Chapter 2
Literature Review

Objective: To explore the purpose of questionnaires, why physical appearance is important, how to decide on question content, the advantages and disadvantages of different question types, explain how the author has researched the subject.

I have read various pieces of literature regarding my choice of methodology. The book that had the most influence regarding this was *Object-Oriented Analysis and Design: Understanding System Development with UML 2.0* by O'Docherty, Mike (2005). I found the methodology used here ripple fairly straightforward. The steps that one should take were outlined along with examples. I decided not to use the object colouration diagrams that were listed in this book.

This book also had a significant impact on the type of architecture I use to implement the system because it discussed the advantages and disadvantages of three tier architectures and two tier architectures.

The book *Questionnaire design & administration* helped me to understand the key concepts with regarding to questionnaire design because it discussed the types of questionnaire available, the types of questions in questionnaires. The appropriate format of questionnaires and so on.

I have reviewed a few books on Fuzzy Logic and artificial intelligence and I believe a rule-based system which has a Developer interface would be the best system to implement the questionnaire design system.

Some of the good things about pre-qualifying questionnaire systems would be:

- It allows people to change the questionnaire as needs of the company changes.
- It enables organizations to tailor the questionnaires developed to their particular needs.

The main advantage of an online survey compared to a traditional paper one is that it takes a lot less time to gather and analyse.

The organization can control the logic of the execution of the web-based engine.

Some of the negative aspects compared with a traditional internet questionnaire approach (which is to design forms in html and code the logic manually) are:

1. It will be more complex to develop the logic to implement the control in how the pages are transferred and how the report is compiled.
2. It does not guarantee the quality of the questionnaire the ways a pre-customized questionnaire would.
3. The questionnaires may be harder to use because of poor design.

I will try to overcome some of these disadvantages by try to check the quality of the questions produced and by the use of template questionnaires which can be customized which would helped to eliminate the poor format and content of the questionnaires.

2.1 The purpose of questionnaires

Questionnaires are defined by Dibb [1] "*Base document for research purposes, providing the questions and structure for an interview or self completion and providing space for respondent's answers*". So questionnaires are closely linked to research in the social sciences and in business and government organizations. Research should not proceed until the problem (or opportunity) has been defined properly because this ensures all research is directed at answering the problem and not simply gathering 'nice to know' information.

Questionnaires are a natural knowledge acquisition there are other natural techniques like group meetings, Interview and observation.

Marshall [48] said "*questionnaires can help you collect information about what people do, what they have, what they think, know, feel or want."* She also classified the types of information as "

- *KNOWLEDGE - what people know; how well they understand something.*
- *BELIEF - what people think is true; an opinion.*
- *ATTITUDE - how people feel about something; a preference.*
- *BEHAVIOR - what people do — may be a physical/manual or mental behaviour.*
- *ATTRIBUTES - what people are; what people have."*

Some of the disadvantages of online questionnaires are according to [15] are *"*

- ***Freezes and crashes.*** *The respondent may be unable to complete the survey due to a browser freeze or server crash, resulting in missing data. To minimize*

this risk, try to keep the survey relatively short. If you have a long survey, you may want to split it across several pages. A respondent's answers are submitted at the end of each page; thus, if the respondent is disconnected during the fourth page of the survey, you have already safely captured the first three pages of data. If you are willing to spend more effort on programming, it is also possible to write a program that will allow respondents to return to the survey at the same point where they were interrupted.

- ***Error messages.*** *If you overlook a programming error in your survey, the error may be triggered when a respondent fills out the questionnaire, resulting in an ugly and confusing error message. To avoid this problem, test and re-test your survey rigorously, and have several other testers fill out the survey as well, to ensure that all the "bugs" have been worked out. If you use a programming language such as Cold Fusion to create your survey, you can write more attractive and helpful error messages. For example, if a respondent accidentally skips a question, a customized message can instruct the respondent to return to the question and complete it.*
- ***Double entry.*** *In many surveys, it is possible for the same subject to return to the survey and completes the questionnaire several times. The best way to avoid this problem is to recruit a specific sample of subjects, assign each subject a unique id, and allow each id to be used only once. If you do not have a specific sample, but are recruiting subjects from the Internet at large, you can use the subject's e-mail address to assign a unique id (for more information, see the section below on informed consent). However, this is not a foolproof method, as many respondents may have several e-mail addresses."*

