequently, there is a need to find ways to alleviate these processing limitations and improve decision-making. As a result, presentation formats emerge as one technology that may affect decision-makers' behaviour.

Chapter Three is a continuation of Chapter Two. This chapter reviews the relevant presentation format literature. Most of the earlier studies that examine presentation formats used small scale types of presentation formats, and these studies were conducted in the hard-copy traditional reporting environment. The main objective of this thesis, however, is to extend the literature by examining not only actual performance in an experimental methodology, but also to include perceptions which have not been extensively explored. In this context, this study uses an experiment and a post experiment questionnaire. In this chapter the previous empirical work reported in various works of literature is also reviewed and the methodological, findings and implications of these studies are discussed.

Chapter Four begins with an overview of the study's objectives in order to reiterate the overall purpose of the current study. This is followed by a discussion of the framework for each objective and consequently leads to the development of the research hypotheses in this study.

Chapter Five provides a discussion of the rationale of the proposed research and the research design. The research instrument is adapted from Hodge et al. (2002; 2004) and Davis (1989). However, some modifications are made to improve the research instrument

in addressing the objectives of this thesis. This chapter also describes the sample selection. The research procedure and details of the pilot study are explained.

The empirical analysis reported in this study is based on the General Linear and Logistic Regression models which are used to examine the effect of presentation formats on decision quality, perceptions and cognitive information processing. Other tests such as Chi-Square and T-Tests are also used to examine the link between perceptions, actual performance outcomes and preferences of presentation formats.

The results on the effect of digital presentation formats on decision quality are presented in Chapter Six. Chapter Six starts with providing information on the demographic statistics of experiment participants, followed by the results of testing the effect of presentation formats on decision accuracy and cognitive effort. Chapter Six concludes with identifying the implications of the main findings.

Chapter Seven presents the results of testing users' perceptions of the digital presentation formats. This chapter presents the results from testing whether participants' perceptions parallel their actual performance outcomes in the experiment, and whether their perceptions influence their preferences for presentation formats. The implications of the main findings in this chapter are also discussed.

Chapter Eight provides the results from testing for the effect of digital presentation formats on information processing stages: information acquisition, evaluation, weighting and judging in the context of recognition versus disclosure. This chapter also provides the implications of the main findings.

This study provides evidence that presentation formats affect decision accuracy but not cognitive effort. Perceptions play an important role in influencing preferred presentation format and that perceptions do not necessarily parallel actual performance (decision accuracy and cognitive effort). The analysis indicates that presentation formats may not be a potential solution for functional fixation in cognitive information processing. The analysis

and interpretation of the results are presented in Chapter Six, Seven and Eight and are summarised in Chapter Nine. Chapter Nine also presents the limitations of this thesis and suggests future research directions on presentation formats in the digital reporting environment.

1.8 SUMMARY AND CONCLUSION

This chapter started with an introduction. Section 1.2 has provided the limitations of prior research and significant research opportunities. Following this, Section 1.3 presented the theme of this study – presentation formats, which then described the presentation formats used in this study. Section 1.4 provided a summary of the hypotheses tested in this study. Section 1.5 explained the research implementation, and was followed by a presentation of the main results in Section 1.6. This chapter has also presented a summary outline of the thesis in Section 1.7. Section 1.8 summarised and concluded this chapter. The next chapter, Chapter two presents a literature review on decision-making.

CHAPTER TWO

DECISION-MAKING

2.1 INTRODUCTION

This chapter reviews literature concerning decision-making. The chapter starts with the nature of decision-making. Section 2.3 presents the inputs to decision-making. Section 2.4 provides discussion on the cognitive processes in decision-making. This is followed by Section 2.5 which discusses decision-makers' processing limitations in decision-making. Section 2.6 summarises and concludes Chapter Two.

2.2 DECISION-MAKING

Decision-making is a cognitive process that leads to the selection of a course of action among alternatives that produces a decision outcome (Einhorn and Hogarth, 1981; Libby, 1981; Cloyd, 1995). Decision-makers need to go through several stages of decision-making before arriving at a decision (Ashton, 1981). Researchers in the decision-making literature have provided several descriptions of the stages of decision-making (Libby and Lewis, 1977; Beach and Mitchell, 1978; Einhorn and Hogarth, 1981; Libby, 1981; Libby and Lewis, 1982; Cloyd, 1995; Roberts, 2002), all of which evolve through three central stages: input, processing and output. Input refers to factors that decision-makers rely on in the decision-making process. Processing is a function of inputs. Output refers to the outcome of the decision-making process. Inaccuracies or biases in input and/or processing could adversely affect output (Roberts, 2002).

Inaccuracies or biases in input and/or processing in decision-making are often caused by the decision-makers themselves (Ebbeson and Konechi, 1980). They tend to become fallible in decision-making (Libby and Lewis, 1977) and are prone to cognitive biases

which lead to ineffective performance (Roberts, 2002). They also have limited ability in retaining, retrieving and processing information (Libby et al., 2002). Although in general decision-makers can be effective in acquiring information, they may not be effective in information evaluation, information weighting and making judgments[3] (Libby, 1981). They tend to be unreliable and inconsistent in decision-making due to the influences of their own personal characteristics (Ebbeson and Konechi, 1980; Roberts, 2002), and become heuristic in nature in order to avoid incurring high cognitive effort (Libby and Lewis, 1977, 1982; Kleinmuntz, 1990). However, the use of a heuristic approach could lead to poor performance (Roberts, 2002). Such limitations affect experienced and non-experienced decision-makers (Smith and Kida, 1991). In summary, both input and processing are key determinants in decision-making.

2.3 INPUT TO DECISION-MAKING

Studies on decision-making input often examine the nature and impact of various characteristics of the information set (such as type of information or method of presentation) on decision-making (Libby and Lewis, 1977). The primary concern with input is the source and form of information to be supplied to decision-makers. Information can be sourced externally and/or internally (self) and applied to the decision-making process[4]. The nature of the task and the environment in which the decision-making takes place determine the extent to which external and/or internally sourced information is used (Vessey 1991; Roberts, 2002). Further, the decision-makers' own personal characteristics also determine the extent to which these inputs are used (Sabherwal and Grover, 1989; Bamber, 1993; Brown and Eining, 1996).

[3] Information acquisition refers to decision-makers' acquisition of information. Information evaluation refers to whether decision-makers evaluate information. Information weighting refers to whether decision-makers provide weighting to the information. Information judging refers to decision-makers judgment or decision made.

[4] In the context of this study, external information means information that evolves around the decision-makers whereas self information means existing information within the decision-makers obtained from prior experience.

2.3.1 External Information

A commonly held objective of accounting is to supply information that is useful to decision-makers (Ahadiat, 1993). Improving the information set or increasing decision-makers' abilities to use that information could enhance the efficiency and effectiveness of decision outcomes (Libby and Lewis, 1977; 1981). Much research has examined the effect of external information on decision-making (for example; Chandra, 1974; Benjamin and Stanga, 1977; Firth, 1978; McNally et al., 1982; Rahman, 1999; Yatim and Omar, 2001; and Sabeni et al., 2002). Most of the findings support the idea that the quantity and quality of the information being inputted are factors that influence decision-making (Cloyd, 1995; Roberts, 2002). Although decision-makers have little control over the content of the information they are provided with, they do have control over the selection and integration of that information (Roberts, 2002). However, and arguably, increasing the quantity of information would increase the demands of selecting and integrating relevant information and decrease decision-making performance (Hwang and Lin, 1999).

The way in which information is presented has also been found to influence decision-making performance (DeSanctis and Jarvenpaa, 1989; Davis et al., 1989; Iselin, 1989; Hard and Vanecek, 1991; Stone and Schkade, 1991; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Dull et al., 2003). Some presentation formats allow decision-making performance to improve when compared to other formats (for example; tabular versus graphical). However, the existing literature largely derives from an information systems perspective. Although some literature does include studies from an accounting perspective, these studies were conducted in a traditional reporting environment and have not considered the impact of a more recent form of reporting in a digital environment. Additionally, the literature has mainly examined the success of presentation formats in terms of their effectiveness on decision-makers' performance. However, the success of presentation formats also depends on other input factors, such as the decision-maker's perceptions (Davis, 1989).

2.3.2 Self Information

Unlike external information, decision-makers have considerable control over their predetermined views and the organisation of their perceptions. Decision-makers generally choose information based on their perceptions of the importance of the information item (Sabeni et al., 2002). They also generally choose a course of action based on their perceptions of the impact of selecting the action (Beach and Mitchell, 1978; Abelson and Levi, 1985; Davis, 1989; Adams et al., 1992), and these perceptions are constructed from the decision-makers' prior experiences and gained knowledge. When the knowledge of an object is limited or different between decision-makers, their perceptions of the object may cloud any recognition of the object's potential benefits. Decision-makers' perceptions also determine whether one strategy or technology will be adopted, although the strategy or technology may provide a different outcome than that of their perceived expectations (Kleinmuntz and Schkade, 1993). When there is a mismatch between perception and actual outcome, performance improvement may not be achieved. Thus, the importance of perception in decision-making is evident.

Decision-makers may often rely on perceptions in decision-making despite the availability of external information. Overconfidence, the state of mood, inadequate knowledge, as well as time pressure may cause decision-makers to forego an additional search of related knowledge (Payne, 1976; Russo and Dosher, 1983; Payne et al., 1988) and rely solely on existing knowledge which may be inaccurate. Because of the general overconfidence of decision-makers in their often inaccurate or out-of-date perceptions (Ebbeson and Konechi, 1980), perception becomes a primary input factor to decision-making. When perceptions are an input factor to decision-making, bias in these perceptions can affect the decision-making process and the output in less effective ways.

Inaccuracies or biases in perceptions may exist for several reasons. Poor knowledge could introduce and intensify inaccuracy and bias in perceptions (Ebbeson and Konechi, 1980). Another potential source of bias is the use of affective responses to data. Affective responses refer to a person's affective reactions or "moods" created by a set of data, rather

than pre-existing states of mind that are brought to the decision domain (Kida and Smith, 1995). Brainerd and Reyna (1993) argue that decision-makers have the natural cognitive habit of using affective responses because of its ease of processing. This is because decision-makers are cognitive misers (Simon, 1956) tending to find alternatives that would reduce their cognitive effort (Hulland and Kleinmuntz, 1994). Hence, decision-makers' perceptions tend to be derived by relying on summary evaluations.

2.4 COGNITIVE PROCESS IN DECISION-MAKING

Apart from input and output, much of the focus in decision-making research is on information processing (Roberts, 2002). Cognitive process relates to how individuals (such as decision-makers) engage in solving a task which eventually leads to making a decision (Swanson and Alexander, 1997). Consideration of information processing is important to gain a better understanding of how to overcome deficiencies in decision-making. This study focuses on two primary decision processes which are important components in the decision-making process: information search and cue usage.

2.4.1 Information Search

Information search is an important component in decision-making (Roberts, 2002). It refers to the strategies that decision-makers employ in order to acquire information (Hunton and McEwen, 1997), with their aim being to achieve search effectiveness (Cloyd, 1995). Inaccuracies and biases in information search would lead to poor performance. The failure to acquire and consider all relevant information would adversely affect performance. A body of information search literature found three factors that affect information search, namely the task structure, the task environment, decision-makers' characteristics and/or the interaction between these three factors (Painton and Gentry, 1985; Bouwman et al., 1987; Purvis, 1989; Hunton and McEwen, 1997).

How the information is presented may also affect information search (Benbasat and Schroder, 1977; Bettman and Kakkar, 1977; Biehal and Chakravati, 1982; Watson and

Driver, 1983; Painton and Gentry, 1985; Bouwman et al., 1987; Purvis, 1989). Information load also affects information search (Swain and Haka, 2000; Roberts, 2002). For example, Swain and Haka (2000) found that when information load is increased, the proportion amount of information search is reduced and the variability of search patterns is increased. Similarly, accountability and motivation have also been found to affect information search (Lee et al., 1999).

Another body of literature found decision-makers' characteristics, such as work experience, affect information search (Bouwman et al., 1987; Bonner and Pennington, 1991; Bedard and Mock, 1992; Hunton and McEwen, 1997; Nouri and Douglas-Clinton, 2006). This group of studies generally found that the information searches of professional decision-makers are different from those of non-professional decision-makers due to their different knowledge and skills. Other characteristics, such as personality type (Kelliher, 1990), problem solving strategies (Moon and Keasey, 1992), cognitive style (Baldwin et al., 2004), and affective responses (Martin et al., 1993; Kida and Smith, 1995; Hirt et al., 1997; Kida et al., 1998; Rose, 2002), also affect information search.

2.4.2 Cue Usage

Another primary decision process is cue usage. Proper information choice and information integration are necessary to enact greater decision-making. Improper choice of information as well as inappropriate evaluation, weighting and judgment of information leads to poor performance (Hogarth, 1980). Although decision-makers are generally good at searching for and acquiring information, they are generally poor at evaluating, weighting and judging (Dawes, 1979; Libby, 1981; Bazerman, 1994; Bonner and Pennington, 1991). Their inability to integrate information is the primary reason of decision-makers' poor performance.

A body of literature has examined how decision-makers acquire and integrate information before arriving at a decision (Cloyd, 1995; Maines and McDaniel, 2000; Roberts, 2002; Hodge et al., 2004). These studies generally used one of four approaches: pre-decisional

behaviour; probabilistic judgment; the lens model; or cognitive style (Libby and Lewis, 1982).

Studies on pre-decisional behaviour often gather data in the form of verbal protocol, normally requiring participants to "think aloud" into a tape or video recorder while performing a task. The recorder is then transcribed and the protocols are further classified into predetermined categories (Libby and Lewis, 1982). Results of these pre-decisional behaviour studies demonstrate that professional and non-professional decision-makers adopt different search strategies (Dickhaut, 1973; Abdel-Khalik, 1974; Bouwman, 1982; Danos et al., 1984; Jacoby et al., 1985; Bouwman et al., 1987), and that use of the best strategies increases when more alternatives are provided (Shield, 1980; 1983; Biggs et al., 1985; Paquetta and Kida, 1988).

Studies on probabilistic judgment often measure the initial input and the final output from which their functional relationship may be inferred, which is to assess the impact of information set variables on cue usage and the deviations of responses from optimality (Libby and Lewis, 1982; Ashton, 1985; Ashton and Ashton, 1995). Results from these studies show that decision-makers prefer simplifying heuristics in information processing (Casey, 1980; Johnson et al., 1983; Casey and Selling, 1986; Moser, 1990).

Lens model studies often examine stability, consistency, self insight and accuracy by using several techniques, from ANOVA, discriminant analysis, conjoint measurement, multidimensional scaling (MDS), to analytical hierarchy procedures. The results show that complex decision processes can be accurately predicted with simple linear models (Libby, 1975, 1976; Abdel Khalik and El-Sheshai, 1980; Lewis et al., 1988).

Cognitive style studies involve measuring processing components and final outputs by examining the impact of personal characteristics of the decision-maker on his/her decision quality as well as information on decision quality (Benbasat and Dexter, 1979; Hoffer, 1982; Reisner, 1981; Gul, 1984; Yen and Scarnell, 1993; Baldwin et al., 2004). The results show that cognitive style could be an important moderating factor in information

processing (Benbasat and Dexter, 1979; Hoffer, 1982; Reisner, 1981; Gul, 1984; Yen and Scarnell, 1993; Baldwin et al., 2004).

In summary, decision-makers suffer from a variety of cognitive biases due to the structure of the task, the nature of the environment and/or the decision-makers' characteristics. With the increasing amount of information that needs to be processed as well as the changing environment from traditional reporting to digital reporting, an examination into ways to mitigate or overcome these biases in order to improve decision-making is warranted.

2.5 HUMAN INFORMATION PROCESSING LIMITATIONS

Psychological studies have suggested:

> Humans are portrayed as intellectual cripples, limited in their capacity to think, and biased by cognitive processes that interfere with rational decision-making. They are oversensitive to variables that are not included in normative theories and under sensitive to variables that are. They become more variable when given more information and increase their confidence in the accuracy of their judgments when they should not (Ebbesen and Konecni, 1980, p. 21).

The quotation implies that decision-makers are imperfect. They are prone to becoming unreliable and inconsistent when processing information (Ashton, 1981). They also have limited ability to process a large quantity of data (Rohrmann, 1986). They can be short-minded or burdened with voluminous issues which exceed their memory capacity (Roberts, 2002). They often seek ways to perform problem solving with minimum cognitive effort (Newell and Simon, 1972).

In general, there are few limitations related to cognitive information processing. First, decision-makers mentally acquire knowledge of similar or related information items or situations and tend to overlook information that is placed out of the normal situation (Dyckman, 1964; Chi et al., 1981; Hirst and Hopkins, 1998; Maines and McDaniel, 2000;

Hodge et al., 2004). Decision-makers tend to assume that a particular interest or practice is being treated similarly at all times. For example, Hirst and Hopkins (1998) found that a fundamental variation in the way accounting information is presented can have a predictable impact on analysts' stock price estimates. They found that analysts only include an information item in their valuation when it is placed in a normal situation. If analysts included an information item that was placed out of a normal situation in their valuation, it was because they had acquired it through accidental discovery.

Consequently, errors or biases in input and/or processing could produce adverse output. Errors or biases in information processing could result from inappropriate information usage and/or inappropriate information processing (Roberts, 2002). Such inappropriateness exists because in decision-making, decision-makers need to: (i) understand which information item is relevant; (ii) locate the information item; and, (iii) evaluate the implications of the information item for judgment (Hodge et al., 2004). For example, if a decision-maker incorrectly selects an irrelevant information item, s/he will incorrectly evaluate the effect of the information item, incorrectly weight it, and overall make an incorrect judgment (Maines and McDaniel, 2000; Hodge et al., 2004).

Secondly, studies have found that decision-makers can be influenced by the placement of information (Kozminky, 1977; Chi et al., 1981; Bernard and Schipper, 1994; Hopkins, 1996; Hirst and Hopkins, 1998; Maines and McDaniel, 2000; Libby et al., 2002; Hodge and Pronk, 2006). These studies suggest that decision-makers rely on a "placement signal" – the placement of information to determine whether the information item should be included in their valuation. Some studies provide evidence that placement signal affects both non-professional decision-makers (Maines and McDaniel, 2000) and professional decision-makers (Hirst and Hopkins, 1998). For example, Hirst and Hopkins (1998) found their participants (analysts) awarded more importance to an information item when it was placed in the income statement compared to when the same item was placed in the balance sheet.

Thirdly, studies have shown that decision-makers generally incur different degrees of cognitive costs in situations where they are required to select an alternative from similar

functions (Russo, 1977; Fischoff et al., 1978; Nisbett et al., 1981; Hackenbrack, 1992; Bernard and Schipper, 1994; Hoffman and Patton, 1997; Shelton, 1999). For example, Hodge et al. (2004) found that participants take longer time to complete an investment decision task when they are given two firms that have adopted different accounting models. This is because they need to place the two firms on par before making investment decisions.

Fourthly, search behaviour could also affect how decision-makers process information (Bouwman, 1982; Bouwman et al., 1995; Hunton and McEwen, 1997; Maines and McDaniel, 2000; Hodge et al., 2004). These studies suggest that professional decision-makers practice directive search, in which they search directly for a specific information item in the financial statement, regardless of the location of the information item. On the other hand, non-professional decision-makers often practice sequential search, in which they tend to search through all available information in a relatively sequential manner. However, as they gain more experience in the decision environment, they progressively develop more sophisticated information search strategies and become more directive in their search patterns (Yates, 1990).

Consequently, each type of search behaviour has negative implications (Hirst and Hopkins, 1998; Hodge et al., 2004). Although directive search potentially reduces decision-makers' cognitive effort, such behaviour may cause them to ignore a related information item appearing in other parts of a corporate report (Hirst and Hopkins, 1998). For example, Hirst and Hopkins (1998) found that their analysts appeared to ignore information they believed *ex ante* would not provide important information. On the other hand, decision-makers adopting sequential search may incur higher cognitive effort. Such behaviour would lead them to reach cognitive overload and most likely discount an information item that is placed at the end of a financial report (Hodge et al., 2004).

Finally, decision-makers are also influenced by the classification of an information item (Petroni and Wahlen, 1995; Lipe, 1998; Hirst and Hopkins, 1998; Dhaliwal et al., 1999; Maines and McDaniel, 2000). They tend to provide more weight to an information item that

they believe is the main or core activity compared to an item which is not related to core activity. For example, Hirst and Hopkins (1998) demonstrated that analysts often fail to acquire unrealised gain and loss information for marketable securities of an electronic manufacturing firm when this information is presented in the balance sheet. However, they do acquire and use this information when it is presented in the income statement. In contrast, Petroni and Wahlen (1995) and Maines and McDaniel's (2000) studies found that professionals acquire such information in the balance sheet when valuing a financial services firm.

Once the limits of human information processing were established, researchers then explored ways to overcome these limitations. There are now many ways available to assist decision-making (Libby, 1981; Libby and Lewis, 1982; Libby et al., 2002). However, before determining which way is the best, there is a need to identify the source of deficiency in decision-making (Bonner, 1999). The source of deficiency can be caused by two main sources: the decision-maker or the task. If the deficiency is caused by the decision-maker, proper training may be beneficial to instil skills and knowledge in performing the task (Roberts, 2002). Experience could also eliminate deficiency (Sabherwal and Grover, 1989; Bamber, 1993; Brown and Eining, 1996). Informing the decision-maker about potential bias is another possible way to improve decision-making (Roberts, 2002), although research has shown this to be ineffective (Bazerman, 1994). If the source of deficiency is the task, then changing the structure of the task may alleviate some of the problem. One potential solution that addresses the limitations of human information processing and improves decision-making is the use of presentation format.

2.6 SUMMARY AND CONCLUSION

This chapter began with an overview on decision-making. The literature demonstrates that decision-making could be influenced by external and self information. Decision-makers also have limitations in cognitive information processing. To overcome these limitations and improve decision-making, decision-makers may need to be supported by external factors.

This chapter is important as it provides an overview of decision-makers' behaviour, specifically, decision-making. Of consequence, understanding decision-making provides suggestions on how to overcome human information processing limitations. This chapter leads us to the theme of this study – presentation formats, a decision aid that could become one potential solution to improve decision-making performance. Although much research has examined the effect of presentation formats on decision outcomes, particularly, in the psychology and information systems literature, few studies have examined the effect of digital presentation formats on decision-making in the accounting literature. The lack of such studies makes it impossible to fully understand the effect of presentation formats on decision-makers and decision outcomes. It is possible that digital presentation formats that are implemented to help overcome human information processing limitations in decision-making may themselves be the cause of poor performance.

The next chapter provides a review of the presentation format literature. Specifically, it examines the current state of knowledge about presentation formats and their effect on decision-makers' behaviour. The chapter then focuses on three related areas: decision quality, perceptions and cognitive information processing in the context of recognition versus disclosure.

CHAPTER THREE

IMPROVING DECISION-MAKING - PRESENTATION FORMATS

3.1 INTRODUCTION

This chapter begins with the presentation format literature, a technology believed to assist in improving decision-making, in Section 3.2. Section 3.3 discusses the relevancy of presentation format to decision-making. Section 3.4 reviews the literature concerning the effect of presentation formats on decision-makers' behaviour. Section 3.5 discusses reliance on presentation formats. The discussion on the effect of presentation formats on decision-making performance in terms of decision quality is presented in Section 3.6. Section 3.7 examines the presentation format and perception literature. This is followed by Section 3.8 which discusses the effect of presentation formats on cognitive processing in the context of recognition versus disclosure. Section 3.9 summarises and concludes this chapter.

3.2 PRESENTATION FORMATS

Numerous studies have suggested the use of presentation formats to minimise human information processing limitations (Chervany and Dickson, 1974; DeSanctis and Jarvenpaa, 1989; Davis et al., 1989; Iselin, 1989; Hard and Vanecek, 1991; Stone and Schkade, 1991; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Stocks and Tuttle, 1998; Dull et al., 2003). These studies suggest that presentation formats could overcome the effect of increased information (Roberts, 2002) and also improve ways of thinking (Schick et al., 1990). It assists decision-makers in processing a large quantity of data and reduces cognitive effort (Brown and Eining, 1996; Rose, 2002). Moreover, the use of presentation formats could also assist decision-makers to be aware of non-eminent information (Hodge et al., 2004).

Presentation format studies are based on cognitive science literature which contributes to the understanding of the decision process (Libby and Lewis, 1982; Dillard, 1984). The evolvement and the use of presentation formats are particularly encouraging although research relating to decision-makers' behaviour from an accounting perspective has not been extensively explored (Maines, 1995; Hopwood, 1996; Debrêceny and Gray, 2001; Wu and Vasarhelyi, 2004).

3.3 RELEVANCE OF PRESENTATION FORMATS

Early accounting behavioral studies tended to disregard investigating presentation formats as researchers were more focused on examining the accounting content of financial reports, such as user information needs (see, for example, Chandra, 1974; Benjamin and Stanga, 1977; Firth, 1978; McNally et al., 1982; Rahman, 1999; Yatim and Omar, 2001; and Sabeni et al., 2002). Such studies have ignored examining the way information is presented to users (Hopwood, 1996).

The lack of early studies on presentation formats could be attributed to normative theories of choice that suggest a decision should not change just because the way a problem is described has a minor variation (Maines, 1995). That is, the way information is presented should not affect the way decision-makers process the information since decision success is dependent on decision-makers' cognitive processes. Yet, Libby and Lewis (1982) argue that failure of this principle to hold across different representations of the same problem still exists. This is consistent with Slovic et al. (1990) who suggest that judgment and choices are actively constructed. If decision-makers' reported preferences are constructed in response to a specific task, then they would be susceptible to influence by the idiosyncrasies of a presentation format.

Although the literature has focused primarily on information content, some studies have examined the importance of presentation formats and their linkages to decision-making performance. The growing number of studies examining presentation formats provides an indication of the importance of presentation formats on decision-making (Dickson et al.,

1986; Vessey and Galletta, 1991; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Dull and Tegarden, 1999; Hodge, 2001; Dull et al., 2003; Hodge et al., 2004; Hodge and Pronk, 2006). The results of these studies, however, are mixed which provides a motivation to re-examine this area.

The resurgence of presentation format studies in the accounting context derives from: (i) the progression of annual reports from the traditional hard copy to digital reporting environment (Dull et al., 2003); (ii) theories combining psychology and economics that allowed researchers to specify more clearly the mechanisms affecting decision-makers' behaviour (Libby et al., 2002); (iii) the demand for further research in order to provide a theory of how different presentation formats affect decision-making performance (Maines, 1995); and, (iv) the increasing demand of various users' information needs, which has motivated the research on the effectiveness of presentation formats as a tool of disseminating financial information (Smith, 2003).

Most presentation format studies have been conducted in the hard copy traditional reporting model, examining the effect of presentation formats on several decision-makers' behaviour. The availability of various presentation formats in the digital reporting environment raises the issue of whether digital presentation formats affect decision-making performance. This is a recent phenomenon in the presentation format literature and has gained considerable interest from practitioners and regulators (Abdolmohammadi et al., 2002; Baldwin et al., 2003; Hodge et al., 2004; Hodge and Pronk, 2006).

3.4 EFFECT OF PRESENTATION FORMATS ON DECISION-MAKERS' BEHAVIOUR

Presentation formats may influence decision-making, with both positive and negative consequences. Presentation formats may affect decision-makers' behaviour in many ways such as search behaviour, affective responses, satisfaction, persuasion and recall. Presentation formats may also affect decision-making performance such as decision

accuracy and cognitive effort. These two key factors, decision accuracy and cognitive effort, will be discussed in later sections as they represent the focus of this study.

3.4.1 Search Behaviour

Search behaviour refers to how decision-makers acquire information (Hunton and McEwen, 1997). It is often assessed by the way decision-makers acquire information (Bouwman et al., 1987; Hunton and McEwen, 1997) and the amount of information acquired (Painton and Gentry, 1985). Several studies have examined the effect of presentation formats on search behaviour (Benbasat and Schroder, 1977; Bettman and Kakkar, 1977; Biehal and Chakravati, 1982; Watson and Driver, 1983; Painton and Gentry, 1985; Bouwman et al., 1987; Purvis, 1989). These studies generally used a similar methodology which involved using various types of presentation formats with students as their participants. The results show that presentation formats affect decision-makers' search behaviour by influencing the amount of information acquired and the manner in which the information is acquired.

Another body of literature used presentation formats as instruments to examine decision-makers' search behaviour (Bouwman et al., 1987; Hunton and McEwen, 1997; Nouri and Douglas-Clinton, 2006). This group of studies generally found that search behaviour differs between professional decision-makers and non-professional decision-makers. This is attributed to their different skills and knowledge (Hirst and Hopkins, 1998). Both professional and non-professional decision-makers tend to follow specific approaches (Vera-Munoz et al., 2002). Professional decision-makers use a direct search method, in which they move from one page to another in the financial statements to search and collect related information (Bouwman et al., 1987). Non-professional decision-makers use a sequential search method, in which they read the reports in the order reported (Bouwman, 1982). These studies found that the direct search method results in more accurate answers to computational questions and greater consensus in participants' decision performance (Klammer and Reed, 1990; Dull et al., 2003; Hodge et al., 2004).

The results from the studies noted above, examining the effect of presentation formats on search behaviour, relate to the features of presentation formats that influence decision-makers to acquire more or less information (Hodge et al., 2004). The personal characteristics of decision-makers such as their work experience, personality and cognitive style may have had some impact on their behaviour in relation to the use of presentation formats (Vera Munoz et al., 2001; Baldwin et al., 2004).

3.4.2 Affective Responses

Researchers have examined the link between presentation formats and affective responses because human beings are prone to influence from certain objects (Rose, 2002). Affective response is measured by the change in the participant's mood or decision (Rose, 2002). In general, presentation format studies suggest that presentation formats affect affective responses (Martin et al., 1993; Kida and Smith, 1995; Hirt et al., 1997; Kida et al., 1998; Rose, 2002). For example, Martin et al. (1993) exposed their participants to movie clips to induce a happy or sad mood prior to completion of a task. They found multimedia presentations significantly altered subjects' moods in the expected direction. Similar results were found by Hirt et al. (1997) where decision-makers who were exposed to a presentation prior to task completion became happier or sadder, and this emotional state affected their strategies or effort in completing the task.

Kida and Smith's (1995) study suggests that affective responses to the presentation of information could help construct and combine memory traces. Ultimate decisions are framed according to the recall of affective responses, and comparisons between decision alternatives may often be made between differences in the recall of affective responses rather than accurately recalled information (Rose, 2002). Kida et al. (1998) found that participants made their decisions largely on affective responses to the presentation formats. In the investment decision context, decision-makers tend to base decisions on their affective responses upon relying on the presentation formats, and their resulting decisions favour investments that are associated with a positive response (Rose, 2002).

The finding that presentation formats have an effect on affective responses could be attributed to the presentation format peripheral cues which influence memory patterns and investment decisions (Rose, 2002), as well as information related to other persons involved in the decision scenario (Kida et al., 2001).

3.4.3 Satisfaction, Persuasion and Recall

Presentation format studies have examined the effect of presentation formats on satisfaction, persuasion and recall (Umanath et al., 1988; Ottinger, 1993; Butler and Mautz, 1996; Hopwood, 1996; Clements and Wolfe, 1998, 2000). Satisfaction is measured by the level of fulfillment upon relying on the presentation formats (Ottinger, 1993). Persuasion is measured by a change of attitude toward an object (Clements and Wolfe, 1998). Recall is measured by users' ability to remember what has been viewed during the presentation (Metcalfe et al., 1981). These variables were examined because users' acceptance of an object could be influenced by the level of satisfaction, the degree of influence and the ability of the object to improve recall (Metcalfe et al., 1981).

In general, these studies found features of presentation formats could influence the level of viewer satisfaction (Ottinger, 1993; Butler and Mautz, 1996). Ottinger (1993), who examined satisfaction among participants on two presentation formats, found participants viewing multimedia kiosk presentations were significantly more satisfied than subjects who viewed a printed brochure. Similar results were found in Butler and Mautz (1996) and Clements and Wolfe (1998). These studies implied that users' satisfaction depends highly on presentation format, particularly the ability to entertain users.

Studies have also found that presentation formats could influence persuasion (Ottinger, 1993; Hopwood, 1996; Clements and Wolfe, 2000). For example, Ottinger (1993) found a multimedia kiosk presentation format had a more positive effect on attitude change as opposed to a printed brochure. Similar results appeared in Clements and Wolfe's (2000) study. However, Clements and Wolfe (1998) did not find any significant difference in persuasion between multimedia presentation format and printed presentation format.

Studies have found that presentation formats affect recall (Metcalfe et al., 1981; Umanath et al., 1988; Umanath et al., 1990; Clements and Wolfe, 1998; Hodge et al., 2004; Nouri and Douglas-Clinton, 2006). The results of such studies are consistent. Presentation formats have different effects on recall. For example, Umanath et al., (1988) examined the role of presentation formats in recall in the decision process. They found graphical presentation enhances recall when the task possesses a spatial format. Similarly, Clements and Wolfe (1998) found a hardcopy presentation format gave greater recall to participants, although they found multimedia more entertaining.

A recent study has also provided some evidence that presentation formats have a greater recall effect on female decision-makers compared to male decision-makers. A study by Nouri and Douglas-Clinton (2006) examined whether gender could affect the influence of presentation formats on recall. They hypothesised that female students would give more importance to verbal cues and descriptions compared to males. They found the effect of presentation formats on recall performance was more significant in female students. This implied that presentation formats could influence users' recall behaviour and the effect varies across gender.

In summary, the presentation format literature has examined decision-makers' behaviour in many ways. An observation of the studies suggests that the features of presentation formats play a role in influencing decision-makers' behaviour. Another observation is that the effect of presentation formats also depends on the tasks to be performed and the decision-makers' characteristics, such as working experience. However, the effect of presentation formats on decision-making can only be materialised provided that the presentation formats are relied upon.

3.5 RELIANCE ON PRESENTATION FORMATS

Even though a technology may have a higher capability to assist decision-makers in their tasks, there is a tendency for decision-makers to avoid relying on the technology (such as

presentation format) (Rose, 2002).[5] An increase in the reliance on presentation formats generally could lead to an improvement in decision-making provided all relevant information is included (Robert, 2002).

The information systems literature has identified few factors that affect reliance (Rose, 2002). For example, familiarity with a technology would encourage reliance on it (Brown and Eining, 1996; Whitecotton and Butler, 1998). Decision framing does not affect reliance (Brown and Jones, 1998). Decision-makers' confidence with the technology may also influence reliance (Arnold and Sutton, 1997). One possible factor that affects reliance on a technology is decision-makers' perceptions, as negative perceptions are likely to affect reliance on the technology (Davis, 1989). However, this factor has not been thoroughly explored in the presentation format literature.

Several studies have investigated whether work experience affects reliance on a technology. The results are mixed. A few studies found that work experience affects reliance on a technology. Others do not. For example, Whitecotton (1996) studied the effect of working experience on reliance on a technology and found experience to have no effect. Other studies found more experienced decision-makers would use and rely on a technology compared to less experienced decision-makers (Kachelmeier and Messier, 1990; Abdolmohammadi, 1992).

Another body of literature suggests that familiarity with a technology also affects users' reliance on it. Mackay and Elam (1992) and Mackay et al. (1992) suggest that a high level of working experience results in better performance when accompanied by a high level of familiarity with the technology. Arkes et al.'s (1986) study found a contrasting result. They found that participants with more knowledge but less familiarity with a technology performed worse when relying on the technology than participants with a moderate level of knowledge. This is consistent with the behavioral decision literature which suggests that the performance of users with a higher level knowledge will be obstructed when relying on a technology which they are not familiar with. For those users with a moderate level of

[5] In the context of this study, reliance indicates users' willingness to use an alternative technology.

knowledge, the unfamiliarity of using a particular technology would not be affected since they would still need to go through a more detailed process compared to the professional users (Vera Munoz et al., 2002). However, Wilson and Zigurs (1999) found that task performance was not affected by participants' familiarity of presentation format.

The different results of these studies could be attributed to the different type of decision tasks in each study. These studies found that the type of decision task is one of the factors that could likely to have an effect on the use of a technology such as presentation format. Such studies are hampered by the lack of a usable taxanomy of decision task types and their characteristics. Secondly, the subjects used in these studies often differ in terms of knowledge and experience. Since the use of presentation formats is contingent upon users' responses on the presentation formats, the characteristics that affect these responses create an important moderator in the focus of the present research.

In summary, the literature suggests that reliance is a key determinant of the success of presentation formats. However, the influence of reliance may depend on factors such as experience and familiarity with presentation format. It may also depend on perceptions which have not been explored thoroughly. Examining the perceptions of presentation formats could contribute to the success of presentation formats. The subsequent reliance would ensure the effectiveness of the presentation formats on decision-makers' behaviour. In the context of digital reporting, studies have yet to thoroughly examine the effect of presentation formats on decision quality in terms of decision accuracy and cognitive effort. Furthermore, the link between the decision-makers' actual performance upon reliance on the presentation formats and their perceptions, has not been explored. Finally, the link between presentation formats and cognitive processes in the presence of alternative accounting disclosure has also not been extensively examined. Therefore, this study focuses on three types of decision-makers' behaviour in the context of digital reporting: decision quality, perceptions and cognitive information processing in the context of recognition versus disclosure.

3.6 PRESENTATION FORMATS AND DECISION QUALITY

The impact of presentation formats on decision quality is examined in a number of studies (Dickson et al., 1986; Vessey and Galletta, 1991; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Dull and Tegarden, 1999; Dull et al., 2003). The findings of these studies indicate that presentation formats have a bearing on the outcome of information processing and specifically, decision quality. A body of literature suggests that the use of appropriate presentation formats increases decision quality in decision-making tasks (Stock and Watson, 1984; Dickson et al., 1986; Iselin, 1988; Vessey, 1991; Mackay and Villareal, 1987; Hard and Vanecek, 1991; Stone and Schkade, 1991; Anderson and Kaplan, 1992; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Almer et al., 2003; Baldwin et al, 2004; Hodge et al., 2004). However, some studies suggest that presentation formats do not affect decision quality (Bricker and Nehmer, 1995; Dull et al., 2003; So and Smith, 2004). These studies suggest that degree of processing as well as type of task affect the effectiveness of presentation formats on decision quality.

One of the earliest studies examining the effect of presentation formats on users' performance was undertaken by Moriarity (1979). Motivated by Chernoff's (1973) study that suggested multidimensional graphics could act as an aid to a person's ability to follow trends in related variables, Moriarity (1979) evaluated the use of multidimensional graphics as a substitute for the standard financial statement presentations. The researcher used four presentation formats to examine effect differences: (i) schematic faces (facial expression such as a smiling dummy indicating a firm with good performance) with no explanation; (ii) schematic faces with an explanation of what the features represent; (iii) selected financial statement balances to calculate relevant ratios; and, (iv) the key ratios. The only significant difference was that the key ratio group was less accurate than the other three presentation formats and the response times for the schematic faces were lower. Moriarity then compared the judgments of 20 practicing accountants based on the ratio and schematic faces on each of the presentation formats. He also found that more participants made incorrect judgments when relying on ratios and few participants relied on the schematic faces.

Moriarity's (1979) findings provide the first preliminary evidence within the accounting context that presentation formats might be useful in aiding users to alleviate their cognitive processing limitations. The use of simpler presentation formats would give an immediate or direct indication of the firm's performance. His participants were able to better determine the financial status of a firm when they used schematic faces rather than balances or ratios, regardless of whether they were professionals or novices. However, the effects of confounding variables, such as experience, were not controlled for in Moriarity's (1979) study. It is therefore not possible to say that the effect of presentation formats is entirely due to the cause and effect relationship between the presentation formats and users' judgments.

Additionally, even though evidence from Moriarity's (1979) study appears to indicate that presentation formats could act as an aid in improving decision-makers' judgments in determining the financial status of a firm, no evidence was provided to determine whether the effect applies to other types of tasks, such as an on investment decision. This argument is reflected in the conflicting results found in many recent studies. Although part of the literature supports Moriarity's (1979) findings (Remus, 1987; Purvis, 1989; Jarvenpaa, 1989; Ricchiute, 1992; Goldwater and Fogarty, 1995; Tuttle and Kershaw, 1998; Dull and Tegarden, 1999), another group of studies failed to provide support (Remus, 1984; Stock and Watson, 1984; Dickson et al., 1986; Davis, 1989; Hard and Vanecek, 1991; So and Smith, 2004).

In general, three factors determine decision quality, namely, type of decision task, the decision-maker's characteristics, and the type of presentation format. The type of decision task refers to the characteristics of a particular decision-making situation. These characteristics exist regardless of the type of presentation format and the environment within which the decision is being made (Payne et al., 1993). Many types of decision tasks have been used to examine decision quality such as financial forecasting and time series information (Carbone and Gorr, 1985; Bouwman et al., 1987; DeSanctis and Jarvenpaa, 1989), predictions of future results (Dull and Tegraden, 1999; Dull et al., 2003), and auditors' effectiveness (Moriarity, 1979).

Within the presentation format literature, decision tasks play an important role in influencing decision quality. Early accounting studies focused on spatial and symbolic tasks (Washburne, 1927; Umanath et al., 1988; Umanath et al., 1990; Vessey, 1991). Spatial tasks involve assessing the problem area as a whole rather than as discrete data, such as comparing two data values, comparing trends, or assessing relationships in the data. Symbolic tasks involve extracting discrete data values. Studies within this area found that decision quality differs depending on the type of task being performed (Hard and Vanecek, 1991; Umanath and Vessey, 1994; Frownfelter-Lohrke, 1998). These studies support the supposition that there is a statistically significant correlation between the type of decision task and the presentation formats that the users relied on.

Decision quality studies have focused on elementary tasks and decision-making tasks (Benbasat et al., 1986; Jarvenpaa, 1989; Amer, 1991; Vessey and Galletta, 1991). Elementary tasks refer to information acquisition tasks and tasks involving comparison of two data values. On the other hand, decision tasks are more complex tasks that may be decomposed into several tasks (Vessey, 1991). The studies in this area suggest that to accomplish a certain level of decision quality, the type of decision task needs to match with the type of presentation format. For example, a tabular presentation format is better suited to a low complexity, or elementary, task (Benbasat and Dexter, 1985; Remus, 1987; Jarvenpaa, 1989; Tuttle and Kershaw, 1998). Graphical, on the other hand, is better suited to high complexity tasks, such as decision-making. Authors of this group of studies argue that graphs assist users to view data in a holistic manner which reduces task complexity. Contrasting results are, however, found in other similar studies (Bricker and Nehmer, 1995; Frownfelter-Lohrke, 1998; Dull et al., 2003).

