

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter describes the methods involved in conducting the study. This study is systematically guided by design and development research model (DDR) pioneered by Richey and Klein (2007). In this research there are three main phases to be followed as a systematic guide in order to design the meaning-based *Tarannum* al-Qur'ān mobile application model which need analysis phase, design and development phase, and evaluation phase.

In this chapter, a detailed explanation regarding the proposed methodology of this research is explained. Several things have been considered in achieving the research objective and in turn, answer the research questions. This chapter discussed the research design in conducting the study. The researcher also discussed on the research samples, research instruments, and the procedure to conduct the study.

#### 3.2 Research Design

This systematic study is basically based on the design and development research (DDR) approach by (Richey & Klein, 2007). These methods are also known as developmental or development research (Richey, Klein, & Nelson, 2004; Seels & Richey, 1994). Design and development research seeks to create knowledge grounded

in data systematically derived from practice. Richey and Klein (2007), offer a concise definition of design and development research as:

“The systematic study of design, development and evaluation processes with the aim of establishing an empirical basis for the creation of instructional and non-instructional products and tools and new or enhanced models that govern their development”. The formulated methodology was based on the design developmental research (DDR) which is empirical by nature. Design and development research leads to knowledge production, a more complete understanding of the field, and ability to make predictions. Design and development research accomplishes these goals through two large categories of research project:

- 1) Type 1 : Product and tool research
- 2) Type 2 : Model research

According to Richey and Klein (2007), the type 1 of design and development research referred to product and tool research which is the most straightforward design and development research. The research conducted on a product or tools of often the entire design and development process being documented. Some research, however, concentrates on one aspect of design and development only (such as production) or de-emphasises some phases (such as needs assessment). Many recent studies focus on the design and development of technology-based instruction. While the second type of design and development research pertains to studies of the development, validation, and use of design and development models. These studies focus on the models and processes themselves, rather than their demonstration. While it is possible to conduct model research in conjunction with the development of a product or program, most

model studies concentrate on previously developed instruction, and consequently are not project-specific. Model research may address the validity or effectiveness of an existing or newly constructed development model, process, or technique. In addition, these studies often seek to identify and describe the conditions that facilitate successful design and development. Model research is the most generalized of design and development research. The ultimate object of this research is the production of new knowledge, often in the form of a new (or an enhanced) design or development model. This research may emphasise comprehensive models or particular design techniques or processes. It commonly examines design and development as it is practiced in the workplace.

Generally, this systematic study is comprised of three phases which respectively are the analysis phase, design and development phase, and evaluation phase. This systematic study helps the researcher to design a study and can also apply multi-method and various kinds of instrumentations according to the phases contained therein.

Design and development research uses a wide variety of methodologies. Many design and development research both product and tool research and model research rely upon a variety of qualitative techniques, including case studies, interviews, document reviews, and observations. Evaluation research techniques (both qualitative and quantitative) are also included in many studies that focus on product and tool development. Model development and use case studies often employ survey research techniques, while model validation studies frequently use traditional experimental designs. Some of the most commonly used design and development research methods

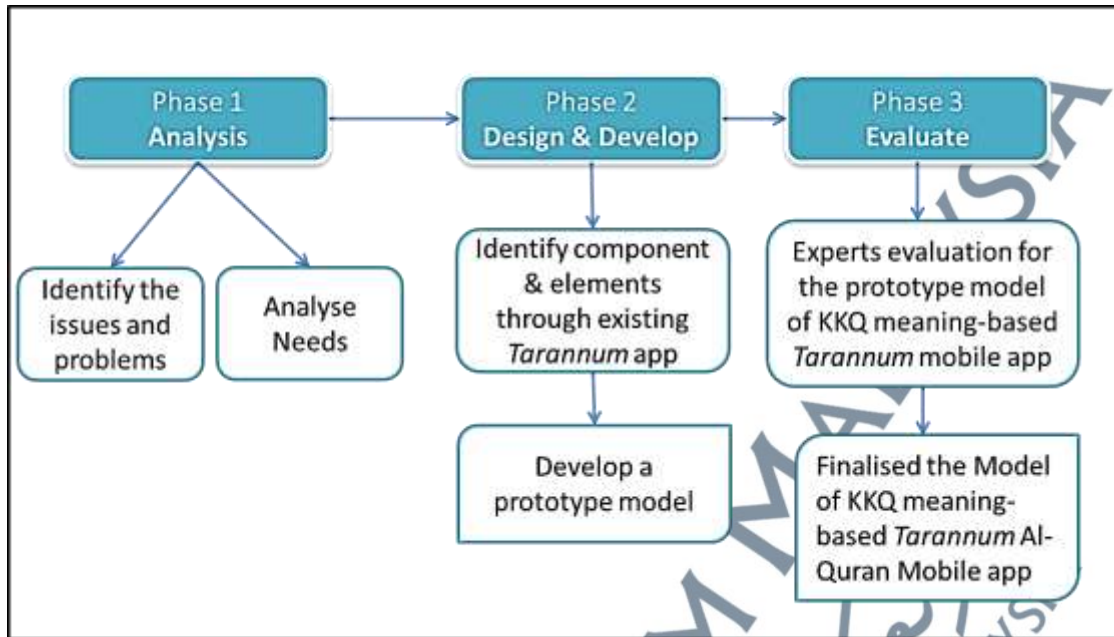
are shown in Table 3.1. The list in Table 3.1 is certainly not exhaustive, but it does represent the methods most commonly used in design and development research.