2.1.1 Ethical Issues with Online Research Questionnaires

Some of the Ethical Issues with online questionnaires according to Marge [16] are:

- Informed Consent : This is according to Mann and Steward "*treating the participants with respect, using clearly easily understood language to inform them of the nature of the research, the time needed to be involved, the methods to be used and the use to be made of any findings, before gaining their consent to take."* Any potential physical, economic or psychological risks (for example, distress, embarrassment, loss of esteem) must be explained and attempts made to mitigate against these.
- Confidentiality: It is particularly important to keep the subject of the research from being show with online researchers, but for a business specific marketing site this needs is less crucial, but it is still important to keep the questionnaires results and the analysis of the results confidential. Madge [16] said "*Hackers may also potentially be able to access project computer files with responses, which is of particular significance if conducting studies dealing with sensitive, personal or illegal subjects*."
- Privacy: This is the prevention of confidential details entered in a questionnaire from being widely distributed. Different users have different

expectations for privacy. Spinello [18] said "*Privacy is under siege as never before thanks to the power of digital technology.*" Privacy is different from confidentiality because it is focused on what the system administrative should do rather than what they should prevent.

- Debriefing: It is important to inform respondents of the conclusions of the research after it is finished. This can be either a copy of the raw data in the case of the quantitative questionnaires or an actual report on the research.
- Netiquette: Netiquette is the term used to describe the code of conduct between those communicating on the internet. It is concerned with internet courtesy and protocols. It is directed at preventing aggressive and insulting behaviour. It includes often unspoken rules about what is considered appropriate and polite and respectful behaviour online.
- Practical issues: This covers issues like online libel, spam and viruses and online copyright. Spam is a potential problem with online forms because people can use these to contact your email address.
- Data Protection: Data protection laws mean that the data has to be kept only for the purpose that it was intended. Data should be accurate, update and be made available to the subject of it when requested and the subject is always entailed to know of if personal about them is being kept unless the data is used as a backup. Data protection is related to the Privacy because it means that data should not be sent to third parties unless the user gives consent to this.

2.1.2 How to choose the methods of reaching target respondents

There are various different methods of reaching your target respondents they include mail based questions, Internet questionnaires, Interview questionnaires, telephone questionnaires, self-administered questionnaires and email questionnaires.

Sharp, Rogers and Preece [11] said that '*the main advantage of email is that you can target specific user. But unless email is just used to contact potential respondent and point them to a web-based questionnaire, an email questionnaire is likely to be simply an electronic editable version of a paper-based questionnaire, and this loses some of the advantages you get with a web-based question'.*

2.1.3 Different styles of questionnaires

It is important to distinguish the questions from the possible answers by using a different font and/or size.

2.1.4 What are the features of a finished questionnaire

According to Toepoel [5], "the tendency to satisfy depends on three things:

(1) The difficulty of the question/answer,

(2) The respondent's ability to retrieve, process and integrate information from memory,

(3) The respondent's motivation" so when you are asking a difficult closed question doesn't give too many choices if the question is difficult to answer.

A welcome screen should be used with online questionnaires to assure the user of what they have to do. There are certain ethical guidelines regarding online questionnaires particularly in the social sciences. According to Marge [16] "*The content of the page was designed to be in line with the American Psychological Association and British Psychological Society ethics guidelines, the guidelines of the US government on the use of human subjects (informed consent) and the additional requirements for listing online studies by the Social Psychology Network*."

2.2 The importance of the physical appearance of the questionnaire

Toepoel [5] said that "Most of the answers that are recorded in surveys reflect judgments that respondents generate on the spot in the context of the specific interview. The words and visual stimuli are perceived as information. Respondents are influenced by all the information they perceive, so that their answers will be influenced by preceding questions as well as questionnaire and question format. "

According to http://www.surveysystem.com/sdesign.htm the following steps should be taken

"

1. *Do not use too many colours or fonts. They are distracting. On the other hand, bolding, italicizing, and changing the colours of key words, used appropriately, can make your questions easier to understand. Using colour and/or a smaller font size to make instructions distinct from question text can make your questionnaire easier to follow.*
2. *Always specify a background colour, even if it is white (usually a good choice). Some browsers may show a background colour you do not expect, if*

you do not specify one. Background images usually make text harder to read, even when they make a page more attractive at first glance.