The different outcomes in these studies could be attributed to the way the research instruments were designed. Because only three variables were able to be included in the graphs, the number of variables included in the tables was also limited to three. Thus, in designing the research instruments, the researchers had to limit the number of variables in the tabular in order to be consistent with the graphical. The results may have differed if more variables were able to be included in both instruments.

Many studies focus on decision-making tasks to determine decision quality (Stocks and Tuttle, 1998; Maines and McDaniel, 2000; Dull et al., 2003; Hodge et al., 2004). They focus on either investment decisions or credit decisions (Maines, 1995). Investment decisions concern the purchase or sale of corporate securities, including predicting future dividends and changes in stock price. Credit decisions involve determining the amount and terms of loans made to firms. Similar to earlier studies, these studies often include some form of presentation format in examining decision quality.

Findings from these studies are mixed. Some studies suggest that with the use of an appropriate presentation format, decision-makers make better decisions (Maines and McDaniel, 2000; Hodge et al., 2004). Vessey's (1991) cognitive fit model also supports the concept that the format of the information presented to decision-makers affects the outcome of their decisions. The model suggests that there are different types of problems, processes to solve the problems, and representations of the problems. If these three variables fit, then the model holds that decision quality should improve (Vessey, 1991). The transfer of financial information to a new form of presentation format could provide a better "fit" between financial information and its users.

Others argue that the component of decision quality in making investment or credit decisions actually depends on other factors and not on the presentation formats. Examples of these factors are the degree of information processing (Bricker and Nehmer, 1995) and decision-makers' characteristics (Lucas, 1981; Brown and Eining, 1996). For example, in Lucas's (1981) study, the impact of computer-based graphs on decision-making performance was examined. He used students as his subjects and found decision or cognitive style, rather than presentation formats, appears to be an important variable in influencing decision-makers' performance.

A common finding among these studies is that decision quality is a function of both the task itself and the presentation format (Jarvenpaa, 1989; Amer, 1991; Vassey and Galletta, 1991; Umanath and Vessey, 1994). Decision-makers produce more accurate decisions in less time when they have information that closely matches the needs of the task (Stock and

Watson, 1984; Amer, 1991; Vessey and Galletta, 1991). Later studies that examine types of presentation format other than graphical and tabular, support the contention that task specific requirements are important determinants of the most useful type of presentation format for decision quality (Stock and Watson, 1984; Amer, 1991).

Decision quality studies have also suggested that users' characteristics, such as work experience, also play an important role in determining decision quality (Brown and Eining, 1996). Work experience relates to the level of knowledge that users possess in performing a task (Brown and Ening, 1996). The literature review revealed that the findings of similar studies often differ, making general conclusions difficult. Only a few studies suggest that users with more experience in their task are expected to bring added skill to their interactions with the presentation formats and hence enhance their decision quality (Baldwin et al., 2003).

Several studies have examined the effect of familiarity with a technology (such as presentation format) on decision-makers' performance. Familiarity with presentation format is described as how much experience the decision-maker has with a particular presentation format (Brown and Eining, 1996). Studies show that: (i) familiarity with a particular presentation format could influence users to perform better (Taylor and Brownfield, 2002); (ii) professionals who are familiar with a presentation format may likely be affected by deviations in format (Fischoff, 1982); (iii) professionals often create an incorrect problem representation when faced with problems not presented in their 'typical' format (Blessing and Ross, 1996); and (iv) decision-makers will not perform well when presented with an inappropriate format because they were accustomed to seeing an appropriate format (Vera-Munoz et al., 2002).

Another body of literature suggests that familiarity with a technology (such as presentation formats) does not necessarily improve decision quality. Decision-makers who are accustomed to their working style would find it problematic to adapt to the presence of an unfamiliar decision aid. This leads them to resist change and is likely to affect their performance. However, this would not have a significant effect on inexperienced decision-

makers as they do not have the experienced decision-makers' many years of experience in adapting to a particular working style. For example, Davis (1994) and Eining et al. (1994) provide some evidence relating to the effects of auditors' experience when in the presence of a technology. Davis (1994) found that a checklist did not increase the performance of experienced users, whereas Eining et al. (1994) found that less experienced users using checklists performed at par to non aided users.

Kleinmuntz and Schkade (1993) proposed two cost-benefit dimensions of decision quality. These are decision accuracy and cognitive cost. Decision accuracy refers to the ability of a strategy to produce an accurate outcome (Ashton, 1991). Decision accuracy is often measured by comparing the outcome of the criterion with a benchmark (Frownfelter-Lohrke, 1998). Presentation format studies often focus on decision accuracy because one of the major concerns in users' performance is whether an appropriate decision could be made.

The importance of decision accuracy in the decision-making process, specifically in the output component, has been examined by various studies (Moriarity, 1979; Hard and Vanecek, 1991; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Dull et al., 2003). The results are mixed. One body of literature suggests that the use of appropriate presentation formats increase decision accuracy (Stock and Watson, 1984; Dickson et al., 1986; Iselin, 1988; Vessey, 1991; Mackay and Villareal, 1987; Hard and Vanecek, 1991; Stone and Schkade, 1991; Anderson and Kaplan, 1992; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Almer et al., 2003; Baldwin et al., 2004; Hodge et al., 2004). Another body of literature suggests that presentation formats do not affect decision accuracy regardless of whether the decision-makers rely on an appropriate presentation format (Bricker and Nehmer, 1995; Dull et al., 2003; So and Smith, 2004).

The link of a dependent relationship between decision accuracy and presentation formats is affected by factors such as matching of a presentation format and task (Vessey, 1991; Umanath and Vessey, 1994), and the idiosyncrasies of the presentation formats (Moriarity, 1979; Hard and Vanecek, 1991; Frownfelter-Lohrke, 1998). However, some studies suggest

that the degree of information processing is the determinant of decision accuracy (Bricker and Nehmer, 1995; So and Smith, 2004). Degree of information processing refers to the amount of relevant information that decision-makers access or refer to before arriving at a decision outcome (Cloyd, 1995). It is argued that if a higher degree of relevant information is processed it should lead to higher decision accuracy (Beach and Mitchell, 1978; Payne, 1982; Davis, 1989). For example, Bricker and Nehmer (1995) suggest that presentation formats are not the main contributor to decision accuracy. They argue that the contributor is the degree of information processing. However, their findings are debatable as a higher degree of information processing could indicate a reliance on inappropriate presentation formats (Vessey, 1991; Vessey, 1994), and consequently lead to information overload (Benbasat and Schroeder, 1977).

Frownfelter-Lohrke (1998) proposes that optimum decision accuracy depends on a combination of presentation formats and the degree of information processing. This is because the presentation formats make decision-makers aware of an information item that is placed outside of its normal placement (Hodge et al., 2004). This is likely to affect professional decision-makers more compared to non-professional decision-makers, as professional decision-makers are known to adopt direct search (Bouwman et al., 1987). However, the potential of presentation formats in making the decision-makers aware of the information item could be affected by other factors such as knowledge (Vera Munoz et al., 2002), experience (Hirst and Hopkins, 1998), the mismatching of a presentation format and task (Vessey, 1991), and the use of a placement signal as an indicator of the importance of an information item (Hodge et al., 2004). Consequently, the failure to process the relevant information item leads to lower decision accuracy (Hogarth, 1980).

Cognitive effort refers to the total expenditure of cognitive resources required to complete a task (Frownfelter-Lohrke, 1998). Cognitive effort is often measured by total decision time or total number of cognitive operations (Kleimuntz and Schkade, 1993; Ramarapu et al., 1997; Dull et al., 2003). Presentation format studies focus on cognitive effort because decision-makers tend to find ways to reduce their cognitive effort (Beach and Mitchell, 1978). They often rely on perceptual, i.e., perceived, processes which consume less time

(Coury and Bouletter, 1992; Vessey, 1994). Coury and Bouletter (1992) found that decision-makers tend to rely on any perceptual cues that are available in the data when time is a constraint.

In general, studies have found that presentation formats do influence cognitive effort (Benbasat and Dexter, 1985; Schwartz and Howell, 1985; Jarvenpaa, 1989; Stone and Schkade, 1991; Coury and Bouletter, 1992; Bricker and Nehmer, 1995; Tuttle and Kershaw, 1998). However, other studies have found that presentation formats do not affect cognitive effort (Benbasat and Dexter, 1985; Dickson et al., 1986; Jarvenpaa, 1989; Dull et al., 2003). For example, Dull et al. (2003) examined the effect of different presentation formats (hyperlinked versus non-hyperlinked) on decision-makers' judgments in terms of decisions, predictions, and the amount of information accessed. The researchers also examined the amount of time participants took to make decisions. In relation to the time taken, Dull et al. (2003) found a significant difference in the impact of the presentation formats on time used, although the effect was only demonstrable for participants assessing small firms. They found no significant difference for those participants assessing large firms.

Basing on Washburne (1927), Vessey (1991) suggests that the mixed findings derived from these studies could be due to a presentation format not suiting the task to be performed. Following on from earlier arguments in decision accuracy, she argued that the failure to match a presentation format to the task involved leads to the ineffective processing of information. However, in practice, it is difficult for users or decision-makers to match a presentation format with a task because of the different types and levels of tasks involved. Therefore, having one specific presentation format to suit all these tasks would be impossible (Benbasat and Dexter, 1985; Dickson et al., 1986; Bonner et al., 1996).

This is consistent with an alternative body of literature that suggests that there could not be a perfect presentation format that could fit all tasks without incurring high cognitive costs (Benbasat and Dexter, 1985; Dickson et al., 1986; Davis, 1989; Jarvenpaa, 1989). A review of the literature supports the alternative body of work. For example, Benbasat and Dexter

(1985) examine the influence of differential presentation formats on decision-making performance. They found a tabular format leads to faster decision-making compared to a graphical format, but graphical formats outperformed tabular when time constraint was low. Tuttle and Kershaw (1998) found that using a tabular format increases speed compared to a graphical format, but in Bricker and Nehmer (1995) graphical formats outperformed tabular.

One reason for the findings in the above studies is that cognitive effort reduces when a presentation format fits the task (Bertin, 1983). Bertin's theory is the first theory introduced in the presentation format literature concerning different forms of presentation formats. The theory relates to the process of obtaining information cues from a presentation format in order to answer questions, and focuses on determining the most appropriate presentation format for a given question.

According to Bertin's (1983) theory, performance with a presentation format is a function of three factors: (i) the information set presented; (ii) the question to be answered; and, (iii) the presentation format. Information sets consist of variables and a title, and are described by the number and type of variables they contain. Variables are described by their type: categorical, ordinal or quantitative. For example, in the information set entitled "Stock price, in dollars, for Firm A and Firm B, from year 2000 to 2004", the stock price in dollars is a quantitative variable, the year is an ordinal variable and the company name is a categorical variable.

The question to be answered defines the information to be extracted from a presentation format, and therefore, how the user interacts with the presentation format. Questions are described in terms of the amount of information which must be examined to answer them. The question becomes more complex when more information needs to be examined to arrive at an answer. The presentation format is the manner in which the information is presented to the user. The number and type of variables in an information set limit the forms of presentation that can be used to effectively present the variables. For example,

information sets containing three quantitative variables cannot be as effectively presented with two dimensional graphs compared to other presentation formats.

According to Bertin (1983), the most appropriate presentation format for a particular question is the one that minimises cognitive effort, measured in terms of the time the user expends to interpret the relevant aspects of the information and obtain an answer to his/her questions. Different forms of presentation make some aspects of the information displayed more apparent, and questions of different levels of complexity pertain to different characteristics or relationships within the information. Therefore, in sum, one presentation format cannot be said as a technology to generally solve an issue; rather certain presentation formats that can be used to achieve low cognitive effort in a specific task, may not be effective in a different task.

Apart from the factors already discussed that may contribute to the mixed findings in the literature in relation to the effect of presentation format on decision quality, the mixed results could also be affected by sample selection. Most of the studies in the presentation format literature (for example, Hard and Vanecek, 1991, Ramarapu et al., 1997, and Dull et al., 2003) examine the effect of presentation formats on decision quality using a sample of students as proxies for investors. Although a recent study by Elliott et al. (2007) indicates that students may have similar characteristics to investors, other studies have shown that students' experiences and beliefs are different from investors (Bouwman et al., 1995; Hunton and McEwen, 1997; Vera Munoz et al., 2002).

Further, the inconsistent findings concerning the link between decision quality and presentation formats could be attributed to research design (Libby et al., 2002). Specifically, studies have examined various presentation formats from tabular and graphical (Stock and Watson, 1984; Hard and Vanecek, 1991; Frownfelter-Lohrke, 1998), to linguistic and numerical (Stone and Schkade, 1991), media versus hardcopy (Clements and Wolfe, 1997; 2000; Rose, 2002), bullet point and graph (Almer et al., 2003), and presentation formats in the digital environment such as PDF, HTML and XBRL (Hodge, 2001; Dull et al., 2003; Hodge et al., 2004).

3.7 PRESENTATION FORMATS AND PERCEPTIONS

One theme emerging from the presentation format literature is that studies often use objective measures in obtaining their findings. Although various issues have been identified in the presentation format literature, most of these studies overlook the importance of subjective measures. Subjective measures, rather than objective measures, have been suggested as a determinant in technology usage (Beach and Mitchell, 1978), as often users need to have some knowledge of the technology before relying on it.

Several studies have used subjective measures such as perceived ease of use and perceived usefulness of technology (Davis, 1989; Adams et al., 1992; Subramaniam, 1994). Such examination is important as it provides insights to preparers and systems designers who are trying to understand the factors that influence users' acceptance of a technology (Adams et al., 1992). However, an examination of the perceptions of presentation formats has not been extensively undertaken. Davis (1989) examined perceived ease of use and perceived usefulness on users' intentions to use information technology in an attempt to develop and validate new measurement scales for the two variables, each of which were hypothesized to be determinants of computer usage.

Davis (1989, p. 320) defined perceived ease of use as "the degree to which a user believes that using a particular aid would reduce or be free of effort". He defined perceived usefulness as "the degree a user believes that a particular aid would enhance his performance". He proposed that the distinction made between objective measures of cognitive effort and decision accuracy is similar to the distinction between perceived ease of use and perceived usefulness. Studies in this area conclude that perceived usefulness is a primary determinant and perceived ease of use is a secondary determinant of intention to use a technology (Adams et al., 1992; Subramaniam, 1994; Taylor and Brownfield, 2002).

The importance of users' perceptions has been examined in the information systems literature (Panko, 1983; Paznik, 1987; Straub and Wetherbe, 1989; Davis, 1989; Adams et al., 1992; Subramaniam, 1994). Adams et al. (1992) propose that users often share similar

perceptions on the usefulness and ease of use of technologies that have a similar function. However, little is known about users' perceptions of different presentation formats in a digital reporting environment. Beattie and Pratt (2003) provide some evidence that users' of financial reports perceived formats in the digital reporting environment as 'fairly useful'. However, similar study has yet to be conducted to provide further evidence on the perceptions of formats in the digital reporting environment. It is likely that users would have similar perceptions on the usefulness and ease of use of presentation formats that have a similar function such as, for example, presenting financial information.

The suggestion that users would share similar perceptions of different technologies in a similar setting could be attributed to the fact that using either technology would provide similar functions and hence produce similar benefits (Adams et al., 1992). For example, Adams et al. (1992) examined the perceptions of users of two technologies (voice mail and electronic mail) and found that their participants viewed these two technologies as somewhat similar. Another attribute could be that for a certain period of time, the benefits of a few technologies (such as presentation formats) may be consistent (Davis, 1989). However, over longer periods, the benefits of these technologies may vary (Adams et al., 1992). Consequently, users' perceptions may also vary across time depending on the change in the nature of the presentation formats.

There is a dearth of studies attempting to link perceptions of a presentation format to their actual performance outcomes upon using that presentation format. The available literature fails to offer insights on whether users' perceptions of usefulness and ease of use are reflected in their decision accuracy and cognitive effort. The exclusion of an examination of users' perceptions and their link to actual performance provides a gap in knowledge. This argument is consistent with Davis (1989, p. 321) who states:

> "This view has not been extensively researched whereby cost benefit research has primarily used objective measures of accuracy and effort in research studies, downplaying the distinction between objective and subjective accuracy and cognitive effort".

This is important as studies in the information systems literature have shown that users' acceptance of a technology is highly dependent on their perceptions (Beach and Mitchell, 1978; Davis, 1989). However, their perception of a technology is not necessarily reflected in their decision-making outcomes (Wright, 1975; Beach and Mitchell, 1978; Abelson and Levi, 1985; Sproull and Kiesier, 1986; Davis, 1989; Kleinmuntz and Schkade, 1993; Schkade and Kleinmuntz, 1994).

The psychology literature provides few insights on the link between perceptions of a technology and the change in actual performance arising from use of the technology. The literature suggests that subjective measures (perception) often are in disagreement with their objective counterparts (actual performance) (Wright 1975; Adelbratt and Montgomery, 1980; Abelson and Levi, 1985). For example, Adelbratt and Montomery's (1980) results show that their participants gave higher ratings of compensatory rules compared to non-compensatory rules, despite the fact that the participants' perceptions were contrary to their actual performance. The results provide some indication that the participants may have perceived the technology as useful but, somehow, when they actually undertook the exercise, the results proved otherwise. Factors such as limited knowledge of the technology may contribute to these results. In this circumstance, users' perceptions were based on limited knowledge, and could eventually deter them from relying on a technology that would actually improve their decision-making outcomes.

The link between information systems and user's preference has been examined in the information systems literature (Beach and Mitchell, 1978; Davis, 1989; Adams et al., 1992). Davis (1989), Moore and Benbasat (1991) and Adams et al. (1992) found that users' perceptions often determine their preference for a technology. Research that examines preferences for presentation formats has been conducted in the digital reporting environment although the number of studies is small. Beattie and Pratt (2001, 2003) and Hodge and Pronk (2006) attempted to link users' preferences to presentation formats.

Beattie and Pratt (2001, 2003) found that users' preferences for a specific presentation format differ. They examined users' preferences for five types of presentation format: PDF,

HTML, XBRL, spreadsheet and word-processed. They found distinct differences between the preferred formats for different groups; professional users preferred a spreadsheet format whereas novice users preferred HTML closely followed by a word-processed and a spreadsheet format. Beattie and Pratt's (2001, 2003) findings could be attributed to the various features and purpose of the technologies (Taylor and Brownfield, 2002), and that systems designers rely on feedback from real and potential users for the purpose of developing and improving their products (Davis, 1989). However, Beattie and Pratt's (2001, 2003) findings are limited to examining one feature, namely, portability of information.

Hodge and Pronk (2006) attempted to link users' preferences for presentation formats by examining whether novice and professional investors prefer the same presentation format in accessing their online quarterly financial statement. The study's methodology involved providing participants with two presentation formats, PDF and HTML, and requesting participants to search for information which was supposedly relevant to their investment decision task. They found professional users preferred PDF while novice users preferred HTML.

The findings of Beattie and Pratt (2003) and Hodge and Pronk (2006) are consistent with studies that show users have different preferences among competing technologies (Rice and Steinfield, 1991; Adams et al., 1992; Hodge et al., 2004). Beattie and Pratt (2003) examine participants' perceptions and preferred presentation formats and Hodge and Pronk (2006) examine only participants' preferences for presentation formats. These studies did not examine whether the participants' preferred presentation formats are influenced by their perceptions of the presentation formats. The exclusion of an examination of users' perceptions and a subsequent linking of these to their preferences provides a gap in knowledge.

The information systems literature theorizes that decision-makers' preference for or choice of a technology is based on subjective measures (perception) rather than objective measures (actual performance) (Beach and Mitchell, 1978). The findings in this body of literature are

consistent with the views of those in the psychology studies, that adoption of a technology or an object is a function of a variety of factors, including perceived usefulness and perceived ease of use (Rogers, 1983). The suggestion is made that often users need to know about a technology before using it. However, the psychology literature suggests that subjective measures are often in disagreement with their objective counterparts (Wright, 1975; Adelbratt and Mongomery, 1980; Abelson and Levi, 1985). This is because what users perceive as the effectiveness of a certain choice of technology, may be different from when they actually use it due to other factors such as their personal characteristics (Brown and Eining, 1996). Therefore, perceptions are deemed to be an important determinant in the preference for a technology. If the decision-maker positively perceives a technology, most likely their preference for the technology is higher.

3.8 PRESENTATION FORMATS AND COGNITIVE INFORMATION PROCESSING IN THE CONTEXT OF RECOGNITION VERSUS DISCLOSURE.

Studies on recognition versus disclosure were motivated by policymakers' concerns that the method of disclosing information items affects decision-makers' evaluations and decisions (Maines, 1995). This issue was raised because of functional fixation (Ijiri et al., 1966). Ijiri et al. (1966, p. 186) state:

> "Psychologists have found that functional fixation exists in most human behaviour in which a person attaches a meaning to a title or an object and is unable to see the alternative meanings or uses. People intuitively associate a value with an item through past experience, and often do not recognise that the value of an item depends, in fact, upon the particular moment in time and may be significantly different from what it was in the past."

Studies in this area have focused on various information items such as employee pension (Harper et al., 1987, 1991; Sami and Schwartz, 1992), leases (Wilkins and Zimmer, 1983), comprehensive income (Hirst and Hopkins, 1998; Lipe, 1998; Maines and McDaniel,

2000), and stock option compensation (Hodge et al., 2004). Although these information items are considered important, there are others that have not been examined in the recognition versus disclosure literature. For example, studies on the accounting of investment property are not available in the recognition versus disclosure literature even though it has been argued to be important (Yungmann, 1999; Praditsmanont, 2002).

Early studies did not support the contention that different accounting methods (recognition versus disclosure)[6] affect decision-makers' information processing (Wilkins and Zimmer, 1983)[7]. In an experimental study, Wilkins and Zimmer (1983) developed a model for explaining loan officers' judgment processes where a credit evaluation task includes assessing loan risk and repayment ability of firms. Using this model, Wilkins and Zimmer (1983) hypothesized that the method of disclosing information has no effect on loan officers' assessments of the ability to repay term loans and the amounts they are willing to lend. Wilkins and Zimmer (1983) used variables related to the users including maximum amount loaned, assessment of ability to repay, years of lending experience, tertiary education, knowledge of lease accounting alternatives, and consideration of proposed lease capitalisation that would affect the firms' abilities to raise funds. Overall, Wilkins and Zimmer (1983) did not provide evidence that alternative accounting methods affect assessment.

Wilkins and Zimmer's (1983) results can be attributed to a few factors. First, their participants were bankers who are often guided by explicit guidelines for the treatment of financial leases, with bank credit manuals readily available to them when processing loan applications. Secondly, the extensive literature in the professional and internal bank area has increased the understanding of these participants on the alternative accounting methods of leases. Thirdly, the considerable controversy that has arisen concerning lease accounting may have made the participants more aware of the development of lease accounting.

[6] The terms 'alternative accounting method' and 'recognition versus disclosure' indicate the same meaning and are being used interchangeably.
[7] The context of "recognition versus disclosure" is also known as placement of information in this study.

Subsequent to Wilkins and Zimmer's (1983) study, many studies have examined the importance of functional fixation arising from recognition versus disclosure (Maines, 1995; Libby et al., 2002). Most of the studies demonstrated some degree of functional fixation when two or more firms adopted alternative accounting methods (Landsman, 1986; Harris and Ohlson, 1987; Harper et al., 1987; Landsman and Ohlson, 1990; Harper et al., 1991; Sami and Schwartz, 1992; Barth, 1994; Hopkins, 1996; Hirst and Hopkins, 1998; Maines and McDaniel, 2000; Luft and Shields, 2001; Hodge et al., 2004). These studies show that firms with identical economic circumstances except for their choice of accounting alternatives may sometimes be judged to be different because the decision-makers fail to adjust for the differences arising from the different adoption of accounting methods (Sami and Schwartz, 1992; Bernard and Schipper, 1994; Libby et al., 2002).

Studies examining alternative accounting disclosures have used either an archival-empirical setting or an experimental setting. Most studies relied on the latter, focusing on users' information processing by manipulating disclosure versus recognition in individual judgment settings. Studies in the archival setting found that stock prices reflect disclosed information, suggesting that investors view disclosed information as relevant (Beaver et al., 1982; Beaver and Landsman, 1983; Beaver and Ryan, 1985; Bernard and Ruland, 1985; Landsman, 1986; Harris and Ohlson, 1987). However, studies have also found that a recognised item also has incremental explanatory power (Bublitz et al., 1985; Murdoch, 1986; Barth, 1994). The mixed findings in the archival literature could be attributed to the sample selection in the studies, often being cross sectional in nature, across industries and model specifications (Barth, 1994).

Experimental studies, on the other hand, have examined whether investors and others adjusted appropriately for the effects of accounting methods and disclosure alternatives (Dyckman, 1964; Jensen, 1966; Maines, 1995). Similar to the findings in the archival-empirical studies, the findings were mixed. Most of these findings demonstrated some degree of functional fixation, where the participants did not fully adjust for differences in the effects of accounting methods and disclosure (Sami and Schwartz, 1992; Harper et al., 1987, 1991; Hopkins, 1996). As a consequence, firms with identical economic

circumstances except for their choice of accounting alternatives were judged to be different (Libby et al., 2002).

The supporting results for the existence of functional fixation arising from placement of information were contributed by classification issues. For example, the assignment of a financial disclosure in a particular financial statement to a specific subsection within a statement, or to the notes, would affect users' decision categorisation of that disclosure, their interpretation of its relevance and meaning (Hopkins, 1986; Hirst and Hopkins, 1998), their perceived magnitude of the item (Petroni and Wahlen, 1995; Dhaliwal et al., 1999), and whether the information item is a core or a non-core related activity (Maines and McDaniel, 2000). For example, Hopkins (1996) examined the effects of classification of items on the right side of the balance sheet as debt, equity, or mezzanine financing on judgments of the stock price effects of new financing. The result showed that experienced buy-side analysts who had knowledge of the differential stock price effect of debt and equity issuances found in the financial economics research, responded to the issuance of hybrid securities based on their categorisation.

Functional fixation is attributed to two factors, namely, work experience (Hirst and Hopkins, 1998; Hopkins et al., 2000; Luft and Shield, 2001) and amount of relevant information (Lipe, 1998). The lack of working experience in dealing with transactions involving alternative accounting disclosures could be the cause of functional fixation (Ijiri et al., 1966). Experienced decision-makers would likely search for the information item regardless of where the information item is located (Maines and McDaniel, 2000). Therefore, it is unlikely for them to incur functional fixation. Similarly, when the amount of potentially relevant data is large enough relative to the decision-maker's cognitive processing resources, an insufficient amount of processing would occur (Luft and Shield, 2001). Therefore, the decision-makers would be unlikely to be able to detect all relevant information.

Recent studies have examined potential solutions to functional fixation in relation to placement of information. However, the number of such studies is sparse. Luft and Shields

(2001) suggested that learning on the information that has alternative methods could be a potential solution and impact on functional fixation, but they did not find any supporting evidence for this. Their results show that accounting affects the allocation of people's attention and influences the learning process; functional fixation continues to exist.

A pioneering study was conducted by Hodge et al. (2002; 2004) to examine whether functional fixation exists and if it does, whether the presentation formats in a digital reporting environment and their interaction with placement of information: stock option compensation would reduce the effect of functional fixation in information processing stages. Hodge et al. (2002; 2004) extended the presentation format literature by examining whether presentation formats (PDF and XBRL) could influence functional fixation caused by placement of information by making the financial information more transparent. They reasoned that if information is presented in a way that enhances the data structure, this would allow decision-makers to become more effective and efficient in information acquisition and usage (Larkin and Simon, 1987).

Hodge et al. (2004) predicted that XBRL would help participants to acquire and integrate (evaluate, weighting and judgment) stock option compensation information disclosed in the financial statement. They reported that the functional fixation was more apparent when the participants used PDF compared to XBRL. Their results also show that XBRL assisted the participants to better acquire and integrate information compared to PDF. That is, decision-makers are prone to making errors and misjudgment due to the failure of information acquisition (Roberts, 2002). After controlling for acquisition, they found some evidence that XBRL affects integration. Their findings provide some indication that presentation formats could alleviate functional fixation in information acquisition and information integration stages.

Studies by Luft and Shield (2001) and Hodge et al. (2002; 2004) found that functional fixation could be alleviated. However, the effect may not necessarily be immediate (Luft and Shield, 2001; Hodge et al., 2004) and it may not be alleviated in all cognitive information processing stages (Hodge et al., 2004). Such findings are attributed to the

opportunity to learn and gain more knowledge in order to have an understanding of the possible accounting disclosure for a particular information item. This could be achieved by assessing how much work experience the decision-maker has before they deal with such an issue.

Behavioural studies also suggest that apart from work experience, other decision-makers' characteristics, such as familiarity with a technology in terms of its features, assist decision-makers in performing their task (Brown and Eining, 1996). Familiarity with the presentation format could affect the potential of a presentation format to improve cognitive processing as well as alleviate the effect of functional fixation caused by placement of information. Presentation formats are seen as potentially influential solution that may address the limits of cognitive information processing as well as alleviating functional fixation (Hodge et al., 2004). However, to what extent presentation formats have potential to improve cognitive information processing in other accounting contexts, such as investment property, has yet to be explored. This warrants further investigation.

3.9 SUMMARY AND CONCLUSION

This chapter has presented a literature review on presentation formats. It discusses the relevance of presentation formats to decision-makers. A general review of the effect of presentation formats on decision-makers' behaviour such as search behaviour and affective responses was given. Specifically, three issues relating to the effect of presentation formats on decision-makers were discussed: decision quality, perceptions and cognitive information processing in a recognition versus disclosure situation. The review on these three issues is summarised as follows:

A review on the presentation format studies in various disciplines revealed mixed results on its effect on decision quality. Some studies support the contention that presentation formats affect decision quality (such as Frownfelter-Lohrke, 1998; Baldwin et al., 2004). Other studies suggest otherwise (such as Dull et al., 2003; So and Smith, 2004). The findings of these studies were mostly conducted in the hard copy traditional reporting environment.

There is a lack of studies examining the perceptions of presentation formats. Recent studies by Beattie and Pratt (2001, 2003) and Hodge and Pronk (2007) examined perceptions and preference of digital presentation formats. However, the available literature in the accounting context fails to provide insights on the linkages between presentation format and perceptions, and the link between perceptions and actual performance outcomes (decision quality) and preferences of presentation formats.

The issue of functional fixation in the context of recognition versus disclosure has long been debated. Most studies examining functional fixation use information items that are highlighted and discussed, such as stock option compensation (Hodge et al., 2004) and employee pension benefits (Sami and Schwartz, 1992). A recent study by Hodge et al. (2004) found that presentation formats are potential solution for improving decision-making. However, the lack of studies to support Hodge et al. (2004) raises doubts on the potential of presentation formats in alleviating functional fixation in the context of recognition versus disclosure, particularly in a digital reporting environment using a less highlighted information item.

The review of the literature on these three issues noted above lead us to conclude that the mixed findings and the lack of studies on presentation format to support the earlier findings until now, is debatable but relevant. This chapter provides a basis for this study to create propositions based on the literature review and consequently, develop the hypotheses of this study. The next chapter provides the objectives of the study and hypotheses development.

CHAPTER FOUR

RESEARCH OBJECTIVES AND HYPOTHESES DEVELOPMENT

4.1 INTRODUCTION

This chapter covers the research objectives and hypotheses. The research objectives are identified in Section 4.2. In Section 4.3 the development of the hypotheses is discussed. The final section provides a summary and conclusion of this chapter.

4.2 RESEARCH OBJECTIVES

Chapters 2 and 3 provided a comprehensive review of the literature on decision-making and presentation formats. One particular finding from the review was that decision-makers' limitations contribute to their inability to perform effectively and efficiently (Newell and Simon, 1972; Ebbeson and Konechi, 1980). Further, decision-makers' reliance on appropriate technology (such as presentation formats) may alleviate these limitations and improve the effectiveness and efficiency of their performance (Roberts, 2002).

This study's main focus is an examination of the impact of presentation formats in the digital reporting environment on decision quality, perceptions and cognitive information processing in the context of recognition versus disclosure. Figure 4.1 depicts the study's objectives. Each objective is discussed separately below.

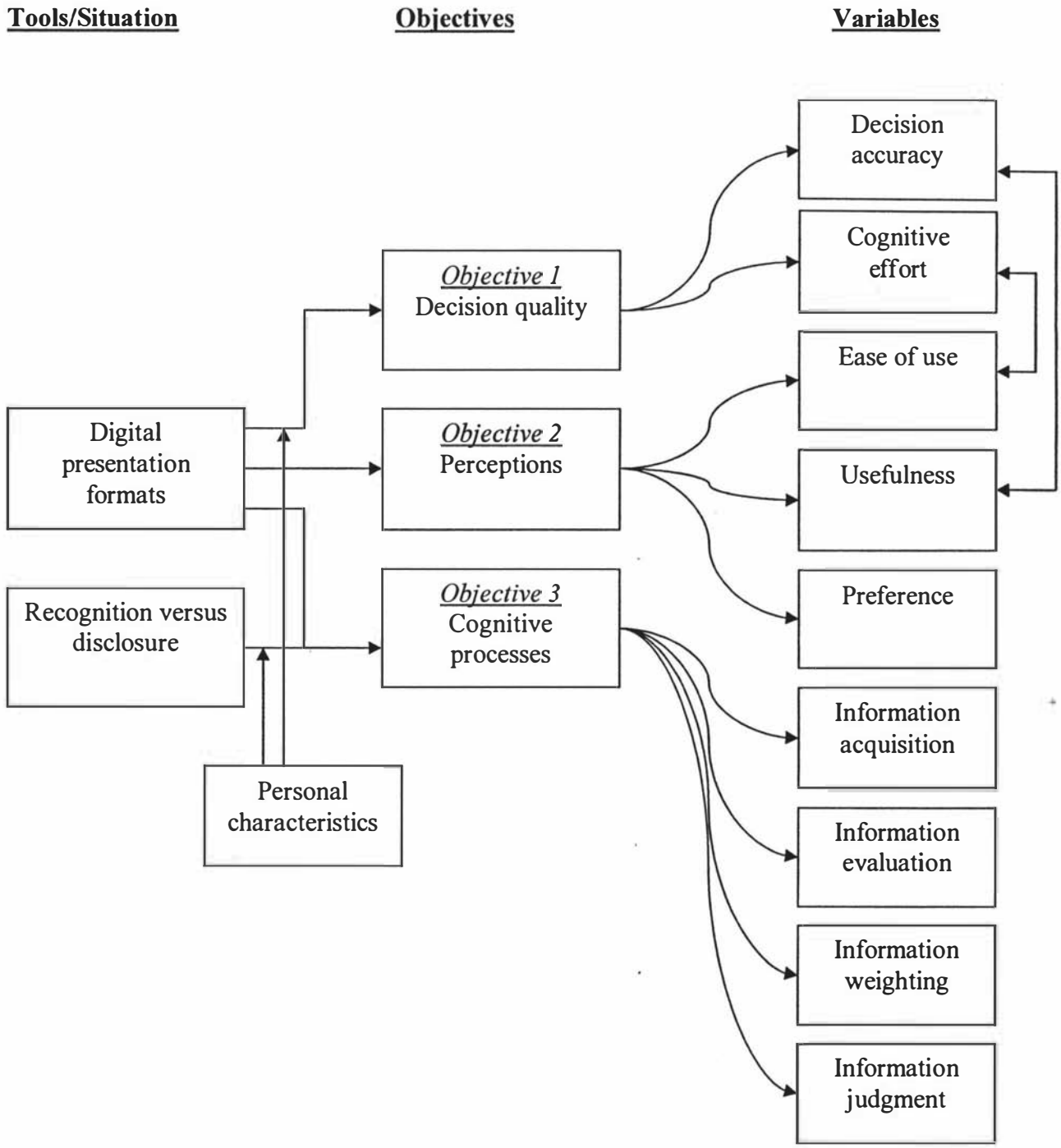

Figure 4.1: Overview of the study's objectives

4.2.1 Decision quality

The first research objective is to examine the effect of presentation formats on decision quality in a digital reporting environment. As shown in Figure 4.1, two dimensions of decision quality are examined: decision accuracy and cognitive effort. These two variables have been established in the behavioural decision literature as objective measures with which to examine the effect of presentation formats on decision quality (Jarvenpaa, 1989; Amer, 1991; Bricker and Nehmer, 1995; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998). Most of the studies reported in the literature also use a decision-input framework and experimental design in a traditional reporting environment, and settings that include investment or credit decisions.

Examining decision quality is important for two reasons. Firstly, findings from previous studies examining the effect of presentation formats on decision quality are inconclusive (Moriarity 1979; Stock and Watson, 1984; Arkes et al, 1986; Purvis, 1989; Jarvenpaa, 1989; Kalcelmeier and Messier, 1990; Amer, 1991; Vessey and Galletta, 1991; Mackay and Elam, 1992; Umanath and Vessey, 1994; Whitecotton, 1996; Ramarapu et al., 1997; Stocks and Tuttle, 1998; Tuttle and Kershaw, 1998; Dull and Tegarden, 1999; Baldwin et al., 2004). The generalisability of these studies' findings is somewhat questionable due to limitations in the scope of the presentation formats used, as well as the studies' methodologies. Most of these studies focused on small scale presentation formats, such as tabular and graphical, which often comprise a small part of a financial report.

Furthermore, some of these studies have not accounted for possible confounding variables, such as work experience and/or familiarity with presentation format in assessing the effect of the presentation formats on decision quality (Ramarapu et al., 1997; Stocks and Tuttle, 1998; Frownfelter-Lohrke, 1998; Tuttle and Kershaw, 1998). Of consequence, this raises doubts on whether the results shown in previous studies was caused by the presentation formats or by other factors such as the characteristics of the decision-makers. It is therefore difficult to generalise conclusions based on the contrasting results from prior studies.

Secondly, the recent development of the Internet as a digital reporting tool has increased interest in the effect of presentation formats in the digital environment (Hodge, 2001; Dull et al., 2003; Hodge et al., 2004). A small number of studies have indicated the importance of the digital presentation formats to decision-makers (Debreceny and Gray, 2001; Baldwin et al., 2003). As the evidence is inconclusive, there are calls for further studies into the potential of digital reporting formats, particularly in enhancing decision quality (Debreceny and Gray, 2001; Wu and Vasarhelyi, 2004). Examining digital presentation formats in this study contributes to the understanding of this new technology and how it affects decision-making in financial reporting context.

4.2.2 Perceptions

The second research objective is to examine the perceived usefulness and ease of use of digital reporting formats. The information systems literature refers usefulness and ease of use in the evaluation of technology (Davis, 1989; Adams et al., 1992; Subramaniam, 1994; Taylor and Brownfield, 2002). Some studies have used questionnaires to assess the perceptions of technology (Davis, 1989; Subramaniam, 1994). Figure 4.1 also shows the link between perceptions and preferences of presentation formats. The information systems literature suggests users' perceptions of the usefulness and ease of use of presentation formats often determines their preference of presentation formats (Beach and Mitchell, 1978; Davis, 1989; Kleinmuntz and Schkade, 1993).

An examination of the perceptions of digital presentation formats is important for three reasons. Firstly, while most studies examine decision-makers' actual performance (i.e., decision accuracy and cognitive effort), such studies have not considered the importance of examining decision-makers' perceptions of the presentation format (Hard and Vanecek, 1991; Bricker and Nehmer, 1995; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Hodge, 2001; Dull et al., 2003). Examining perceptions of a technology (such as presentation formats) is important as perceptions influence the acceptance of and intention to use a technology (Adam et al., 1992; Beach and Mitchell, 1978; Davis, 1989). Such examination is necessary to provide a holistic and comprehensive view of the importance of

perceptions in the selection and usage of a technology, in particularly, digital presentation formats.

Secondly, the literature suggests that a link exists between users' perceptions of usefulness and ease of use of a particular technology and the actual performance outcomes such as decision accuracy and cognitive effort (Wright, 1975; Beach and Mitchell, 1978; Abelson and Levi, 1985; Davis, 1989). Studies reported in this body of literature suggest that users' perceptions of the usefulness and ease of use of a technology do not necessarily correspond to the technology's actual usefulness and ease of use once a particular task has been performed (Wright, 1975; Beach and Mitchell, 1978; Abelson and Levi, 1985; Sproull and Kiesier, 1986; Davis, 1989; Kleinmuntz and Schkade, 1993; Schkade and Kleinmuntz, 1994). However, as noted in Chapter 3, most studies examining technology use objective measures of decision quality, without considering the link between objective measures (decision accuracy and cognitive effort) and subjective measures (perceived usefulness and perceived ease of use) (Davis, 1989, p. 321).

Finally, findings reported in the psychology and information systems literature indicate that users' perceptions often determine their preference of a technology (Beach and Mitchell, 1978; Rogers, 1983; Davis, 1989; Adams et al., 1992). If users have positive perceptions of a technology, they are likely to develop a stronger preference for using the technology. Similarly, if the users have negative perceptions of a technology, they are likely to have less preference for use of the technology. In the digital reporting literature, Beattie and Pratt (2001; 2003) and Hodge and Pronk (2006) examined users' perceptions and preference for presentation formats. However, these studies have not examined the link between perceptions and preferences for presentation formats. This indicates that this dimension of presentation formats has not been explored in the accounting literature and thus further insights on the linkages between perceptions and preferences are needed. This examination is particularly relevant since if more advanced forms of digital reporting are to be encouraged, then there is also the need for users to be made more aware of the benefits to be gained from the different forms of presentation.

4.2.3 Cognitive information processing in the context of recognition versus disclosure

The third research objective is to examine the effect of digital presentation formats on cognitive information processing in the context of recognition versus disclosure (refer Figure 4.1). The literature refers to information processing as comprising of four stages: information acquisition, information evaluation, information weighting and information judging (Hogarth, 1980; Maines and McDaniel, 2000). The literature on information processing in recognition versus disclosure situations generally uses experimental designs involving settings where information items are provided in accordance with different accounting treatments (Libby et al., 2002).

An examination of information processing in the context of recognition versus disclosure is important because previous studies have shown that decision-makers may experience functional fixation depending on the accounting method adopted by a firm (Landsman, 1986; Harris and Ohlson, 1987; Harper et al., 1991; Hopkins, 1996; Hopkins, 1997; Hirst and Hopkins, 1998; Maines and McDaniel, 2000; McDaniel et al., 2002; Hodge et al., 2004). These studies examined alternative accounting treatments for accounting for leases (Wilkins and Zimmer, 1983), accounting for pensions (Sami and Schwartz, 1992), and accounting for stock option compensation (Maines and McDaniel, 2000). However, there are other accounting situations which, although important, have not been examined, such as investment property (Paraditsmanont, 2002).

The recent development of digital reporting has provided a new environment in which a variety of presentation formats have become available. It has been suggested that digital presentation formats may provide a solution to the problem of functional fixation in recognition versus disclosure situations. In a pioneer study, Hodge et al. (2002; 2004) used the accounting for stock option compensation and found that presentation formats could influence functional fixation in recognition versus disclosure situations. However, Hodge et al.'s study involved a topical issue, stock option compensation, where the participants had a strong awareness of the issue. The finding of Hodge et al. may not be relevant to less

prominent situations such as accounting for investment property, where accounting standards allow but do not require measurement of investment property at fair value.

In summary, the aim of this study is to examine if decision-making performance can be affected, and thus optimized, by using presentation formats. The three research objectives represent the overall flow of the decision-making process and involve three central stages: input, processing and output. Before a decision outcome (output) can be obtained, decision-makers not only need to rely on inputs such as information content, but also on inputs involving how the information is presented using a digital presentation format.

Decision-makers also need to choose the best presentation format for performing their tasks. In selecting a presentation format, decision-makers rely on their perceptions. After choosing their preferred presentation format, decision-makers then rely on the presentation format to process information before arriving at a decision outcome (output). Finally, the quality of their decision outcome (decision quality) often depends on their input (such as presentation format) and their processing information (a function of input).

4.3 RESEARCH HYPOTHESES

This section provides the research hypotheses and outlines three research objectives identified in section 4.2. Specifically:

1. To examine the effect of digital presentation formats on decision quality.
2. To examine the perceived usefulness and ease of use of digital reporting formats.
3. To examine the effect of digital presentation formats on cognitive information processing in recognition versus disclosure situations.

Research hypotheses for each research objective are identified in this section.

4.3.1 Decision quality

Figure 4.2 illustrates the framework that underpins the first objective of this study. This objective is to examine the effect of digital presentation formats on decision quality. This

framework is based on Libby and Lewis's (1977) classification of variables affecting decision quality. Libby and Lewis (1977) suggest task features, information content, decision-makers' characteristics and the environment within which the decision is made affect decision quality. They also suggest that the quantity and quality of information being inputted and the way in which it is presented are also recognised as factors that influence decision quality. The framework suggests that presentation formats may impact on decision accuracy and cognitive effort. However, the impact of presentation formats is confounded by decision-makers' characteristics such as work experience and familiarity with the presentation format.

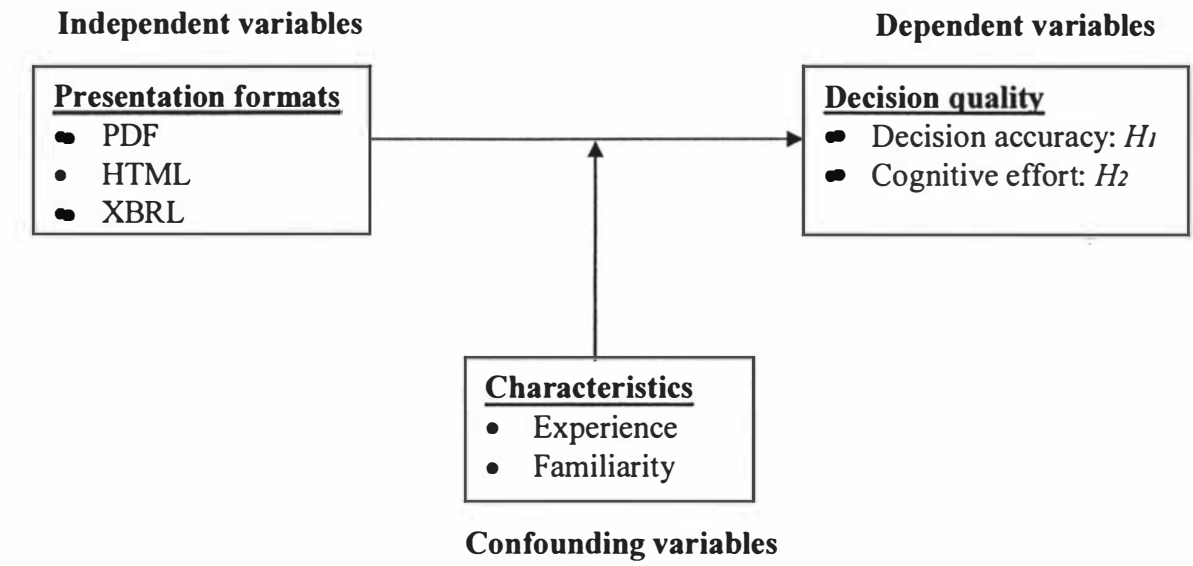

Figure 4.2: Research Framework – Decision quality

The framework shows that presentation formats is the independent variable. Hodge et al. (2002; 2004) examined and compared two presentation formats in the digital reporting environment, PDF (non-searchable) and XBRL (searchable) presentation formats. They examined the effectiveness of the two presentation formats, displaying stock option compensation information, in assisting users to acquire and integrate information. They describe searchable technology as a technology that facilitates directed searches and

simultaneous presentation of related financial statement and footnote information, whereas non-searchable technology does not.

Hodge et al. (2004) found that participants were able to acquire and integrate stock option compensation information reported in the footnotes section when an XBRL presentation format was used. The use of an XBRL presentation format appeared to make the information reported in the footnotes more transparent. Consequently, the participants who used XBRL were more accurate when making investment decisions. Hodge et al. (2004) examined the use of only PDF and XBRL presentation formats as non-searchable and searchable facilities. This study extends Hodge et al. by examining the impact of three presentation formats available in the digital reporting environment on decision quality, namely, PDF, HTML and XBRL. This study includes HTML as it has one feature that distinguishes it from PDF and XBRL, its information processing facility.

Bosak and Bray (1999) and Abdolmohammadi et al. (2002) noted that one of the features that distinguish between PDF, HTML and XBRL is information processing facility. They describe PDF as one that does not allow at all for information processing. HTML is described as static information processing where the data cannot be analysed on the spot (because there is a need for additional queries). XBRL is described as allowing dynamic information processing of the data on the spot, where the data can be extracted and processed automatically by XBRL-aware applications such as Excel for analysis (SEC, 2007). Therefore, this study examines presentation formats by using PDF as a non-information processing facility, HTML as a semi-information processing facility, and XBRL as a full information processing facility.

Decision quality is the dependent variable in the present study. This study used decision accuracy and cognitive effort as measures of decision quality as these two variables are widely used as measures of the effectiveness of a presentation format on decision quality (Kleinmuntz and Schkade, 1993). It is argued that an appropriate presentation format would enhance the structure of the information and facilitate processing information more accurately with less cognitive effort (Mackay et al., 1992; Hodge et al., 2004).

The relationship between presentation formats and decision quality is moderated by decision-makers' characteristics in this study. Studies have suggested that decision-makers' characteristics such as work experience, familiarity with decision aid, gender, confidence and personal characteristics (cognitive style), may influence the impact of presentation formats on decision performance (Sabherwal and Grover, 1989; Bamber, 1993; Brown and Eining, 1996; Nouri and Douglas-Clinton, 2006). Two characteristics, work experience and familiarity with presentation format, have been found to moderate the impact of presentation formats on decision quality and both will be incorporated into this study. Kalchelmeier and Messier (1990) found that experience moderates decision accuracy as more experienced decision-makers bring added skills to their interactions with a presentation format. Mackay et al. (1992) found that familiarity with a technology impacts on decision quality since greater familiarity with the technology leads to higher decision accuracy and lower cognitive effort.

In prior experimental studies, examining the effect of presentation formats on decision quality has produced mixed results. A group of these studies support the view that presentation formats impact on decision accuracy and cognitive effort (Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Almer et al., 2003; Baldwin et al, 2004; Hodge et al., 2004). For example, Tuttle and Kershaw (1998) found their participants were more accurate when information was presented in graphical compared to tabular although less cognitive effort was expensed when participants used tabular compared to graphical. Similarly, Dull et al. (2003) concluded that presentation formats (hyperlink such as HTML versus non-hyperlink such as PDF) do impact on decision accuracy and cognitive effort when evaluating large firms[8].

However, some studies indicate that presentation formats do not impact on decision quality (Bricker and Nehmer, 1995; So and Smith, 2004)[9]. For example; Hard and Vanecek (1991) found that presentation formats (graphical versus tabular) do not impact on decision

[8] Dull et al. (2003), however, found that presentation format does not impact decision accuracy and cognitive effort when evaluation small firms.

[9] These studies examined presentation formats such as graphical which includes raw numeric, processed numeric, bar graph, facial image and colour codes graphics.

accuracy and cognitive effort although the participants in tabular group were better in recalling, reading and retrieving and evaluating information. This group of studies have identified other factors that impact on decision quality, *inter alia* decision accuracy and cognitive effort, such as confidence (Whitecotton, 1996), degree of processing (Bricker and Nehmer, 1995), task characteristics (Dull et al., 2003), and decision-makers' characteristics (Baldwin et al., 2004). The mixed results motivate the need to re-examine the link between presentation formats and decision quality. The results of this study would provide further understanding on the effect of presentation formats on decision quality. Using digital presentation formats (PDF, HTML and XBRL), the null hypotheses testing the link between presentation formats and decision accuracy and cognitive effort are developed as follows:

H_1 : *There is no significant effect difference on decision-makers' decision accuracy between digital presentation formats.*

H_2 : *There is no significant effect difference on decision-makers' cognitive effort between digital presentation formats.*

4.3.2 Perceptions

Figure 4.3 illustrates the framework that underpins the second objective of this study. This objective is to examine the perceived usefulness and perceived ease of use of digital presentation formats. This framework is based on Libby and Lewis's (1977; 1982) classification of variables affecting the ability of individuals to perform their tasks better. The framework suggests that presentation formats may impact on users' perceptions and actual performance. Further, users' perceptions of a particular presentation format may not be similar to their actual performance on using such a presentation format. This framework also indicates that users' perceptions of presentation formats also influence their preference for the presentation formats.

As reviewed in Section 4.3.1, studies in the presentation format literature have focused on the link between presentation formats and decision quality. Prior studies, employing experimental settings, often used decision accuracy and cognitive effort as objective

measures of decision quality. However, Davis (1989) noted that, there is an alternative: an under-researched yet subjective measure of decision quality, namely the user's perceptions.

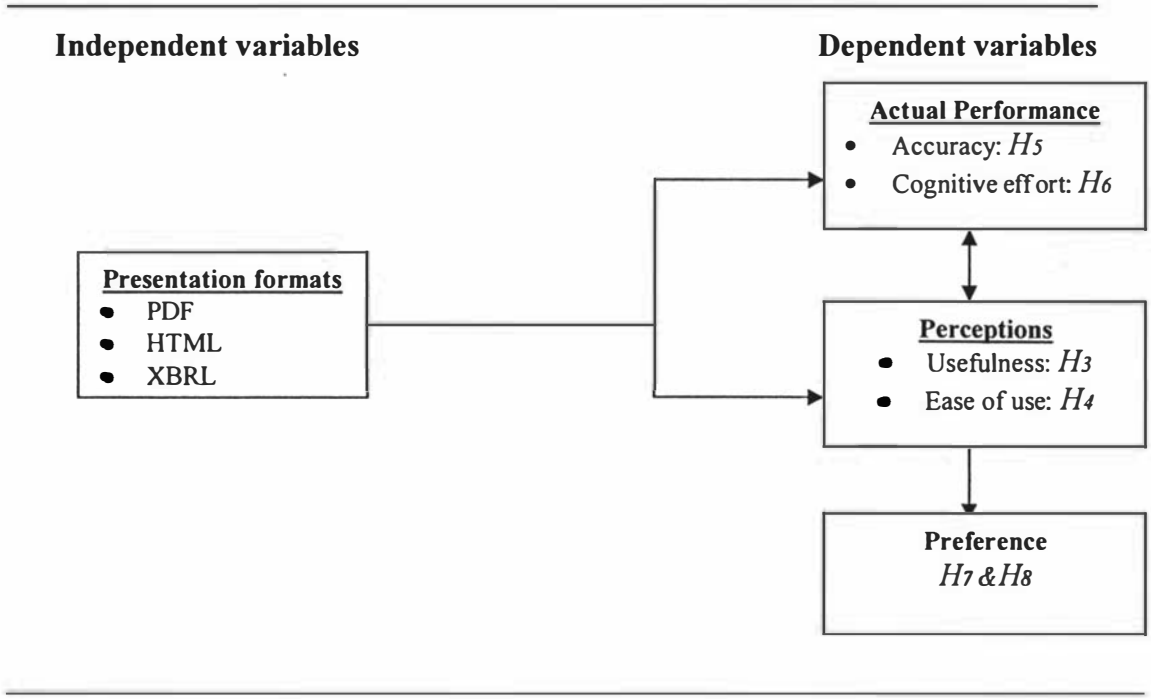

Figure 4.3: Research Framework - Perceptions

Studies in the information technology literature show that users' perceptions of the usefulness and ease of use of a particular technology (or presentation format) do not necessarily similar to the improved decision-making outcomes (Davis, 1989; Adams et al., 1992; Subramaniam, 1994; Taylor and Brownfield, 2002). The availability of digital reporting has given rise to the development of various presentation formats, providing opportunities for researching the link between users' perceptions and presentation formats. Therefore, this study aims to explore similar issues by examining users' perceptions and their actual performance in the decision-making process, using different presentation formats. Hence, digital presentation format is the independent variable.

The digital reporting literature has recently expanded its scope to include presentation formats (Beattie and Pratt, 2001; Hodge, 2001; Beattie and Pratt, 2003; Hodge et al., 2002; Hodge et al., 2004; Hodge and Pronk, 2006). However, these studies have not extensively examined users' perceptions of different digital presentation formats. Studies in the

information systems literature suggest that users often share similar perceptions (perceived usefulness and perceived ease of use) of technologies having similar functions (Panko, 1983; Paznik, 1987; Straub and Wetherbe, 1989; Adams et al., 1992). Arguably, such findings may also apply to presentation formats. Therefore, users' perceptions become the dependent variable in this study.

Studies reported in the psychology and information systems literature suggest that users' perceived usefulness and perceived ease of use of different technologies are often at odds with their actual level of decision accuracy and cognitive effort (Wright, 1975; Adelbratt and Montgomery, 1980; Abelson and Levi, 1985; Davis, 1989). This issue has not been examined in the presentation format and digital reporting literature. In this study, users' actual performance (decision accuracy and cognitive effort) is the second dependent variable.

Studies also suggest that users' perceptions of the usefulness and ease of use of a technology determine their preference of a technology (Beach and Mitchell, 1978; Davis, 1989; Kleinmuntz and Schkade, 1993). Although Beattie and Pratt (2001; 2003) and Hodge and Pronk (2006) examined users' perceptions and preference of presentation formats within a digital reporting environment, these studies did not examine the association of users' perceptions and preferences. Accordingly, users' preference is the third dependent variable.

Decision accuracy and cognitive effort are widely used measures in assessing the efficiency and effectiveness of presentation formats in the decision-making process (Kleinmuntz and Schkade, 1993). While some studies have examined the link between decision quality and presentation formats, the scope of these studies is generally limited to examining the effect of presentation formats on objective measures of decision quality (i.e., decision accuracy and cognitive effort) (Stock and Watson, 1984; Dickson et al., 1986; Iselin, 1988; Vessey, 1991; Mackay and Villareal, 1987; Hard and Vanecek, 1991; Stone and Schkade, 1991; Anderson and Kaplan, 1992; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Dull et al., 2003). Studies examining subjective measures (such as perceptions) are sparse.

Studies in information systems have found no significant differences between users' perceptions of technologies (Panko, 1983; Paznik, 1987; Straub and Wetherbe, 1989; Adams et al., 1992). Little is known about whether there is any difference in users' perceptions of different digital reporting formats. Investigating users' perceptions will provide an insight into the acceptance or rejection of a technology and provide an understanding of the factors that influence the success of digital presentation formats. This study examines users' perceptions of three digital presentation formats: PDF, HTML and XBRL. The null hypotheses are developed as follows:

H_3 : *There are no significant differences in users' perceptions of the usefulness of digital presentation formats.*

H_4 : *There are no significant differences in users' perceptions of the ease of use of digital presentation formats.*

Studies in information systems suggest that users' initial perceptions of usefulness and ease of use of a technology (such as presentation formats) may not necessarily correspond to actual accuracy of decision or cognitive effort (Wright, 1975; Adelbratt and Montgomery, 1980; Abelson and Levi, 1985; Davis, 1989; Kleinmuntz and Schkade, 1993). However, this has not been examined in an accounting context. This is particularly important as users' acceptance of a technology is highly dependent on their perceptions (Beach and Mitchell, 1978; Davis, 1989). Therefore, users' perceptions may influence their decision to use a technology that may or may not improve their decision-making outcome. The following hypotheses are developed:

H_5 : *There are no significant differences between users' perceived usefulness of a digital reporting format and decision accuracy by using such a format.*

H_6 : *There are no significant differences between users' perceived ease of use of a digital reporting format and their cognitive effort required for completion of a decision-making task by using such a format.*

Preferences for a technology have been found to be dependent on subjective measures of perceived usefulness and perceived ease of use (Davis, 1989; Kleinmuntz and Schkade, 1993). In the digital reporting environment, Beattie and Pratt (2001; 2003) found that participants had different preferences of presentation formats. Similarly, Hodge and Pronk

(2006) found that users preferred different presentation formats depending on whether they were novice users or professional users. However, apart from whether they are novice or professional users, these studies have not examined factors that may influence the participants' preferences of presentation format.

Studies in the psychology and information systems literature suggest that users' perceived usefulness and ease of use of presentation formats determine their preferences for presentation formats (Beach and Mitchell, 1978; Davis, 1989; Kleinmuntz and Schkade, 1993). This link between users' perceptions and their preferences for presentation formats has not been explored thoroughly in the accounting literature. Thus, it is difficult to generalise whether the results obtained in other studies would also be applicable in accounting contexts. This leads to the development of the following hypotheses:

H7: *There is no association between users' perceptions of the usefulness of digital presentation formats and their preference for presentation formats.*

H8: *There is no association between users' perceptions of the ease of use of digital presentation formats and their preference for presentation formats.*

4.3.3. Cognitive information processing in the context of recognition versus disclosure

Figure 4.4 illustrates the framework that underpins the third objective of this study. This objective is to examine the effect of digital presentation formats on cognitive information processing in the context of recognition versus disclosure. The framework is based on Hodge et al.'s (2002; 2004) study that suggests presentation formats may impact on cognitive information processing in the context of recognition versus disclosure. The framework suggests that in the digital reporting environment, certain presentation formats alleviate functional fixation in the cognitive information processing stages. The framework shows presentation formats as the independent variable. Similar to the argument outlined in Sections 4.3.1 and 4.3.2, this study examines one of the features of presentation formats, information processing, provided by Bosak and Bray (1999) and Abdolmohammadi et al. (2002).

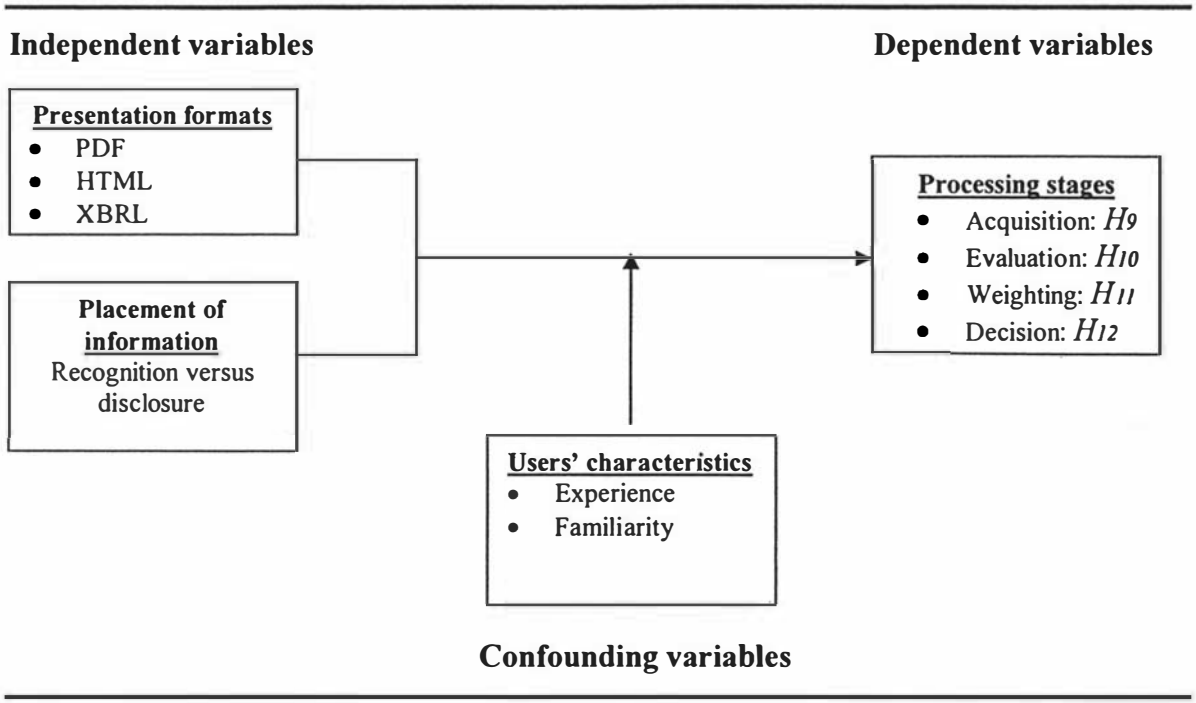

Figure 4.4: Research framework – Cognitive information processing

Recognition versus disclosure is the second independent variable. Hodge et al. (2002; 2004) linked presentation formats to recognition versus disclosure by examining the potential impact of presentation formats on functional fixation that arises from recognition versus disclosure of stock option compensation. They found functional fixation could be alleviated if certain presentation format was used. This study extends Hodge et al. by examining the effect of presentation formats and placement of information in a different context, accounting for investment property. A description of recognition versus disclosure in accounting for investment property is provided in Chapter 5.

Cognitive information processing is the dependent variable. Hogarth (1980) identified four stages in cognitive information processing: information acquisition, information evaluation, information weighting and making judgment. Maines and McDaniel (2000) argue that functional fixation caused by placement of information would appear in these stages. Hodge et al. (2004) found that presentation formats could impact on functional fixation in the information processing stages in a digital reporting environment. However, their study

combines evaluation, weighting and judgment as information integration. This study extends Hodge et al.'s study by re-examining the effect of presentation formats on each stage of cognitive information processing in the context of recognition versus disclosure.

Similar to the arguments provided in Section 4.3.1, it is argued that decision-makers' personal characteristics could influence the effect of presentation formats on cognitive information processing (Kalchelmeier and Messier, 1990; Mackay et al., 1992). This study includes decision-makers' work experience and familiarity with presentation format as moderating variables because these two variables are believed to affect professional decision-makers more than non-professional decision-makers (Brown and Eining, 1996).

Hodge et al. (2004) argue that decision-makers process their information by acquiring and evaluating an information item only when it is accounted for as a recognised information item, but not when the information item is treated as a disclosed information item. However, Hopkins (1996) argues that decision-makers would also account for a disclosed information item if they accidentally found the information item and the information item was relevant to their model. Hodge et al. (2004) found that XBRL significantly affects functional fixation in information acquisition, but found weaker support for the effect of evaluation in the context of stock option compensation. Hodge et al. (2004) used information acquisition and information integration. Information integration consists of information evaluation, weighting and making a decision. They combined Hogarth (1980) and Maines and McDaniel's (2000) studies which state that information processing involves information acquisition, evaluation, weighting and making a decision.

This study examines the effect of presentation formats on information acquisition and evaluation using alternative accounting method for investment property. International Accounting Standard in accounting for investment property (IAS 40) permits firms to choose either a fair value model or a cost model (IAS 40.30). The fair value model reports the fair value of the asset on the balance sheet and recognises any gain or loss on revaluation in the income statement. The cost model reports the cost of the asset on the

balance sheet and provides information on fair value in the explanatory notes to the financial statements (IAS 40)[10]. Therefore, the following null hypotheses are developed:

H9 : The digital presentation formats do not impact upon decision-makers' information acquisition in recognition versus disclosure situations.

H10 : The digital presentation formats do not impact upon decision-makers' information evaluation in recognition versus disclosure situations.

Studies have shown that decision-makers use different weighting for information items due to functional fixation (Hopkins, 1996; Hirst and Hopkins 1998). Professional decision-makers are found to be impacted by placement signals where more weight is given to recognised information items on the face of the financial statement rather than disclosed information items in explanatory notes (Maines and McDaniel, 2000). Lipe and Salterio (1999) found where the information items is presented influences decision-makers to mentally group these items, hence increasing the weight placed on the information items in the judgment process.

Decision-makers would incur additional cognitive effort to weigh information items when they have to process information items of two firms adopting different models as they need to put the two firms at equal footing before they can weigh their information items (Hodge et al., 2004). Hodge et al. (2004) found that a presentation format affects functional fixation in decision-makers' weighting in the context of stock option compensation information. This study examines the same issue in the context of investment property in a digital reporting environment. The following hypothesis is developed:

H11 : There is no significant difference in the effect of digital presentation formats on decision-makers' information weighting in recognition versus disclosure situations.

Studies have also found that decision-makers experience functional fixation when making judgment of investment decision (Maines and McDaniel, 2000; McDaniel et al., 2002). Their decisions are affected when they make comparisons between two firms with different accounting models (Hodge et al., 2004). Hodge et al. (2004) found that an XBRL format significantly influences functional fixation in investment decisions compared to participants

[10] A further description of IAS 40, Accounting for investment property is provided in the next chapter.

using a PDF format. This study extends Hodge et al. (2004) by re-examining the impact of presentation formats on alleviating functional fixation (if any) in an investment decision. The following hypothesis is developed:

H_{12}: *There is no significant difference in the effect of digital presentation formats on decision-makers' judgment in investment decisions in recognition versus disclosure situations.*

In summary, decision-makers may perform poorly in their decision-making for a number of reasons. Poor inputs and/or poor information processing could lead to poor decision-making. Presentation formats may assist decision-makers in achieving greater decision-making. Optimum decision-making can be achieved when reliance is placed on an appropriate presentation format. However, perceptions may affect reliance or preferred presentation formats. Additionally, presentation formats may also assist decision-makers with their cognitive information processing in a high load environment (such as the existence of recognition versus disclosure information items).

4.4 SUMMARY AND CONCLUSION

This chapter began with the objectives of this study. The development of the hypotheses was then discussed. The hypotheses were developed to examine the impact of presentation formats on three aspects, decision quality, perceptions and cognitive information processing in the context of recognition versus disclosure. The next chapter describes the research design to test the hypotheses.

CHAPTER FIVE

RESEARCH DESIGN

5.1 INTRODUCTION

This study has three research objectives. These objectives were discussed in Chapter 4. They comprise:

1. Assessing whether digital presentation formats affect decision quality, in particular, decision accuracy and cognitive effort;
2. Assessing whether users have different perceptions of the usefulness and ease of use of the different digital presentation formats, whether these perceptions differs from the decision-making outcomes (decision accuracy and cognitive effort) and whether these perceptions influence preferences; and
3. Assessing whether digital presentation formats affect cognitive information processing in the context of recognition versus disclosure.

The three research objectives led to the development of 12 testable hypotheses by way of an experiment and post experimental questionnaire.

This chapter is structured as follows. The next section describes the sample selection. Section 5.3 explains accounting for investment property as the context of the research design. Section 5.4 describes the experimental design. Section 5.5 outlines the experiment procedure. Section 5.6 provides details of the pilot study, followed by Section 5.7 which details the sample used in this study. Section 5.8 explains the data entry and statistical analysis used, and Section 5.9 summarises and concludes this chapter.

5.2 SAMPLE SELECTION

The sample for this study is drawn from public accounting practitioners in New Zealand. Public accounting practitioners were chosen as they perform a broad range of accounting, auditing, tax, and consulting activities for their clients (Vera-Munoz et al., 2002), and one of their services is likely to be assisting and advising clients in investment decision tasks. Public accounting practitioners are also believed to be one of the principal decision-makers among people who use financial information to make decisions (Goldwater and Fogarty, 1995). They are also knowledgeable about and provide advice in assessing corporate reports (Vera-Munoz et al., 2002). They also have a good understanding of recent developments in accounting related issues (Goldwater and Fogarty, 1995).

The sample is comprised of public accounting practitioners who own public accounting firms and those who are working in public accounting firms. The public accounting practitioners selected must have experience in providing investment advice services to their clients. The sample is drawn from public accounting practitioners who are members of the New Zealand Institute of Chartered Accountants (NZICA). Only public accounting practitioners who are located in the major cities of New Zealand were approached via formal letters as it was believed that there would be a higher number of public accounting practitioners who may have experience in investment decisions and therefore, a higher possibility of their participation in the study[11].

Most of the previous studies in the digital reporting literature (such as Hodge, 2001; Dull et al., 2003; Hodge et al., 2002; Hodge et al., 2004) use students as proxy for actual decision-makers. These studies use students because this group is readily available and are deemed to have sufficient accounting knowledge and skills (Libby et al., 2002). However, using students as proxy for real decision-makers raises the issue of external validity; it is likely that students would not have practical skills and experience (Stedry, 1960; Birnberg and Nath, 1967; Anderson, 1988; Vera-Munoz et al., 2002). The way students and practitioners acquire and process information is also different (Yates, 1990; Bouwman et al., 1995;

[11] The major cities are Auckland, Wellington and Christchurch.

Hunton and McEwen, 1997). Students in general have limited working experience and have different or less developed analytical techniques in comparison with experienced decision-makers (Vera-Munoz et al., 2002). The use of public accounting practitioners as participants will improve external validity and therefore contribute greatly to the presentation format and digital reporting literature[12].

5.3 ACCOUNTING FOR INVESTMENT PROPERTY

For the purpose of meeting objective three, this study uses accounting for investment property. Objective three sets out to examine whether digital presentation formats affect cognitive information processing in a recognition (information item is presented in the financial statement) versus disclosure (information item is disclosed in explanatory notes to the financial statements) context. Accounting for investment property is chosen as it represents one information item that has received the least attention by researchers (Paraditsmanont, 2002) compared to other information items such as stock option compensation (Maines and McDaniel, 2000; Hodge et al., 2004) and employee pension (Harper et al., 1987, 1991; Sami and Schwartz, 1992). This lack of attention to accounting for investment property available under International Generally Accepted Accounting Principle (GAAP) may be attributed to the absence of choices of different accounting treatments for investment property under US GAAP. US GAAP only allows the cost model in accounting for investment property.

Previous studies such as Maines and McDaniel (2000) and Hodge et al. (2002; 2004) have used the context of accounting for stock option compensation, which has been a recent topical issue with wide coverage in professional and academic literature. Therefore, decision-makers are likely to be more aware of this accounting issue, making the results of

[12] The initial plan was to use financial analysts as the participants. However, the organisation of the certified financial analysts did not consent to providing the names of their members. The researcher has also tried to contact the financial analysts directly via telephone or emails without success. Hence, the next best alternative is public accounting practitioners that have experience in making investment decisions. Furthermore, the use of accountants to examine presentation format has been used in the psychological and information systems literature to determine whether presentation format affects users' performance such as in Lusk and Kersnik (1979) and Ricchiute (1984). Mackay and Elam (1992) used accountants to examine the effect of presentation format (Lotus 1-2-3) on decision performance on a business oriented task.

these studies less likely to extend to other accounting contexts. It is argued that the use of an accounting for investment property situation which has attracted less attention in prior studies will provide less biased results than other accounting issues that are more topical.

5.3.1 Definition of investment property

IAS 40 defines investment property (land or a building or part of a building or both) as "property held (by the owner or by the lessee under a finance lease) to earn rentals or for capital appreciation or both" (IAS 40.5).

NZ-IAS 40 defines investment property (land or a building-or part of a building-both) as "property held (by the owner or by the lessee under a finance lease) to earn rentals or for capital appreciation or both, rather than for:

(a) use in the production or supply of goods or services or for administrative purposes; or

(b) sale in the ordinary course of business" (NZ-IAS 40.5).

Under IAS 40, investment property should be identified as an asset[13] when it is probable that the future economic benefits that are associated with the property will flow to the enterprise, and the cost of the property can be reliably measured (IAS 40.16). Similarly, under NZ-IAS 40, investment property shall be identified as an asset[14] when it is probable that the future economic benefits that are associated with the investment property will flow to the entity, and the cost of the investment property can be measured reliably (NZ-IAS 40.16). Probability and reliability of measure are part of the recognition criteria of an asset, and the general principle is that once an investment property satisfies both definition and recognition criteria, then it should go into the financial reports.

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[13] The International Accounting Standard Board (IASB) Framework defines an asset as "a resource by the enterprise as a result of the past events and from which future economic benefits are expected to flow to the enterprise" (IASB Framework.49).

[14] The New Zealand Financial Reporting Standards Board (FRSB) Framework defines an asset as "a service potential or future economic benefits controlled by an entity as a result of past transactions or events" (NZ-IAS Framework.4.6)

IAS 40 permits a firm to choose either a fair value model or a cost model (IAS 40.30). The International Accounting Standard Board (IASB) provides two reasons for allowing such choices. First, it provides more time for the preparers and decision-makers to gain more experience with the fair value model. Second, it provides more time for countries with less developed property markets and valuation professions to mature (IASB, 2004). Although such choices are given, it is important to note that an investment property is always recognised. However, the point of difference between the fair value model and the cost model is the reported value on the balance sheet, the recognition of change in value in the income statement and additional disclosure (when the cost model is used).

In accordance with NZ-IAS 40, a firm shall measure all of its investment property at fair value unless the fair value of the investment property could not be reliably determinable in a continuing basis (NZ-IAS 40.33). In this circumstance, the investment property needs to be accounted using the cost model under NZ-1AS 16. However, firms that satisfy the criteria of a "qualifying entity"[15] under a differential reporting framework are given choices to account for investment property using the fair value or the cost model although the fair value of the investment property can be reliably measured (NZ-IAS 40 Partial exemption). Under NZ-IAS Differential reporting framework, the purpose of such exemption is to provide some relief for small entities.

5.3.2 The accounting models

The reporting choice of either the fair value model or the cost model is used in practice by firms in developed as well as developing countries. A review shows that firms in developed countries adopt either the fair value model and/or the cost model of investment property. For example, in the USA, their GAAP requires firms to record investment property using the cost model (Deloitte, 2005), but in Australia (AASB 140) the fair value of an investment property could either be recognised or disclosed. Similar requirements

[15] The criteria to become a qualifying entity under the Framework for Differential Reporting issued by the FRSB is that the entity does not have 'public accountability'- that is the firm was not an issuer in the current or preceding reporting period, the firm does not have the coercive power to tax, rate or levy to obtain public funds and the firm is not large – a firm is considered large if the following two out of three apply: total income exceeds $20 million, total assets exceed $10 million and the number of full-time equivalent paid employees exceeds 50.

exist in developing countries. In Malaysia, preparers are given the choice for the recognition or disclosure of fair value (FRS 140). Similar practices are adopted in the Philippine (SFAS ED 56) but in Indonesia, an investment property is classified as long term investment which is carried at cost (PSAK 13[16]). This suggests that there is diversity of practices in the reporting of investment property.

Under the fair value model, an investment property is re-measured and recorded at fair value, which is the amount agreeable between knowledgeable and willing parties (NZ-IAS 40.42). Under this model, an investment property recognised the gain or loss in the fair value of the investment property. The gain or loss on re-measurement is included in the profit and loss statement for the period (NZ-IAS 40.35)[17]. The model takes into account the change in the fair value of an investment property and treats the information item as a recognised item in the body of the financial statements (NZ IAS 40)[18]. Proponents of the fair value model support the IASB's decision on the adoption of the fair value model because investment property generates independent cash flows through rental or capital appreciation, thus distinguishing investment property from owner-occupied property (IASB, 2004).

On the other hand, under the cost model, an investment property is recorded at cost, which is the amount paid in acquiring the asset[19]. Subsequent increase or decrease in the value of the investment property would only require the firms to provide disclosure of the fair value (increase or decrease in value) in the explanatory notes (IAS 40.56). The difference between the fair value and the cost of the investment property is also provided in the explanatory notes. Proponents of the cost model support the IASB's decision on the

[16] DSAK IAI has proposed ED PSAK 13, Investment property, in 2006 which complies with IAS 40 to supersede PSAK 13.

[17] The fair value model differs from the revaluation model. Under the revaluation model, increases in carrying amount above a cost-based measure are recognized as revaluation surplus. However, under the fair value model, all changes in fair value are recognized in the income statement (Paraditsmont, 2002).

[18] NZ-IAS 40 replaces SSAP-17 Investment property. Under SSAP-17, the reporting firm was given two choices to account for the changes in the value of investment property in either the income statement (SSAP-17.4.17) or to disclose in the revaluation reserves (SSAP-17.4.18). However, under NZ-IAS 40, investment property is to be accounted using the fair value model with exemption to qualifying firms adopting either the fair value model or the cost model.

[19] Under the cost model, the investment property is accounted in accordance to IAS 16.

adoption of the cost model for two reasons: (i) there is no active market for investment property and (ii) the fair value measurement does not enhance comparability (IASB, 2004).

In summary, IAS 40 and NZ-IAS 40 Partial exemption allow the use of either the fair value or cost model in accounting for investment property. In the context of this study, when investment property is accounted for at fair value, it is referred to as the recognition method since the fair value of the item is recognised on the face of financial statements. Where investment property is accounted for at cost, it is referred to as the disclosure method since fair value information is disclosed in the explanatory notes (footnotes). The choices given in IAS 40 and NZ-IAS 40 Partial exemption where an entity may adopt the fair value model or the cost model provide an appropriate setting for examining the effect of presentation formats on decision-makers' processing information (refer Figure 5.1).

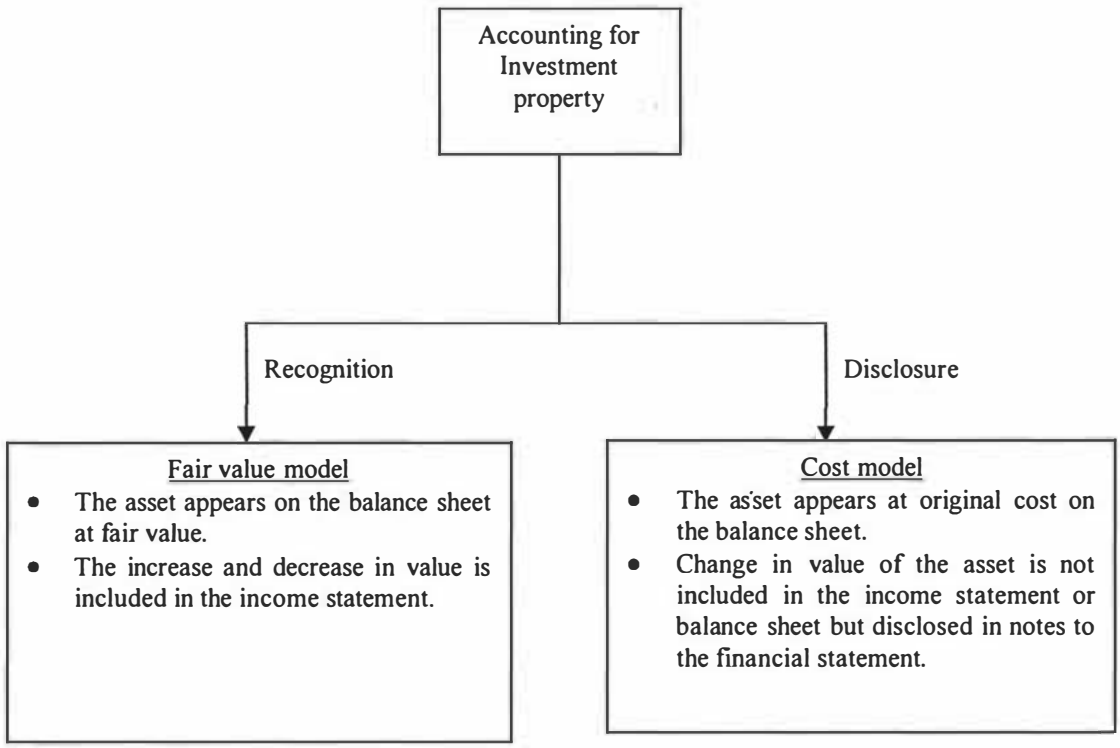

Figure 5.1: Investment property in the context of this study

5.4 EXPERIMENTAL DESIGN

This section describes the experimental design of the study. The experimental design comprises three stages: (1) experiment instrument, (2) experiment exercise and (3) post experiment questionnaire.

5.4.1 Experiment instrument

The experiment instrument is adapted from the work of Hodge et al. (2002; 2004), with appropriate modification. Hodge et al. used two presentation formats, PDF (non-searchable) and XBRL (searchable), with each format providing a different placement of information (in the accounting context, 'recognition' versus 'disclosure') on stock option compensation. The searchable format contained a search engine that allowed participants to retrieve all information on the site related to a specific account. The non-searchable format contained the same information (financial statements and footnotes) but in a static form. This study used three presentation formats: PDF, HTML and XBRL, with each presentation format providing decision-makers different way of processing information.

The experiment information involves fictitious financial statements. The financial statements comprise a statement of financial performance (income statement), a statement of financial position (balance sheet), notes to the accounts, and a statement of cash flows[20] (refer Appendix A).

Fictitious financial statements were developed for two firms: Firm A and Firm B. Firm A and Firm B's financial statements contain the same information, except for placement of information items related to investment property, and digital presentation formats. The information items relating to investment property are accounted for using either recognition

[20] The financial statements and explanatory notes used in this study were chosen because the Securities and Exchange Commission (SEC) has suggested that financial statements should be used in an evaluation of the effectiveness of XBRL (SEC Release No. 33-8529, 2005). Hodge et al. (2004) also used financial statements and footnotes in their study. The statement of cash flows is not included in the appendix as it is merely cosmetic.

(fair value model) or disclosure (cost model). Firm A is the control firm which recognises the fair value of investment property in the financial statements (fair value model), while Firm B is the treatment firm, which either recognises (fair value model) or discloses (cost model) investment property information (refer to Table 5.1 and Appendix B).

Participants are divided into two groups: The recognition group and the disclosure group. In the recognition group, both Firm A and Firm B recognise the fair value of the investment property. The material is developed in such a manner that in the recognition group, where both firms recognise investment property, Firm B outperforms Firm A on key ratios[21]. For example: based on the financial statements shown in Appendix B, a participant in the recognition group would calculate the ratio for return on fixed assets for Firm A in 2005 as 14.4% and Firm B as 16.2%.