3. *Use graphics sparingly. Most home Internet users still connect via modems, and graphics slow download times. Remember that showing a large graphic at a small size on a Web page does not reduce the time needed to download the graphic. Create or modify the graphic to a file size that is no bigger than you need. If your sample consists of people at work, you may be able to use somewhat more graphics, since those people usually have faster connections, but even they appreciate faster downloads. Use video only if that is what you are testing (e.g., a commercial).*
4. *Include an introduction or welcome page. Explain the reason for the survey (as far as you can without compromising the survey). Put instructions at the point they are needed, instead of grouping them on the first page."*

2.3 How to decide on question content

Trochim [24] said that their different levels of measurement associated with the various attributes they are

- Nominal: This is the simplest level using associating a name with a variable.
- Ordinal: This is where the attributes have a natural order to them and are numeric like that used in the Likert Scale.
- Interval: Here the distance between the values in important. But the ratio is meaningless. I.e. The difference between 10 degrees and 5 degrees Celsius.
- Ratio: Here the ratio is a important i.e. the difference between the weight of an obese man and a normal weight man of the same height and age is a reliable guide to how many health problems that he has, and this could be used to compare two different people.

These measurements can be used to devise reports based on the responses. According to Trochim [24]" *if a question has two possible responses it is considered dichotomous*". Dichotomous questions are best implemented using radio buttons. Trochim [24] also stated that with the **Guttman scale** is used for *'is to establish a one-dimensional continuum for a concept you wish to measure'*. Check lists are used so that the respondent can agree to a range of attribute values which may have values associated with them.

For Internet Questionnaires there is an important need for clear headings in each section or page of the questionnaire. There needs to be help with each question to explain its meaning. With closed questions, the questions should be put in table with the answers so that the questionnaire aligned properly and neatly.

	Advantages	**Disadvantages**
Closed-ended	• Easy and quick to answer • Answers across responses are easy to compare. • Answers easier to analyze on computer. • Response choices make question clearer • Easy to replicate study	• Can put ideas in respondent head. • Respondents with no opinion answer anyway • Respondents can feel constrained/frustrated • Many choices can be confusing • Can't tell if respondent misinterpreted the question • Fine distinctions may be lost • Clerical mistakes easy to make • Force respondents into simple responses
Open-ended	• Permit unlimited number of answers • Respondents can qualify and clarify responses • Reveal responders thinking processes • Can find the unanticipated	• Respondents give answers w/ diff. level of detail • Answers can be irrelevant • Inarticulate or forgetful responders are at disadvantage • Intimidates respondents • Coding responses is subjective and tedious • Requires more

		Respondents. time and effort • When responders omits a response, can't tell if its because of belief or just forgetfulness

Figure 2.1: *The advantages and disadvantages of various question types* from Borgatti [4]

2.3.1 Examples of open-ended and closed ended questions.

The following are examples of closed and open questionnaires.

Open-ended questions

What are the qualities needed so that a person can be a good businessman. _____

_____

_____

Comparison of the advantages and disadvantages of closed-ended and open-ended questions.

Figure 2.2 Example of an open-ended question

Close ended questions

These questions provide the user with various options so that they don't have to enter the answer. There are various types of closed-ended questions used in forms they are radio buttons answers, scale-based response, combo-lists and list boxes.

How much do you earn per week in euros?

100 – 200 ☐ *350-500* ☐

200 – 350 ☐ *600 or Above* ☐

Figure 2.3 Example of a closed-ended question

An advantage of close-ended questions is that

1) You don't have to validate the input if they give it and
2) You can associate logic with these options that can affect the route through the questionnaire or the output of the report.

Sharp, Rogers and Preece [11] said' *that there are number of different types of rating scales that can be used, each with its own purpose.* '

2.3.2 Deal with Questions where the respondent does not know an answer to

With the standard format don't know options are not presented to the respondent. With questions were you want to know the opinion of a respondent you should include a don't know answer filter and another open-ended question just for respondents who don't know to explain why they don't know.