The disclosure group receives the version of Firm B's financial statements that contain the manipulated (either using the recognition method or the disclosure method) information item of investment property. Firm A recognises the fair value of investment property in the statement of financial performance (the recognition method) and Firm B discloses the fair value of investment property in the footnotes (the disclosure method). When Firm A recognises and Firm B discloses fair value of investment property, Firm A outperforms Firm B on the key ratios. However, if the participants adjust Firm B's income statement to reflect the fair value of the investment property (that is, participants adjusting for differences in accounting methods and place the two firms on an equal footing), Firm B outperforms Firm A on the key ratios. This would result in the same outcome as the one for the recognition group (Firm B outperforms Firm A). For example: based on the financial statements shown in Appendix B, a participant in the disclosure group would calculate the ratio for return on fixed assets for Firm A as 14.4% and Firm B as 12.73%.

[21] The key ratios are return on assets, return on sales, return on fixed assets, and fixed assets turnover. These four key ratios are chosen as they include assessing information items relating to the investment property item.

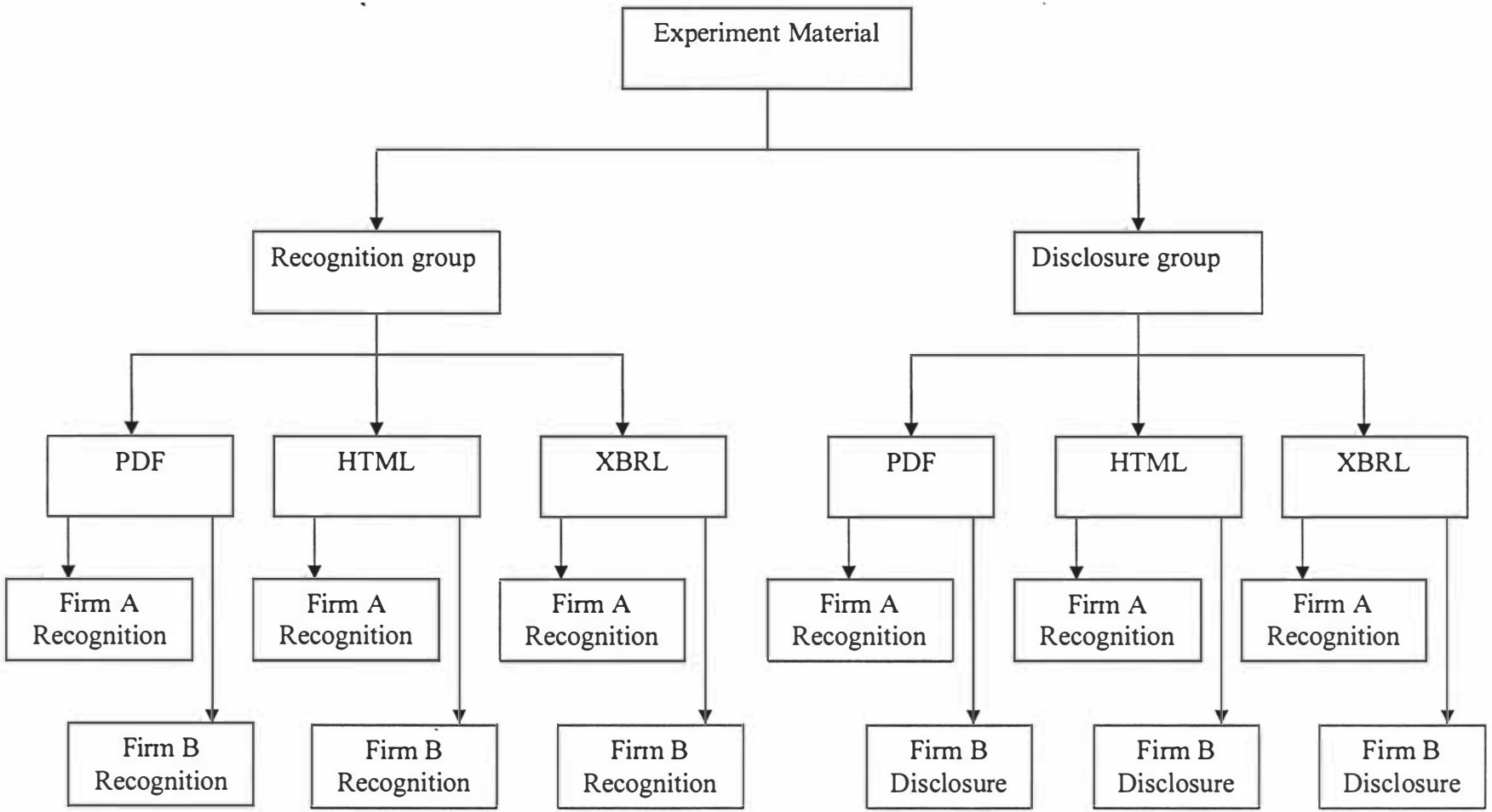

Figure 5.2: Allocation of research material to participants

However, if the participant realised that the two firms adopted different accounting model and placed the two firms at par (that is placing the two firms as adopting recognition method for investment property)[22], then the ratio for return on fixed assets for Firm A is 14.4% and Firm B is 16.2%. Table 5.1 provides a summary of the design of the information placement.

Table 5.1
Placement of information (Investment property)

RECOGNITION GROUP	DISCLOSURE GROUP
Firm A is the control group and Firm B is the manipulated group.	
• Both Firm A and Firm B adopt fair value model.	• Firm A adopts fair value model and firm B adopts cost model.
• Both Firm A and Firm B record investment property item at fair value in statement of financial position.	• Firm A records investment property at fair value in statement of financial position. • Firm B records investment property item at cost in statement of financial position.
• Both Firm A and Firm B record the difference between fair value and cost value in statement of financial performance as a gain or loss.	• Firm A records the difference between fair value and cost value in statement of financial performance as a gain or loss. • Firm B reports the fair value and the difference between fair value and cost in explanatory notes.
• Firm B outperforms Firm A.	• Firm A outperforms Firm B if participants do not adjust for fair value information.
When both firms adopt the fair value model, the gain from the increase in value of the investment property is included in the income statement. The instrument was created in a manner whereby if both firms are on an equal footing, Firm B outperforms Firm A. However, if the firms adopt different models, the firm that adopts the cost model shows a lower profit. Hence, when evaluating performance based on profitability, it would incorrectly appear that the firm adopting the fair value model performs better (Firm A) than the one adopting the cost model (Firm B).	

The financial statements for both firms (Firm A and Firm B) were then converted into three digital presentation formats: PDF[23], HTML and XBRL[24]. These presentation formats are technologies available to preparers of financial reports in the dissemination of financial

[22] The participants may also place both firms at par using the cost model. However, because the information related to Firm A does not include information on the cost value of the investment property in the balance sheet, the participants are not able to put both firms on par by using the cost model, as they are requested to rely solely on the information provided in the experiment material. The cost value of the investment property is intentionally left out to lead participants who choose to put both firms at par to use the fair value model.

[23] In the financial statements of PDF format, footnote indicators of information items in the financial statements are not provided to require participants to read the information in a sequential order.

[24] The information in the pivot table in Excel after downloading from XBRL contains only 10 items. These items are selected in this study as it is expected that decision-makers would have known the types of information that they required and therefore, would have programmed it that way.

performance and position information. The conversion of the financial statements to XBRL was made using Microsoft Excel for two reasons: first, Microsoft Excel was chosen as this is similar to the model XBRL financial statement developed by XBRL-NZ (XBRL-NZ, 2004). Secondly, accounting users often use Microsoft Excel when performing decision analyses (Beattie and Pratt, 2003). The financial statements in three presentation formats (PDF, HTML and XBRL) were then uploaded to a webpage.

The allocation of the research material to participants was made as follows: each main group was divided into three sub-groups of PDF, HTML and XBRL. Each sub-group received the fictitious financial statements of Firm A and Firm B as illustrated in Figure 5.2.

5.4.2 Experiment exercise

In the introductory paragraphs of the experiment exercise participants are asked to calculate four key ratios and make an investment decision. The ratios are: return on assets, return on sales, return on fixed assets, and fixed assets turnover[25]. The participants are required to calculate and evaluate these ratios in order to make them aware of the model adopted by the two firms in relation to investment property.

The purpose of the experiment exercise is to gather data to test hypotheses related to decision accuracy (H_1), the time taken to complete the experiment exercise (cognitive effort) (H_2), whether the participants of both recognition group and disclosure group provided similar weight to the information item (investment property) (H_{11}), and their investment decisions (H_{12}).

Hypothesis 1 states *there is no significant effect difference on decision-makers' decision accuracy between digital presentation formats.* Decision accuracy is measured by the proportion of participants extracting relevant values and calculating correctly the four ratios

[25] These ratios may not necessarily used in investment decision task. However, in the context of this study, these ratios are used because one of the information items needed to calculate the ratios is investment property, the manipulated item.

for each firm as required in the experiment. The participants' answers are assessed to determine a score (Bricker and Nehmer, 1995; Dunn and Grabski, 2000). The score is the dependent measure for decision accuracy. For each ratio calculated correctly a participant earns one mark, and therefore, a measure of decision accuracy per participant ranges between 0 and 4 for each firm. This approach is similar to that used by Bricker and Nehmer (1995) and Dunn and Grabski (2000).

Hypothesis 2 states *there is no significant effect difference on decision-makers' cognitive effort between digital presentation formats.* To measure cognitive effort, the continuous-open approach is used (Courneya and McAuley, 1993). The participants are required to record the starting time when they commence a particular step/stage of the experiment exercise and the time when the step/stage is completed. The total time taken to complete the experiment exercise is the dependent variable for cognitive effort.

Hypothesis 11 states *there is no significant difference in the effect of different digital presentation formats on decision-makers' information weighting in recognition versus disclosure situations.* To obtain the data for testing hypothesis 11, the difference of the sum totals of ratios for Firm A and Firm B in the recognition group and the sum totals of ratios of Firm A and Firm B in the disclosure group are determined and compared. If the recognition group and the disclosure group, using the same presentation format, gave the same weight to the information related to investment property, the sum total of the two groups would be similar and the difference between the sum total financial ratios of the recognition group and the disclosure group for the same presentation format would not be significantly different from 0.[26] The larger the difference between the sum totals of two groups, the stronger the indication that a higher proportion of participants in the disclosure group than the recognition group gave less weight to the investment property item.[27] The difference of the sum total is the dependent measure for participants' weighting.

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[26] This approach is the same as Hodge et al. (2002; 2004).

[27] This argument is based on the notion that participants would reach the same results if they were provided with the same information. Since the only manipulated information in the experiment is the accounting method for investment property, any difference in results is likely to be caused by participants with the manipulated information failing to give appropriate weight to the information item related to the investment property.

Hypothesis 12 states that *there is no significant difference in the effect of digital presentation formats on decision-makers' judgment in investment decisions in recognition versus disclosure situations.* Two questions were developed to assess participants' judgment (investment decision). One question requires participants to choose the firm they would invest $10,000. The purpose of this question is to ensure that their decision to choose either one of the two firms is based on their calculation of the four ratios. Another question requires participants to allocate the $10,000 between Firm A and Firm B in terms of percentage. If the participants in the disclosure group (the manipulated group) invest more in Firm B than Firm A, this indicates that the manipulative group is aware of the difference in the accounting methods the two firms use and has placed the two firms at par. Their percentage of investment in Firm B would then be similar to the participants in group one. Therefore, the percentage of investment in Firm B is the dependent measure.

5.4.3 Post experiment questionnaire

The questionnaire is provided to the participants after the completion of the experimental exercise. The post experiment questionnaire has four sections (see Appendix H). Section A relates to the participants' experience in the experimental exercise. The questionnaire is developed to gain further understanding of how participants process information. Section B of the post experiment questionnaire relates to participants' perceived usefulness of the three digital presentation formats. The data from section B was used to test hypotheses 3, 5 and 7. Section C consists of questions related to participants' perceived ease of use of the three presentation formats. The data from section C was used to test hypotheses 4, 6 and 8. Section D seeks participants' demographic profiles.

Two questions were developed and placed in section A. The data from these two questions was used to test hypotheses 9 and 10. Hypothesis 9 states that *the digital presentation formats do not impact upon decision-makers' information acquisition in recognition versus disclosure situations.* To obtain the data for testing hypothesis 9, a question was developed to assess whether the participants are aware of the accounting model (recognition or disclosure) that was adopted by each firm. The participants are asked to answer either 'yes'

or 'no' for each firm on the model adopted. If participants identify the accounting model of each firm correctly, this provides an indication that the presentation format used in the investment decision task has assisted in making them aware of the accounting model adopted. The participants' response to model identification is the dependent measure for information acquisition.

The second question in section A is developed to determine participants' evaluation of the information item related to investment property. The data of this question was used to test hypothesis 10. Hypothesis 10 states that *the digital presentation formats do not impact upon decision-makers' information evaluation in recognition versus disclosure situations.* The participants are required to answer 'yes' if they evaluate the information item on investment property. If participants did not evaluate the information item on investment property, they are asked to answer 'no'. The answer 'yes' indicates a participant has evaluated the information item. The answer 'no' indicates that the participants did not evaluate the information item. The participants' response to whether they have evaluated the information item on investment property is the dependent measure of information evaluation.

Sections B and C of the questionnaire drew on the instrument used by Davis (1989), with appropriate modification to fit the purpose and context of this study. This includes 4 additional statements related to perceived usefulness and 2 additional questions related to perceived ease of use[28]. Perceived usefulness and perceived ease of use are subjective measures which are similar to the objective measures of decision quality (decision accuracy and cognitive effort). Davis (1989) examined perceived ease of use and perceived usefulness of computer usage in an attempt to develop and validate new measurement scales for these two variables. Other information systems studies have also used a similar instrument which supports the use of this method in the current study (see Adams et al., 1992; Subramaniam, 1994; Taylor and Brownfield, 2002). Baldwin et al. (2004) extended Davis's (1989) instrument to include cognitive style and effect of presentation formats on users' performance.

[28] The variables are identified in the next two paragraphs.

Section B relates to perceived usefulness. The data obtained from this section was used to test hypotheses 3, 5 and 7. Hypothesis 3 states that *there are no significant differences in users' perceptions of the usefulness of digital presentation formats.* Hypothesis 5 states that *there are no significant differences between users' perceived usefulness of a digital reporting format and the decision accuracy by using such format.* Hypothesis 7 states that *there is no association between users' perceptions of the usefulness of digital presentation formats and their preference of presentation format.* Usefulness of presentation formats is assessed by way of a series of statements that require participants to indicate their views on each of the presentation formats. A 7-point scale is used, ranging from 1 (very strongly disagree) to 7 (very strongly agree). There are 9 statements related to perceived usefulness: usefulness of presentation format to improve work performance, informed investment decisions, well-formatted, volume of information, reliability, relevant information, reliance, usefulness and overall usefulness performance. The total score of the 9 statements were calculated and averaged to obtain an overall score to represent the perceived usefulness of each presentation format.

Section C seeks participants' responses concerning the perceived ease of use of each of the three formats. The data obtained from this section was used to test hypotheses 4, 6 and 8. Hypothesis 4 states that *there are no significant differences in users' perceptions of the ease of use of digital presentation formats.* Hypothesis 6 states that *there are no significant differences in users' perceived ease of use of a digital reporting format and their cognitive effort required for completion of a decision-making task by using such a format.* Hypothesis 8 states that *there is no association between users' perceptions of the ease of use of digital presentation formats and their preference of presentation formats.* . Users' perceived ease of use is determined by asking the participants to assess 7 statements related to ease of use of the presentation formats using a 7-point scale of 1 (strongly disagree) to 7 (strongly agree). The 7 statements related to perceived ease of use are ease of learning, flexibility, skilful and understandable, ease of finding information, training and overall ease of use of the presentation formats. The total score of the 7 statements were calculated and averaged to obtain an overall score to represent the perceived ease of use of each presentation format.

Section D relates to demographic profiles. Demographic information on each participant includes age, gender, and experience. Participants are also requested to provide an indication of their familiarity with each presentation format based on a 7-point scale and their preference for a specific presentation format. The participants' preferences are the dependent measure for preferences of presentation formats which were also used to test hypotheses 7 and 8.

5.5 PILOT STUDY

Although the research instruments were presented in an accounting seminar to obtain feedback, this study proceeded to perform a pilot study before commencing the main experiment to ensure that relevant data could be captured for testing the hypotheses.

5.5.1 Pilot study 1

The first pilot study was conducted with a group of students as participants. The researcher decided to approach students who had working experience. This decision was made as it was expected that getting real decision-makers to participate in a pilot study would be difficult, and that they might be more likely to participate in the main study. Extramural students who are studying accounting at the postgraduate level at Massey University were therefore the most suitable participants for the pilot study. The researcher approached the students at a contact course by introducing the topic under investigation and its importance to the accounting profession, and then inviting students to participate in the pilot study. Six students agreed to participate.

After the contact course session, the participants gathered at a computer laboratory as instructed by the researcher. The experiment was conducted in the laboratory so all participants could attempt the experiment together. The purpose of having the participants attempt the experiment together was to obtain feedback on the content of the experiment instrument and the operation of the experiment exercise. Each participant was pre-allocated a presentation format. Each participant was given a research instrument set. Each set consisted of a covering letter, which introduced the topic under investigation, and two

envelopes. One envelope contained the experiment exercise and the other envelope contained the post experiment questionnaire.

The participants were requested to ask any questions if they had any doubts during the exercise, and they were encouraged to provide comments during the research experiment with regard to the research instrument. Two of the participants had some difficulty in accessing the webpage of one of the presentation formats. The range of time the participants took to complete the research exercise was from 40 minutes to 1 hour.

5.5.1 Pilot study 2

After reviewing the outcome of the first pilot study, a second pilot study was conducted to obtain more commentary and observations from participants in order to improve the content and presentation of the research instrument. The second pilot study was conducted with public accounting practitioners as participants. Ten professional accountants were invited to participate in the experiment. They were randomly selected from the NZICA database. An invitation letter was sent out to the professionals informing them of the topic under investigation and its importance to the accounting profession, and inviting them to participate in the pilot study.

Two out of the 10 public accounting practitioners replied. The same process as for pilot study 1 was followed. The participants were pre-allocated a presentation format. They were given the research instrument set, consisting of the covering letter and two envelopes. The participants were provided with two choices in attempting the research instrument. They could either attempt the research instrument in the researcher's presence or they could choose to attempt the research instrument themselves in their own time and location. Both participants decided to choose the latter. One participant successfully completed the research instrument. The other participant called up a month later to report that he could not

access one of the presentation formats[29]. A time and date was set up with him so he could complete the research instrument in the researcher's presence.

The difficulties that one of the participants had in accessing one of the presentation formats indicated that to overcome this problem the researcher needed to be available and/or in attendance while participants were completing the exercise. Accordingly, participants could complete the research exercise in the researcher's presence. In his 2001 study, Hodge describes these participants as 'in-lab' participants. Alternatively, participants could elect to access the research material on their own and at their own convenience. Hodge (2001) describes these participants as 'out-of-lab' participants. This latter option was given to participants in acknowledgement of their significant work commitments which may mean they would not be able to participate 'in-lab'.

However, in the letter of invitation it was indicated to participants that the preference was for the researcher to be in attendance (in-lab). This was to ensure that participants would be able to complete the experiment and post experiment questionnaire with little, if any, difficulty. There were no further comments on the research instrument, giving an indication that the participants were able to complete the research instrument.

Prior to the commencement of the main experiment, an application was made to the Massey University Human Ethics Committee requesting permission to conduct the experiment. The application included a description of the research objectives, hypotheses examined and the data collection method. The required approval was received.

5.6 SAMPLE

Formal letters were sent to 800 public accounting practitioners inviting them to participate in the study[30] (refer Appendix C). This number was considered sufficient to obtain a

[29] The reason why participants may have failed to access the presentation format, specifically XBRL, is because to download XBRL document, the computer needs to be installed with Microsoft Professional 2003, which contains Excel that is XBRL friendly. Unavailability of such software on the computer results in failure to access XBRL document.

reasonable number of public accounting practitioners who would be willing to participate in the experiment. Their addresses were obtained via the NZICA website. The formal letter also extended invitations to their staff who are involved in giving advice to clients on investment decisions. An information sheet was attached with the invitation letter to further explain the topic being investigated, the research instrument, the research process, research approval by the University Ethics Committee, and details of the researcher and her supervisors. The participants were given a month to consider whether they would agree to participate. Once confirmations of participation were received, a follow-up by way of an email and telephone call was made to the participants to determine their preference for either in-lab or out-of-lab participation.

Out of the 800 potential participants contacted, 39 letters were returned undelivered. Sixty-eight members replied either by mail or email declining to participate in the study. Among the reasons given were that they were not directly involved in investment decisions, semi-retired or retiring, computer illiterate, not interested, or they lacked the time to participate. The researcher made several attempts to email and telephone those members who did not reply before the one month period. Most of these potential participants declined to participate, giving the same reasons as those who replied by mail or email. Others could not be contacted.

Fifty-three NZICA members agreed to participate in this study. Through these 53 members, the researcher was able to contact 23 other members who agreed to participate. However, 3 decided not to proceed when the researcher reconfirmed that this study includes those who are involved in performing investment decision tasks. To further increase the number of participants, a third and final email or telephone call was made. The members who had already agreed or declined to participate were first eliminated from the list of follow-ups. In total, seventy-three members that qualified to be participants in the study agreed to participate either through letters, emails or telephone calls. Twenty-three chose to attempt

[30] The initial phase of the data collection involved sending 500 formal letters with the intention to get at least a 20% response rate from the public accounting practitioners. However, the response rate was not encouraging. The researcher then increased the numbers to 600, then 700, and finally stopped at 800 after getting a sufficient number of responses in order to test the hypotheses of this study.

the research instrument in the researcher's presence (in-lab) while the rest chose to attempt the research instrument on their own (out-of-lab). Eleven participants did not return the research instrument despite a couple of reminders sent via email or telephone calls. The researcher decided not to proceed with further reminders, after the third reminder. In total, 62 participants successfully completed the research instrument.

The sample of 62 participants was regarded as a sufficient number in order to adequately test the hypotheses. Previous experimental studies examining presentation formats have had similar sample sizes. For example, Hodge (2001) had 49 participants in his experimental study examining the effect of HTML and PDF on decision-makers' performance. He argued that the number of participants in his study was sufficient, and there was no need to increase the number. The substantial costs in getting more participants would not change his findings significantly. He further argued that the costs of increasing the number of participants in an out-of-lab experiment would only outweigh the benefits, especially in terms of the likely timeliness of the reported findings.

On average, for the in-lab participants, the researcher spent about 10 to 20 minutes with the participants, and during this time the experiment exercise and the post experiment questionnaire were completed.

On the instruction page, participants were informed that the research material should be attempted in one sitting. This instruction was given in order to ensure that both the in-lab participants and out-of-lab participants attempted the research exercise in a similar setting (for example, there were no prolonged breaks during the experiment). Before testing the hypotheses of the study, a comparison was made between the average amounts of time taken to complete the experimental exercise for each group. This was important as it provided assurance that these two groups attempted the experiment in a similar setting.

The participants were also reminded in the instructions to rely solely on the information in the research material provided when making their investment decisions. Before testing the hypotheses of the study, a comparison was made between the two groups of their accuracy

in extracting relevant values and correct calculations of the four requested ratios. This was important as it provided a certain level of reliability that the two groups attempted the experiment in a similar manner (for example, information usage).

Finally, the participants were each allocated a presentation format. The allocation of the different presentation formats to the participants was on sequential distribution of PDF, followed by HTML and then, XBRL. For example, the first two public accountants agreeing to participate in the experiment were allocated to PDF (Recognition group) and PDF (Disclosure group). This was followed by the next two public accountants agreeing to participate being allocated to HTML (Recognition group) and HTML (Disclosure group). Similar allocations were made for the remaining participants. Each participant was advised to complete the research material based on the allocated presentation format. The purpose of such allocation was to ensure an equal distribution of presentation formats.

5.7 EXPERIMENT PROCEDURE

The experiment was conducted over a series of sequential events. All participants were provided with two envelopes, a covering letter of the experiment, an instruction page and an information sheet describing the three presentation formats (PDF, HTML and XBRL) used in this study (refer Appendix D, E and F). The covering letter of the experiment provides information related to the aims of the project and the details of the researcher and her supervisor. On the instruction page, participants were asked to complete the research material in sequence beginning with envelope 1 and followed by envelope 2. The participants commenced the experiment by opening envelope 1 which contained a compact disk (CD)[31]. Material on the CD included an instruction page, a homepage containing general information about the nature of the business that the two firms are involved in, and the financial statements of the two firms. The participants began their analysis by viewing each firm's homepage. Once they have accessed the firms' homepages, the participants click on their pre-allocated presentation format. The presentation includes the financial statements and relevant footnotes for the particular firm.

[31] A CD was selected instead of the Internet for experimentation purposes as it provides a direct link to the webpage of the two firms with a low probability of "connection" problems occurring.

After viewing the firms' financial information, the participants were asked to calculate four key ratios and to make an investment decision. The participants were then asked to evaluate the financial performance of Firm A and Firm B and decide how much they would invest in one or across both firms (refer Appendix G).

Once the experimental exercise was completed, the participants were asked to open envelope 2 which contained the post experiment questionnaire and a CD. Material on the CD included all digital presentation formats (PDF, HTML and XBRL), which contained the same amount of information. The participants were asked not to look back at the experimental material when completing the post experiment questionnaire[32]. The participants were also asked to view and have a hands-on experience with all three presentation formats before they commenced the post experimental questionnaire[33]. The participants were asked to complete a series of questions related to the perceived usefulness and perceived ease of use for each of the presentation formats. Then, participants were asked to complete section C which consisted of demographic information (refer Appendix G). The range of time the participants took to complete the experimental exercise and the post experiment questionnaire was between 10 to 20 minutes.

5.8 DATA ENTRY AND STATISTICAL ANALYSIS

The statistical analyses were performed using a computer statistics program, the Statistical Package for the Social Sciences (*SPSS*). To start with, each data variable was coded and entered in *SPSS,* starting with demographic variables, followed by the experimental exercise variables and post experiment variables. Eighty-five variables were keyed into an *SPSS* database. New data variables such as conversion of cognitive effort from actual time to a 7-point scale, overall score of perceived usefulness and overall score of perceived ease

[32] The reason for asking the participants not to look back at the experiment material is to determine whether the presentation format used in the experiment could assist the participants in making them aware of the accounting model for investment property adopted by Firm A and Firm B.

[33] The participants were advised not to include prior experience with any of the presentation formats when completing the questionnaire to avoid biases in the perception of the formats.

of use were also created and entered for the purpose of testing the hypotheses. Upon completion, the final number of data variables stood at 99.

Responses from participants were coded and entered into *SPSS* as each response was returned. The participants would either return the research material directly to the researcher upon completion, in the in-lab setting, or use the self addressed envelope provided in the out-of-lab setting. The responses were coded sequentially in order of receipt regardless of whether they were from the in-lab group or the out-of-lab group. An independent samples T-test analysis was performed between the in-lab group and the out-of-lab group to assess whether there were significant differences in the time taken to complete the experiment exercise and information usage (participants solely relied on the information in the experiment material), before proceeding to test the hypotheses.

Before testing research hypotheses for objective 3, which examines the effect of digital presentation formats on cognitive information processing in the context of recognition versus disclosure, a manipulation check was performed to provide some assurance that the results of the experiment could be attributed to the impact of the presentation formats on information processing in the context of recognition versus disclosure, and not to the decision-makers' ability to recall information (working memory capacity)[34]. A Multinomial logistic regression analysis was performed on the participants' model identification adopted by the firms in the experiment exercise.

5.8.1 Decision quality

Hypothesis 1 states *there is no significant effect difference on decision-makers' decision accuracy between digital presentation formats.* A new data variable was created to code the marks allocated to each participant. An ANOVA test was performed to determine whether there were significant differences in decision accuracy between presentation formats. The Pairwise multiple comparisons was then performed to determine whether one presentation

[34] Working memory is the "workspace" within memory, separate from long-term memory, responsible for temporary storage and information processing (Roberts, 2002). Studies have suggested that working memory capacity differs among decision-makers (Baddeley, 1992; Engle, 1996).

format could outperform the others in enhancing decision accuracy. The tests incorporated confounding factors, work experience and familiarity with presentation format. An ANCOVA was performed to examine the effect of the confounding variables on decision accuracy.

Hypothesis 2 states that *there is no significant effect difference on decision-makers' cognitive effort between digital presentation formats.* An ANOVA test was performed to determine whether there is a significant difference between on the impact on cognitive effort between the presentation formats. The Pairwise multiple comparison test was performed to determine whether one presentation format could outperform the others in reducing cognitive effort. To ensure that the results would not be biased due to confounding factors, work experience and familiarity of presentation format were included as covariates. The ANCOVA was performed.

5.8.2 Perceptions

Hypothesis 3 states that *there are no significant differences in users' perceptions of the usefulness of digital presentation formats.* The participants were asked to indicate their perception of usefulness of the presentation formats using a 7-point scale of 1 (strongly disagree) to 7 (strongly agree). The total score (responses) of the 9 statements related to perceived usefulness for each presentation format was calculated and averaged to obtain an overall score to represent the perceived usefulness of each presentation format, hence producing three overall scores (PDF, HTML and XBRL formats). These overall scores were compared and a new score was subsequently created to code the highest mean score representing the most useful among the three presentation format. For example: if the overall mean score for perceived usefulness for PDF format is 4.3, HTML format is 4.2 and XBRL format is 4.5 for one participant, this indicates that the participant provides the highest mean score for XBRL format. The new score becomes the dependent measure to test hypothesis 3. Multinomial logistic regression analysis was used to test the hypothesis.

Hypothesis 4 states that *there are no significant differences in users' perceptions of the ease of use of digital presentation formats.* The total score (responses) of the 7 statements related to perceived ease of use for each presentation format were calculated and averaged to obtain an overall score to represent the perceived ease of use of each presentation format, producing three overall scores (PDF, HTML and XBRL formats). The overall score for perceived ease of use of each presentation format was compared and a new score was created to represent the format most ease of use of the three presentation formats. The overall score for perceived ease of use becomes the dependent measure to test hypothesis 4. Multinomial logistic regression analysis was used to test the hypothesis.

Hypothesis 5 states that *there are no significant differences between users' perceived usefulness of a digital reporting format and decision accuracy by using such format.* The overall scores of perceived usefulness for each presentation format used in testing hypothesis 3 were used. The measurement for decision accuracy used in testing hypothesis 1 was deflated from 8 marks to 7 marks to represents a new score for decision accuracy. This is to ensure comparability between the perceived usefulness (a 7-point scale) and decision accuracy. The overall score of perceived usefulness for each presentation format was compared to participants' decision accuracy for the same presentation format, to determine whether their mean scores were similar or different. For example, PDF participants' actual performance was compared with their perceived usefulness of PDF to determine whether there was a significant difference. A Paired T-Test was used to test hypothesis 5.

Hypothesis 6 states that *there are no significant differences between users' perceived ease of use of a digital reporting format and their cognitive effort required for completion of a decision-making task by using such format* .The overall scores for perceived ease of use for each presentation format used in testing hypothesis 4 were used. The participants' actual performance of cognitive effort was determined by the total time taken to complete the experiment exercise. In order to make an effective comparison of the actual time taken (which measures cognitive effort) to the perceived ease of use (which is measured using a 7-point scale), the actual time was converted into a 7-point scale. The higher the mean the

less cognitive effort participants took to complete the experiment. A Paired T-Test was then used to test hypothesis 6. The overall score for perceived ease of use for each presentation format was compared with participants' converted time scores.

Hypothesis 7 states that *there is no association between users' perceptions of the usefulness of digital presentation formats and their preference of presentation format.* A new variable was created to code the score of the highest mean of perceived usefulness among the three new variables created in hypothesis 3. This new variable represents the overall perceived usefulness. Preference of presentation format was measured by participants' preferences for a presentation format if they were to repeat the experimental exercise. The participants were given three options: PDF format, HTML format or XBRL format and were asked to select their most preferred presentation format. The two variables (perceived usefulness and preference of presentation format) were correlated to determine whether there is any association between perceived usefulness and preferred presentation formats. The Chi-square test was used to examine significant association between perceived usefulness and preference of presentation formats.

Hypothesis 8 states that *there is no association between users' perceptions of the ease of use of digital presentation formats and their preference of presentation format.* A new variable was created to code the score of the highest mean of perceived ease of use among the three new variables created in hypothesis 4. This new variable represents the overall perceived ease of use. Preference of presentation format was measured by participants' preferences for a presentation format if they were to repeat the experimental exercise. The participants were also given three options: PDF format, HTML format or XBRL format and were asked to select their most preferred presentation format. The two variables (perceived ease of use and preference of presentation format) were correlated to determine whether there is any association between perceived ease of use and preferred presentation formats. The Chi-square test was used to examine significant association between perceived usefulness and preference of presentation formats.

5.8.3 Cognitive information processing in the context of recognition versus disclosure

Hypothesis 9 states that *the digital presentation formats do not impact upon decision-makers' information acquisition in recognition versus disclosure situations.* Information acquisition was measured by the participants' ability to correctly recall the model adopted by Firm A and Firm B. Multinomial logistic regression was used.

Hypothesis 10 states that *the digital presentation formats do not impact upon decision-makers' information evaluation in recognition versus disclosure situations.* Evaluation was measured by asking participants whether they have included the information item related to investment property in performing their investment task. Multinomial logistic regression was used[35].

Hypothesis 11 states that *there is no significant difference in the effect of digital presentation formats on decision-makers' information weighting in recognition versus disclosure situations.* Weighting was measured by the difference of the sum totals of ratios for Firm A and Firm B for the recognition group and the sum totals of ratios of Firm A and Firm B for the disclosure group[36]. The larger the variance of the difference of the sum totals of the two firms between the recognition group and the disclosure group, the stronger the indication that more participants in the disclosure group did not provide weight to the investment property item[37]. UNIANOVA was used.

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[35] Multinomial Logistic Regression is a new functionality added to SPSS 14.0 that allows users to save estimated response probabilities, predicted response categories, probability of predicted response categories, and probability of actual response categories.

[36] Hodge et al. (2002) have used this measurement as their dependent variable for information judgment and investment decision. In their 2004 article stated that the measurement of information acquisition and information integration (information evaluation, information weighting and investment decision) are model identification and amount invested in Firm B. Therefore, it is likely that such measurement represents information weighting.

[37] This argument is based on the notion that participants would reach the same results if they were provided with the same information. Since the only manipulated information in the experiment is the accounting method for investment property, any difference in results is likely be caused by participants with the manipulated information failing to give appropriate weight to the information item related to the investment property.

Hypothesis 12 states that *there is no significant difference in the effect of digital presentation formats on decision-makers' judgment in investment decisions in recognition versus disclosure situations.* Judgment was measured by asking participants to determine their hypothetical percentage of investment in Firm B. As explained in the earlier chapter that in the recognition groups, Firm A and Firm B adopted the same model, and in the disclosure groups the two firms adopted different models. If the participants of the disclosure groups adjust for the difference in the model and place the two firms at par, then their investment decision should favour Firm B. UNIANOVA was used.

5.9 SUMMARY AND CONCLUSION

This chapter describes the research design for this study. This chapter also includes the development of the experimental material, experimental exercise and the post experiment questionnaire, as well as the experiment procedure, data entry and statistical analysis.

Public accounting practitioners were used as participants in this study. An experiment and a post experiment questionnaire were conducted to investigate effect of digital presentation formats on three issues surrounding users' decision making: decision quality, perceptions and information processing stages. The responses were collected from the participants and consequently analysed using *SPSS.* The next chapter, Chapter 6, provides the findings and discussion of objective 1, which examines the effect of presentation formats on decision quality.

CHAPTER SIX

RESULTS AND DISCUSSION
DIGITAL PRESENTATION FORMATS AND DECISION QUALITY

6.1 INTRODUCTION

This chapter presents the results for objective 1 and their implications. Objective 1 assesses whether digital presentation formats affect decision quality. The chapter starts by providing the demographic statistics of the participants involved in the experiment. Following this, in Section 6.3 the results of testing the effect of digital presentation formats on decision accuracy and cognitive effort are provided. In Section 6.4, the implications of the main findings are identified. This chapter is summarised and concluded in Section 6.5.

6.2 DEMOGRAPHIC STATISTICS OF EXPERIMENT PARTICIPANTS

The main demographic attributes of participants are comprised of years of accounting experience, their familiarity with the presentation formats, and their preferred presentation format in making investment decisions. These have been examined using categorical scales and are presented in Table 6.1. The purpose of examining subjects' demographics is to obtain a general overview of the participants before testing the hypotheses developed in this study. The table is divided into four panels: work experience, familiarity with presentation format, preference for presentation formats for all participants and preference for presentation formats in categorical according to which format participants used in the experiment.

Table 6.1
Participants' demographic attributes

Panel A: Level of accounting experience

Experience	Number of subjects	Percent
Less than 5 years	15	24.2
5 to 10 years	15	24.2
11 to 15 years	12	19.4
16 – 20 years	6	9.7
More than 20 years	14	22.6
Total	62	100.0

Panel B: Familiarity of presentation format

		Presentation format					
		PDF		HTML		XBRL	
Familiarity		Number of subjects	Percent	Number of subjects	Percent	Number of subjects	Percent
Familiarity:	7	24	38.7	9	14.5	2	3.2
	6	18	29.0	12	19.4	2	3.2
	5	20	16.1	11	17.7	1	1.6
	4	3	4.8	10	16.1	2	3.1
	3	2	1.6	7	11.3	5	8.1
	2	0	0	3	4.8	12	19.4
Unfamiliarity:	1	6	9.7	10	16.1	38	61.3
Total		62	100.0	62	100.0	62	100.0

Panel C: Preferred presentation formats (All participants)

Presentation format	Frequency	Percent	Valid percent
PDF	21	33.9	33.9
HTML	22	35.5	35.5
XBRL	19	30.6	30.6
Total	62	100.0	100.0

Panel D: Preferred presentation formats (Participants categorical according to which format they used in the experiment)

Presentation format used in the experiment	Preferred presentation format					
	PDF		HTML		XBRL	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
PDF	9	42.9	7	31.8	5	26.4
HTML	4	19.0	9	40.9	7	36.8
XBRL	8	38.1	6	27.2	7	36.8
Total	21	100.0	22	100.0	19	100.0

The participants have substantial relevant work experience. More than half of the participants have in excess of 10 years' accounting experience, including 22% of the participants with more than 20 years' accounting experience.

A significant proportion of the participants were familiar with PDF (83%) compared with 51% and 8% of participants who were familiar with HTML and XBRL, respectively. This is not surprising as PDF has been in popular use as a reporting format for longer than HTML and XBRL (Baldwin et al., 2003). The small number of participants who were familiar with XBRL may be attributed to its more recent emergence as a digital reporting technology (Baldwin et al., 2003)[38].

Participants were asked for their preferred presentation formats if they were to repeat the investment decision-making task and could use any one of the three presentation formats. Thirty five percent of the participants chose HTML, 33% chose PDF and 30% chose XBRL to perform investment decision task. Reasons provided for preference for a particular format are summarised in Table 6.2.

Panel D, Table 6.1 presents participants' preferences of presentation formats based on categories according to which format they used in the experiment. The results show that most of the participants who were exposed to one format in the initial phase of the experiment preferred to use it again, over any other format, except for the XBRL format, in which case participants reported a preference to use the PDF format instead.

Specifically, those participants who were pre-allocated PDF and HTML in the experiment preferred to use the same format in their future investment tasks. Forty two percent of the participants in PDF groups preferred PDF format compared to HTML (31.8%) and XBRL (26.4%) formats. Participants in the HTML groups preferred HTML format first (40.9%), followed by XBRL format (36.8%) and PDF format (19%). In contrast, participants who were pre-allocated XBRL in the experiment preferred not to use the same format. Instead,

[38] The participants who were familiar with XBRL had some exposure with XBRL either from becoming members of XBRL-NZ, conferences or involvement with a pilot study performed by XBRL-NZ. The pilot study involved 12 listed companies and was completed in 2005.

the participants preferred to use PDF format (38.1%) in their future investment tasks compared to XBRL (36.8%) and HTML (27.2%) formats.

Table 6.2
Participants' reasons for preferring a particular format

PDF	HTML	XBRL
• Format which participants were most familiar with. • Resistant to change. • Ability to read the whole content of corporate reports rather than relying solely on the numbers. • Easier to obtain software to download a PDF document and most users would have the software to download it. • No technical competencies required for manipulating data online. • Easier to use, clear, concise, understandable and reliable.	• Easier to navigate and more user friendly for viewing the information. • The participants prefer the way it links to the basis of the information. • Increases the under-standability of information, although may need to enter the data into Excel spreadsheet. • Easier to drill down into numbers.	• The ability to be used as an analytical tool. • Increases understandability since the information required could be viewed at the time it is required. For example, an information item in the financial statement and footnotes could be viewed simultaneously. • It allows greater manipulation of data into various categories. • Helps to update figures automatically without the need to do extensive manipulations. • It has the ability to standardise results. • Reduces effort.

The participants in this study completed the experiment in in-lab and out-of-lab settings. Table 6.3 provides a comparison between the two groups in relation to the amount of time taken to complete the experiment. Panel A in Table 6.3 shows 23 participants attempted the research instrument in the researcher's presence (in-lab) while 39 participants chose to attempt the research instrument at their convenience (out-of-lab). The average amount of time taken to complete the experiment was compared. If the out-of-lab participants did not complete the experiment in one sitting, then the average time taken by them would be significantly longer than the in-lab participants.

On average, the in-lab participants took about 13 minutes while the out-of-lab took 15 minutes to complete the experiment. A t-test shows no significant differences (p=0.159) with equal variances based on Levene's test (p=0.092) between these two groups. This indicates that in-lab and out-of-lab participants attempted the experiment in a similar manner (there were no prolonged breaks during the experiment).

Table 6.3
Nature of experiment

Panel A: Descriptive statistics

Nature of experiment	N	Mean	Std. deviation	Std. error mean
In-lab	23	13.6087	6.72674	1.40262
Out-lab	39	15.8974	5.71607	0.91530

Panel B: Levene's test of equality of variance

Dependent variable: Total time taken	F	Sig.
Equal variances assumed	3.829	0.092

Panel C: T-test for equality of means

	T	Df	Sig.	Mean difference	Std. error difference	95% confidence interval of the difference	
						Lower	Upper
Equal variances assumed	-1.426	60	0.159	-2.28874	1.60533	-5.49987	0.92239

The participants in this study completed the experiment using the information presented in the research instrument. However, because the participants were allowed to complete the experiment in an out-of-lab setting, there is a possibility that the participants could have accessed information outside of the research instrument[39]. If the participants solely relied on the information in the research instrument in completing the experiment exercise, then the accuracy in extracting and calculating ratios between the in-lab and out-of-lab participants would not be significantly different. The participants were asked to extract figures for 8 ratios which were used to determine whether there was any significant difference in the extraction of numbers when calculating the 8 ratios[40]. Table 6.4 provides a comparison between the two groups in relation to their accuracy in extracting and calculating ratios.

The mean accuracy of extracting and calculating the ratios of the two groups was compared. On average, the in-lab participants scored about 4.3 while the out-of-lab participants scored about 5. A t-test shows no significant difference (p=0.288) between these two groups. This indicates that the in-lab and out-of-lab participants attempted the

[39] The participants were advised in the information sheet to rely solely on the experiment instrument when completing the experiment exercise.
[40] This test is purely an extraction exercise depending on the financial information presented in the financial statements.

experiment by relying solely on the information provided in the experiment instrument. This is important as it provides high assurance that these two groups attempted the experiment in a similar manner (i.e., they extracted and calculated the ratios by relying on the same information).

Table 6.4
Information usage

***Panel A*: Descriptive statistics of extracting and calculating ratios**

Completion time	Number of subjects	Extracting and calculating ratios		
		Mean	Std deviation	Std error mean
In-lab	23	4.3043	2.85139	0.59456
Out-lab	39	5.0769	2.67920	0.42902

***Panel B*: Levene's test of equality of variance**

Dependent variable: Extracting and calculating ratios	F	Sig.
Equal variances assumed	0.091	0.764

***Panel C*: T-test for in-lab and out-of lab experiment**

	T	Df	Sig.	Mean difference	Std. error difference	95% confidence interval of the difference	
						Lower	Upper
Equal variances assumed	-1.071	60	0.288	-.77258	0.72131	-2.21540	0.67025

This finding paves the way for a thorough examination of the hypotheses developed in this study. In the next section the results from the experiment and post experiment questionnaire are reported.

6.3 PRESENTATION FORMATS AND DECISION QUALITY

In this section two hypotheses relating to decision quality are tested. Decision quality in this study refers to decision accuracy in investment decisions and the cognitive effort that participants incur during decision-making.

6.3.1 Decision accuracy

In this section the results from testing hypothesis 1 are presented. Hypothesis 1 states that *there is no significant effect difference on decision-makers' decision accuracy between digital presentation formats.*

Decision accuracy refers to the ability of a strategy to produce an accurate outcome (Ashton, 1991). Hypothesis 1 was tested using ANOVA to determine the effect of digital presentation formats on decision accuracy.

As provided in Chapter 5, decision accuracy is measured by the proportion of participants extracting relevant values and the correct calculation of the 4 ratios for each firm (Firm A and Firm B) as required in the experiment. The participants' answers were marked to determine a score (Bricker and Nehmer, 1995; Dunn and Grabski, 2000). The score is the dependent measure for decision accuracy. For each ratio calculated correctly a participant earned one mark, and therefore, a measure of decision accuracy per participant ranges between 0 and 4 for each firm, making a total of 8 for both firms.

Table 6.5 presents the results on whether presentation formats impact on decision accuracy. The table is divided into four panels: descriptive statistics of presentation format on decision accuracy, the analysis of variance (ANOVA) to determine the significant impact of presentation formats on decision accuracy, the Pairwise multiple comparison test to further examine which format outperforms the others, and the Tukey HSD that shows whether a significant difference exists on the impact of presentation formats on decision accuracy between groups (PDF, HTML and XBRL).

Panel A of Table 6.5 provides the descriptive statistics of the effect of presentation formats on decision-makers' decision accuracy[41]. Participants in the XBRL group have the highest mean score in decision accuracy (5.6667) followed by the HTML group (5.0000) and the PDF group (3.7143). Participants in the PDF group have the least score indicating that

[41] The participants were asked to calculate 4 ratios for Firm A and Firm B, making the total numbers of ratios to be calculated 8. The highest score possible for participants is therefore, 8.

reliance on PDF format in performing an investment decision task is likely to result in decision–makers' errors and reduce decision-making effectiveness. This indicates that digital presentation formats may affect decision accuracy.

Table 6.5
Effect of presentation formats on decision-makers' decision accuracy

Panel A: Descriptive statistics of presentation formats impact on decision accuracy

Presentation format	Number of subjects	Decision accuracy mean	Std. deviation
PDF	21	3.7143	2.41128
HTML	20	5.0000	2.91999
XBRL	21	5.6667	2.65204
Total	62	4.7903	2.74690

Panel B: Analysis of variance

Dependent variable: Decision accuracy	d.f	Mean square	F	Sig.
Between groups	2	20.661	2.910	0.062
Within groups	59	7.101		
Total	61			

Panel C: Pairwise multiple comparisons

	Format (I)	Format (J)	Accuracy mean difference (I) – (J)	Sig.
Tukey HSD	PDF	HTML	-1.28571	0.278
		XBRL	-1.95238	0.054
	HTML	PDF	1.28571	0.278
		XBRL	-0.66667	0.704
	XBRL	PDF	1.95238	0.054
		HTML	0.66667	0.704

Panel D: Tukey HSD

Presentation format	Number of subjects	Subset for alpha=.05 1
PDF	21	3.7143
HTML	20	5.0000
XBRL	21	5.6667
Sig.		0.056

The results in Panel B, Table 6.5 indicate that the differences in the impact of presentation formats on decision accuracy are marginally statistically significant (p=0.062)[42]. The results of comparing each presentation format with another format are provided in Panel C. These results indicate that participants using XBRL had higher decision accuracy than participants using PDF (marginally significant p=0.054). However, no significant difference was found between PDF and HTML (p=0.278), or between HTML and XBRL (p=0.704). Overall, the Tukey HSD test shows a marginally significant difference between the three presentation formats on decision accuracy (p=0.056) as shown in Panel D. The results indicate that hypothesis 1 is not supported.

It is possible that the level of decision accuracy is influenced by factors such as participants' work experience (Kachelmeier and Messier, 1990; Abdomohammadi, 1992) and familiarity with the presentation formats[43] (Mackay et al., 1992; Whitecotton, 1996). ANCOVA is used to assess the effect of presentation formats on decision accuracy, after controlling for the participants' experience and familiarity with the presentation formats.

Table 6.6 presents the results on whether the impact of presentation formats on decision accuracy reported in the earlier results in Table 6.5 differ. The table shows the ANCOVA results for decision accuracy and presentation formats, controlling for work experience and familiarity with presentation format. The results suggest that the null hypothesis of no significant effect difference between the presentation formats on decision accuracy is marginally rejected (p=0.075). This indicates that the effect of presentation formats on decision accuracy is significantly higher (p=0.062) when experience is accounted for compared to when experience is not accounted for (p=0.075). Familiarity with presentation format, however, does not moderate the effectiveness of presentation formats on decision accuracy. These results indicate that experience is a significant covariate (p=0.009) that impacts on decision accuracy but not familiarity with presentation format (p=0.604).

[42] The results could be interpreted as significant at the 10% confidence level. However, this study interpreted the results as marginally significant at the 5% confidence level in order to maintain consistency throughout the study.

[43] The measure of familiarity with presentation format used in this study is based on the participants' familiarity of PDF format. This was chosen as it is believed that more participants were more familiar with this format compared to the other two formats and therefore, it is to likely impact the results in this study. This measure, where applicable, was used throughout this study.

Table 6.6
Effect of presentation formats on decision accuracy, controlling experience and familiarity with presentation format

Source of variance	Sum of squares	d.f	Mean square	F	Sig.
Experience	47.520	1	47.520	7.340	0.009
Familiarity	1.759	1	1.759	0.272	0.604
Presentation format	35.065	2	17.532	2.708	0.075
Error	369.012	57	6.474		
Total	1883.000	62			

Overall, the results indicate that hypothesis 1 is not supported. It appears that the effect of digital presentation formats on decision accuracy is marginally significant.

6.3.2 Cognitive effort

In this section the results from testing hypothesis 2 are presented. Hypothesis 2 states that *there is no significant effect difference on decision-makers' cognitive effort between digital presentation formats.* The results are presented below.

Cognitive effort refers to the total expenditure of cognitive resources required to complete a task, which often measured by total decision time (Frownfelter-Lohrke, 1998). ANOVA was used to test the effect of presentation formats on cognitive effort.

As provided in Chapter 5, to measure cognitive effort, the participants were required to record the starting time when they commence a particular step/stage of the experiment exercise and the time when the step/stage was completed.

Table 6.7 presents the results on whether there is an impact of the presentation formats on cognitive effort. The table is divided into four panels: descriptive statistics of presentation formats on cognitive effort, the analysis of variance (ANOVA) to determine the significant impact of presentation formats on cognitive effort, the Pairwise multiple comparison test to further examine which format outperforms the others and the Tukey HSD that shows whether a significant difference exists on the impact of presentation formats on cognitive effort between groups (PDF, HTML and XBRL).

Table 6.7
Effect of presentation formats on cognitive effort

Panel A: Descriptive statistics of the effect of presentation formats on cognitive effort (time)

		Cognitive effort	
Presentation format	Number of subjects	Mean	Std. deviation
PDF	21	16.1429	5.90157
HTML	20	14.1500	6.15822
XBRL	21	14.8095	6.53161
Total	62	15.0484	6.15757

Panel B: Analysis of variance

Dependent variable: Cognitive effort	Df	Mean square	F	Sig.
Between groups	2	21.248	0.552	0.579
Within groups	59	38.481		
Total	61			

Panel C: Pairwise multiple comparisons

	Format (I)	Format (J)	Cognitive effort mean difference (I) – (J)	Sig.
Tukey HSD	PDF	HTML	1.99286	0.562
		XBRL	1.33333	0.766
	HTML	PDF	-1.99286	0.562
		XBRL	-0.65952	0.938
	XBRL	PDF	-1.33333	0.766
		HTML	0.65952	0.938

Panel D: Tukey HSD

		Subset for alpha=.05
Presentation format	Number of subjects	1
PDF	21	14.1500
HTML	20	14.8095
XBRL	21	16.1429
Sig.		0.560

Panel A of Table 6.7 provides the descriptive statistics of the effect of the presentation formats on decision-makers' cognitive effort. The results show that participants using HTML format, compared to the participants using PDF or XBRL formats spent less cognitive effort in completing the experiment. Specifically, participants in the HTML group took the least time to complete the experiment (14.15 minutes) compared to participants in the XBRL group, who took 14.80 minutes.

The reason for the longer time for the XBRL group could be that the participants were not familiar with XBRL (refer Table 6.1, Panel B) and therefore it took them some time to adjust to the format. Participants in the PDF group took slightly longer (16.14 minutes) to complete the experiment. Having to view the financial information from one page to another on the screen is probably the reason for the longer time taken (Hodge et al., 2004). This provides an indication that participants found it easier to perform the investment decision task using HTML compared with other presentation formats. HTML provides hyperlinks between various parts and allows greater movements between the various sections of the financial reports.

The ANOVA results in Panel B, Table 6.7 indicate that the differences in the impact of presentation formats on cognitive effort are not statistically significant (p=0.579). The results of comparing each presentation format with another presentation format are provided in Panel C. These results indicate no significant differences were found between PDF and HTML (p=0.562) and between HTML and XBRL (p=0.938). Overall, the Tukey HSD test shows no significant difference in effect between the three presentation formats on decision-makers' cognitive effort (p=0.560) as shown in Panel D. The results indicate that hypothesis 2 is supported.

Similar to decision accuracy, it is possible that the level of cognitive effort is influenced by factors such as participants' experience and familiarity with the presentation format. Table 6.8 presents the results on whether the impact of presentation format on cognitive effort reported in the earlier results in Table 6.7 differ. The table shows the ANCOVA results for cognitive effort and presentation formats, controlling for work experience and familiarity with presentation format.

The results suggest that when controlling for experience and familiarity with presentation format, the null hypothesis that presentation formats impact on cognitive effort is not rejected at the 0.05 level of significance (p=0.529). This indicates that the effect of presentation formats on cognitive effort still stands when experience (p=0.508) and familiarity with presentation format is accounted for (p=0.813). The results also indicate

that experience and familiarity with presentation format are not significant covariates (p=0.508; p=0.813) in assessing cognitive effort.

Table 6.8
Effect of presentation formats on cognitive effort, controlling experience and familiarity with presentation format

Source of variance	Sum of squares	d.f	Mean square	F	Sig.
Experience	17.505	1	17.505	0.443	0.508
Familiarity	2.232	1	2.232	0.057	0.813
Presentation format	50.814	2	25.407	0.643	0.529
Error	2251.015	57	39.491		
Total	16353.000	62			

Overall, the results support hypothesis 2. It appears that there is no effect of digital presentation formats on cognitive effort.

6.4 IMPLICATIONS OF THE MAIN FINDINGS

While previous studies have examined the effect of presentation formats on decision-makers' performance, most of these studies were conducted in the traditional reporting model which focuses mainly on the use of tabular versus graphical presentation formats (Lucas, 1981; Stock and Watson, 1984; Hard and Vanecek, 1991; Vessey, 1991; Vessey and Galletta, 1991; Umanath and Vessey, 1994; Frownfelter-Lohrke, 1998; Speier et al., 2003). Other studies have included formats from linguistic and numerical (Stone and Schkade, 1991), multimedia versus hardcopy (Clements and Wolfe, 1998; Rose, 2002; Clements and Wolfe, 2000), bullet point and graph (Almer et al., 2003), to digital presentation formats such as PDF, HTML and XBRL (Hodge, 2001; Dull et al., 2003; Hodge et. al., 2004). However, the findings of these studies may not be applicable to presentation formats in general.

The development of the digital reporting environment and the availability of digital presentation formats allow wider options to preparers in presenting their corporate reports to users of such reports (Oyelere et al., 2003; Smith, 2003; Fisher et al., 2004). Consequently, opportunities are available to researchers to expand the literature on presentation format into the digital reporting literature by examining the effect of

presentation formats on decision-makers' performance (Hodge, 2001; Dull et al., 2003; Hodge et al., 2004; Hodge and Pronk, 2006). One factor of decision-makers' performance is decision quality (Libby and Lewis, 1977; 1982), and this is often measured using two variables: decision accuracy and cognitive effort (Kleinmuntz and Schkade, 1993).

Generally, most of the studies that have examined presentation formats have concluded that presentation formats affect decision-makers' decision quality (Stock and Watson, 1984; Dickson et al., 1986; Iselin, 1988; Mackay and Villareal, 1987; Hard and Vanecek, 1991; Stone and Schkade, 1991; Vessey, 1991; Anderson and Kaplan, 1992; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Almer et al., 2003; Baldwin et al., 2004; Hodge et al., 2004). These studies have primarily used experimental designs with students as proxies for actual decision-makers either because of the lack of participation from professional decision-makers or time constraints. However, it has been suggested that the use of students as subjects limits the generalisability of the findings to the wider decision-maker groups (Vera Munoz et al., 2002; Libby et al., 2002), and the findings from these studies cannot be generalised to infer how or if presentation formats influence professional decision-makers.

In this study, the effect of presentation formats on decision quality was examined, using an experimental research design involving public accounting practitioners as research subjects. Two hypotheses related to decision quality were developed indicating the impact of presentation formats on decision accuracy and cognitive effort.

The finding that presentation formats affect decision accuracy is consistent with previous studies (Stock and Watson, 1984; Dickson et al., 1986; Iselin, 1988; Mackay and Villareal, 1987; DeSanctis and Jarvenpaa, 1989; Hard and Vanecek, 1991; Stone and Schkade, 1991; Anderson and Kaplan, 1992; Bricker and Nehmer, 1995; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Hodge, 2001; Almer et al., 2003; Baldwin et al, 2004; Hodge et al., 2004).

The results showing the impact of presentation formats on decision accuracy in this study support the notion given in the psychology literature. The psychology literature suggested

that different forms of presentation make some aspects of the information displayed more apparent, and questions of different levels of complexity pertain to different characteristics or relationships within the information (Bertin, 1983). For example, relying on schematic faces (facial impression such as a smiling dummy indicating a firm with good performance) may likely be better to indicate firms' performance than using ratios (Moriarity, 1979). Therefore, one presentation format cannot be said as a technology to generally solve an issue since the features and capability that the presentation formats offer vary among them (Davis, 1989). Rather, certain presentation formats that can be used to achieve decision accuracy in a specific task, may not be effective in a different task. In this case, this study suggests that XBRL seems to be the best presentation format compared to PDF and HTML to possibly promote decision accuracy in investment decision tasks.

The information systems literature also supports the theory that presentation formats has an impact on decision accuracy. The information systems literature suggests that when presentation format matches the task type, the decision quality improves. Vessey (1991) suggested that if a presentation format does not match the task type, the decision-makers would need to either convert the presentation format to a form similar to the task, leading to potential poor performance. In this study, the task type is investment decisions. Therefore, this study suggests that for investment decision purposes, using PDF or HTML would require the decision-makers to convert the information presented to a more analytical form, and during this process, the decision-makers are likely to make errors, which leads to poor decision performance. In contrast, XBRL allows information processing of the data on the spot, where the data can be extracted and processed automatically by XBRL-aware applications such as Excel for analysis (SEC, 2007).

The results in this study also show that the effectiveness of the impact of presentation formats on decision accuracy is higher when decision-makers' work experience is accounted for. Such results are consistent with results of previous studies that suggest decision-makers' with more experience in their task are expected to bring added skill to their interactions with the presentation format and therefore, enhance decision accuracy (Mackay et al., 1992; Baldwin et al., 2004).

On the other hand, the results in this study show that presentation formats do not impact on cognitive effort. This is consistent with the findings in So and Smith (2004) and Dull et al. (2003) where presentation formats do not increase the efficiency of decision-making. However, this finding is not consistent with studies that found presentation format does impact on cognitive effort (Benbasat and Dexter, 1985; Jarvenpaa, 1989; Ramarapu et al., 1997; Tuttle and Kershaw, 1998). It has been suggested that other factors such as task characteristics (Dull et al., 2003), cognitive style (Baldwin et al., 2004), gender (Nouri and Douglas-Clinton, 2006), and degree of information processed (Bricker and Nehmer, 1995) may impact on cognitive effort.

Most of the studies that used students as subjects show that presentation formats impact on cognitive effort. However, some studies show that less experienced decision-makers have only one supposition and therefore search for information to confirm that supposition (Bouwman, 1982; Biggs et al. 1985; Anderson, 1988). On the other hand, when decision-makers become more experienced, they would have several suppositions in their working memories and search for potential information to contradict and distinguish among these suppositions (Bouwman, 1982; Biggs et al, 1985; Anderson, 1988). Such information processing behaviour would mean a longer time would be taken to complete a task. As a result, with experienced decision-makers, presentation formats may not impact on cognitive effort.

Table 6.9
Summary results for objective 1

Hypothesis	Proposition	Outcome
H1	*There is no significant effect difference on decision-makers' decision accuracy between digital presentation formats.*	Rejected
H2	*There is no significant effect difference on decision-makers' cognitive effort between digital presentation formats.*	Accepted

Table 6.9 provides a summary of the results on the effect of digital presentation formats on decision quality. The results show that hypothesis 1 is not supported indicating digital presentation formats impact on decision accuracy. However, the results support hypothesis 2 indicating no impact of digital presentation formats on cognitive effort.

Given that the presentation formats in the digital reporting environment are more advanced and sophisticated compared to the ones in the traditional reporting environment, one may expect that the presentation formats may be able to affect decision-makers' decision quality by enabling them to achieve poor decision accuracy with less cognitive effort. The findings of this study provide evidence to regulators and financial preparers that presentation formats have some impact on users' decision quality, in particular, decision accuracy, and the selection of appropriate presentation formats can lead to improvements in decision-making. Therefore, such parties need to recognise the benefits of issuing financial information in a format that is user-friendly.

6.5 SUMMARY AND CONCLUSION

In this chapter the results of objective 1 were presented. The results from an examination of the effect of presentation formats on decision-makers' performance in investment decision tasks were presented and these show that presentation formats influence decision-makers' decision accuracy. The results indicate that similar to previous studies focusing on inexperienced decision-makers, presentation formats may also have an impact on professional decision-makers' decision accuracy.

On the other hand, the results show no significant differences were found between the presentation formats in influencing cognitive effort. The results indicate that when attempting to make an effective investment decision, presentation formats could not be solely relied on if attempting to complete the task at a reduced effort. Such results suggest that there may be other contributing factors that influence cognitive effort rather than presentation formats alone.

The next chapter, Chapter 7, provides the findings for objective 2 on decision-makers' perceptions of digital presentation formats.

CHAPTER SEVEN

RESULTS AND DISCUSSION
DIGITAL PRESENTATION FORMATS AND PERCEPTIONS

7.1 INTRODUCTION

This chapter presents the results of objective 2 in this study and their implications. Objective 2 assesses users' perceptions of the usefulness and ease of use of the three digital presentation formats: PDF, HTML and XBRL. The chapter starts by presenting the descriptive statistics of the perceived usefulness and ease of use. Section 7.3 provides the results of testing the hypotheses regarding users' perceptions of the digital presentation formats (hypotheses 3 to 8). This includes results from testing whether participants' perceptions parallel their actual performance in the experiment, and whether their perceptions influence their preferences for presentation formats. In Section 7.4 the implications of the main findings are discussed. This chapter is summarised and concluded in Section 7.5.

7.2 DESCRIPTIVE STATISTICS OF PERCEPTIONS

This section provides the descriptive statistics of participants' responses regarding the perceived usefulness and ease of use of digital presentation formats. The results are shown in Tables 7.1, 7.2 and 7.3.

The participants were asked to complete a post experiment questionnaire in which each presentation format was viewed and their responses of perceived usefulness and ease of use was assessed on a 7-point scale of 1 (strongly disagree) to 7 (strongly agree). The participants were asked to assess 9 statements related to perceived usefulness and 7 statements related to perceived ease of use. The questionnaire was drawn on the instrument used by Davis (1989) as explained in Chapter 5.

7.2.1 Perceived usefulness and ease of use of PDF format

Table 7.1 presents the results on perceived usefulness and ease of use of PDF format. The table is divided into four panels: descriptive statistics of perceived usefulness of PDF format, the analysis of variance (ANOVA) to determine the significant difference on perceived usefulness of PDF format between participants categorically based on the format allocated in the experiment, descriptive statistics of perceived ease of use of PDF format, and the analysis of variance (ANOVA) to determine the significant difference on perceived usefulness of PDF format between participants categorically based on the format allocated in the experiment.

Panel A of Table 7.1 presents the descriptive statistics of perceived usefulness of PDF format. The results show that all the participants provide the highest mean score for statement number 2: "The reporting format would enable me to make a more informed investment decision" (4.4032), followed by statement number 6, "The reporting format provides me with sufficient information for the investment decision task" (4.3710), and statement number 9: "Overall, I find the reporting format is useful for the investment decision task" (4.258). The results in Panel B, Table 7.1 indicate that the differences are not statistically significant for all 9 statements related to perceived usefulness of PDF format between participants based on the format allocated in the experiment.

Table 7.1
Participants' perceived usefulness and ease of use of presentation formats

Panel A: Descriptive statistics of perceived usefulness of PDF format: Scale 1 (Very strongly disagree) to 7 (Very strongly agree) [44]

	Perceived usefulness	PDF Group N = 21		HTML Group N = 20		XBRL Group N = 21		Total N = 62	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
1	The reporting format would enable me to accomplish my investment decision task more quickly.	4.1429	1.68184	3.9500	1.31689	4.2381	1.33809	4.1129	1.43841
2	The reporting format would enable me to make a more informed investment decision.	4.3333	1.46059	4.3500	1.30888	4.5238	1.20909	4.4032	1.31148
3	The reporting format is very useful for identifying information (well formatted).	4.0952	1.78619	4.3000	1.30182	4.2857	1.05560	4.2258	1.39577
4	The reporting format allows me to gather more information for the investment decision task.	4.0952	1.48003	4.2500	1.25132	3.9048	1.17918	4.0806	1.29689
5	The reporting format contains too much irrelevant information for the investment decision task.	3.6190	1.53219	3.5500	1.53811	3.8571	1.55839	3.6774	1.52331
6	The reporting format provides me with sufficient information for the investment decision task.	4.4286	1.46872	4.4000	0.99472	4.2857	1.23056	4.3710	1.23130
7	I do not have to rely on other reporting format upon relying on this reporting to perform my investment decision task.	4.1905	1.56905	4.2500	1.51744	3.8095	1.47034	4.0806	1.50734
8	I would find the reporting format useful in performing the investment decision task.	4.1429	1.49284	4.3500	1.46089	4.0952	1.33809	4.1935	1.41234
9	Overall, I find the reporting format is useful for the investment decision task.	4.2381	1.44585	4.5000	1.19208	4.0476	1.24403	4.2581	1.29229

[44] For analyses purpose, such scale applies to all statements except for statement number 5 which scale was reversed due to the nature of the statement being negative.

Table 7.1, Continued...
Participants' perceived usefulness and ease of use of presentation formats

Panel B: Analysis of Variance-Perceived usefulness of PDF format

Dependent variable: Statement			Df	Mean Square	F	Sig.
1	The reporting format would enable me to accomplish my investment decision task more quickly.	Between Groups	2	0.439	0.207	0.814
		Within Groups	59	2.124		
		Total	61			
2	The reporting format would enable me to make a more informed investment decision.	Between Groups	2	0.232	0.131	0.877
		Within Groups	59	1.770		
		Total	61			
3	The reporting format is very useful for identifying information (well formatted).	Between Groups	2	0.272	0.136	0.874
		Within Groups	59	2.005		
		Total	61			
4	The reporting format allows me to gather more information for the investment decision task.	Between Groups	2	0.614	0.357	0.701
		Within Groups	59	1.718		
		Total	61			
5	The reporting format contains too much irrelevant information for the investment decision task.	Between Groups	2	0.537	0.226	0.799
		Within Groups	59	2.381		
		Total	61			
6	The reporting format provides me with sufficient information for the investment decision task.	Between Groups	2	0.120	0.077	0.926
		Within Groups	59	1.563		
		Total	61			
7	I do not have to rely on other reporting format upon relying on this reporting to perform my investment decision task.	Between Groups	2	1.185	0.513	0.601
		Within Groups	59	2.309		
		Total	61			
8	I would find the reporting format useful in performing the investment decision task.	Between Groups	2	0.373	0.182	0.834
		Within Groups	59	2.050		
		Total	61			
9	Overall, I find the reporting format is useful for the investment decision task.	Between Groups	2	1.055	0.624	0.539
		Within Groups	59	1.691		
		Total	61			

Table 7.1, Continued...
Participants' perceived usefulness and ease of use of presentation formats

Panel C: Descriptive statistics of perceived ease of use of PDF format: Scale 1 (Very strongly disagree) to 7 (Very strongly agree)

	Perceived ease of use	PDF Group N = 21		HTML Group N = 20		XBRL Group N = 21		Total N = 62	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
1	I can easily learn how to use the reporting format.	5.0952	1.60950	5.0500	1.23438	5.1905	1.12335	5.1129	1.31952
2	The reporting format is very clear and understandable.	5.1429	1.85164	4.9000	1.20961	5.0952	1.30018	5.0484	1.46464
3	I can easily become skilful in using the reporting format.	5.2857	1.70713	4.9500	1.27630	5.0000	1.44914	5.0806	1.47435
4	I can easily find the information that I require for my investment decision task.	4.6190	1.62715	4.3000	1.41793	4.2381	1.54612	4.3871	1.51879
5	The reporting format enables to easily retrieve and manipulate the information for the investment decision task.	3.3333	1.39044	3.8500	1.72520	3.6667	1.74165	3.6129	1.61301
6	Further training will improve my performance in using the reporting format.	3.0476	1.35927	4.0000	1.68585	3.9048	1.86828	3.6452	1.68013
7	Overall, I find the reporting format is very easy to use.	4.9048	1.70014	4.8500	1.49649	5.0952	1.41084	4.9516	1.51957

Table 7.1, Continued...
Participants' perceived usefulness and ease of use of presentation formats

Panel D: Analysis of variance - perceived ease of use of PDF format

Dependent variable: Statement			Df	Mean Square	F	Sig.
1	I can easily learn how to use the reporting format.	Between Groups	2	0.106	0.059	0.943
		Within Groups	59	1.797		
		Total	61			
2	The reporting format is very clear and understandable.	Between Groups	2	0.337	0.153	0.859
		Within Groups	59	2.206		
		Total	61			
3	I can easily become skilful in using the reporting format.	Between Groups	2	0.681	0.306	0.738
		Within Groups	59	2.224		
		Total	61			
4	I can easily find the information that I require for my investment decision task.	Between Groups	2	0.874	0.371	0.692
		Within Groups	59	2.355		
		Total	61			
5	The reporting format enables to easily retrieve and manipulate the information for the investment decision task.	Between Groups	2	1.413	0.535	0.589
		Within Groups	59	2.642		
		Total	61			
6	Further training will improve my performance in using the reporting format.	Between Groups	2	5.716	2.098	0.132
		Within Groups	59	2.725		
		Total	61			
7	Overall, I find the reporting format is very easy to use.	Between Groups	2	0.343	0.144	0.866
		Within Groups	59	2.376		
		Total	61			

Panel C of Table 7.1 presents the descriptive statistics of perceived ease of use of PDF format. The results show that all the participants provide the highest mean score for statement number 1: "I can easily learn how to use the reporting format" (5.1129), followed by statement number 3: "I can easily become skilful in using the reporting format" (5.0806). The participants, however, generally agree that the PDF format does not enable them to retrieve and manipulate the information for the investment decision task (statement number 5: mean score 3.6129). The ANOVA results in Panel D, Table 7.1 indicate that the differences in the perception of ease of use of PDF format are not statistically significant for all the 7 statements between participants based on the format allocated in the experiment.

7.2.2 Perceived usefulness and ease of use of HTML format

Table 7.2 presents the results on perceived usefulness and ease of use of HTML format. The table is divided into four panels: descriptive statistics of perceived usefulness of HTML format, the analysis of variance (ANOVA) to determine the significant difference on perceived usefulness of HTML format between participants categorically based on the format allocated in the experiment, descriptive statistics of perceived ease of use of HTML format, and the analysis of variance (ANOVA) to determine the significant difference on perceived usefulness of HTML format between participants categorically based on the presentation format allocated in the experiment.

Panel A, Table 7.2 presents the descriptive statistics of perceived usefulness of HTML format. The results show that all the participants provide the highest mean score for statement number 3: "The reporting format is very useful for identifying information (well formatted)" (4.6774). Specifically, the participants in the HTML groups provide the highest mean score for this statement (5.0500) compared to the participants in the PDF groups (4.0476) and XBRL groups (4.9524). This indicates that although all participants agree that HTML format is a useful format to identify information, the HTML groups perceive the HTML format as more highly useful compared to the perceptions of usefulness by the PDF and XBRL groups. The ANOVA results in Panel B, Table 7.2 show a marginally

significant difference on perceived usefulness with regards to statement number 3 (p=0.065) between the participants categorically according to the presentation format they used in the experiment.

The participants, in general, also agreed that HTML format enable them to make a more informed investment decision (statement number 2: mean score 4.3226). Specifically, the participants in the XBRL and HTML groups provide a mean score of 4.666 and 4.6000 respectively. In contrast, the PDF groups provide a much lower mean score (3.7143). This provides an indication that the PDF groups compared to the HTML and XBRL groups do not perceive as highly that the HTML format would enable them to make a more informed investment decision. The results in Panel B, Table 7.2 also shows that there is a marginally significant difference on the perceptions between the participants based on the presentation format they used in the experiment (p=0.052).

Participants' overall perceptions (statement number 9) of HTML format as useful for the investment decision task are somewhat different. The participants in the HTML groups provide the highest mean score for overall usefulness of HTML format in the investment decision task (5.0000), followed by XBRL (4.3810). The PDF groups, however, only provide a mean score of 3.9524. The ANOVA results in Panel B, Table 7.2 reflect the difference in perceptions between the three groups by showing a marginally significant difference (p=0.061).

Panel C of Table 7.2 presents the descriptive statistics of perceived ease of use of HTML format. The results show that all the participants, irrespective of which format they were pre-allocated in the experiment, provide the highest mean score for statement number 3: "I can easily become skilful in using the reporting format" (5.2581). This indicates that the participants have the same perception on HTML format with regards to easily becoming skilful in using the reporting format. The results in Panel D, Table 7.2 indicate that the differences are not statistically significant for all the 7 statements related to perceived ease of use of PDF format between participants based on the presentation format allocated in the experiment.

Table 7.2
Participants' perception usefulness and ease of use of presentation formats

Panel A: Descriptive statistics of perceived usefulness for HTML format: Scale 1 (Very strongly disagree) to 7 (Very strongly agree) [45]

	Perceived usefulness	PDF Group N = 21		HTML Group N = 20		XBRL Group N = 21		Total N = 62	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
1	The reporting format would enable me to accomplish my investment decision task more quickly.	3.9524	1.53219	4.6000	1.39170	4.5238	1.43593	4.3548	1.46903
2	The reporting format would enable me to make a more informed investment decision.	3.7143	1.48805	4.6000	1.35336	4.6667	1.27802	4.3226	1.42316
3	The reporting format is very useful for identifying information (well formatted).	4.0476	1.77415	5.0500	1.39454	4.9524	1.24403	4.6774	1.53403
4	The reporting format allows me to gather more information for the investment decision task.	3.8095	1.69172	4.2000	1.23969	4.5238	1.20909	4.1774	1.40869
5	The reporting format contains too much irrelevant information for the investment decision task.	3.9524	1.65759	3.2500	1.58529	3.6910	1.59613	3.6129	1.61301
6	The reporting format provides me with sufficient information for the investment decision task.	3.9048	1.51343	4.6500	1.22582	4.5714	0.97834	4.3710	1.28336
7	I do not have to rely on other reporting formats upon relying on this reporting format to perform my investment decision task.	4.0952	1.51343	4.8000	1.32188	4.4286	1.20712	4.4355	1.36251
8	I would find the reporting format useful in performing the investment decision task.	3.7143	1.58565	4.5000	1.60591	4.2381	1.48003	4.1452	1.56652
9	Overall, I find the reporting format is useful for the investment decision task.	3.9524	1.53219	5.0000	1.16980	4.3810	1.43095	4.4355	1.43288

[45] For analyses purpose, such scale applies to all statements except for statement number 5 which scale was reversed due to the nature of the statement being negative.

Table 7.2, Continued...
Participants' perceived usefulness and ease of use of presentation formats

Panel B: Analysis of variance - perceived usefulness of HTML format

Dependent variable: Statement			Df	Mean Square	F	Sig.
1	The reporting format would enable me to accomplish my investment decision task more quickly.	Between Groups	2	2.602	1.228	0.300
		Within Groups	59	2.118		
		Total	61			
2	The reporting format would enable me to make a more informed investment decision.	Between Groups	2	5.898	3.114	0.052
		Within Groups	59	1.894		
		Total	61			
3	The reporting format is very useful for identifying information (well formatted).	Between Groups	2	6.347	2.862	0.065
		Within Groups	59	2.218		
		Total	61			
4	The reporting format allows me to gather more information for the investment decision task.	Between Groups	2	2.686	1.370	0.262
		Within Groups	59	1.961		
		Total	61			
5	The reporting format contains too much irrelevant information for the investment decision task.	Between Groups	2	2.527	0.970	0.385
		Within Groups	59	2.604		
		Total	61			
6	The reporting format provides me with sufficient information for the investment decision task.	Between Groups	2	3.483	2.198	0.120
		Within Groups	59	1.585		
		Total	61			
7	I do not have to rely on other reporting formats upon relying on this reporting format to perform my investment decision task.	Between Groups	2	3.299	1.360	0.265
		Within Groups	59	2.425		
		Total	61			
8	I would find the reporting format useful in performing the investment decision task.	Between Groups	2	2.545	1.388	0.258
		Within Groups	59	1.833		
		Total	61			
9	Overall, I find the reporting format is useful for the investment decision task.	Between Groups	2	5.669	2.936	0.061
		Within Groups	59	1.931		
		Total	61			

Table 7.2, Continued...
Participants' perception usefulness and ease of use of presentation formats

Panel C: Descriptive statistics of perceived ease of use for HTML format: Scale 1 (Very strongly disagree) to 7 (Very strongly agree)

	Perceived ease of use	PDF Group N = 21		HTML Group N = 20		XBRL Group N = 21		Total N = 62	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
1	I can easily learn how to use the reporting format.	4.7143	1.87464	5.3500	1.30888	5.2857	1.05560	5.1129	1.46102
2	The reporting format is very clear and understandable.	4.8095	1.99045	5.2000	1.10501	5.3810	1.16087	5.1290	1.47641
3	I can easily become skilful in using the reporting format.	4.9048	1.70014	5.5000	1.14708	5.3810	1.11697	5.2581	1.35423
4	I can easily find the information that I require for my investment decision task.	4.4286	1.80476	5.3000	1.12858	4.7619	1.41084	4.8226	1.49890
5	The reporting format enables to easily retrieve and manipulate the information for the investment decision task.	3.3810	1.32198	4.1500	1.69442	3.7619	1.72930	3.7581	1.59595
6	Further training will improve my performance in using the reporting format.	3.7143	1.48805	4.3500	1.63111	4.0952	1.86828	4.0484	1.66376
7	Overall, I find the reporting format is very easy to use.	4.4762	1.86062	5.1500	1.53125	5.1429	1.45896	4.9194	1.63264

Table 7.2, Continued...
Participants' perceived usefulness and ease of use of presentation formats

Panel D: Analysis of variance - perceived ease of use of HTML format

Dependent variable: Statement			Df	Mean Square	F	Sig.
1	I can easily learn how to use the reporting format.	Between Groups	2	2.544	1.200	0.309
		Within Groups	59	2.121		
		Total	61			
2	The reporting format is very clear and understandable.	Between Groups	2	1.789	0.816	0.447
		Within Groups	59	2.193		
		Total	61			
3	I can easily become skilful in using the reporting format.	Between Groups	2	2.055	1.125	0.332
		Within Groups	59	1.826		
		Total	61			
4	I can easily find the information that I require for my investment decision task.	Between Groups	2	3.948	1.804	0.174
		Within Groups	59	2.189		
		Total	61			
5	The reporting format enables me to easily retrieve and manipulate the information for the investment decision task.	Between Groups	2	3.030	1.197	0.309
		Within Groups	59	2.531		
		Total	61			
6	Further training will improve my performance in using the reporting format.	Between Groups	2	2.105	0.754	0.475
		Within Groups	59	2.791		
		Total	61			
7	Overall, I find the reporting format is very easy to use.	Between Groups	2	3.119	1.177	0.315
		Within Groups	59	2.650		
		Total	61			

7.2.3 Perceived usefulness and ease of use of XBRL format

Table 7.3 presents the results on perceived usefulness and ease of use of XBRL format. The table is divided into four panels: descriptive statistics of perceived usefulness of XBRL format, the analysis of variance (ANOVA) to determine the significant difference on perceived usefulness of XBRL format between participants categorically based on the format allocated in the experiment, descriptive statistics of perceived ease of use of XBRL format, and the analysis of variance (ANOVA) to determine the significant difference on perceived usefulness of XBRL format between participants categorically based on the presentation format allocated in the experiment.

Panel A, Table 7.3 presents the descriptive statistics of perceived usefulness of XBRL format. The results show that all the participants provide the highest mean score for statement number 4: "The reporting format allows me to gather more information for the investment decision task" (5.0968), followed by statement number 8: "I would find the reporting format useful in performing the investment decision task" (5.0161), and statement number 6: "The reporting format provides me with sufficient information for the investment decision task" (4.9516). The results in Panel B, Table 7.3 show support for the participants having somewhat similar perceptions of the usefulness of XBRL format on all 9 statements, where no significant differences on perceived usefulness were found between participants categorically based on the presentation format allocated in the experiment.

Panel C of Table 7.3 presents the descriptive statistics of perceived ease of use of XBRL format. The results show that all the participants provide the highest mean score for statement number 6: "Further training will improve my performance in using the reporting format" (5.7742), followed by: "The reporting format enables them to easily retrieve and manipulate the information for the investment decision task" (5.4194), and: "I can easily become skillful in using the reporting format" (4.7419). Further analysis using ANOVA shows no significant difference on the perceived ease of use of XBRL format on all the 7 statements as shown in Panel D, Table 7.3.

Table 7.3
Participants' perception usefulness and ease of use of presentation formats

Panel A: Descriptive statistics of perceived usefulness for XBRL format: Scale 1 (Very strongly disagree) to 7 (Very strongly agree) [46]

1	*Perceived usefulness*	PDF Group N = 21		HTML Group N = 20		XBRL Group N = 21		Total N = 62	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
1	The reporting format would enable me to accomplish my investment decision task more quickly.	4.6667	1.96013	4.9000	1.87084	4.8571	2.10442	4.8065	1.96560
2	The reporting format would enable me to make a more informed investment decision.	4.2381	1.70014	4.8500	1.66307	4.8095	2.04007	4.6290	1.80377
3	The reporting format is very useful for identifying information (well formatted).	4.1429	1.76878	4.6000	1.78885	4.5238	1.69172	4.4194	1.73251
4	The reporting format allows me to gather more information for the investment decision task.	5.0000	1.87083	5.2000	1.64157	5.0952	1.72930	5.0968	1.72455
5	The reporting format contains too much irrelevant information for the investment decision task.	3.6667	1.55991	4.2000	1.86281	4.3333	1.87872	4.0645	1.80046
6	The reporting format provides me with sufficient information for the investment decision task.	4.7143	1.45406	5.0000	1.52177	5.1429	1.74028	4.9516	1.56213
7	I do not have to rely on other reporting formats upon relying on this reporting format to perform my investment decision task.	4.2381	1.72930	4.7500	1.55174	4.8095	2.13586	4.5968	1.81487
8	I would find the reporting format useful in performing the investment decision task.	5.0476	1.62715	5.1500	1.66307	4.8571	1.62128	5.0161	1.61440
9	Overall, I find the reporting format is useful for the investment decision task.	5.0000	1.84391	5.3500	1.58852	4.8571	1.62128	5.0645	1.67793

[46] For analyses purpose, such scale applies to all statements except for statement number 5 which scale was reversed due to the nature of the statement being negative.