2.4. How to decide on question wording

Frazer [2] stated "The choice of wording is critical in questionnaire design. "Because the easy to easy. "

The conventions of good question wording are according to Frazier are:

1) ***Target the vocabulary and grammar to the population surveyed.*** *It is important to target the wording of the questions for the population to be survey use jargon that is used in the organization and avoid unnecessary abbreviations.*

2) ***Avoid ambuity, confusion and vagueness.*** *This basically means that you make it absolutely clear what you are asking and how you want it answered.*

   Avoid emotional language, prestige bias and leading questions*. This means you should watch for loaded words like murderous, cancerous. An example of an inappropriate question would be how often you have used abortion in a questionnaire on sexual habits. While it may be interesting in statistical purposes it is too personal. Another inappropriate question type is leading question which suggests that the questioner would prefer a*

certain answer i.e. Give a description of your annual incomes a) totally inadequate, b) low, c) average d) higher than average.

3) ***Avoid double-barrelled questions****: The question should be about one topic only particularly for closed questions.*

4) ***Don't assume the respondent is an expert on themselves (unless you have no choice).*** *Asking a general population sample about some leading edge internet would not get a good response because most of them are familiar with technological innovation.*

5) ***Avoid asking questions beyond the respondent's capability.*** *These would be questions that put a limit on the respondents memory like "how many cans of beer have you drink since you were 13".*

6) ***Avoid false premises.*** *A premise is a conclusion that the questionnaire has used in a questionnaire that may or may not be true. I.e. it is debatable.*

7) ***Avoid asking about future intentions (if you can).*** *Certain future intentions like if and how a person shops are unrelated to how they actually shop.*

8) ***Avoid negatives and especially double negatives.*** *This is especially important when using verbs in questions. So when the following question comes up "Fathers should not have to see their spouse to see their children' can cause confusion because they are agreeing not to do something. "*

Marshall [48] said the following are necessary considerations when choose the wording of wording of questions in addition to the considerations above.

"

1) *Use clear wording: Don't use vague terms like majority, often, governmental, older people. Try to be specific instead i.e. More than half, daily, city, over 65.*

2) *Avoid questions that are too time consuming: Examples of these are "15 favourite vegetables", "explain in depth how run a run a business" to a manager. "*

2.5 Preliminary decisions in questionnaire design

The questionnaire design process is according to Malhotra [3] follows the following steps.

“

1. *Determine the required information and from whom it should be sought.*
2. *Determine the interview method and the length of the questionnaire (not appropriate for internet-based questionnaires).*
3. *Prepare the draft questionnaire: which means put in the question content, question wording, response format and the structure and layout. (*
4. *Pre-test and revise the questionnaire.*
5. *Assess the reliability and validity of the questionnaire. “*

Steps 1 involve formulating the research question and screen the respondents to ensure they are worthy to complete the questionnaire.

Practical and common mistakes with Internet questionnaires include. “Not testing the questionnaire through website to ensure that it works properly and respondents can actually complete and send the questionnaire. “

Andrews [10] said designing a web-based questionnaire involved the following steps ‘

a. *Device the questionnaire as if is to be delivered on paper first,*
b. *Develop strategies for reaching the target population.*
c. *Produce an error-free interactive electronic version from the original paper-based one.*
d. *Make the questionnaire accessible from all common browsers and readable from different sized monitors and different network locations.*
e. *Make sure information identifying each respondent can be captured and stored confidentially because the same person may submit several completed surveys.*
f. *Thoroughly pilot test the questionnaire. This may be achieved in four stages; the survey is reviewed by knowledgeable analysts; typical participants complete the survey using a think-aloud protocol, a small version of the study is attempted; a final check to catch small errors is conducted. ‘*

The author agrees with most of these steps Andrews outlined although I think it may not be necessary to develop the questionnaire on paper first.

Cacioppo and Petty [6] (1982) developed a scale to measure the need for cognition. They argued "*Need for cognition (NFC) represents the tendency for individuals to engage in and enjoy thinking.* " They reasoned that when respondents are motivated (such as when the topic is of high relevance to the respondent) respondents are more eager to think than when their motivation is low (such as when the topic is of low interest).

It is important to motivate respondents because many surveys results in very low responses rates, such as 10% or even less. Techniques for motivating respondents include

1) Provide rewards: This means showing positive regards, consulting the respondent and making the questionnaire interest.
2) Minimize costs: This means trying to make the questionnaire appear easy to fill in. This can be done by segmenting the questionnaire into pages, Eliminate the chance of embarrassment and reducing the cognitive and mental effort
3) Establish trust: This means building on the existing relationship, identify with a legitimate organization.

Internet questionnaire administration. Is similar to mail questionnaires in relation to administration with the key difference being due to electronic delivery rather than hard copy delivery. The steps are as follows:

Step 1. Before administration: Check to ensure mailing list and questionnaire sites is operational and that the email list o respondents is right and the URL for the questionnaire site is right.

Step 2. Commencement. Send e-mail to whole sample inviting response and link to questionnaire URL.

Step 3. 1 week after step 2. Send combined thank you/reminder email to whole sample.

The following are some of the guidelines which Shneiderman [12] advised for computer based forms:

- "*Meaningful title*
- *Comprehensible Instructions.*
- *Logical grouping and sequencing of fields.*
- *Visually appealing layout of the form.*
- *Familiar field labels.*
- *Consistent terminology and abbreviations.*
- *Visible space and boundaries for data-entry field.*
- *Convenient cursor movement.*

- *Error correction for individual character and entire fields.*
- *Error prevention where possible.*
- *Error message for unacceptable values.*
- *Marking of optional fields*
- *Explainary messages for fields.*
- *Completion signal to support user control. "*

Questionnaire is a good way to find out information when you plan to do research and/or find out information about a companies needs in software engineering.

According to burgess [49] there are five stages in survey design they are

"

1. define your research aims

2. identify the population and sample

3. decide how to collect replies

4. design your questionnaire

5. run a pilot survey

6. carry out the main survey

7. analyse the data

"

He also said that "*A crucial part of good research design concerns making sure that the questionnaire design addresses the needs of the research.* "

1. **To define the research aims** is important because you want the questionnaire to be tailored to your audience and get the required information from them. Most researchers make the mistake of asking too many questions.
2. **Identify the population and sample** The population is the people who you would be interested in. The sample is the actual people who take your survey. You will need a minimum amount of people to take your survey when researching, although this requirement is not so necessary in business particularly for the application that I have in mind for it.
3. **Decide How to collect Replies** This is necessary because there is a wide variety of ways for responses to questionnaires. There is the structured interview questionnaire which means interviewing a respondent and filling out the questionnaire by the questioner. He/she may phrase the questions slightly different from the way that they have been printed. In the self-administered questionnaire.

4. **Questionnaire design** This phrase is broken down into a) Determining the Questions to be asked and (b) Decide on the Layout and Sequence, c) Question types.

2.6 Critique and Evaluation of Literature Review

In summary, the author feels that my literature review was fairly broad. The author learned about the purpose of questionnaires which is as a base document for research purposes. The author learned about the disadvantages of online questionnaires (the main disadvantages are Freezes and crashes of the browser, error messages caused by programming incorrectly, the possibility of a person doing a questionnaire more than once).

How to choose the methods of reaching the respondents (which discusses the different ways of the respondents completing questionnaires i.e. telephone, by interviews etc) what are the quality of a satisfying questionnaire i.e. one which will give the best results (The questions should not be difficult, the respondent should have a good ability to retrieve, process and integrate from memory, the respondent motivation (which can be affected by the length the questionnaire).

I learned about the importance of the physical appearance of the questionnaire i.e. (why too colours or fonts are recommended, how colours or font sizes can make questions distinct from the answers and easier to follow (this is more relevant to a paper questionnaire), why a background colour is needed, why graphics in questionnaires should be avoided and why it is necessary to include an introduction page. The author learned about how to decide the question content and the different types of question that can be used, the different attribute types i.e. Nominal, Ordinal, Interval and Ratio. The advantages and disadvantages of different question types, example of closed-ended and open ended questions and an analysis of them. I learned about the preliminary decisions in questionnaire design which is akin to a methodology of questionnaire construction, they are many of these in existence, what are readability statistics and how they are used. I then went through a discussion of the survey software that exists and an analysis of the file type which Statpac uses.

I have reviewed a wide variety of literature during my literature review most of which has been online research papers.

2.7 Issues that the author is going to address in my questionnaire development system

1) Implement security on both the questionnaire designer application, website and by email were the users will use them.