Table 7.3, Continued...
Participants' perceived usefulness and ease of use of presentation formats

Panel B: Analysis of variance - perceived usefulness of XBRL format

Dependent variable: Statement			Df	Mean Square	F	Sig.
1	The reporting format would enable me to accomplish my investment decision task more quickly.	Between Groups	2	0.320	0.080	0.923
		Within Groups	59	3.984		
		Total	61			
2	The reporting format would enable me to make a more informed investment decision.	Between Groups	2	2.435	0.742	0.481
		Within Groups	59	3.281		
		Total	61			
3	The reporting format is very useful for identifying information (well formatted).	Between Groups	2	1.244	0.406	0.668
		Within Groups	59	3.061		
		Total	61			
4	The reporting format allows me to gather more information for the investment decision task.	Between Groups	2	0.205	0.067	0.935
		Within Groups	59	3.068		
		Total	61			
5	The reporting format contains too much irrelevant information for the investment decision task.	Between Groups	2	2.604	0.798	0.455
		Within Groups	59	3.263		
		Total	61			
6	The reporting format provides me with sufficient information for the investment decision task.	Between Groups	2	0.999	0.401	0.671
		Within Groups	59	2.489		
		Total	61			
7	I do not have to rely on other reporting formats upon relying on this reporting format to perform my investment decision task.	Between Groups	2	2.061	0.618	0.543
		Within Groups	59	3.336		
		Total	61			
8	I would find the reporting format useful in performing the investment decision task.	Between Groups	2	0.455	0.170	0.844
		Within Groups	59	2.679		
		Total	61			
9	Overall, I find the reporting format is useful for the investment decision task.	Between Groups	2	1.310	0.457	0.635
		Within Groups	59	2.866		
		Total	61			

Table 7.3, Continued...
Participants' perceived usefulness and ease of use of presentation formats

Panel C: Descriptive statistics of perceived ease of use for XBRL format: Scale 1 (Very strongly disagree) to 7 (Very strongly agree)

	Perceived ease of use	PDF Group N = 21		HTML Group N = 20		XBRL Group N = 21		Total N = 62	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
1	I can easily learn how to use the reporting format.	3.9048	1.48003	4.4000	1.35336	4.6190	1.59613	4.3065	1.48863
2	The reporting format is very clear and understandable.	4.2857	1.48805	4.2500	1.55174	4.2381	1.51343	4.2581	1.49245
3	I can easily become skilful in using the reporting format.	4.8095	1.72102	4.9000	1.48324	4.5238	1.47034	4.7419	1.54639
4	I can easily find the information that I require for my investment decision task.	4.6667	1.71270	5.0000	1.45095	4.8095	1.83355	4.8226	1.65484
5	The reporting format enables to easily retrieve and manipulate the information for the investment decision task.	5.0476	1.71686	5.6500	1.18210	5.5714	1.46872	5.4194	1.47713
6	Further training will improve my performance in using the reporting format.	5.4762	1.66190	5.9500	0.99868	5.9048	1.17918	5.7742	1.31098
7	Overall, I find the reporting format is very easy to use.	4.2857	1.87464	4.9500	1.50350	4.8571	1.68184	4.6935	1.69463

Table 7.3, Continued...
Participants' perceived usefulness and ease of use of presentation formats

Panel D: Analysis of variance - perceived ease of use of XBRL format

Dependent variable: Statement			Df	Mean Square	F	Sig.
1	I can easily learn how to use the reporting format.	Between Groups	2	2.808	1.279	0.286
		Within Groups	59	2.196		
		Total	61			
2	The reporting format is very clear and understandable.	Between Groups	2	0.013	0.006	0.994
		Within Groups	59	2.302		
		Total	61			
3	I can easily become skilful in using the reporting format.	Between Groups	2	0.797	0.326	0.723
		Within Groups	59	2.445		
		Total	61			
4	I can easily find the information that I require for my investment decision task.	Between Groups	2	0.572	0.203	0.817
		Within Groups	59	2.812		
		Total	61			
5	The reporting format enables to easily retrieve and manipulate the information for the investment decision task.	Between Groups	2	2.226	1.021	0.367
		Within Groups	59	2.180		
		Total	61			
6	Further training will improve my performance in using the reporting format.	Between Groups	2	1.421	0.822	0.445
		Within Groups	59	1.729		
		Total	61			
7	Overall, I find the reporting format is very easy to use.	Between Groups	2	2.685	0.933	0.399
		Within Groups	59	2.878		
		Total	61			

The next section provides the results from testing the hypotheses of users' perceived usefulness and ease of use of digital presentation formats. Six hypotheses (Hypotheses 3 to 8) were developed to examine the issues related to perceptions of usefulness and ease of use.

7.3 PRESENTATION FORMATS AND PERCEPTIONS

This section presents the results of testing hypotheses 3 to 8 relating to perceptions of presentation formats. Two aspects of perception of presentation format are examined: usefulness and ease of use.

7.3.1 Perceived usefulness

This section presents the results of hypothesis 3. Hypothesis 3 states that *there are no significant differences in users' perceptions of the usefulness of digital presentation formats.*

Davis (1989) described perceived usefulness as "the degree a user believes that a particular aid would enhance his performance". Hypothesis 3 was tested using Multinomial logistic regression analysis[47] to determine the difference in perceived usefulness of digital presentation formats.

As provided in Chapter 5, the participants were asked to indicate their perceptions of usefulness of the presentation formats using a 7-point scale of 1 (strongly disagree) to 7 (strongly agree). The total score (responses) of the 9 statements related to perceived usefulness for each presentation format was calculated and averaged to obtain an overall score to represent the perceived usefulness of each presentation format, hence producing three overall scores (PDF, HTML and XBRL formats). These overall scores were compared

[47] Multinomial logistic regression was used to test hypothesis 3 because the nature of the dependent variable is categorical. Multinomial Logistic Regression is a new functionality added to SPSS 14.0 that allows users to save estimated response probabilities, predicted response categories, probability of predicted response categories, and probability of actual response categories (SPSS 14.0).

and a new score was subsequently created to code the highest mean score representing the most useful among the three presentation format. The new score becomes the dependent measure to test hypothesis 3.

The Cronbach's Alpha test was used to determine the reliability of the variables of perceived usefulness. The test for all variables were examined for each presentation format and the reliability test results of all three formats are higher than 0.80 (lowest 0.838 to highest 0.937), which is somewhat similar to Davis (1989) and Adams et al. (1992).

Table 7.4 provides the results on the participants' perceptions of usefulness of presentation formats. The table is divided into four panels. Panel A provides the descriptive statistics for perceived usefulness of each presentation format divided into three groups according to which format the participants used in the experiment. Panel B presents the descriptive statistics for perceived usefulness for each presentation format by all participants. Panel C provides the ANOVA results on whether there are significant differences on the perceived usefulness of each presentation format. Panel D provides the Multinomial logistic regression analysis results on hypothesis 3, indicating whether there are significant differences in perceived usefulness of presentation formats.

Panel A, Table 7.4 provides the descriptive statistics for participants' perceived usefulness divided into three groups according to the format they used in the experiment. The purpose of this panel is to compare the perceived usefulness of each presentation format between groups. The results show that the PDF group provides mean score of 4.1895 on PDF format compared to the other groups (XBRL: 4.0952; HTML: 4.1010). On the other hand, the HTML group also provide the highest score for HTML format (4.5285) compared to the XBRL (4.3548) and PDF (3.8881) groups. Similarly, the HTML group provides the highest mean score for XBRL format (4.7840), followed by participants in the XBRL (4.6181) and PDF (4.4819) groups. The results above indicate that the participants in their allocated formats in the experiment tend to the highest mean score for their respective formats as being useful except XBRL format.

Table 7.4
Users' perceptions of usefulness

Panel A: Descriptive statistic for perceived usefulness (participants categorically grouped according to which format they used in the experiment)

Presentation format	Perceived usefulness	Number of subjects	Mean	Standard deviation
PDF	PDF USE	21	4.1895	1.10102
HTML		20	4.1010	0.94829
XBRL		21	4.0952	0.96465
		62	4.1290	0.99225
PDF	HTML USE	21	3.8881	1.11042
HTML		20	4.5285	0.92355
XBRL		21	4.3548	0.94899
		62	4.2527	1.01956
PDF	XBRL USE	21	4.4819	1.39353
HTML		20	4.7840	1.22806
XBRL		21	4.6181	1.38132
		62	4.6255	1.32188

Panel B: Descriptive statistic for perceived usefulness (all participants)

Perceived usefulness	N	Mean	Standard deviation
PDF	62	4.1290	0.99225
HTML	62	4.2527	1.01956
XBRL	62	4.6255	1.32188

Panel C: Analysis of variance - each presentation format

Perceived usefulness	Presentation format	d.f	Mean square	F	Sig
PDF	Between groups	2	0.058	0.057	0.944
	Within groups	59	1.016		
HTML	Between groups	2	2.266	2.271	0.112
	Within groups	59	0.988		
XBRL	Between groups	2	0.468	0.262	0.771
	Within groups	59	1.791		

Panel D: Multinomial logistic regression – dependent measure: overall score of perceived usefulness

Effect	Model fitting criteria	Likelihood ratio tests		
	-2LL	Df	χ^2	Sig.
Presentation format	23.441	4	5.117	0.275

The results above are supported by the ANOVA test which was used to determine whether there are any significant differences in the perceptions of usefulness of each of the presentation formats. Panel C of Table 7.4 reports the results and shows no significant difference in the users' perceptions of usefulness of each of the presentation formats in the digital reporting environment (p=0.994 for PDF, p=0.112 for HTML and p=0.771 for XBRL). The results also suggest that the participants were not influenced by the presentation format they used in the experiment since the mean scores of perceived usefulness of the presentation format they used were not necessary the highest.

Panel B of Table 7.4 shows the descriptive statistics for perceived usefulness of presentation formats by all participants. The results show that the participants provide the highest mean score for XBRL format (4.6255), followed by HTML format (4.2527) and PDF format (4.1290). This indicates that the participants perceived XBRL format as most useful among the three presentation formats.

To test hypothesis 3, Multinomial logistic regression analysis was used to determine whether there were any significant differences in users' perceptions of the usefulness of presentation formats. The results show that the likelihood of significant differences on the participants' perceptions of usefulness on the presentation formats are not significant (p=0.275) as shown in Panel D, Table 7.4. The results support hypothesis 3 that there are no significant differences in users' perceptions of the usefulness of presentation formats.

In summary, the results indicate that the perceptions of usefulness are somewhat similar for all presentation formats. Further, the results show no significant differences in the perceptions of the usefulness of digital presentation formats. Therefore, hypothesis 3 is supported.

7.3.2 Perceived ease of use

In this section the results from testing hypothesis 4 are presented. Hypothesis 4 states that *there are no significant differences in users' perceptions of the ease of use of digital presentation formats.*

Davis (1989) described perceived ease of use as "the degree to which a user believes that using a particular aid would reduce or be free of effort". Hypothesis 4 was tested using Multinomial logistic regression to determine the difference in perceived ease of use of the presentation formats.

As provided in Chapter 5, the participants were asked to assess the ease of use of the presentation formats using a 7-point scale of 1 (strongly disagree) to 7 (strongly agree). The total score (responses) of the 7 statements related to perceived ease of use for each presentation format were calculated and averaged to obtain an overall score to represent the perceived ease of use of each presentation format, producing three overall scores (PDF, HTML and XBRL formats). The overall score for perceived ease of use of each presentation format was compared and a new score was created to represent the format most ease of use of the three presentation formats. The overall score for perceived ease of use becomes the dependent measure to test hypothesis 4.

The Cronbach's Alpha test was used to determine the reliability of the variables of perceived ease of use. The test for all variables was examined for each presentation format and the reliability test results of all three formats were higher than 0.80 (lowest 0.838 to highest 0.937) which is somewhat similar to Davis (1989) and Adams et al. (1992).

Table 7.5 provides the results on the participants' perceptions of usefulness of presentation formats. The table is divided into four panels. Panel A provides the descriptive statistics for perceived ease of use of each presentation format divided into three groups according to which format participants used in the experiment. Panel B presents the descriptive statistics for perceived ease of use for each presentation format by all participants. Panel C provides

the ANOVA results on whether there are significant differences on the perceived ease of usefulness of each presentation format. Panel D provides the Multinomial logistic regression analysis[48] results on hypothesis 3, whether there are significant differences in perceived ease of use of digital presentation formats.

Panel A, Table 7.5 shows the results of the participants' perceived ease of use of the presentation formats divided into three groups according to the formats they used in the experiment. The results show that the XBRL group provides the highest mean score of perceived ease of use for PDF format (4.6390) for perceived ease of use compared to the other groups (HTML: 4.5635; PDF: 4.5271). On the other hand, the HTML group perceived HTML as the most ease of use (4.9500) compared to the other groups (XBRL: 4.8300; PDF: 4.3467). The HTML group also perceived XBRL format to be the most easy to use (5.0045) followed by the XBRL (4.8986) and PDF (4.6400) groups.

Panel C of Table 7.5 reports the ANOVA results for testing for significant differences in the perceived ease of use of each of the presentation formats. Although Panel A, Table 7.5 shows marginal differences in the mean score of perceived ease of use of each of the presentation formats, the ANOVA results show no significant difference in the participants' perceptions of ease of use of each of the presentation formats in the digital reporting environment (p=0.946 for PDF, p=0.191 for HTML and p=0.633 for XBRL). The results indicate that participants' perceived ease of use of each of the presentation formats is somewhat similar irrespective of which format they were pre-allocated to perform their investment decision. The results also indicate that the participants' experience in the experiment with a particular presentation format did not influence their perceptions of the presentation formats since they did not provide the highest mean score for the presentation format that they used in the experiment.

[48] Multinomial logistic regression was used to test hypothesis 4 because the nature of the dependent variable is categorical.

Table 7.5
Users' perceptions of ease of use

Panel A: Descriptive statistic for perceived ease of use (participants categorically grouped according to which format they used in the experiment)

Presentation format	Perceived ease of use	Number of subjects	Perceived ease of use Mean	Standard deviation
PDF	PDF USE	21	4.5271	1.29082
HTML		20	4.5635	0.90516
XBRL		21	4.6390	1.10007
		62	4.5768	1.09568
PDF	HTML USE	21	4.3467	1.40596
HTML		20	4.9500	0.95036
XBRL		21	4.8300	0.90793
		62	4.7050	1.12648
PDF	XBRL USE	21	4.6400	1.46458
HTML		20	5.0045	1.03170
XBRL		21	4.8986	1.22202
		62	4.8452	1.24428

Panel B: Descriptive statistic for perceived ease of use (all participants)

Perceived ease of use	N	Mean	Standard deviation
PDF	62	4.5768	1.09568
HTML	62	4.7050	1.12648
XBRL	62	4.8452	1.24428

Panel C: Analysis of variance – each presentation format

Perceived ease of use	Presentation format	d.f	Mean square	F	Sig
PDF	Between groups	2	0.068	0.055	0.946
	Within groups	59	1.239		
HTML	Between groups	2	2.113	1.703	0.191
	Within groups	59	1.240		
XBRL	Between groups	2	0.726	0.461	0.633
	Within groups	59	1.576		

Panel D: Likelihood ratio tests – dependent measure: overall score of perceived ease of use

Effect	Model fitting criteria	Likelihood ratio tests		
	-2LL	Df	x^2	Sig.
Presentation format	21.623	4	2.784	0.595

Panel B, Table 7.5 shows the descriptive statistics for perceived ease of use of the presentation formats by all participants. The results show that the participants provided the highest mean score for XBRL format (4.8452), followed by HTML format (4.7050) and PDF format (4.5768). The results indicate that XBRL format is the most easy to use of the three presentation formats.

Multinomial logistic regression analysis was used to test hypothesis 4[49]. Hypothesis 4 examines whether there are any significant differences in the users' perceptions of the ease of use of presentation formats. The results presented in Panel B, Table 7.5 show that the likelihood of significant differences on the participants' perception of ease of use on the presentation formats are not significantly different (p=0.595). The results support hypothesis 4 that there are no significant differences in users' perceptions of the ease of use of presentation formats.

In summary, the results indicate that the perceptions of ease of use are somewhat similar for all presentation formats. The results also show no significant differences on the perceptions of the ease of use of the presentation formats. Therefore, hypothesis 4 is supported.

7.3.3 Perceived usefulness and decision accuracy

In this section hypothesis 5 is tested. Hypothesis 5 states that *there are no significant differences between users' perceived usefulness of a digital reporting format and decision accuracy by using such format.*

Davis (1989) argued that the cost benefit research has primarily used objective measures of accuracy in research studies, downplaying the distinction between subjective (perception) and objective (decision accuracy) measures. Further, subjective measures are often in disagreement with objective measures (Abelson and Levi, 1995). Hypothesis 5 was tested using a Paired T-test to determine the difference between perceived usefulness and decision accuracy.

[49] Multinomial logistic regression was used to test hypothesis 4 because the nature of the dependent variable is categorical.

As discussed in Chapter 5, the participants were asked to assess the usefulness of the presentation formats using a 7-point scale of 1 (strongly disagree) to 7 (strongly agree). The total score (responses) of the 9 statements related to perceived usefulness for each presentation formats were calculated and averaged to obtain an overall score to represent the perceived usefulness of each presentation format.

The participants' actual performance was determined by their accuracy in extracting relevant values and the correct calculation of the four ratios for each firm (Firm A and Firm B) as required in the experiment. The participants' answers are marked to determine a score (Bricker and Nehmer, 1995; Dunn and Grabski, 2000). For each ratio calculated correctly a participant earns one mark, and therefore, a measure of decision accuracy per participant ranges between 0 and 4 for each firm, resulting in a total of 8 marks[50]. To test hypothesis 5, in order to make effective comparison between perceived usefulness and decision accuracy, the measurement for decision accuracy was deflated from 8 marks to 7 marks to represent a new score for decision accuracy[51]. The overall score for perceived usefulness was then compared with the new mean score for decision accuracy.

Table 7.6 provides the results on the difference between perceived usefulness of a presentation format and decision accuracy by using such a format. The table is divided into two panels. Panel A presents the descriptive statistics for perceived usefulness and the actual performance (decision accuracy) of each group. Panel B presents the results of a Paired T-test comparing the perceived usefulness and decision accuracy for each presentation format.

Panel A of Table 7.6 shows the descriptive statistics for participants' perceived usefulness and their actual performance (decision accuracy) in the experiment. The results show that the perceived usefulness of the presentation formats was higher than the decision accuracy by using such formats. The mean difference of perceived usefulness and the decision accuracy of the PDF group is the highest (0.9371), compared with that for the HTML group

[50] The score is the dependent measure for decision accuracy in hypothesis 1.
[51] As the marks have been deflated from 8 to 7, the mean score for decision accuracy in Chapter 6 vary from the mean score of decision accuracy in Section 7.3.3.

(0.2395) and the XBRL group (0.1331). This result indicates that participants in the PDF group had a higher perception of the usefulness of PDF format compared to how useful the format was when a task was performed. The results also indicate that among the three presentation formats, participants in the XBRL group has the least mean difference between the perception of usefulness and their actual performance (decision accuracy) when using such a format.

Table 7.6
Users' perceptions versus actual performance of usefulness

Panel A: Descriptive statistics for perceived and actual performance of usefulness in each group

Presentation format perceived/ used in the experiment	Usefulness	N	Mean	Std. deviation
PDF	Perceived	21	4.1895	1.10102
	Decision accuracy	21	3.2524	2.10851
HTML	Perceived	20	4.5285	0.20651
	Decision accuracy	20	4.2890	2.42260
XBRL	Perceived	21	4.6181	1.38132
	Decision accuracy	21	4.7512	2.04318

Panel B: Paired T-test between perceived usefulness and decision accuracy in each group

Presentation format perceived/used in the experiment	Paired differences		T	d.f	Sig.
	Mean	Std. deviation			
PDF	-0.93714	2.40875	1.783	20	0.090
HTML	0.23950	2.56905	0.417	19	0.681
XBRL	-0.13310	2.12385	-0.287	20	0.777

Panel B, Table 7.6 provides the results of the Paired T-test between perceived usefulness of the presentation format and the decision accuracy by using such a format. The results given in Panel A, Table 7.6 indicate a greater point of difference between perceived usefulness and decision accuracy for the PDF group and this difference is marginally significant difference (p=0.090), However, there is no significant difference between all groups' perceived usefulness and decision accuracy for each presentation format (HTML format, p=0.681; and XBRL format, p=0.777) as shown in Panel B, Table 7.6.

In summary, the results show no significant differences between the perception of usefulness of a presentation format and decision accuracy by using such a format except for PDF format. Therefore, hypothesis 5 is supported for HTML and XBRL but not PDF.

7.3.4 Perceived ease of use and cognitive effort

In this section hypothesis 6 is tested. Hypothesis 6 states that *there are no significant differences between users' perceived ease of use of a digital reporting format and their cognitive effort required for completion of a decision-making task by using such a format.*

Similar to the argument of perceived usefulness and decision accuracy, Davis (1989) also argued that the cost benefit research has primarily used objective measures of cognitive effort in research studies, downplaying the distinction between subjective (perception) and objective (cognitive effort) measures. Hypothesis 6 was tested using a Paired T-test to determine the difference between perceived ease of use and cognitive effort.

As in Chapter 5, the participants were asked to assess ease of use of the presentation formats using a 7-point scale of 1 (strongly disagree) to 7 (strongly agree). The total score (responses) of the 7 statements related to perceived ease of use for each presentation format were calculated and averaged to obtain an overall score to represent the perceived ease of use of each presentation format.

The participants' actual performance for cognitive effort was determined by the total time taken to complete the experiment exercise. In order to make an effective comparison of the actual time taken (which measures cognitive effort) to the perceived ease of use (which is measured using a 7-point scale), the actual time was converted into a 7-point scale (refer to Chapter 5). The higher the mean, the less the cognitive effort participants took to complete the experiment.

Table 7.7 provides the results of the difference between perceived ease of use of a presentation format and the cognitive effort required to complete a decision-making task.

The table is divided into two panels. Panel A presents the descriptive statistics for perceived ease of use and the actual performance (cognitive effort) of each group. Panel B presents the results of Paired T-test comparing the perceived ease of use and cognitive effort required to complete a decision-making task.

Panel A of Table 7.7 shows the descriptive statistics for participants' perceived ease of use and their actual performance (cognitive effort) in the experiment. The results show theat in general, the perceived ease of use of the presentation formats was higher than the cognitive effort. The participants who were pre-allocated PDF format have the least mean difference between the perceived ease of use and cognitive effort (0.1461) , compared with the mean difference of the participants who were pre-allocated the XBRL format (0.8034) and HTML format (1.000)[52]. The results indicate that participants in the XBRL groups perceived XBRL format to be highly ease of use. However, their actual performance (cognitive effort) upon using the format in completing the experiment task did not parallel to their high perception of ease of use.

In all cases, participants perceived a greater ease of use than actual ease of use, but this difference is significant only in the case of HTML and XBRL. The results indicate that for PDF participants there was little difference between perceived ease of use and actual cognitive effort. This is evidenced after further analysis, showing that there is no significant difference between the perceived ease of use and the cognitive effort for the participants who were pre-allocated the PDF format (p=0.703).

On the other hand, the participants who were pre-allocated the HTML and the XBRL formats had significant differences between perceived ease of use and cognitive effort (p=0.022 for HTML and p=0.050 for XBRL). This indicates that the perceived ease of use for these presentation formats does not correspond to their actual performance (cognitive effort). The results suggest that participants in the HTML and XBRL groups perceived their respective formats as highly reducing their cognitive effort, but their actual performance does not reflect their perceived ease of use.

[52] The mean difference is the difference between the perceived mean score and the cognitive effort mean score.

Table 7.7
Users' perceptions of ease of use and cognitive effort

Panel A: Descriptive statistics of perceived and cognitive effort

Presentation format perceived/ used in the experiment	Ease of use	Mean	Number of subject	Std. deviation
PDF	Perceived	4.5271	21	1.29082
	Cognitive effort	4.3810	21	1.43095
HTML	Perceived	4.9500	20	0.34393
	Cognitive effort	3.9500	20	1.53811
XBRL	Perceived	4.8986	21	1.22202
	Cognitive effort	4.0952	21	1.33809

Panel B: Paired T-test between perceived ease of use and cognitive effort in each group

Presentation format perceived/ used in the experiment	Paired Differences		T	d.f	Sig.
	Mean	Std. deviation			
PDF	-0.14619	1.73279	-0.387	20	0.703
HTML	-1.00000	1.79810	-2.487	19	0.022
XBRL	-0.80333	1.76395	-2.087	20	0.050

In summary, the results show no significant difference between perceived ease of use and cognitive effort required to complete a task for PDF. However, there is a significant difference between the perception of ease of use of the presentation format and the cognitive effort for HTML and XBRL formats. Therefore, hypothesis 6 is not supported for HTML and XBRL formats but is supported for PDF format.

7.3.5 Perceived usefulness and preferred presentation formats

In this section the results from testing hypothesis 7 are presented. Hypothesis 7 states that *there is no association between users' perceptions of the usefulness of digital presentation formats and their preference of presentation format.*

Preference indicates users' preferred presentation format in performing their investment decision task. Hypothesis 7 was tested using a Chi-square correlation test to determine the association between perceived usefulness and preferred presentation formats.

The participants were asked the perceived usefulness of the presentation formats using a 7-point scale of 1 (strongly disagree) to 7 (strongly agree). The response of each participant on the perceived usefulness of the presentation formats was averaged to obtain an overall score of the presentation formats (refer to Panel A, Table 7.4). As discussed earlier in Section 7.3.3, the overall score for perceived usefulness of each presentation format was compared and a new score was created to represent the most useful of the three presentation formats. This new variable represents the overall perceived usefulness (refer chapter 5).

The participants were also given three options: PDF format, HTML format or XBRL format and were asked to select their most preferred presentation format (refer to Panel D, Table 6.1). The two variables (perceived usefulness and preference of presentation format) were correlated to determine whether there is any association between perceived usefulness and preferred presentation formats.

Table 7.8 presents the results of whether any association exists between participants' perceived usefulness and their preference of presentation formats. The table is divided into two panels. Panel A presents the cross tabulation of participants' perceived usefulness and their preferred presentation formats. Panel B presents the results of a Chi-square test to determine the association between perceived usefulness and preferred presentation formats.

Panel A, Table 7.8 provides the descriptive statistics (cross tabulation) for participants' perceived usefulness and their preference of presentation formats. In general, the results show participants who perceived that a presentation format is useful, tended to prefer that presentation format for performing their future investment decision task. As shown in Panel A, Table 7.6, participants perceiving PDF as most useful prefer to use PDF format (38%) compared to HTML format (13%) and XBRL format (15%) in their investment decision tasks. On the other hand, participants perceiving HTML and XBRL as most useful, tend to prefer HTML (45%) and (84.2%) respectively in performing investment decision tasks.

Panel B, Table 7.8 presents the results showing the association between perceived usefulness and preferred presentation format using a Chi-square correlation test. The results show a significant correlation (r=0.002) between participants' perceived usefulness and their preference of a presentation. The results indicate that participants' preference of a presentation format is influenced by their perceptions of the presentation format. This suggests that users' perception of the usefulness of a presentation format is an important determinant in their preference for a presentation format.

Table 7.8

Users' perception of usefulness and their preference of presentation formats

Panel A: Cross tabulation of perceived usefulness and preference of presentation formats (all participants)

Perceived useful	Preferred presentation format						Total	
	PDF		HTML		XBRL			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
PDF	8	38.1	3	13.6	3	15.8	14	22.6
HTML	5	23.8	10	45.5	0	0	15	24.2
XBRL	8	38.1	9	40.9	16	84.2	33	53.2
	21	100	22	100	19	100	62	100

Panel B: Chi-square test: users' perceptions on usefulness and preferred presentation formats

	Value	Df	Sig. (2-sided)
Pearson Chi-Square	17.072(a)	4	0.002
Likelihood Ratio	20.240	4	0.000
Linear-by-Linear Association	6.874	1	0.009
Number of subjects	62		

In summary, the results do not support the hypothesis that there is no significant relationship between the perceived usefulness of presentation formats and preference of presentation formats. Therefore hypothesis 7 is not supported.

7.3.6 Perceived ease of use and preferred presentation formats

In this section the results from testing hypothesis 8 are reported. Hypothesis 8 states that *there is no association between users' perceptions of the ease of use of digital presentation formats and their preference of presentation format.*

Similar to preference in perceived usefulness, preference indicates users' preferred presentation format in performing their investment decision task. Hypothesis 8 was tested using a Chi-square correlation test to determine the association between perceived ease of use and preferred presentation formats.

To test the hypothesis, the participants were asked their perceived ease of use of the presentation formats using a 7-point scale of 1 (strongly disagree) to 7 (strongly agree). The response of each participant on the perceived ease of use of the presentation formats was averaged to obtain an overall score of the presentation formats (refer to Panel A, Table 7.5). Similar to Section 7.3.5, the overall score for perceived usefulness of each presentation format was compared and a new score was created to represent the format most easy to use (highest mean score) of the three presentation formats. This new variable represents the overall perceived ease of use (refer Chapter 5) which was used to test hypothesis 8.

The participants were also given three options: PDF format, HTML format or XBRL format and were asked to select their most preferred presentation format (refer to Panel D, Table 6.1). The two variables (perceived ease of use and preference of presentation format) were correlated to determine whether there is any association between perceived ease of use and preferred presentation formats.

Table 7.9 presents the results of whether any association exists between participants' perceived ease of use of the presentation format and their preference of presentation formats. The table is divided into two panels. Panel A presents the cross tabulation of participants' perceived ease of use and their preferred presentation formats. Panel B presents the results of a Chi-square test to determine association between perceived ease of use and preferred presentation formats.

Panel A, Table 7.9 provides the descriptive statistics (cross tabulation) for participants' perceived ease of use and their preference of presentation formats. In general, the results show participants who perceived that a presentation format is easy to use, tended to prefer that presentation format for performing their future investment decision task. As shown in

Panel A, Table 7.9, participants perceiving PDF format as the most easy to use prefer to use PDF format (52%) in their investment decision tasks. On the other hand, participants perceiving HTML as the most easy to use, tend to prefer HTML format (36%) in performing investment decision tasks. Similar results occur with XBRL format.

Table 7.9
Users' perceptions of ease of use and their preference of presentation formats

***Panel A*:** Cross tabulation of perceived ease of use and preference of presentation formats (all participants)

Perception ease of use	Preferred presentation format						Total	
	PDF		HTML		XBRL			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
PDF	11	52.4	5	22.7	2	10.5	18	29.0
HTML	4	19.0	8	36.4	2	10.5	14	22.6
XBRL	6	28.6	9	40.9	15	79.0	30	48.4
	21	100	22	100	19	100	62	100

***Panel B*:** Chi-square test: Users' perceptions of ease of use and preferred presentation formats

	Value	df	Sig. (2-sided)
Pearson Chi-Square	15.301(a)	4	0.004
Likelihood Ratio	15.029	4	0.005
Linear-by-Linear Association	11.306	1	0.001
Number of subjects	62		

Panel B, Table 7.9 presents the results that show the association between perceived ease of use and preferred presentation format. The results show a statistically significant correlation (r=0.004) between participants' perceived ease of use of a presentation format and their preference for a particular format. The results indicate that the participants' preference of a presentation format is influenced by their perception of ease of use.

In summary, the results show that there is an association between the perception of ease of use of presentation formats and the preference of presentation formats. Therefore, hypothesis 8 is not supported as there is evidence that users' perceived ease of use is an important criteria used to determine preference of presentation format.

7.4 IMPLICATIONS OF THE MAIN FINDINGS

In this study, users' perceptions of the usefulness and ease of use of different presentation formats in a digital reporting environment were examined. The findings were presented in three parts and the discussion presented below follows the same sequence.

In the first part of the results, an analysis of users' perceived usefulness and perceived ease of use across the presentation formats was reported. On average, most of the participants agreed that the presentation formats in the digital reporting environment are useful and are easy to use. This was reflected in further analysis that showed no significant difference in the users' perceived usefulness and ease of use of the presentation formats. The results found here support previous studies in the information systems literature which report users' perceptions of technologies which have similar purpose are homogenous (Panko, 1983; Paznik, 1987; Straub and Wetherbe, 1989). The results of this study are also consistent with Beattie and Pratt (2003) where their respondents perceived all the digital presentation formats as "fairly useful".

The results showing that users' perceptions of usefulness and ease of use are homogenous across the presentation formats derive from the fact that for a certain period of time, the effect of a few technologies (such as presentation formats) may be consistent (Davis, 1989). However, as time changes, the effect of these technologies may vary (Adams et al., 1992) due to the evolvement of the technologies. Therefore, users' perceptions may also vary across time depending on the change in the nature of the presentation formats.

Finally, the results showing participants did not perceive the presentation formats (in the case of PDF and XBRL) that they used in the experiment higher than other presentation formats suggest that users may be biased or receptive towards certain presentation formats. Such an attitude may be caused either by participants' existing experience with the presentation formats or lack of knowledge on the presentation formats (Davis, 1994). However, the fact that there is no significant difference on the participants' perceptions of the digital presentation formats between the three groups suggests no significant bias was

caused either by existing experience with the presentation formats or by lack of knowledge of the presentation formats. This finding also suggests that even when users are given the opportunity to perform a decision-making task using a new presentation format, they may still perceive another presentation format as better.

In the second part of the results, it was revealed that users' perceived usefulness of presentation formats was reflected in their decision accuracy for HTML and XBRL but not PDF. The results show that there is a marginally significant difference between participants' perceived usefulness and their decision accuracy. This finding is similar to the findings in previous studies (Wright, 1975; Adelbratt and Montgomery, 1980; Davis, 1989; Kleinmuntz and Schkade, 1993). Interestingly, this study found no significant difference between the participants' perceived usefulness and their decision accuracy for HTML and XBRL. These findings do not parallel the findings reported in the psychology and information systems literature, that perception often disagrees with actual performance (Wright, 1975; Adelbratt and Montgomery, 1980; Davis, 1989; Kleinmuntz and Schkade, 1993).

The link between perceived usefulness and decision accuracy could be attributed to factors such as work experience (Adams et al., 1992). For example, half of the participants in this study have more than 10 years of accounting experience (refer to Chapter 6, Section 6.1). Studies have shown that the more experience decision-makers have, the higher possibility there is of them predicting their decision outcome correctly because of their wide and in-depth decision-making knowledge (Vera-Munoz et al.; 2002). This provides some indication that the participants may be able to anticipate their decision outcome with or without reliance on presentation formats even though the results for PDF format show a marginally significant difference between perception and actual performance. In such a situation, their decision outcomes would be similar irrespective of which presentation formats they use.

Participants' perception of ease of use was reflected in the cognitive effort required by participants who were pre-allocated the PDF format. The results indicate that the users who

were pre-allocated the PDF format have perceptions similar to their actual performance for ease of use. Such a result could be derived from their familiarity with PDF for investment decision tasks, as most of the participants may be more familiar with the PDF format. However, this may not be the case for those participants who were pre-allocated the HTML and XBRL formats. The results show that for participants who were pre-allocated the HTML and XBRL formats, perceived ease of use for the HTML and XBRL formats was not reflected in their actual performance (cognitive effort). The participants perceived that using HTML and XBRL formats would require more cognitive effort than they actually required when performing their tasks. This result is similar to Sproull and Kiesier (1986) who found that users tended to over or under estimate the required effort to complete a task.

The results showing a significant difference between perceived ease of use and actual performance (cognitive effort) for HTML and XBRL formats may be attributed to a variety of factors such as experience, type of presentation format used, or other user characteristics which may affect the link between ease of use and cognitive effort, particularly as after a period of time the usage of the presentation format affects the ease of use.

The results discussed above are consistent with those reported in the psychology and information systems literature that subjective measures (perceived usefulness and perceived ease of use) of a technology (such as presentation formats) are often in disagreement with their objective counterparts (decision accuracy and cognitive effort) (Wright, 1975; Adelbratt and Montgomery, 1980; Abelson and Levi, 1985), possibly caused by lack of knowledge or experience with the presentation formats.

This study further examined whether users' perceptions of usefulness and ease of use influences their preference of presentation format. The results show that the link between users' perceived usefulness and perceived ease of use is consistent with the findings from previous studies reported in the information systems literature (Davis, 1989; Subramaniam, 1992; Adams et al., 1992). Adams et al. (1992) indicate that perceived usefulness is related to preference but that perceived ease of use is less important in determining preference to use a technology. However, this study shows that perceived ease of use is almost as equally

important as perceived usefulness when determining preference; a finding which is similar to Davis et al. (1989) and Moore and Benbasat (1991).

The findings in this study also show that, in general, participants who were pre-allocated a particular format in the experiment prefer to use the same presentation format in their investment decision tasks. However, participants who were pre-allocated PDF have equal preference on PDF and XBRL. Table 7.10 presents a summary of the results of objective 2.

Table 7.10
Summary results for objective 2

Hypothesis	Proportion	Outcome
H3	*There are no significant differences in users' perceptions of the usefulness of digital presentation formats.*	Accepted
H4	*There are no significant differences in users' perceptions of the ease of use of digital presentation formats.*	Accepted
H5	*There are no significant differences between users' perceived usefulness of a digital reporting format and the decision accuracy by using such a format.*	Rejected[53]
H6	*There are no significant differences between users' perceived ease of use of a digital reporting format and their cognitive effort required for completion of a decision-making task by using such a format.*	Rejected[54]
H7	*There is no association between users' perceptions of the usefulness of digital presentation formats and their preference of presentation format.*	Rejected
H8	*There is no association between users' perceptions of the ease of use of digital presentation formats and their preference of presentation format.*	Rejected

This study's findings provide some insights to preparers on the selection of presentation formats for presenting their corporate reports to users and their implications for users. In particular, when preparers are deciding which presentation format to adopt, users' perceptions of a particular presentation format would be useful. In addition, users' perceptions could be used by systems designers as feedback on different presentation formats in the digital reporting environment. Therefore, it is essential to create more awareness of the presentation formats available in the digital reporting environment to

[53] Hypothesis 5 was rejected for PDF format.
[54] Hypothesis 6 was rejected for HTML and XBRL formats but not for PDF format.

decision-makers. Users may also equip themselves with more skills, training and knowledge on the potential benefits of digital presentation formats in order to maximise their decision-making performance.

The implementation of XBRL in New Zealand firms has not been vigorously imposed due to lack of support from firms, for reasons such as the imposition of cost. However, the fact that all participants perceived XBRL as the most useful and easy to use is an interesting result for XBRL developers. The results could provide an indication to preparers and users of the potential benefits of XBRL and, as a consequence, lead to a demand for the adoption of XBRL. This demand would definitely lead to the success of firms supplying financial information using XBRL in the digital reporting environment.

7.5 SUMMARY AND CONCLUSION

In this chapter the results of objective 2 in this study were presented. The results found in this study also demonstrate that professional decision-makers' perceptions are different to their actual performance for certain formats, indicating that related parties need to provide more information and exposure to this group of people concerning how these presentation formats could benefit them in terms of effort. Consequently, the professional decision-makers' perceptions seem to be the important determinant in their preference for a presentation format. This study also found that the professional decision-makers' perceptions may not necessary parallel to their actual performance.

In summary, the findings of this study provide useful insights on users' perceptions, performances and preferences on the digital presentation formats. Such results provide a holistic and comprehensive view of the importance of perceptions and the effect of presentation format on decision-makers' performance. This is particularly relevant if more advanced forms of digital reporting are to be encouraged - there is also the need for users to be made more aware of the benefits to be gained from the different forms of presentation.

The next chapter provides the results of objective 3, digital presentation formats and information processing in the context of recognition versus disclosure and its implications.

CHAPTER EIGHT

RESULTS AND DISCUSSION
DIGITAL PRESENTATION FORMATS AND COGNITIVE INFORMATION PROCESSING IN THE CONTEXT OF RECOGNITION VERSUS DISCLOSURE

8.1 INTRODUCTION

This chapter presents the results of objective 3 and discusses their implications. Objective 3 assesses whether digital presentation formats affect cognitive information processing in the context of recognition versus disclosure. Section 8.2 provides the results of a manipulation check. Section 8.3 provides the results of testing the effect of presentation formats on the four information processing stages: information acquisition, evaluation, weighting and judgment in the context of recognition versus disclosure. Section 8.4 provides the implications of the main findings. This chapter is summarised and concluded in Section 8.5.

8.2 MANIPULATION CHECK

This study focuses on the effect of presentation formats on information processing in recognition versus disclosure situations. Four hypotheses were developed (hypotheses 9 to 12). Before testing hypotheses 9 to 12, a manipulation check was conducted to assess that the results of the experiment can be attributed to the impact of the presentation formats on information processing in recognition versus disclosure situations, and not to the decision-makers' ability to recall information (working memory capacity). Working memory is the "workspace" within memory, separate from long-term memory, responsible for temporary storage and information processing (Roberts, 2002). Studies have suggested that working memory capacity differs among decision-makers (Baddeley, 1992; Engle, 1996). Therefore,

a manipulation check is necessary to ensure that the results of the experiment would not be affected significantly by the decision-makers' differences in working memory capacity.

The manipulation check was performed by requesting the participants to identify the model adopted by Firm A and Firm B in the post experiment questionnaire. The participants were not allowed to view the webpage after they had completed the experiment exercise. The manipulation check, adapted from Hodge et al. (2002), examines the accuracy of the participants in identifying the model adopted by the two firms within the recognition and disclosure situations in the experiment. Within each situation, if the results show significant differences in model identification among the participants, this indicates that the participants' working memory capacities differ significantly. For example, if the results show significant differences in model identification within the recognition group where both firms adopt the same model for accounting of investment property, the results indicate that the presentation format and/or participants' working memory capacities affect the model identification. If the results show no significant differences, that would indicate either that the presentation formats do not affect the model identification or there are no significant differences in participants' working memory capacities. A new variable, model identification, was created to code whether the participants correctly identified the model adopted by the two firms.

Table 8.1 presents the results of the manipulation check using Multinomial logistic regression analysis. The table is divided into six panels. Panel A presents the descriptive statistics of the presentation formats and model identification in a recognition situation. Panel B presents the results of testing significant differences between the presentation formats in a recognition situation. Panel C provides the descriptive statistics of the presentation formats and model identification in a disclosure situation. Panel D presents the results of testing significant differences between the presentation formats in the disclosure situation. Panel E presents the descriptive statistics of presentation formats and model identification. Panel F presents the results from testing for significant differences between the presentation formats in general.

Panel A, Table 8.1, provides the descriptive statistics of the participants' accuracy in identifying information related to investment property in a recognition situation. The results show that more participants in the XBRL format managed to identify the model adopted by Firm A and Firm B correctly (40%), followed by the participants in the HTML format (33%) and PDF format (27%). The results in Panel B, Table 8.1, shows that the participants' accuracy in identifying the model adopted by Firm A and Firm B (both firms adopted the Fair value model) do not differ significantly between PDF, HTML and XBRL formats in the recognition situation (p=0.549).