   The design will have to register to use designer, administrator can assign certain privileges to designer. Security on website can be implemented by registering and spam filters.

2) Allow for taken questionnaires on both the website and at home by email.

   This can be implemented by emailing the questionnaires, logic files and the database as an XML files to the users. PHP would be the best language to do this.

3) Implement rules for grammatical testing the questions entered.

   The author will try to implement this using either the Flesch reading test so I will break down a sentence in its words. I will determine if they are Nouns, pronouns, verbs.

4) When taken at home the system should remind the person to submit failed questionnaires, thank them when received and possibility email the results.

   Have a trigger on the database system for the attempt that has not been returned within a certain time period.

5) Implement style guidelines based on HCI so colours, fonts and size of elements are coordinated.

6) Allow uses to finish filling in web-based questionnaires if prematurely exit system. *Keep track of what the user fills in after each page. The author could then recreate the progress using the following code* from [17]

```
<%@ page contentType="application/x-javascript"%>
<%@ taglib prefix="c"
uri="http://java.sun.com/jsp/jstl/core" %>
<%@ taglib prefix="sql"
uri="http://java.sun.com/jsp/jstl/sql" %>
<%@ taglib prefix="fn"
uri="http://java.sun.com/jsp/jstl/functions" %>

<sql:setDataSource var="pizza"
  driver="org.gjt.mm.mysql.Driver"
  url="jdbc:mysql:///test"
/>

<sql:query var="sizes" dataSource="${pizza}">
  SELECT * FROM Sizes
</sql:query>

<sql:query var="toppings" dataSource="${pizza}">
  SELECT * FROM Toppings
</sql:query>

values = new Array(
  new Array(
    <c:forEach items="${sizes.rows}" var="size"
varStatus="s">
      new Array("${fn:escapeXml(size.Name)}",
"${size.Id}")
      <c:if test="${not s.last}">,</c:if>
    </c:forEach>
  ),
  new Array(
    <c:forEach items="${toppings.rows}" var="topping"
varStatus="s">
      new Array("${fn:escapeXml(topping.Name)}",
"${topping.Id}")
      <c:if test="${not s.last}">,</c:if>
```

```
    </c:forEach>
  )
);

function setList(selectCtrl, itemArray) {
  // Remove current items
  for (i = selectCtrl.options.length; i >= 0; i--) {
    selectCtrl.options[i] = null;
  }
  for (i = 0; i < itemArray.length; i++) {
    selectCtrl.options[i] = new Option(itemArray[i][0]);
    selectCtrl.options[i].value = itemArray[i][1];
  }
}
```

Figure 2.4 Code uses fn:escapeXml to extract the details of a questionnaire partly filled in back to a form.

7) Have rules that no more than X questions are allowed on a page.

   The author will use a variable as a counter in my application.

8) Allow for the customization of the pre-defined report templates.

   This could be done by allowing the edit of the Microsoft word templates which the reports will be probably in. They will probably use mail merge facilities to insert the fields. The conclusions derived table will be these fields.

9) Statistically analysis of the reports produced.

   THE AUTHOR will not be analysing the actual reports but the conclusions derived based an attempt.

10) Track progress of the questionnaire completion. *In the author's opinion this could be done based on a progress bar (with the number of pages completed and the number of pages to be completed.*

11) Valuate the answers to the forms so that they match the data types specified. *Validation can be performed in java server pages but these ones will have to automatically create.*

12) Allow the design to test the questionnaire before it is used. *This could be done by allowing the expert system to be used*

13) Specify the dates that a questionnaire can be available online. *This will be done in the questionnaire design by*

14) Have logs regarding the failure of the system which will specify what caused the failure. *This log will need to have necessary information like time it happened, was it a communications failure.*

15) Include the Company's URL's and contact details of company in reports and statistics produced. *This is fairly easily done which it is a word document.*

16) Allow designer to redesign previous questionnaires either by changing the questionnaire structure or by modifying the forms produced directly.

    To change the questionnaire structure is fairly easy by using a similar procedure to the form creation but to modify the forms is more complex.

17) Allow designer to assign a questionnaire as a questionnaire template.

    This can be done by changing the questionnaires status to read-only or by adding an attribute called type.