Panel C, Table 8.1, provides the descriptive statistics of the participants' accuracy in identifying information related to investment property in a disclosure situation. The results show that more participants in the XBRL format managed to identify the model adopted by Firm A and Firm B correctly (45%), followed by the participants in the HTML format (27%) and PDF format (27%). The results in Panel D, Table 8.2, show that the participants' accuracy in identifying the model adopted by Firm A and Firm B (Firm A adopted the Fair value model and Firm B adopted the Cost model) do not differ significantly between the presentation formats in the disclosure situation.

Since the results presented above may also examine the influence of presentation formats rather than participants' working memory capacities, a further analysis was conducted to ensure that the results above assess participants' working memory capacities. This was done by examining the proportion of participants who correctly identified the model adopted by both firms between the presentation formats without taking into account recognition and disclosure situations. If the results show no significant differences, this would indicate that presentation formats in general do not affect participants' model identification. Hence the results above test working memory capacity. The results of testing presentation formats and model identification in general would lend support to results in Panel A to D, Table 8.1, that indicate there are no significant differences between the participants' working memory capacities.

Table 8.1
Manipulation check

***Panel A*:** Descriptive statistics (presentation formats in recognition situation)

Information acquisition	Presentation format					
	PDF		HTML		XBRL	
	N	Percent	N	Percent	N	Percent
Correctly Identify Model	4	26.7	5	33.3	6	40.0
Incorrectly Identify Model	7	43.7	5	31.3	4	25.0
Total	11	35.4	10	32.3	10	32.3

***Panel B*:** Multinomial logistic regression (presentation formats in recognition situation)

	Model fitting criteria	Likelihood ratio tests		
Effect	-2LL	Df	x^2	Sig.
Presentation format	9.592	2	1.199	0.549

***Panel C*:** Descriptive statistics (presentation formats in disclosure situation)

Information acquisition	Presentation format					
	PDF		HTML		XBRL	
	N	Percent	N	Percent	N	Percent
Correctly Identify Model	3	27.3	3	27.3	5	45.4
Incorrectly Identify Model	7	35.0	7	35.0	6	30.0
Total	10	32.2	10	32.2	11	35.6

***Panel D*:** Multinomial logistic regression (presentation formats in disclosure situation)

	Model fitting criteria	Likelihood ratio tests		
Effect	-2LL	Df	x^2	Sig.
Presentation format	8.903	2	0.731	0.694

***Panel E*:** Descriptive statistics (presentation format and model identification)

Information acquisition	Presentation format					
	PDF		HTML		XBRL	
	N	Percent	N	Percent	N	Percent
Correctly Identify Model	7	26.9	8	30.7	11	42.4
Incorrectly Identify Model	14	38.9	12	33.3	10	28.8
Total	21	33.8	20	32.4	21	33.8

***Panel F*:** Multinomial logistic regression (presentation formats)

	Model fitting criteria	Likelihood ratio tests		
Effect	-2LL	Df	x^2	Sig.
Presentation format	11.968	2	1.612	0.447

Panel E, Table 8.1, presents the descriptive statistics of the participants' model identification. The results show that more participants who were in the XBRL group correctly identified the model adopted by the two firms (42.4%) compared to the participants in the PDF (26.9%) and HTML (30.7%) groups. However, the results in Panel F, Table 8.1, indicate that the proportion of participants who correctly identified the model adopted by both firms does not differ significantly between the presentation formats (p=0.447). Therefore, these results support the results in Panel B and Panel D, Table 8.1, which indicate that it is unlikely that the results of testing hypotheses 9 to 12 were caused by differences in each participant's ability to recall information.

8.3 PRESENTATION FORMATS AND COGNITIVE INFORMATION PROCESSING

This section provides the results of testing four hypotheses (hypotheses 9 to 12) on cognitive information processing in the context of recognition versus disclosure. The four hypotheses relate to four cognitive information processing stages identified by Hogarth (1980): information acquisition, information evaluation, information weighting and judgment (making an investment decision).

8.3.1 Information acquisition

This section presents the results of testing hypothesis 9. Hypothesis 9 states that *the digital presentation formats do not impact upon decision-makers' information acquisition in recognition versus disclosure situations.*

Information acquisition is tested by assessing whether participants could identify the model adopted by Firm A and Firm B. Multinomial logistic regression analysis was used to determine the effect of presentation formats on information acquisition in recognition versus disclosure situations. Multinomial logistic regression was used because: the dependent variable (information acquisition) is categorical in nature; there was a need for interaction between the independent variables (presentation format and placement of

information); it was not necessary to create a dummy variable; and, covariate control variables could be included (Inc SPSS, 2005).

As explained in Chapter 5, the research design comprises two groups: the recognition group and the disclosure group (refer to Figure 5.2). In the recognition group, both firms (Firm A and Firm B) adopted the same model (the Fair value model) for accounting for investment property, whereas in the disclosure group different accounting models (the Fair value model for Firm A and the Cost model for Firm B) for investment property were adopted (refer Table 5.1). If the participants in the disclosure group managed to identify the model adopted by both firms, this indicated that the presentation formats had reduced functional fixation (caused by placement of information) in information acquisition (Hodge et al., 2004). Therefore, the percentage of correct model identifications in the disclosure group would be similar to the percentage in the recognition group.

Table 8.1 presents the results of testing the effect of presentation formats on information acquisition in recognition versus disclosure situations. The table is divided into two panels. Panel A presents the descriptive statistics of information acquisition. Panel B provides the results of Multinomial logistic regression that tests the likelihood of significant differences in information acquisition between presentation formats in recognition versus disclosure situations.

Between the recognition and disclosure groups (refer to Figure 5.2), the results show that 48% of the recognition group and 35% of the disclosure group correctly identified the model adopted as shown in Panel A, Table 8.2. The results indicate that more participants in the recognition group managed to identify the model adopted by Firm A and Firm B compared to the participants in the disclosure group. Panel B of Table 8.2, however, shows that the effect of placement of information on information acquisition is not significant (p=0.273).

Panel A of Table 8.2 shows that more participants in the XBRL groups managed to identify the model adopted in both firms correctly (52%), compared to those in the PDF (40%) and

the HTML groups (33%). However, the p value of 0.417 in Panel B, Table 8.2, indicates that the effect of presentation formats on information acquisition do not differ significantly.

Table 8.2
Effect of presentation formats and recognition versus disclosure on decision-makers' acquisition

Panel A: Descriptive statistics of information acquisition

		Identify Model B			
Format	Group	Correctly	Percent	Incorrectly	Percent
PDF	Recognition	4	36.36	7	63.64
	Disclosure	3	30.00	7	70.00
	Total	7	33.33	14	66.67
HTML	Recognition	5	50.00	5	50.00
	Disclosure	3	30.00	7	70.00
	Total	8	40.00	12	60.00
XBRL	Recognition	6	60.00	4	40.00
	Disclosure	5	45.45	6	54.54
	Total	11	52.38	10	47.62
Total	Recognition	15	48.39	16	51.61
	Disclosure	11	35.48	20	64.52

Panel B: Multinomial logistic regression[55]

	Model fitting criteria	Likelihood ratio tests		
Effect	-2LL	Df	x^2	Sig.
Presentation	18.495	2	1.751	0.417
Recognition versus disclosure	17.946	1	1.202	0.273
Presentation x Recognition versus disclosure	16.744	2	0.180	0.914

Panel A, Table 8.2, presents the results of testing the interaction between presentation formats and placement of information on information acquisition. The results show that the percentage difference between the) recognition group and the disclosure group that managed to identify the model correctly is the least in the PDF groups (6.36%), compared to the XBRL (14.55%) and HTML (20%) groups. The results indicate that participants' information acquisition is less influenced by the differences in placement of information

[55] The results combined two tables: the main effect of independent variables and the interaction between the independent variables. The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

when the financial information is presented in PDF format, compared to the HTML and XBRL formats. However, as shown in Panel B, Table 8.2, the results show that the interaction of presentation formats and placement of information on information acquisition does not differ significantly (p=0.914).

To assess whether the results above have been influenced by other factors such as the participants' characteristics (work experience and familiarity with presentation format), covariates were also included subsequently to determine their importance to information acquisition.

Table 8.3 presents the results of the interaction of presentation formats and placement of information on information acquisition, controlling for work experience and familiarity with presentation format. The results indicate that work experience and familiarity with presentation format are not important covariates (p=0.403 and p=0.864). These results further indicate that hypothesis 9 should not be rejected.

Table 8.3
Work experience and familiarity with presentation format in information acquisition

Multinomial logistic regression

	Model fitting criteria	Likelihood ratio tests		
Effect	-2LL	Df	x^2	Sig.
Work experience	77.145	1	0.700	0.403
Familiar with presentation format	76.474	1	0.029	0.864
Presentation x Recognition versus disclosure	79.480	5	3.035	0.695

In summary, the results indicate that functional fixation does not exist in the information acquisition stage, nor is there an effect of presentation formats on information acquisition. Further analysis shows that the interaction between presentation formats and placement of information has no effect on functional fixation significantly. Finally, work experience and familiarity with presentation format does not influence the effect of presentation formats on information acquisition in recognition versus disclosure situations. Therefore, hypothesis 9 is accepted.

8.3.2 Information evaluation

In this section the results from testing hypothesis 10 are presented. Hypothesis 10 states that *the digital presentation formats do not impact upon decision-makers' information evaluation in recognition versus disclosure situations.*

Information evaluation is tested by assessing whether participants have evaluated the information related to investment property in their evaluation. Multinomial logistic regression[56] was used to determine the effect of presentation formats on information evaluation in recognition versus disclosure situations.

The post experiment questionnaire includes a question which requests the participants to state 'yes' or 'no' on whether they evaluated the investment property information for Firm A and Firm B. The information item is the investment property which is included in the Statement of Financial Position and the income from the difference of Fair value and Cost value which is included in the Statement of Financial Performance for Firm A. For Firm B, the investment property is included in the Statement of Financial Position and the income from the difference of Fair value and the Cost value is presented in the Notes to the Accounts. A new variable was created to code the participants' responses on the evaluation of the information item related to investment property in Firm A and Firm B, which became the dependent measure to test hypothesis 10.

Table 8.4 presents the results of testing the effect of presentation formats on information evaluation in recognition versus disclosure situations. The table is divided into two panels. Panel A presents the descriptive statistics of information evaluation. Panel B provides the results of Multinomial logistic regression that tests the likelihood of significant differences in information evaluation between presentation formats in recognition versus disclosure situations.

[56] Multinomial logistic regression was used to examine hypothesis 10 for the following reasons: the nature of the dependent variable is dichotomous; there was a need for interaction between the independent variables; a dummy variable did not have to be used; and, covariate control variables were included.

Panel A of Table 8.4 shows that 58% of the recognition group and 42% of the disclosure group evaluated the information item related to investment property. The results indicate that irrespective of which format the participants were pre-allocated, the proportion of participants in the disclosure group that evaluated the information item related to investment property is less than the proportion of participants in the recognition group. However, the results in Panel B, Table 8.4, show that the effect of placement of information on information evaluation is not significant (p=0.146).

Table 8.4
The effect of presentation formats and recognition versus disclosure on decision-makers' evaluation

Panel A: Descriptive statistics of information evaluation

		Evaluate information related to investment property			
Format	Group	Yes	Percent	No	Percent
PDF	Recognition	4	36.36	7	63.64
	Disclosure	2	20.00	8	80.00
	Total	6	28.57	15	71.43
HTML	Recognition	7	70.00	3	30.00
	Disclosure	4	40.00	6	60.00
	Total	11	55.00	9	45.00
XBRL	Recognition	7	70.00	3	30.00
	Disclosure	7	63.64	4	36.36
	Total	14	66.67	7	33.33
Total	Recognition	18	58.06	13	41.94
	Disclosure	13	41.94	18	58.06

Panel B: Multinomial logistic regression[57]

	Model fitting criteria	Likelihood ratio tests		
Effect	-2LL	χ^2	Df.	Sig.
Presentation	23.676	7.053	2	0.029
Recognition versus disclosure	18.733	2.110	1	0.146
Presentation x Recognition versus disclosure	16.623	0.533	2	0.766

Panel B, Table 8.4, shows that more participants in the XBRL groups evaluated the information item related to investment property (67%) compared to those in the PDF (29%) and HTML (55%) groups. The results indicate that the use of XBRL format was more

[57] The results combined two tables: the main effect of independent variables and the interaction between the independent variables.

likely to lead participants to evaluate the information item, than the use of PDF or HTML formats. The p value of 0.029 indicates that there are significant differences between the presentation formats on information evaluation.

Panel A, Table 8.4, presents the results of testing the interaction between presentation formats and placement of information on information evaluation. The results show that the percentage difference between the recognition group and the disclosure group for participants using XBRL format is the least (6%), compared to participants using PDF (16%) or HTML (30%) formats in information evaluation. The results indicate that the use of XBRL format was more likely to lead participants to evaluate the information item in recognition versus disclosure situations, than the use of PDF or HTML formats. However, the effect of presentation formats and placement of information on information evaluation is not significant (p=0.766).

Covariates for work experience and familiarity with presentation format were also included subsequently to determine their importance to information evaluation. Table 8.5 shows that familiarity with presentation format is a marginally important covariate for information evaluation (p=0.097). The results indicate that the effect of presentation formats and their interaction with placement of information is less significant (p=0.126) when accounted for by familiarity with presentation format. This indicates that familiarity with the presentation format influences the effectiveness of the presentation formats in information evaluation in recognition versus disclosure situations. However, work experience is not a significant covariate (p=0.958). These results indicate that the effect of presentation formats on information evaluation in recognition versus disclosure was not influenced by work experience. These results further indicate that hypothesis 10 is not rejected.

In summary, the results indicate that functional fixation does not exist in the information evaluation. However, presentation formats affect information evaluation. Further analysis shows that the interaction between presentation formats and placement of information has no significant effect on information evaluation. Finally, familiarity with presentation format does influence the effect of the presentation formats on information evaluation in

recognition versus disclosure situations. Work experience does not have a significant effect. Therefore, hypothesis 10 is accepted.

Table 8.5
Work experience and familiarity with presentation format in information evaluation

Multinomial logistic regression

	Model fitting criteria	Likelihood ratio tests		
Effect	-2LL	χ^2	Df.	Sig.
Work experience	67.062	0.003	1	0.958
Familiar with presentation format	69.810	2.751	1	0.097
Presentation x Recognition versus disclosure	75.660	8.601	5	0.126

8.3.3 Information weighting

In this section hypothesis 11 is tested. Hypothesis 11 states that *there is no significant difference in the effect of digital presentation formats on decision-makers' information weighting in recognition versus disclosure situations.*

Information weighting is tested by assessing participants' decisions to include or exclude the information item related to investment property in their analysis. If the participants weigh the information as very important, then they would include the related information item in their analysis. If they do not weigh the related information item as important, then their analysis would exclude the information item. UNIANOVA was used.

As explained in Chapter 5, weighting was measured by the difference of the sum totals of ratios for Firm A and Firm B for the recognition group and the sum totals of ratios of Firm A and Firm B for the disclosure group. If both recognition and disclosure groups gave the same weight to information related to investment property, then the difference of the sum totals of Firm A and Firm B between the recognition group and the disclosure group would be 0. The larger the variance of the difference of the sum total of the two firms between the recognition group and the disclosure group, the stronger the indication that more participants in the disclosure group did not provide the same weight to the investment property item as the recognition group.

Table 8.6 presents the results of testing the effect of presentation formats on information weighting in recognition versus disclosure situations. The table is divided into two panels. Panel A presents the descriptive statistics of information weighting. Panel B provides the results of a UNIANOVA that test for significant differences in information weighting between presentation formats in recognition versus disclosure situations.

Panel A of Table 8.6 shows that comparing the recognition versus disclosure groups, participants in the recognition group had a mean sum total of 10.0823, whereas those in the disclosure group had a mean sum of 9.5058, resulting in a mean sum total difference of 0.5765. However, Panel B, Table 8.6, shows that the difference is not significant (p=0.666).

Between presentation formats, the results show that there is an effect of presentation formats in the information weighting. When considering the weighting means sum total of the three presentation formats in Panel A, Table 8.6, it appears that the participants in the PDF groups obtained a mean sum total of 8.4662, the HTML groups a mean sum total of 8.9100, and the XBRL groups, 11.9638. However, the results in Panel B, Table 8.6, show that the effect of presentation formats in decision-makers' weighting is not significant (p=0.138).

Panel A, Table 8.6, presents the results of testing the interaction of presentation formats and placement of information on information weighting. The results show that the mean difference of weighting between the HTML recognition groups and the HTML disclosure groups is the least (0.132), compared to the recognition and disclosure participants in the PDF groups (0.9943) and the XBRL groups (2.9079). This indicates that the participants in the HTML groups gave similar weightings by placing Firm A and Firm B at par, compared to the PDF and XBRL groups. However, the results in Panel B, Table 8.6, show no significant difference in the effect of presentation formats on information weighting in recognition versus disclosure situations (p=0.578).

Table 8.6
Effect of presentation formats and recognition versus disclosure on decision-makers' weighting

Panel A: Descriptive statistics of information weighting

Format	Group	Number of subjects	Mean	Std. Deviation
PDF	Recognition	11	7.9927	3.60458
	Disclosure	10	8.9870	4.95411
	Total	21	8.4662	4.21899
HTML	Recognition	10	8.9760	3.08310
	Disclosure	10	8.8440	2.32583
	Total	20	8.9100	2.65887
XBRL	Recognition	10	13.4870	12.23956
	Disclosure	11	10.5791	5.47105
	Total	21	11.9638	9.19749
Total	Recognition	31	10.0823	7.61562
	Disclosure	31	9.5058	4.42960
		62	9.7940	6.18528

Panel B: UNIANOVA

Source of variance	Df	F	Sig.
Presentation	2	2.051	0.138
Recognition versus disclosure	1	0.189	0.666
Presentation x Recognition versus disclosure	2	0.554	0.578

Similar to the analysis for information acquisition and evaluation, covariates were included subsequently to assess their importance in information weighting. Table 8.7 presents the results of testing the impact of presentation formats and their interaction with placement of information on information weighting, controlling for work experience and familiarity with presentation format.

The ANCOVA results in Table 8.7 show that work experience and familiarity with presentation format are not important covariates in information weighting (p=0.520 and p=0.867). These results support the acceptance of hypotheses 11 that digital presentation formats do not impact on information weighting in recognition versus disclosure situations.

In summary, the results indicate that participants did not incur functional fixation in the information weighting stage. Further, presentation formats do not impact on information weighting. Further analysis shows that the interaction of presentation formats and

placement of information does not have a significant effect on information weighting. Finally, work experience and familiarity with presentation format does not influence the effect of the presentation formats on information weighting in recognition versus disclosure situations. Therefore, hypothesis 11 is accepted.

Table 8.7
Work experience and familiarity with presentation format in information weighting.

ANCOVA

Source of variance	Sum of squares	d.f	Mean square	F	Sig.
Experience	16.451	1	16.451	0.429	0.520
Familiarity	1.101	1	1.101	0.028	0.867
Presentation Format x Recognition versus disclosure	42.544	2	21.272	0.543	0.584

8.3.4 Judgment on investment decisions

In this section hypothesis 12 is tested. Hypothesis 12 states that *there is no significant difference in the effect of digital presentation formats on decision-makers' judgment in investment decisions in recognition versus disclosure situations.*

Judgment is tested by assessing participants' percentage of investment in Firm B[58]. UNIANOVA was used to determine the effect of presentation formats on judgment in recognition versus disclosure situations.

As provided in Chapter 5, (Table 5.1), in the recognition group, Firm A and Firm B adopted the same model (Fair value model) and in the disclosure group, the two firms adopted different models (Firm A adopts the Fair value model and Firm B adopts the Cost model). If the participants in the disclosure group adjust for the difference in the model and place the two firms at par, then their investment should favour Firm B[59]. Therefore, the

[58] This choice to use the percentage of investment in Firm B as a dependent measure is the same as in Hodge et al. (2002; 2004).
[59] The participants may also place both firms at par using the Cost model. However, because the information related to Firm A does not include information on the cost value of the investment property in the balance sheet, the participants were not able to put both firms at par using the Cost model as they were requested to rely solely on the information provided in the experiment material. The cost value of the investment property is intentionally left out to lead the participants to put both firms at par using the Fair value model.

percentage investment in Firm B would be higher than the percentage investment in Firm A.

Table 8.8 presents the results of testing the effect of presentation formats on judgment in recognition versus disclosure situations. The table is divided into two panels. Panel A presents the descriptive statistics of judgment. Panel B provides the results of a UNIANOVA that test for significant differences in judgment between presentation formats in recognition versus disclosure situations.

Between the recognition and disclosure groups, Panel A, Table 8.8, shows that the mean investment decision in Firm B for participants in the recognition groups is 61%, which represents the investment decision when the two firms were placed at par. The participants in the disclosure groups reported the mean investment decision in Firm B at 40%. The mean difference between the recognition group and the disclosure group in judgment suggests that the participants in the disclosure group did not place the two firms at par and therefore, decided to invest more in Firm A. The results in Panel B of Table 8.8 show a significant difference in the effect of placement of information on decision-makers' judgment (p=0.001), suggesting the existence of functional fixation.

Panel A, Table 8.8, shows that participants in the PDF groups invested 36% of their $10,000 in Firm B, whereas participants in the HTML and XBRL groups invested 37% and 47% percent respectively of their $10,000 in Firm B. This indicates that the participants in the XBRL group appear to have invested more in Firm B compared to the participants in the PDF and HTML groups. However, the results presented in Panel B, Table 8.8, show there is no significant difference in the effect of presentation formats on judgment (p=0.492).

Panel A, Table 8.8, shows that the mean difference in judgment between the participants in the PDF recognition and PDF disclosure groups is 18%. The mean difference in judgment between the participants in the XBRL recognition and XBRL disclosure groups is 20%. The mean difference in investment decisions in the HTML recognition and HTML disclosure groups is much greater, at 30%, than for the other groups. The results indicate

that more participants in the HTML group did not place the two firms at par and therefore, placed more investment in Firm A. However, as shown in Panel B, Table 8.8, there is no significant difference in effect of the presentation formats in judgment of investment decision (p=0.485).

Table 8.8
Effect of presentation formats on decision-makers' investment decision

Panel A: Descriptive statistics

Format	Group	Number of subjects	Decision Mean	Std. Deviation
PDF	Recognition	11	54.4545	26.31108
	Disclosure	10	36.0000	26.43651
	Total	21	46.1905	27.56378
HTML	Recognition	10	67.5000	14.95363
	Disclosure	10	37.0000	21.10819
	Total	20	52.2500	23.70182
XBRL	Recognition	10	60.4000	24.82024
	Disclosure	11	47.2727	23.06118
	Total	21	53.5238	24.25411
Total	Recognition	31	60.9355	22.54172
	Disclosure	31	40.3226	23.41422
		62	50.6290	25.04961

Panel B: UNIANOVA

Source of variance	Df	F	Sig.
Presentation	2	0.718	0.492
Recognition versus disclosure	1	12.725	0.001
Presentation x Recognition versus disclosure	2	0.733	0.485

Covariates were included subsequently to determine whether they were important to information weighting. Table 8.9 presents the results of testing the impact of presentation formats and their interaction with placement of information on investment decisions, controlling for work experience and familiarity with a presentation format.

The ANCOVA results in Table 8.9 show that controlling for work experience and familiarity with presentation format, work experience is a marginally important covariate in investment decisions (p=0.097). This indicates that when participants have more working experience in investment decisions, the impact of presentation formats on investment decisions in recognition versus disclosure situations is less significant. The results,

however, found that familiarity with presentation format is not an important covariate (p=0.973). The results indicate that the interaction of presentation formats and placement of information on judgment would not be influenced by familiarity with presentation format.

Table 8.9
Work experience and familiarity with presentation format in investment decision

ANCOVA

Source of variance	Sum of squares	d.f	Mean square	F	Sig.
Experience	1510.364	1	1510.364	2.853	0.097
Familiarity	0.600	1	0.600	0.001	0.973
Presentation format x Recognition versus disclosure	815.299	2	407.649	0.770	0.468

In summary, the results indicate that functional fixation does exist in judgment. However, the effect of presentation formats on judgment is not significant. Further analysis shows that the interaction of presentation formats and placement of information has no effect on judgment, suggesting that presentation formats could not reduce functional fixation. Finally, work experience does influence the effect of the presentation format on judgment in recognition versus disclosure situations, but not familiarity with presentation format. Therefore, hypothesis 12 is accepted.

8.4 IMPLICATIONS OF THE MAIN FINDINGS

In this study the effect of presentation formats and their interaction with placement of information (recognition versus disclosure) on decision-makers' acquisition, evaluation, weighting and investment decisions, was examined. A discussion of the main findings is presented below.

The first part of the results establishes whether functional fixation caused by placement of information exists in information processing stages. The results show no significant effect from placement of information on information acquisition, information evaluation and information weighting. This indicates that functional fixation does not exist in the information acquisition, information evaluation and information weighting stages. The results of this study parallel the results in Wilkins and Zimmer (1983) in which no evidence

was provided that different accounting methods affect bankers' assessments. Similar results also appear in Maines and McDaniel (2000) where they found placement of information either in the Statement of Comprehensive Income or Statement of Stockholders' Equity does not affect their information acquisition. Hence, the results in this study could not support the results in previous studies that functional fixation often exists in a situation of recognition versus disclosure (such as in Hopkins, 1996; Hirst and Hopkins, 1998; Luft and Shields, 2001; Hodge et al., 2004).

One possible reason for the results not supporting those found in previous studies, where the existence of functional fixation in a recognition versus disclosure situation was established, could be the sample used in this study. For example, Hodge et al. (2004) used students as proxies for actual decision-makers whereas in this study actual decision-makers were used, public accounting practitioners. Public accounting practitioners may often be guided and updated with the review of the New Zealand International Accounting Standards (NZ-IAS), thus enabling them not to be influenced by placement of information when acquiring, evaluating and weighting information. Hence, placement of information could not significantly affect information acquisition, information evaluation and information weighting. This argument is consistent with Wilkins and Zimmer (1983) where their participants' assessments (bankers) were not affected by alternative accounting methods.

However, when it comes to making investment decisions, the decision-makers are influenced by the placement of information, and such decisions are possibly made under the influence of other human factors, such as intuition (Ijiri et al., 1966). Looking at the results, there is an observed effect due to the placement of information when participants undertook an investment decision. It is shown that when making an investment decision, professional decision-makers tend to include an information item related to investment property only when the information item is recognised in the Statement of Financial Performance, rather than when the information item is disclosed in explanatory notes (Notes to the Accounts). This finding is consistent with previous studies suggesting placement of information plays an important role in influencing decision-makers' decisions (Harper et al., 1987, 1991;

Bernard and Schipper, 1994; Hopkins, 1996; Hirst and Hopkins, 1998; Maines and McDaniel, 2000).

The results noted above could also be attributed by decision-makers' work experience. Studies have shown that functional fixation exists in professional decision-makers (Hopkins, 1996; Hirst and Hopkins, 1998; Hopkins et al., 2000). Although they do not exhibit functional fixation in the early stages of information acquisition, evaluation and weighting, at the point when they need to decide which investment to make, they make a decision based on their experience in which they normally give importance to information items based on placement of information (Libby et al., 2002; Dearman and Shield, 2005).

Another possible influence on the results is that the experiment exercise involved in this study concerns information on investment property which is not related to a core-business activity. Because non-core activity is less important to a firm's valuation (Maines and McDaniel), this might lead the participants to exclude such information in their investment decisions even though they have acquired, evaluated and/or weighted the information. Certainly, some studies have shown that decision-makers tend to include an information item that is related to a core business activity regardless of the placement of the information, and exclude an information item that is a non-core business activity since it is considered less important for an investment decision (Petroni and Wahlen, 1995; Lipe, 1998; Hirst and Hopkins, 1998; Dhaliwal et al., 1999; Maines and McDaniel, 2000).

This study then examined whether there was an effect from presentation formats in the information processing stages. The results show no significant effect of the presentation formats on information acquisition, information weighting and investment decision. The results however, lend support to an effect of the presentation formats on information evaluation. The results suggest that presentation formats could at least help to alleviate some cognitive processing difficulties by leading decision-makers to evaluate certain information items. The findings are consistent with those of previous studies reporting that presentation formats could somewhat influence decision-makers' evaluations (Lusk and Kersnick, 1979; Vessey, 1994).

One reason to these results is that participants may have become too complacent with the presentation format and ignored the importance of the information item despite acquiring the information. Users tend to become more careful when they are faced with new circumstances or a new technology, such as a presentation format, and become too complacent with a presentation format that they are familiar with. This argument is consistent with Wilson and Zigurs (1999) who found their participants had no difference in task performance when using formats that they were familiar with.

Finally, in testing the hypothesis for objective 3, which is to examine whether there is an effect of digital presentation formats on information processing stages in a recognition versus disclosure situation, the results do not provide significant evidence that presentation formats impact on any of the information processing stages in the context of recognition versus disclosure. Particularly in the investment decision stage where functional fixation exists (refer earlier paragraphs), the findings suggest that presentation formats alone could not impact on functional fixation (caused by recognition versus disclosure) in an investment decision. This study supports the findings of Luft and Shields (2001) that external aids (presentation formats in the context of this study) could not impact on functional fixation caused by placement of information, because accounting itself would affect the allocation of people's attention and influence the effectiveness of the decision aids; functional fixation would continue to exist.

The results in this study fail to support the results found in Hodge et al. (2004) which could be attributed to the information item chosen in this study. This study used an investment property setting which has received the least attention from researchers (Paraditsmanont, 2002), compared to the setting used by Hodge et al. (2004). Hodge et al. (2004) used the context of accounting for stock option compensation, which has been a recent topical issue with wide coverage in the professional and academic literature. The results of this study raise the issue of whether presentation formats could actually alleviate functional fixation in information processing in general.

Another possible reason is that the effectiveness of the presentation formats may depend on the decision-makers themselves. The expectation that presentation formats alone could impact on functional fixation is not supported could be caused by other contributing factors. In this study, 2 moderating variables were included: work experience and familiarity with the presentation format. The results shows that work experience is an important factor in influencing the effectiveness of the presentation formats in reducing functional fixation in judgment of investment decisions (Refer Table 8.8). This finding is supported by previous studies in the decision aid literature on the effects of experience on decision-makers' judgment in the presence of decision aids (Arkes et al., 1986; Eining et al., 1994).

The ANCOVA results show that familiarity with presentation format affects the effectiveness of presentation formats on information evaluation (refer Table 8.4). In other words, participants that are familiar with the presentation format used to perform an investment task would reduce the effectiveness of the presentation formats in information evaluation, hence, resulting in less difference between the presentation formats. The result suggesting that familiarity with presentation format would dilute the effect of presentation format on task performance, consistent with Wilson and Zigurs (1991) that found two groups of participants who were familiar with the presentation formats have no significant difference in their task performance.

Surprisingly, the result shows that most of the participants who were pre-allocated the PDF format decided not to evaluate the information item related to investment property, indicating that in their opinion, information related to investment property is not important for an investment task. Table 8.10 presents a summary of the results on the effectiveness of presentation formats on cognitive information processing in recognition versus disclosure situations.

The findings in this section provide insights for preparers and system designers; presentation formats is not the sole potential solution to assist decision-makers in alleviating functional fixation. Although one part of the findings shown that presentation formats could lead decision-makers to evaluate an information item placed differently in

two financial reports, the influence of the placement of information outweighs the influence of the presentation formats, causing the decision-makers to make an investment decision due to the accounting itself, giving rise to functional fixation. Therefore, preparers and system designers should not expend too much effort in improving presentation formats for such a purpose.

Table 8.10
Summary results for objective 3

Hypothesis	Proposition	Outcome
H9	*The digital presentation formats do not impact upon decision-makers' information acquisition in recognition versus disclosure situations.*	Accepted
H10	*The digital presentation formats do not impact upon decision-makers' information evaluations in recognition versus disclosure situations.*	Accepted
H11	*There is no significant difference in the effect of digital presentation formats on decision-makers' information weighting in recognition versus disclosure situations.*	Accepted
H12	*There is no significant difference in the effect of digital presentation formats on decision-makers' judgments in investment decisions in recognition versus disclosure situations.*	Accepted

8.5 SUMMARY AND CONCLUSION

In this chapter the results of objective 3 in this study were presented. It was found that functional fixation in the context of recognition versus disclosure is apparent in judgment. The results show presentation formats only affect decision-makers' evaluations. This finding affirms the need for an appropriate presentation format in the digital reporting environment to assist professional decision-makers in information evaluation. However, this study did not find any evidence that the interaction between presentation formats and placement of information could influence information processing stages. These results suggest that presentation formats alone is not a potential solution for functional fixation in information processing stages, consistent with Luft and Shields (2001).

The findings of this study lay a valuable foundation on which to base further examination of these issues, in order to explicitly recognise the nature and role of presentation formats in financial reporting in a digital reporting environment. The next chapter concludes the thesis.

CHAPTER NINE

SUMMARY AND CONCLUSION

9.1 INTRODUCTION

This chapter provides a summary and conclusion. It is structured as follows. Section 9.2 identifies the contribution of the study and Section 9.3 provides a summary of the major findings and discusses their implications. A comparison of the results of this study with the results of previous studies on presentation format in a digital reporting environment is presented in Section 9.4. Section 9.5 discusses the limitations of the study and Section 9.6 provides suggestions for future research avenues. Finally, Section 9.7 concludes this chapter and the thesis.

9.2 CONTRIBUTION OF THE STUDY

This study contributes to the literature in several areas. It provides a contribution to the understanding of the links between three bodies of literature: presentation formats, digital reporting and recognition versus disclosure. Understanding such linkages provides further insight and knowledge into the role and value of presentation formats in decision-makers' performance. This study addresses some of the gaps identified in the literature related to presentation formats in a digital reporting environment (such as Debreceny and Gray, 2001; Abdolmohammadi et al., 2002; Baldwin et al., 2003; Wu and Vasarhelyi, 2004).

Studies in the information systems and psychology literature have indicated that people's perceptions of their performance often differ from their actual performance. This notion has not been extensively examined in the accounting and digital reporting literature. This study provides empirical evidence, based on experiment and post experiment questionnaires, on the link between perceptions and actual performance in a digital reporting environment.

The results of this study contribute to the understanding of the links between perceptions and actual performance.

Hodge et al. (2004) suggested the need to examine the effect of presentation formats on cognitive information processing in the context of recognition versus disclosure using contexts other than that used in their study. Their study was in the context of stock compensation. This study extends the literature by examining the effect of presentation formats on cognitive information processing in the context of recognition versus disclosure in the accounting for investment property. This study contributes to the recognition versus disclosure literature on a less topical issue (investment property) than that used by Hodge et al. (2004) (stock option compensation), further enhancing the understanding of the impact of presentation formats on cognitive information processing.

Most of the studies examining the effect of presentation formats on decision-makers' performance have used students as proxies for actual decision-makers. Although it is more convenient to use students in experimental studies, the findings derived from using such non-professional participants are questionable and may not represent professional decision-makers (Bouwman et al., 1995; Hunton and McEwen, 1997; Vera Munoz et al., 2002). This study used professional decision-makers and the results are somewhat different to those found in previous studies. The participants are public accounting practitioners and they represent professional decision-makers who are actively involved in investment decision tasks.

The previous studies have examined the link between presentation format, digital reporting and decision-makers' performance in various settings. Most of these studies were conducted in the US. This study used New Zealand subjects. The examination of this issue in a new environmental setting contributes to the literature on human behaviour outside the US.

9.3 SUMMARY OF THE MAJOR FINDINGS AND THEIR IMPLICATIONS

This section provides a summary of the findings and the implications of the study to the presentation format and digital reporting literature. As noted earlier, the aim of this study is to investigate the effect of digital presentation formats on decision-makers' performance. Specifically, this study examines presentation formats in the digital reporting environment with three objectives: decision quality, perceptions and cognitive information processing in the context of recognition versus disclosure. The following discussion is divided into three parts, each discussing one of the study's objectives.

9.3.1 Decision quality

The first objective of this study is to examine the effect of digital presentation formats on decision quality. Specifically, this study examines whether:

1. Presentation formats affect decision accuracy.
2. Presentation formats affect cognitive effort.

These issues were examined by way of an experimental design which attempts to mimic the "real" environment.

The results indicate that presentation formats have an impact on decision accuracy. This finding is consistent with findings of previous studies (Stock and Watson, 1984; Dickson et al., 1986; Iselin, 1988; DeSanctis and Jarvenpaa, 1989; Mackay and Villareal, 1987; Hard and Vanecek, 1991; Stone and Schkade, 1991; Anderson and Kaplan, 1992; Bricker and Nehmer, 1995; Ramarapu et al., 1997; Frownfelter-Lohrke, 1998; Almer et al., 2003; Baldwin et al., 2004; Hodge et al., 2004).

The results in this study show that presentation formats do not impact on cognitive effort. This is consistent with the findings in Dull et al. (2003) and So and Smith (2004) where presentation formats do not increase the efficiency of decision-making[60]. However, this finding is not consistent with studies that found presentation formats do impact on

[60] Dull et al. (2003) and So and Smith (2004) used graphical and hyperlink versus non-hyperlink formats respectively in their studies.

cognitive effort (Benbasat and Dexter, 1985; Jarvenpaa, 1989; Ramarapu et al., 1997; Tuttle and Kershaw, 1998)[61].

A key finding is that presentation formats affect decision quality. This evidence points to the conclusion that digital presentation formats improve decision accuracy but not cognitive effort. This would support the view that preparers should recognise that digital presentation formats impact on users' decision-making processes and should select an appropriate presentation format to improve the decision quality of the users of their financial reports.

9.3.2 Perceptions

The second objective of this study focuses on users' perceptions of the usefulness and ease of use of different presentation formats in a digital reporting environment. Specifically, this study examines whether:

1. Users' have different perceptions of the usefulness and ease of use of digital presentation formats.
2. Users' perceptions of the usefulness and ease of use of different presentation formats correspond to decision-making outcomes (decision accuracy and cognitive effort).
3. Users' perceptions of the usefulness and ease of use of different presentation formats influence their preference for the use of presentation formats.

These issues were examined by way of an experimental and post experimental questionnaire.

The results show that users' perceptions of usefulness and ease of use are similar across the three presentation formats: PDF, HTML and XBRL. The results indicate that in general, users perceived all the presentation formats in the digital reporting environment as useful. The users also perceived all the presentation formats as user-friendly (easy to use).

[61] Benbasat and Dexter (1985) used graphical versus tabular; Jarvenpaa (1989) used graphical; Ramarapu et al. (1997) used linear versus non-linear; Tuttle and Kershaw (1998) used graphical versus tabular formats.

The results also show that users' perceived usefulness of presentation formats was similar to their decision accuracy for HTML and XBRL formats but not for PDF format. However, perception of ease of use was reflected in the cognitive effort required by participants who were pre-allocated the PDF format but not for users who were pre-allocated the HTML and XBRL formats. The results support the suggestions by previous studies in the information systems literature that perception does not necessarily correspond to actual performance (Wright, 1975; Adelbratt and Montgomery, 1980; Abelson and Levi, 1985; Davis, 1989; Kleinmuntz and Schkade, 1993).

The results also support previous findings that users' perceptions influence their preference of reporting technology. One possible reason for this finding could be the participants' limited knowledge of the potential applications and usages of the different presentation formats (Beach and Mitchell, 1978). Of consequence, the lack of knowledge of the applications and usages of such presentation formats leads to poor performance.

A key finding in this study is that users' often have similar perceptions on digital presentation formats. However, their perceptions of a digital presentation format may not be similar to their actual performance upon reliance on that presentation format. The evidence points to the conclusion that users are still lacking in knowledge and are often biased in their perceptions of digital presentation formats, particularly new formats.

9.3.3 Cognitive information processing in the context of recognition versus disclosure

The third objective of this study focuses on the effect of presentation formats on cognitive information processing in the context of recognition versus disclosure. Specifically, this study examines whether:

1. Presentation formats impact on information acquisition in a recognition versus disclosure situation.
2. Presentation formats impact on information evaluation in a recognition versus disclosure situation.

3. Presentation formats impact on information weighting in a recognition versus disclosure situation.
4. Presentation formats impact on judgment in an investment decision in a recognition versus disclosure situation.

These issues were examined by way of an experimental and a post experiment questionnaire.

The results indicate that the use of different models (recognition versus disclosure) do not impact on information acquisition, evaluation and weighting. These results are consistent with studies that examine the phenomenon of functional fixation in different settings, such as Wilkins and Zimmer (1983) which indicates that different accounting methods do not affect bankers' assessments, and Maines and McDaniel (2000) where it was found that the placement of information either in the Statement of Comprehensive Income or Statement of Stockholders' Equity does not affect information acquisition. The results in this study are not consistent with studies that found functional fixation in recognition versus disclosure situations (e.g., Hopkins, 1996; Hirst and Hopkins, 1998; Luft and Shields, 2001; Hodge et al., 2004). One possible reason for the inconsistency with prior studies is the study sample and experimental design.

In contrast, the results show that functional fixation does appear in the judgment stage. The results suggest that at the point when decision-makers make judgments in an investment decision, they tend to include the information item related to investment property when the information item is presented in the financial statements, rather than when the information item is disclosed in explanatory notes (Notes to the Accounts). However, the results show that presentation formats do not alleviate functional fixation caused by placement of information significantly in the judgment of an investment decision, supporting Hodge et al. (2002) suggestion that XBRL used as a format to search and view information through mediating software is not a universal remedy for differences between recognition and disclosure caused by cognitive processing.

A key finding is that functional fixation exists in the judgment stage when the information is either recognised or disclosed in the financial statements. The evidence in this study points to the conclusion that digital presentation formats have not assisted professionals in overcoming human limitations in relation to functional fixation. This would support the view that until presentation technology provides the tools to assist users, the options to recognise or disclose lead to different economic consequences.

9.4 COMPARISON WITH PREVIOUS STUDIES ON PRESENTATION FORMATS IN A DIGITAL REPORTING ENVIRONMENT

Table 9.1 provides a comparison of the findings of this study with other studies that examine presentation formats in the digital reporting environment. It is interesting to analyse and compare the results of these related presentation format studies with the current study as this provides further understanding of the impact of presentation formats on decision-makers' behaviour.

The results of this study on the impact of presentation formats on decision quality show that there is no significant difference in the effect of presentation formats on cognitive effort. This is inconsistent with previous studies. For example, Dull et al. (2003) examined the effect of presentation format (linked versus un-linked) on cognitive effort. Their results show a significant difference in the presentation format effect on cognitive effort when participants evaluated a small firm. However, no significant difference in the effect of presentation formats on cognitive effort was found when participants evaluated a large firm. As argued earlier, the difference in this study's result could be attributed to the sample selection. Dull et al. (2003) used students whereas the current study used actual decision-makers.

Table 9.1
A comparison with related presentation format studies in the digital financial reporting environment

Author	Hodge	Beattie & Pratt	Dull et al.	Hodge et al.	Hodge & Pronk	Present study
Country	US	UK	UK	US	US	NZ
Year	2001	2001; 2003	2003	2002; 2004	2006	2008
Digital presentation formats	HTML, Hardcopy	PDF, HTML Spreadsheet, Word-processed, XBRL	PDF, HTML	PDF, XBRL	PDF, HTML	PDF, HTML, XBRL
Decision accuracy	-	-		-	-	√**
Decision differences	-	-	√*	-	-	-
Cognitive effort	-	-	√*	-	-	√
Classification error rates	√**	-	-	-	-	-
Information credibility	√*	-	-	-	-	-
Earnings potential judgment	√	-	√*	-	-	-
Perceived usefulness	-	√	-	-	-	√
Perceived ease of use	-	-	-	-	-	√
Perceived useful versus decision accuracy	-	-	-	-	-	√**
Perceived ease of use versus cognitive effort	-	-	-	-	-	√*
Preference	-	√	-	-	√	√
Perceived useful and preference	-	-	-	-	-	√*
Perceived ease of use and preference	-	-	-	-	-	√*
Amount of information used	-	-	√**	-	-	-
Pages extract	-	-	√	-	-	-
Information acquisition/ and information placement	-	-	-	√/ √*	-	√ / √
Information evaluation/ and information placement	-	-	-	√/ √*	-	√* / √
Information weighting/ and information placement	-	-	-		-	√ / √
Information judgment/ and information placement	-	-	-		-	√ / √*
Method: Questionnaire	-	-	-	-	-	√
Method: Experimental	√	√	√	√	√	√
Subject: Student	√	-	√	√	-	-
Subject: Real decision-makers	-	√	-	-	√	√

*Significant at 5% ** Significant at 10%

The finding of this study on the perceptions and preferences of digital presentation formats is similar to previous studies whereby the participants perceived all the presentation formats (PDF, HTML and XBRL) to be useful. This finding is also consistent with these studies where most of the participants also preferred HTML, although there is no distinct difference when comparing HTML with PDF and XBRL. For example, Beattie and Pratt (2001; 2003) found that the decision-makers perceived all presentation formats in the study as "fairly useful".

The present study's result is also consistent with Hodge and Pronk (2006) where most of the participants also prefer HTML, although there are no distinct differences when comparing HTML with PDF and XBRL. For example, Hodge and Pronk (2006) found that the professionals preferred PDF while the non-professionals preferred HTML. One possible explanation for this is that almost half of the participants (48.4%) in this study have less than 10 years' experience (refer to Table 6.1) which, if compared with professional decision-makers, deems them to be considerably less experienced.

In comparison with Hodge et al.'s (2002; 2004) study, the present study does not support Hodge et al.'s findings of no significant impact of presentation formats on cognitive information processes in the context of recognition versus disclosure. For example, the current study found that functional fixation caused by placement of information does not appear in the information acquisition stage, but in Hodge et al. (2004), it was found that functional fixation caused by placement of information appears in the information acquisition stage, and presentation format helps to reduce this functional fixation. However, the present study is consistent with Hodge et al. (2002) where it was found that functional fixation caused by placement of information appears in the investment decision stage, although the results of this study also show that presentation formats could not alleviate this functional fixation, which is inconsistent with Hodge et al. (2002).

The difference in the results of the present study with the results in Hodge et al. (2002, 2004) could be attributed to the different contexts of the studies. Hodge et al. (2002, 2004) used an information item that is widely debated (stock option compensation) while

the current study used a less eminent information item (investment property) (Paraditsmanont, 2002). It could be argued that decision-makers, in general, would be aware of information items that are widely discussed and debated compared with those that are not.

9.5 LIMITATIONS OF THE STUDY

This study is similar to other studies that involve experimental designs. The experimental design in this study involves the participation of 62 public accounting practitioners with working experience in making investment decisions. The number of participants in this study could be considered small. However, similar experiments have used a small number of participants such as Tuttle and Kershaw (1998): 39 participants; Hodge (2001): 57 participants; Dull et al. (2003): 60 participants; and Hodge et al. (2002, 2004): 96 participants.

The participants in this study are public accounting practitioners. Although they represent one of the major users of financial information, the experience and decision contexts in the study may not be consistent with their experiences. Also, accounting practitioners' use of analytical techniques is not necessarily similar to the techniques used by other decision-makers. However, because of the different constraints (time and resources), this study had to limit the sample to only public accounting practitioners with investment decision experience.

The participants in this study were provided with a limited amount of information. In real situations, decision-makers would have access to more comprehensive information and may interact with other people before making decisions. Therefore, the results found in this study may be different if a more complex environment had been given to the participants.

The experiment information involves fictitious financial statements. The purpose of using fictitious financial statements is to enable the researcher to control over the participants

and variables used and examined in this study. For example: the absence of footnotes in the PDF format is to provide distinct different of features between the three presentation formats. In real situation, using fictitious financial statements may not be similar to the information provided in real financial statements.

The public accounting practitioners may have various types of ratios and analytical procedures in performing investment decision task. This study only allows the participants to base their decision on the ratios and information provided in this study. The results in this study may be different if the participants could have the options to choose their types of analyses.

Davis (1989) noted that perceived usefulness and perceived ease of use are similar to decision accuracy and cognitive effort. However, research examining the link between perceptions and actual performance is sparse probably because there is no absolute measure to link perceptions to actual performance. This study links these two measures in order to gain further understanding of the link between perceptions and actual performance outcomes. This study assumes that perceptions of usefulness and ease of use are similar to decision accuracy and cognitive effort as proposed by Davis (1989). However, it may be argued that perceptions of usefulness and ease of use could not fully represent decision accuracy and cognitive effort.

Sekaran (2003) noted that contamination of results would not exist when participants are assigned to groups. Although this study has randomly assigned its participants, there may be confounding variables that could contaminate the results. Furthermore, there are many moderating variables that could be incorporated to examine the effect of presentation format on decision-makers' behaviour. However, this study only included work experience and familiarity with presentation format as the moderating variables.

This study used two experimental settings (in-lab and out-of-lab). Although the results show no significant differences between the time taken and reliability of information usage between the two groups, this study cannot eliminate the possibility that

uncontrolled factors such as participants' cognitive styles and working environments may have affected their responses.

Finally, the participants were asked to complete the research material based on a pre-selected format to avoid biases caused by improper distribution, such as having more participants in one presentation format compared to the others. The research design in this study did not allow participants to select the format they preferred.

9.6 FUTURE RESEARCH AVENUES

As discussed in Section 9.5, the present study was conducted using a small sample size. Future research may use a larger sample size which may enhance the validity of the findings.

Additionally, given the heterogeneity in decision-makers, the use of any one group (public accounting practitioners) may limit the ability to generalise the results to other decision-makers. Because of the different constraints (time and monetary), incentives and decision contexts experienced by various decision-makers, using other types of decision-makers may assist in enhancing the understanding of other decision-makers such as financial analysts and investment brokers.

This study used two experimental settings (In-lab and Out-of-lab) in a simple environment involving a limited amount of information. Therefore, the results found in this study may be different if a more complex environment with a greater amount of information had been provided for the participants. Future research should examine how decision-makers are affected by presentation formats in more complex environments involving far greater information.

This study examined the link between perceptions of digital presentation formats and actual performance outcomes. This study also examined the link between perceptions and preferences of digital presentation formats. This study did not examine the link between

actual performance and preferred presentation formats. Future research should examine this issue to provide further understanding on the linkages between actual performance outcomes and preferred presentation formats.

The experimental design in this study uses the context of accounting for investment property. Future research may use other contexts which would assist in enhancing the understanding of the impact of presentation formats on decision-making.

Finally, the present study only includes two moderating variables: work experience and familiarity with presentation format. Future research should examine the inclusion of other moderating variables such as cognitive style effect (Baldwin et al., 2004) and gender (Nouri and Douglas-Clinton, 2006).

9.7 CONCLUSION

The current study is important because disseminating financial information via the internet (digitally) is becoming a common trend. The shift to this paradigm is attributed to the increasing availability of information (Jensen and Sandlin, 1997), which in turn is fuelling the need for easy access to such information. Therefore, understanding the complexities of how information is presented (presentation formats) and how presentation formats affect interpretation of information is important to the future of the accounting domain.

This chapter summarises and concludes the thesis by outlining the contribution of this study. It also summarises the major findings and implications. This chapter also provides a comparison of this study with other studies on presentation formats in the digital reporting environment. Limitations are discussed and future research avenues are suggested.

This study provides evidence that presentation formats affect decision accuracy and the way decision-makers evaluate information. This study also provides evidence that

decision-makers' perceptions may not parallel their actual performance, and that their perceptions influence their selection of presentation formats. The findings of this study do not support the notion that presentation formats influence cognitive effort, and that decision-makers' perceptions of presentation formats are homogenous. The findings of this study do not support the proposition that presentation formats affect decision-makers' acquisition, weighting and investment decisions. There is no evidence that the interaction between presentation formats and placement of information influence (alleviate) the effect of functional fixation in cognitive information processing.

In summary, this thesis provides insights into the potential impact of presentation formats on users' decision quality, perceptions and cognitive information processing in the context of recognition versus disclosure. Future research may examine further issues relating to digital reporting formats on users' perspective such as examining comparison of the effect of presentation formats on various decision-makers' performance and the link between actual performance and preferred presentation formats. Future research could also be conducted on the effect of presentation formats on decision-makers' performance in more complex environments.

APPENDICES

APPENDIX A

EXAMPLES OF THE PRESENTATION FORMATS IN THIS STUDY

PDF

FIRM A
STATEMENT OF FINANCIAL PERFORMANCE

Year ended 31 December	2005 $	2004 $
Sales	1,693,771	983,754
Cost of sales	1,460,797	713,740
Gross Profit	234,974	270,014
General and administrative expense	77,631	90,719
Salary expense	28,577	30,092
Research and development expense	30,000	40,000
Interest and other financing expense, net	25,948	24,122
Operating income	72,818	85,081
Other income	61,603	4,500
Net income before tax	134,421	89,581
Income tax expense	20,000	8,888
Net income (Loss)	114,421	80,693
Earnings (loss) per share – basic	0.20	0.14

See Accompanying Notes to Financial Statements

FIRM A
STATEMENT OF FINANCIAL POSITION

Year ended 31 December	2005 $	2004 $
Fixed Assets:		
Property, plant and equipment (net)	535,263	410,082
Other assets	272,888	217,888
Investment	124,000	107,972
	932,151	735,942
Current Assets:		
Inventories	239,458	208,260
Accounts receivables	149,606	114,772
Cash	20,646	11,707
Less: Current Liabilities		
Accounts payable	298,579	239,879
Notes payable	152,985	140,854
Other current liabilities	43,340	11,440
Total Net Assets	846,957	678,508
Shareholders' Equity		
Common stock	567,815	567,815
Retained Earnings (Loss)	131,142	19,307
Long Term Liabilities		
Long term debt	148,000	130,000
Total Shareholders' Equity and Long Term Liabilities	846,957	678,508

See Accompanying Notes to Financial Statements

HTML

PLEASE SELECT ONE OF THE FIRMS BELOW TO BEGIN YOUR ANALYSIS

FIRM A

- STATEMENT OF FINANCIAL RERFORMANCE
- STATEMENT OF FINANCIAL POSITION
- CASH FLOW STATEMENT
- NOTES

HTML document downloaded using Microsoft word

FIRM A

STATEMENT OF FINANCIAL PERFORMANCE

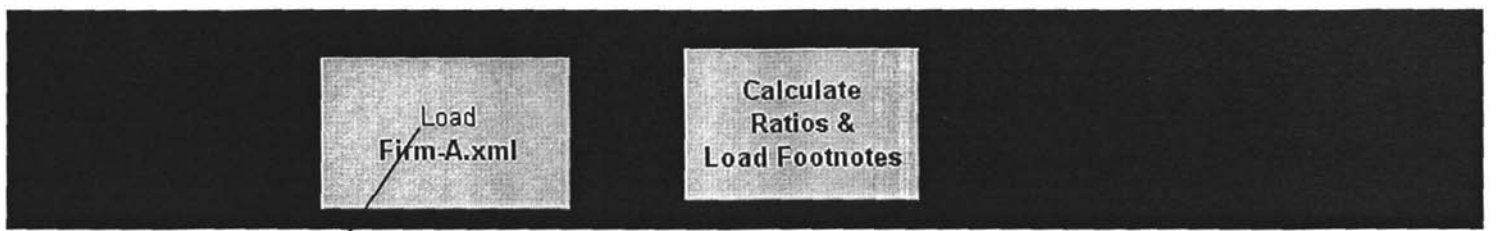
Year ended 31 December	2005	2004
	$	$
Sales	1,695,771	983,754
Cost of sales	1,460,797	713,740
Gross Profit	234,974	270,014
General and administrative expense	77,631	90,719
Salary expense	28,577	30,092
Research and development expense	30,000	40,000
Interest and other financing expense, net	25,948	24,122
Operating income	72,818	85,081
Other income	61,603	4,500
Net income before tax	134,421	89,581
Income tax expense	20,000	8,888
Net income (Loss)	**114,421**	**80,693**
Earnings (loss) per share – basic	**0.20**	**0.14**

XBRL

XBRL Experimental Exercise Firm-A

This application will allow you to perform a quick analysis of XBRL/XML data for the purpose of Experimental Exercise. The download will be transferred via XBRL/XML, where pivot table analysis and ratios will be created via Microsoft Office VBA.

Should use for the purpose of Experimental Exercise only



XBRL document downloaded using Excel

Elements Financial Table

Sum of value	Year		
Newelement	2004	2005	Grand Total
Account Receivables	114772	149606	264378
Cash	11707	20646	32353
Inventories	208260	239458	447718
Investment	107972	124000	231972
Net Income / Loss	80693	114421	195114
Net Income Before Tax	89581	134421	224002
Other Assets	217888	272888	490776
Property, Plant and Equipment	410082	535263	945345
Sales	983754	1695771	2679525
Total Net Assets	678508	846957	1525465

Financial Item Notes (Footnotes)

Newelement	Year	Value	Footnote
Account Receivables	2005	149606	Accounts receivable are stated at net of an allowance for doubtful accounts equal to approximately 1% of sales.
Other Assets	2005	272888	Other assets are stated at cost and amortized using the straight line method over the estimated useful lives, which range from five to eight years. The firm evaluates the possible impairment of long lived assets, including intangible assets, whenever events or circumstances indicate the carrying value of the assets may not be recoverable. The firm currently has no goodwill.
Other Current Liabilities	2005	43340	Other current liabilities consist of warranty costs, professional fees and miscellaneous acquisition costs.
Other Income	2005	61603	The firm's investments consist of investment property, specifically land. In accordance with IAS 40, investments property can be accounted for using the fair value method or the cost method. Under the cost method, the firm did not recognized unrealized gain on the statement of financial performance. Just merely disclose the fair value of the investment property in the notes. An alternative method of accounting for investment property is the fair value method in which any unrealized gain will be recognized in the statement of financial performance. The firm adopted the fair value method, and recognized the increase value of the investment property on the statement of financial performance. The market value of the investments is currently at $124,000. Had the firm adopts the cost model, the firm's other income for 2005 would have been $45,575 and the net income before tax would have been $118,393
Investment	2005	124000	The firm's investments consist of investment property, specifically land. In accordance with IAS 40, investments property can be accounted for using the fair value method or the cost method. Under the cost method, the firm did not recognized unrealized gain on the statement of financial performance. Just merely disclose the fair value of the investment property in the notes. An alternative method of accounting for investment property is the fair value method in which any unrealized gain will be recognized in the statement of financial performance. The firm adopted the fair value method, and recognized the increase value of the investment property on the firm adopts the cost model, the firm's other income for 2005 would have been $45,575 and the net income before tax would have been $118,393

APPENDIX B

EXAMPLES OF RECOGNITION VERSUS DISCLOSURE

FINANCIAL STATEMENTS OF FIRM A (RECOGNITION)

FIRM A
STATEMENT OF FINANCIAL PERFORMANCE

Year ended 31 December	2005 $	2004 $
Sales	1,695,771	983,754
Cost of sales	1,460,797	713,740
Gross Profit	234,974	270,014
General and administrative expense	77,631	90,719
Salary expense	28,577	30,092
Research and development expense	30,000	40,000
Interest and other financing expense, net	25,948	24,122
Operating income	72,818	85,081
Other income	61,603	4,500
Net income before tax	134,421	89,581
Income tax expense	20,000	8,888
Net income (Loss)	114,421	80,693
Earnings (loss) per share – basic	0.20	0.14

See Accompanying Notes to Financial Statements

FIRM A
STATEMENT OF FINANCIAL POSITION

Year ended 31 December	2005 $	2004 $
Fixed Assets:		
Property, plant and equipment (net)	535,263	410,082
Other assets	272,888	217,888
Investment	124,000	107,972
	932,151	735,942
Current Assets:		
Inventories	239,458	208,260
Accounts receivables	149,606	114,772
Cash	20,646	11,707
Less: Current Liabilities		
Accounts payable	298,579	239,879
Notes payable	152,985	140,854
Other current liabilities	43,340	11,440
Total Net Assets	846,957	678,508
Shareholders' Equity		
Common stock	567,815	567,815
Retained Earnings (Loss)	131,142	19,307
Long Term Liabilities		
Long term debt	148,000	130,000
Total Shareholders' Equity and Long Term Liabilities	846,957	678,508

See Accompanying Notes to Financial Statements

FIRM A
Notes to Financial Statements

Accounts Receivable

Accounts receivable are stated net of an allowance for doubtful accounts equal to approximately 1% of sales.

Inventories

Inventories are stated at the lower of cost or market. Cost is determined on the last-in, first out basis.

Property, Plant and Equipment

Property, plant and equipment are stated at cost and depreciated using the straight line method over the assets' estimated useful lives. Buildings' useful lives are 39 years, building improvements' useful lives are 10 years, and the useful lives of computer hardware, computer software, and furniture and fixtures range from two to six years. During the year, the firm purchased some equipment.

Other Assets

Other assets are stated at cost and amortized using the straight line method over the assets' estimated useful lives, which range form five to eight years. The firm evaluates the possible impairment of long-lived assets, including intangible assets, whenever events or circumstances indicate that the carrying value of the assets may not be recoverable. The firm currently has no goodwill.

Other Current Liabilities

Other current liabilities consist of warranty costs, professional fees and miscellaneous acquisition costs.

Notes Payable

Interest on the following long term notes is payable quarterly.

	December 31, 2005	December 31, 2004
Senior Notes (6.75% and 6.80%)	65,864	53,862
Unsecured Term loans (7.25% and 7.40%)	87,121	86,992

Investments

The firm's investments consist of investment property, specifically land. In accordance with IAS 40, investments property can be accounted for using the fair value method or the cost method. Under the cost method, the firm did not recognized unrealized gain on the statement of financial performance. Just merely disclose the fair value of the investment property in the notes. An alternative method of accounting for investment property is the fair value method in which any unrealized gain will be recognized in the statement of financial performance. The firm adopted the fair value method, and recognized the increase value of the investment property on the statement of financial performance. The market value of the investments is currently at $124,000. Had the firm adopt the cost model, the firm's other income for 2005 would have been $45,757 and the net income before tax for 2005 would have been $118,575.

FINANCIAL STATEMENTS OF FIRM B (RECOGNITION)

FIRM B
STATEMENT OF FINANCIAL PERFORMANCE

Year ended 31 December	2005	2004
	$	$
Sales	955,629	1,194,535
Cost of sales	614,907	709,213
Gross Profit	340,722	485,322
General and administrative expense	220,503	329,760
Salary expense	29,796	45,000
Research and development expense	20,000	20,000
Interest and other financing expense, net	23,974	26,510
Operating income	46,449	64,052
Other income	35,899	20,000
Net income before tax	82,348	84,052
Income tax expense	13,300	16,559
Net income (Loss)	69,048	67,493
Earnings (loss) per share – basic	0.21	0.20

See Accompanying Notes to Financial Statements

FIRM B
STATEMENT OF FINANCIAL POSITION

Year ended 31 December	2005 $	2004 $
Fixed Assets:		
Property, plant and equipment (net)	280,900	314,123
Investment	151,000	131,000
Other assets	77,594	117,006
	509,494	562,129
Current Assets:		
Inventories	209,004	225,490
Accounts receivables	44,397	31,964
Cash and cash equivalent	8,344	46,670
Less: Current Liabilities		
Accounts payable	189,889	160,905
Notes payable	125,256	193,091
Other current liabilities	23,466	62,440
Total Net Assets	432,628	449,817
Shareholders' Equity		
Common stock	334,630	334,630
Retained Earnings (Loss)	39,048	23,563
Long Term Liabilities		
Long term debt	58,950	138,750
Total Shareholders' Equity and Long Term Liabilities	432,628	449,817

See Accompanying Notes to Financial Statements

FIRM B
Notes to Financial Statements

Cash and Cash Equivalent

The firm includes all highly liquid instruments with a maturity of three months or less at the time of purchase to be cash equivalent.

Inventories

Inventories are stated at the lower of cost (primarily last in, first out) or market.

Property, Plant and Equipment

Property, plant and equipment are stated at cost. Depreciation is computed using the straight line method over the estimated useful life of the related assets, generally ranging from three to seven years for equipment and 40 years for buildings. During the year, the firm acquired and disposed some plant and equipment.

Other Assets

Other assets mainly consist of intangible assets resulting from acquisitions. The firm continually monitors conditions that may affect the carrying value of its intangible assets. When conditions indicate potential impairment of an intangible asset, the asset is written down to its net realizable value. The firm currently has no goodwill.

Notes Payable

Interest on the following long term notes is payable quarterly.

	December 31, 2005	December 31, 2004
Medium term notes (6.35% and 6.85%)	125,256	193,091

Investments

The firm's investments consist of investment property, specifically land. In accordance with IAS 40, investments property can be accounted for using the fair value method or the cost method. Under the cost method, the firm did not recognized unrealized gain on the statement of financial performance. Just merely disclose the fair value of the investment property in the notes. An alternative method of accounting for investment property is the fair value method in which any unrealized gain will be recognized in the statement of financial performance. The firm adopted the fair value method, where the investment property is recorded at fair value, and the increase value from cost to market value is recognized as an income, and therefore recognized in the statement of financial performance. Had the firm adopts the cost method, the firm's other income for 2005 would have been $15,899 and the net income before tax would have been $62,348.

FINANCIAL STATEMENTS OF FIRM B (DISCLOSURE)

FIRM B
STATEMENT OF FINANCIAL PERFORMANCE

Year ended 31 December	2005 $	2004 $
Sales	955,629	1,194,535
Cost of sales	614,907	709,213
Gross Profit	340,722	485,322
General and administrative expense	220,503	329,760
Salary expense	29,796	45,000
Research and development expense	20,000	20,000
Interest and other financing expense, net	23,974	26,510
Operating income	46,449	64,052
Other income	15,899	-
Net income before tax	62,348	64052
Income tax expense	13,300	16,559
Net income (Loss)	49,048	47,493
Earnings (loss) per share – basic	0.15	0.14

See Accompanying Notes to Financial Statements

FIRM B
STATEMENT OF FINANCIAL POSITION

Year ended 31 December	2005 $	2004 $
Fixed Assets:		
Property, plant and equipment (net)	280,900	314,123
Investment	131,000	131,000
Other assets	77,594	117,006
	489,494	562,129
Current Assets:		
Inventories	209,004	225,490
Accounts receivables	44,397	31,964
Cash and cash equivalent	8,344	37,726
Less: Current Liabilities		
Accounts payable	189,889	160,905
Notes payable	125,256	193,091
Other current liabilities	23,466	62,440
Total Net Assets	412,628	440,873
Shareholders' Equity		
Common stock	334,630	334,630
Retained Earnings (Loss)	19,048	(32,507)
Long Term Liabilities		
Long term debt	58,950	138,750
Total Shareholders' Equity and Long Term Liabilities	412,628	440,873

See Accompanying Notes to Financial Statements

FIRM B
Notes to Financial Statements

Cash and Cash Equivalent

The firm includes all highly liquid instruments with a maturity of three months or less at the time of purchase to be cash equivalent.

Inventories

Inventories are stated at the lower of cost (primarily last in, first out) or market.

Property, Plant and Equipment

Property, plant and equipment are stated at cost. Depreciation is computed using the straight line method over the estimated useful life of the related assets, generally ranging from three to seven years for equipment and 40 years for buildings. During the year, the firm has acquired and disposed some plant and equipment.

Other Assets

Other assets mainly consist of intangible assets resulting from acquisitions. The firm continually monitors conditions that may affect the carrying value of its intangible assets. When conditions indicate potential impairment of an intangible asset, the asset is written down to its net realizable value. The firm currently has no goodwill.

Notes Payable

Interest on the following long term notes is payable quarterly.

	December 31, 2005	December 31, 2004
Medium term notes (6.35% and 6.85%)	125,256	193,091

Investments

The firm's investments consist of investment property, specifically land. In accordance with IAS 40, investments property can be accounted for using the fair value method or the cost method. Under the cost method, the firm did not recognized unrealized gain on the statement of financial performance. Just merely disclose the fair value of the investment property in the notes. An alternative method of accounting for investment property is the fair value method in which any unrealized gain will be recognized in the statement of financial performance. The firm adopted the cost method, in which the firm disclose, but does not recognize the increase value of the investment property on the statement of financial performance. The market value of the investments is currently at $151,000. Had the firm adopts the fair value method, the firm's other income for 2005 would have been $35,899 and the net income before tax for 2005 would have been $82,348.

APPENDIX C

INVITATION LETTER TO POTENTIAL PARTICIPANTS

Massey University
COLLEGE OF BUSINESS

School of Accountancy
Private Bag 11 222
Palmerston North
New Zealand

P + 64 6 356 9099
F + 64 6 350 5658
wwwaccountancy.massey.ac
.nz

19th July 2006

Partner
ERNST & YOUNG
490, Majestic Centre
WELLINGTON

Dear Mr Partner

INVITATION TO PARTICIPATE IN DIGITAL REPORTING RESEARCH

In recent years, financial reporting has moved from hard copy to a digital format. Many organisations provide their financial reports in digital form on their websites. It is expected that digital reporting would provide significant benefits to both preparers and users of financial reports.

I am currently engaged in a research project entitled **"Digital reporting and users of financial reports"** which forms part of my PhD thesis. This research aims to examine the manner in which various formats of digital financial reporting impact on users' decision making. This research seeks to understand the views, opinions and experiences of users of financial reports in relation to digital reporting. I believe that are an ideal candidate to represent the users of corporate reports. Therefore, I would like to invite you to participate in this research project.

I believe that by participating in this research project, you will be able to:

- Gain knowledge and hands-on experience of various digital reporting formats including recent developments in the area of XBRL.
- Provide insights into the benefits to be derived from using alternative reporting formats (i.e. PDF, HTML and XBRL).

An information sheet is enclosed that sets out the purpose of the study, research procedure and your rights as a potential participant.

I encourage your participation in my research project and look forward to your response. If you have any comments or need clarification of any aspect of this research, please do not hesitate to contact me (Contact details are provided in the information sheet).

Yours Sincerely

ERLANE K. GHANI

INFORMATION SHEET

Introduction

Many organisations provide their financial reports using digital reporting formats such as PDF and HTML. Recently, XBRL (Extensible Business Reporting Language) was developed to enable the communication of information to users of corporate reports. XBRL-tagged information allows users to view and extract information.

Research Objectives

The aim of this research project is to understand users' judgment, decision quality and information needs in a digital reporting environment. The objectives of this research are:

- To examine whether different digital presentation formats influence users' decision-making performance.
- To investigate the impact of these digital presentation formats on the quality of decision made.

Research Process

The research project consists:

- The completion of an experiment exercise and a related post experiment questionnaire. This process is expected to take about 10-15 minutes to complete. The experiment involves the assessing of information and evaluation of two firms for investment decisions. Upon completion, the participants are requested to express their opinions and views on the digital presentation formats provided in the experiment. The participants are requested to return this part immediately upon completion. Alternatively, the participants can complete the research process at their convenience and return the questionnaire in a self addressed envelope provided within a period of one month.

Your Rights as a Participant

Participation in this research is entirely voluntary, and you may withdraw your consent to participate at anytime. Nevertheless, I would encourage and value your participation.

The identity of all participants and affiliated organisations will be protected. Individual responses will be aggregated and presented in a summarised form. Any code showing on the documentation forwarded to you is to enable me to identify the source of each returned material. The coding systems will be securely stored and destroyed upon completion of the research.

Should you participate in the research project, and if indicated, a summary of the research findings will be provided upon completion of the project.

Research Approval

This project has been reviewed and approved by the Massey University Human Ethics Committee, Palmerston North. If you have any concerns about the conduct of this research, please contact Professor Sylvia Rumball, Chair, Massey University Campus Human Ethics Committee: Palmerston North, telephone 06 350 5249, email: Humanethicspn@massey.ac.nz. Please note that no part of the information you provide will be used for any purposes other than academic study. The report will not identify any person by name unless permission has been given. The analysis of data will be undertaken and reported in such a way that information cannot be linked directly to any person or organization.

Information about the researchers

I am being supervised by Prof. Fawzi Laswad and Dr Stuart Tooley. Our contact details are:

Professor Fawzi Laswad
Head of School
School of Accounting
Massey University
Palmerston North

Dr Stuart Tooley
Associate Professor
School of Accounting
Massey University
Palmerston North

Erlane K Ghani
Research Student
School of Accounting
Social Sciences Tower
Massey University
Private Bag 11222
Palmerston North

Phone: 06-3569099 ext 2188
Mobile: 021-02398617
E-mail: E.kghani@massey.ac.nz

APPENDIX D

COVERING LETTER OF THE EXPERIMENT

DIGITAL REPORTING AND USERS OF FINANCIAL REPORTING:

Researcher:	Erlane K. Ghani
Supervisor:	Prof. Dr. Fawzi Laswad
E-Mail Address:	F.Laswad@massey.ac.nz
Telephone:	356 9099 extn 2860
Contact Address:	Head of School School of Accounting Social Sciences Tower Massey University Private Bag 11222 Palmerston North, New Zealand
Researcher's Contact:	School of Accounting Social Sciences Tower Massey University Private Bag 11222 Palmerston North, New Zealand E.kghani@massey.ac.nz

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This study aims at examining the impact of the evolvement of digital reporting technology in enhancing the users' performance of financial reporting. The results of this study will provide some indicators in understanding further the effect of the presentation format in the digital reporting environment. The success of this project depends highly on your response to our survey. As such, we seek your participation in attempting the experimental exercise and questionnaire.

Please note that the information provided will be used only for academic purposes. No part of the information will be used for any purposes other than academic study. The report will not identify any person by name unless permission is being given. The analysis of data will be undertaken and reported in such a way that information cannot be linked directly to any person or organization.

This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor Sylvia Rumball, Assistant to the Vice-Chancellor (Ethics & Equity), telephone 06-3505249, email humanethicspn@massey.ac.nz.

APPENDIX E
INSTRUCTION PAGE

INSTRUCTION PAGE

Instructions:

Each participant should receive two envelopes. You should start with Envelope 1 and complete it before opening Envelope 2. You need to complete in ascending order the following:

Envelope 1:	**Experimental Exercise**
Envelope 2:	**Post experimental questionnaire**

APPENDIX F
DIGITAL PRESENTATION FORMATS

Portable Document Format (PDF)

Portable Document Format (PDF) is a presentation format that allows decision-makers to view and read electronic documents, either on or off line. It preserves all formatting in a document, regardless of the platform used to read it. PDF complements the traditional print-based form approach. It is identical to print-based forms when viewed on screen and when printed. PDF is easily accessible and provides document security since it is a proprietary format. Proprietary format means that the document cannot be simply altered without authorisation. It has special access rights and can be digitally signed. PDF files can only be accessed using Acrobat Reader™.

Hypertext Mark-up Language (HTML)

Hypertext Mark-up Language (HTML) is a presentation format that allows decision-makers to read documents, either online or offline. HTML is designed specifically to structure a document. by defining and labelling the document with a set of elements with HTML tags. Most documents have common elements such as titles, paragraphs and footnotes. HTML tags describe the document, and the appearance of the document is not essential as HTML focuses on structuring the document. This was done on purpose so that the structure of the document could be separated from the appearance when necessary. A user could change the appearance of the document without significant tinkering.

Extensible Business Reporting Language (XBRL)

XBRL is a presentation format that provides the financial community a standard based method to prepare and publish corporate reports in a variety of formats depending on the software used to download the XBRL documents for decision-making purposes. An XBRL document can be assessed with XBRL friendly software. How the information is presented depends on the software used to access the document. For example: a user who wants to make an investment decision can download XBRL documents using Excel

2003™ relating to two firms directly from the Internet without the need to copy the files. The information for the two firms would be presented in the form of rows and columns. The user would be able to select, copy and paste the relevant information items in order to perform various analytical tasks without the need to re-key the information items.

APPENDIX G

EXPERIMENT EXERCISE AND POST EXPERIMENT QUESTIONNAIRE

EXPERIMENTAL EXERCISE

To begin the experiment exercise, please insert the CD provided to you in the envelope. In the CD, you will see the general instructions similar to the one below. **Please select the group and format allocated to you** as stated on the envelopes and proceed to begin the experiment exercise. **Please ensure that you record the starting and finishing time**. Once the experiment exercise is complete, please proceed to the post experimental questionnaire.

GENERAL INSTRUCTIONS

Experiment Exercise

You are to assume the role of an investor with $10,000 to invest in the equity capital of one, or both of the following firms: **Firm A and Firm B.** Both firms manufacture semiconductors for use in technology-based products for various industries. The manufacturing process is capital intensive and subject to cyclical swings in the economy. The following factors are critical to the financial performance and earnings potential of these firms:

- Return on assets (net income before tax/ total assets)
- Return on sales (net income before tax/ total sales)
- Return on fixed assets (net income before tax/ fixed assets)
- Fixed asset turnover (sales/ fixed asset)

Your task is to evaluate the financial performance and earnings potential of **Firm A** and **Firm B.** At the conclusion of your analysis, you must decide how you will invest your $10,000 by comparing **Firm A** and **Firm B.** You will be asked to describe the reasons for your choice.

The information on the following pages is not intended to be fully representative of what would be available to you if you were to undertake a detailed evaluation of Firm A and Firm B. Nevertheless, while completing the case, please base your judgments only on the information provided. Please do not consult with others or use additional material.

Please preview Firm A's and Firm B's Financial Statements

PREVIEW

========

EXPERIMENTAL EXERCISE

- **You may view the information contained on the CD when answering this questionnaire.**
- **After you have answered a question, please do not go back and change your response.**

Q.1 **Please record the starting time:**

Hr/ Min ☐

Q.2 Please fill in the numerator and denominator for the following four ratios for **Firm A.** The ratios to be calculated are for the **2005 year.**

- Return on assets (net income before tax/ total assets) ☐ / ☐
- Return on sales (net income before tax/ total sales) ☐ / ☐
- Return on fixed assets (net income before tax/ fixed assets) ☐ / ☐
- Fixed asset turnover (sales/ fixed asset) ☐ / ☐

Q.3 Please fill in the numerator and denominator for the following four ratios for **Firm B.** The ratios to be calculated are for the **2005 year.**

- Return on assets (net income before tax/ total assets) ☐ / ☐
- Return on sales (net income before tax/ total sales) ☐ / ☐
- Return on fixed assets (net income before tax/ fixed assets) ☐ / ☐
- Fixed asset turnover (sales/ fixed asset) ☐ / ☐

Q.4 **Please record the time**

Hr/Min ☐

Q.5 I believe that overall, **Firm A**'s financial performance for the 2005 year outperforms **Firm B**'s financial performance. Please indicate using the following scale.

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

Q.6 If you had to invest $10,000 in <u>one</u> firm, which firm would you invest in? (Please tick)

Firm A ☐

Firm B ☐

Q.7 If you could invest in <u>both</u> firms, what percentage would you invest in each (the total must add up to 100)

Firm A ☐ %

Firm B ☐ %

Total 100%

Q.8 **Please record the completion time**

Hr/Min ☐

You have completed stage one of the research project. Please proceed immediately to Envelope 2. Thank you.

POST EXPERIMENTAL QUESTIONNAIRE

SECTION A

Important note: Section A is based on your recollection of information presented in the CD that was used for the experiment. Please do not browse through the CD.

Based on the digital reporting format used in the experimental exercise, please state your views on the following:

Q1. From your recollection of information presented in the experiment exercise, please tick "Yes" or "No" to indicate if Firm A or Firm B, or both Firm A and B used a "fair value model" for investment property.

Firm A	Yes ☐	No ☐
Firm B	Yes ☐	No ☐

Q.2 Please tick "Yes" or "No" to indicate you took information item "**investment property**" into consideration before deciding on the investment decision.

Firm A	Yes ☐	No ☐
Firm B	Yes ☐	No ☐

SECTION B

Important note: Please load the CD enclosed in Envelope 2. On opening the CD, click on the index file and in that file, you will see general instructions similar to the one in experiment one. Please browse and review through the three formats on the CD (these digital reporting format being PDF, HTML and XBRL) before you proceed to this section. Please indicate your opinion on the **perceived usefulness** of each of the three digital reporting format.. Please do not dwell on the selection of score rather go with your initial 'gut' feeling.

		SCALE							
	Strongly Disagree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Strongly Agree**
Q1. The reporting format would enable me to accomplish my investment decision task more quickly.									
a.	PDF	1	2	3	4	5	6	7	
b.	HTML	1	2	3	4	5	6	7	
c.	XBRL	1	2	3	4	5	6	7	
Q2. The reporting format would enable me to make a more informed investment decision.									
a.	PDF	1	2	3	4	5	6	7	
b.	HTML	1	2	3	4	5	6	7	
c.	XBRL	1	2	3	4	5	6	7	
Q3. The reporting format is very useful for identifying information (well-formatted)									
a.	PDF	1	2	3	4	5	6	7	
b.	HTML	1	2	3	4	5	6	7	
c.	XBRL	1	2	3	4	5	6	7	
Q.4 The reporting format allows me to gather more information for the investment decision task.									
a.	PDF	1	2	3	4	5	6	7	
b.	HTML	1	2	3	4	5	6	7	
c.	XBRL	1	2	3	4	5	6	7	

Q5. The reporting format contains too much irrelevant information for investment decision task.

a.	PDF	1	2	3	4	5	6	7
b.	HTML	1	2	3	4	5	6	7
c.	XBRL	1	2	3	4	5	6	7

Q6. The reporting format provides me with sufficient information for investment decision task.

a.	PDF	1	2	3	4	5	6	7
b.	HTML	1	2	3	4	5	6	7
c.	XBRL	1	2	3	4	5	6	7

Q7. I do not have to rely on other reporting format upon relying on this reporting format to perform my investment decision task.

a.	PDF	1	2	3	4	5	6	7
b.	HTML	1	2	3	4	5	6	7
c.	XBRL	1	2	3	4	5	6	7

Q8. I would find the reporting format useful in performing the investment decision task.

a.	PDF	1	2	3	4	5	6	7
b.	HTML	1	2	3	4	5	6	7
c.	XBRL	1	2	3	4	5	6	7

Q9. Overall, I find the reporting format is useful for the investment decision task.

a.	PDF	1	2	3	4	5	6	7
b.	HTML	1	2	3	4	5	6	7
c.	XBRL	1	2	3	4	5	6	7

SECTION C

Please indicate your opinion on the **perceived ease of use** of each digital reporting format. Please do not dwell on the selection of score rather go with your initial 'gut' feeling.

SCALE

Strongly Disagree 1 2 3 4 5 6 7 **Strongly Agree**

Q1. I can easily learn how to use the reporting format

a.	PDF	1	2	3	4	5	6	7
b.	HTML	1	2	3	4	5	6	7
c.	XBRL	1	2	3	4	5	6	7

Q2. The reporting format is very clear and understandable.

a.	PDF	1	2	3	4	5	6	7
b.	HTML	1	2	3	4	5	6	7
c.	XBRL	1	2	3	4	5	6	7

Q3. I can easily become skilful in using the reporting format.

a.	PDF	1	2	3	4	5	6	7
b.	HTML	1	2	3	4	5	6	7
c.	XBRL	1	2	3	4	5	6	7

Q4. I can easily find the information that I require for my investment decision task.

a.	PDF	1	2	3	4	5	6	7
b.	HTML	1	2	3	4	5	6	7
c.	XBRL	1	2	3	4	5	6	7

Q5. The reporting format enables to easily retrieve and manipulate the information for the investment decision task.

a. PDF	1	2	3	4	5	6	7
b. HTML	1	2	3	4	5	6	7
c. XBRL	1	2	3	4	5	6	7

Q6. Further training will improve my performance in using the reporting format.

a. PDF	1	2	3	4	5	6	7
b. HTML	1	2	3	4	5	6	7
c. XBRL	1	2	3	4	5	6	7

Q7. Overall, I find the reporting format is very easy to use.

a. PDF	1	2	3	4	5	6	7
b. HTML	1	2	3	4	5	6	7
c. XBRL	1	2	3	4	5	6	7

SECTION D

Demographic profile

Q1. Gender

- ☐ Male
- ☐ Female

Q2. Age

- ☐ 20 – 30 Years.
- ☐ 31 – 40 Years
- ☐ 41 – 50 Years
- ☐ Above 50 Years

Q3. Educational Background

- ☐ Bachelors Degree
- ☐ Postgraduate Diploma
- ☐ Masters Degree
- ☐ PHD
- ☐ Other. Please state _____

Q4. Are you a member of professional body?

- ☐ Yes. Please state: _____
- ☐ No

Q5. Total work experience

- ☐ Less than 5 Years
- ☐ 5 – 10 Years
- ☐ 11- 15 Years
- ☐ 16 - 20 Years
- ☐ More than 20 Years

Q6. How familiar are you with relying on the following reporting format in making investment decisions?

Not familiar	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Familiar**
a. PDF	1	2	3	4	5	6	7	
b. HTML	1	2	3	4	5	6	7	
c. XBRL	1	2	3	4	5	6	7	

Q7. If you had the choice between using PDF, HTML and XBRL in completing the experiment , which would you prefer? Please tick one only

a. PDF ☐

b. HTML ☐

c. XBRL ☐

Please state the reason(s) to your answer

You have completed the post experimental questionnaire. Please return the experiment exercise and post experimental questionnaire in the self addressed envelope. Thank you.

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