18) Have a report editor to change the look of the reports.

Chapter 3
Design

Objective: To explain the importance of plain English, use of readability tests and how questionnaire systems are implemented by existing software.

3.1 Types of Questions

The format of the questions should be considered as ell. The different types of question are

1. Screening question: This is used to determine if a person is an approximate person to answer the questionnaire.
2. Open-ended question: This is used when precise answers are needed. There are two types of open-ended question they are text box and select area (or lines of text) In HTML forms these are implemented using select area.
3. Close-ended question: This is when the response needed is a number or scale. With html forms these can be radio buttons, select options, and drop down lists, buttons or text fields.
4. Likert Scale – questions: These are questions were the answers may be on a range of numbers. It is advisable that the number of answers possible should be odd because even answers could confuse the respondent because if their value falls between two values.

3.2 Writing in Plain English

I think that a Plain English is important to the success of questionnaires along with most other forms of business communication. The Office of Investor Education and Assistance [27] said "*Because many investors are neither lawyers, accountants, nor investment bankers, we need to start writing disclosure documents in a language investors can understand: plain English.*"

Definition of plain English according to Office of Investor Education and Assistance [27] is *"Plain English means analyzing and deciding what information investors need to make informed decisions, before words, sentences, or paragraphs are considered.*

A plain English document uses words economically and at a level the audience can understand. Its sentence structure is tight. Its tone is welcoming and direct. Its design is visually appealing. A plain English document is easy to read and looks like it is meant to be read."

Some of the common problems of bad English in disclosure documents is according to Office of Investor Education and Assistance [27] are:

- *"Long sentences*
- *Passive voice*
- *Weak verbs*
- *Superfluous words*
- *Legal and financial jargon*
- *Numerous defined terms*
- *Abstract words*
- *Unnecessary details*
- *Unreadable design and layout"*

3.2.1 Introduction to the Grammar of Questions

Foley [26] stated "*there is range of issues to take account of in the use of questions in English, these include word order, word choice and intonation.* ". The author considers that the grammar of questions and the general readability of the questions to have a strong link because questions with good grammar are usually readable.

There are various types of questions that are frequently used in English. They are according to Foley [26]

"

1. *Closed questions: These types of questions have either a yes or no answer. They allow start with a main verb.*
2. *Open questions.*
3. *Tag questions. These are short questions which are often attached to the end of a sentence. They can be used for requests.*

4. *Indirect questions: An indirect question is a question enclosed in an another question or sentence. We use a statement order where the subject always the verb or very phrase. We also use tag questions to make a question more polite or more tentative.*
5. *Echo questions: Echo questions are commonly used with the be word. They are used to show interest and to make a conversation 'flow' with a rising intonation. Such as 'We went a really interesting play last', 'Did you?' "*

3.2.2 Readability Statistics and how to use them

The author planned to incorporate a readability test so that the questions will be easy to understand. Most tests use the various readability statistics that are around. Readability of a passage of text is a rough guide to how plain the English used in it is.

There are various readability statistics for different groups of users.

*According to [12] "**Readability statistics** are indicators, under the form of scores, that measure how easily an adult can read and understand a text. Readability statistics are therefore a good predictor of the level of difficulty of particularly technical documents. They present different **readability scores** that are computed using readability formulas.*

They include:

***Flesch Reading Easy Formulae**: readability statistics formula rates text on a 100-point scale based on the average number of syllables per word and words per sentence. The higher the score, the easier it is to understand the document. For most standard documents, aim for a readability score of approximately 60 to 70."*

Flesch Reading Ease Formulae = 206.835- (84.6 * ASW) - (1.015 * ASL)

*The **Flesch-Kincaid Grade Level** readability statistics formula rates text on a U.S. grade-school level based on the average number of syllables per word and words per sentence. For example, a score of 8.0 means that an eighth grader would understand the text. Given standard writing averages seventh to eighth grade, aim for a score between 7.0 and 8.0.*

The formulae is as follows

FKGL = (0.39 x ASL) + (11.8 x ASW) - 15.59

Where FKGL is the Score, ASL is the average sentence length and ASW is the average number of syllables per word.

*The **Coleman-Liau Grade Level** readability statistics formula gauges the understand ability of a text. The formula uses word length in characters and sentence length in words to determine grade level.*

The formula is as follows:

CLGL = (5.89 x (AWL / ASL)) – (30 x ANS / ASL) – 15.8

Where AWL is the average word length and **ANS** is the average number of sentences.

Rosson [28] said "Both Flesch Kincaid score and Flesch Reading Ease score formulas require the counts of the average number of syllables per word and average sentence length to be done in 100-word chunks of text. Additionally, FK and FRE formulas rely on sentence-ending punctuation to determine the number of words used in analysis and where to demarcate chunks of text. The Flesch Kincaid score and Flesch Reading Ease score analyses report the total number of words submitted but only analyze the words within sentences." This means that an important limitation of these scores is that they require whole sentences for them to work.

3.2.3 Analysis of online surveys

Online survey services are becoming fairly popular recently. There are a variety of them in existence including www.surveymonkey.com. [45] stated "*Web-based questionnaires are rapidly gaining popularity as the Internet and World-Wide Web usage increases"*

3.3 Comparison of Programming Lanaguages

The author considered using either Visual Basic and or Java Swing for the implemented of the questionnaire designer part of my project.
Java has some important advantages for Graphic User Interface programming. These include:

Dalheimer [53] stated "*The main design goal of Java is increased programmer-efficiency compared to other general-purpose programming languages, rather than increased memory- or runtime-efficiency*.". Java has garbage collection of free unlike C++ which requires a programmer to deallocate memory. Dalheimer [53] said that "*Research shows that in practice, garbage collection and other Java features, do not have a major influence on the programmer-efficiency".*

Choudhari [54] argued the following are advantages of using Java
"

Java is simple: No language is simple, but Java considered a much simpler and easy to use object-oriented programming language when compared to the popular programming language, C++.

- *Java is Distribute: Distributed computing involves several computers on a network working together. Java is designed to make distributed computing easy with the networking capability that is inherently integrated into it.*
- *Java is Interpreted: An interpreter is needed in order to run Java programs. The programs are compiled into Java Virtual Machine code called bytecode. The bytecode is machine independent and is able to run on any machine that has a **Java** interpreter*
- *Security: Java is one of the first programming languages to consider security as part of its design. The Java language, compiler, interpreter, and runtime environment were each developed with security in mind.*
- *Reliability: Security and reliability go hand in hand. Security measures cannot be implemented with any degree of assurance without a reliable framework for program execution.*
- *Multimedia Images, Sounds and Animation: JAVA, however through the packages of classes that are an integral part of the Java programming world, provides extensive multimedia facilities that will enable a programmer to start developing powerful multimedia applications immediately.*
- *The Virtual Machine: Java VM This VM sits, metaphorically, between the Java program and the machine it is running on, offering the program an "abstract computer" that executes the Java code and guarantees certain behaviours regardless of the underlying hardware or software platform. Java compilers thus turn Java programs not into assembly language for a particular machine but into a platform-neutral "byte code" that the machine-specific VM interprets on the fly.*

Choudhari [54] then went to say the following as its important disadvantage:

" *Although Java's ability for producing portable, architecturally neutral code is desirable, the method used to create this code is inefficient. As mentioned above, once Java code is compiled into byte code, an interpreter called a Java Virtual Machine, specifically designed for a computer architecture, runs the program."*

Although Java's disadvantage of being slow is very important it is not critical on most modern personal computers because the speed of these are constantly improving.

There is a comparison of object oriented programming languages from [52] in the Appendix 3.4 Summary of Choices made

While Java Fathom can calculate the Fog Index and the Flesch Kincaid grade score, the author will use fathom to implement my readability tests using the Flesch Reading Ease reading test because it does not require a paragraph of text for it to work unlike the Gunning fog test I will have to calculate the formulae by myself using the formulae given above in section 3.2.2.

The author will to create multi-page questionnaires because they can be customized depending on the answers entered and screening questions can be used more effectively.

3.5 Summary

In this chapter the author has discussed types of questions that questions have, the importance of writing in plain English i.e. language that is easily understand and does not have over long sentences, what is meant by readability. The different types of readability tests and the formulae used to calculate them and how to understand the result of these formulae. The author also reviewed some of the critical files types used by a freely available online survey software statpac which include codebooks,

Appendix B: References

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