**Table 3.1:** Common Methods Employed in Design and Development Research

Type of Research	Project Emphasis	Research Methods Employed
Product & Tool Research	Comprehensive Design & Development Projects	Case Study, Content Analysis, Evaluation, Field Observation, In-Depth Interview
Product & Tool Research	Phases of Design & Development	Case Study, Content Analysis, Expert Review, Field Observation, In-Depth Interview, Survey Evaluation, Expert Review, In-Depth Interview, Survey
Product & Tool Research	Tool Development & Use	Review, In-Depth Interview, Survey
Model Research	Model Development	Case Study, Delphi, In-Depth Interview, Literature Review, Survey, Think-Aloud Methods
Model Research	Model Validation	Experimental, Expert Review, In-Depth Interview
Model Research	Model Use	Case Study, Content Analysis, Field Observation, In-Depth Interview, Survey, Think-Aloud Methods

Source: Richey & Klein (2007)

This research is intended to design a *Tarannum* al-Qur'ān mobile application model for the use of KKQ classes by utilising the design and development research of type 2, the model research. Figure 3.1 showed the overview of the whole research flow from Phase 1 which is the analysis phase until Phase 3, which is the evaluation phase. Each phase has its process to achieve the research objectives and to answer the research questions.

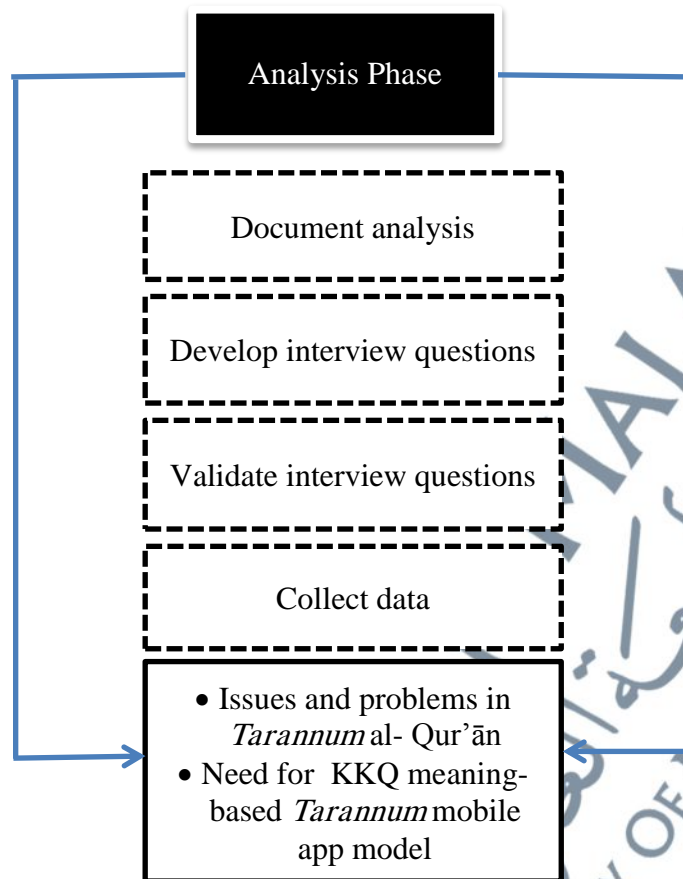


Adapted & Adopted from: Richey & Klein (2007)

**Figure 3.1:** Research Diagram Flow

### 3.3 Phase 1 : Analysis phase

This section explained the analysis phase conducted by the researcher. The explanation includes how data collection and procedures for the study, the research instruments used, the sampling, location for this study as well as the data analysis applied within research scope. Figure 3.2 depicted is the flowchart of the analysis phase occurred.



**Figure 3.2:** Flowchart of Analysis Phase

Based on Figure 3.2, there were two data collection methods used to answer the research questions. The first involves document analysis and conducting interview sessions to identify the issues and problems in *Tarannum al-Qur'an* field. Next was finding the needs for the KKQ *Tarannum* mobile app model development.

### 3.3.1 Data Collection and Procedures

This section explained in detail the data collection methods and procedures used in phase I; the analysis phase which is the document analysis and interview session conducted.

## *Document Analysis*

The document analysis was conducted through this study to gather information regarding the research topic apart from answering the research questions. According to Bowen (2009), document analysis is a systematic procedure for reviewing or evaluating documents in both printed and electronic (computer-based and internet-transmitted) material. Document analysis requires that data be examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge.

In phase I, various kinds of documents that are related to research objectives in this analysis phase were collected in order to get an overview of data and information related to the research. The online documents which are the article journals, theses, books, proceedings, and websites were used. For printed documents, al-Qur'ān and printed books, researcher were directly reviewed and cited the documents. For the electronic materials, researcher collected the information through various databases such as SAGE journals, ACM Digital Library, EBSCOhost, Emerald Management Plus, ProQuest Central, and Tylor and Francis Online.

In searching for the articles, the keywords such as *Tarannum* al-Qur'ān, *Maqamat* al-Qur'ān, *Kelas Khas Membaca Dan Menghafaz* al-Qur'ān, KKQ, mobile application, mobile app, mobile learning, mobile environment, and mobile app model were used in order to search for the information regarding to the research topic. The searches are also from Mendeley library catalogue and from google scholar. After obtaining the document that meets the requirements for the study, researcher compiled into Mendeley and sorted into folders. The names for the respective folder were given. Next, the data were imported into .xml format and the .xml format was exported to

ATLAS.ti in order to do the analysis part. The documents are sorted and the texts are deductively coded based on the research questions. Then, the data from document was analysed through inductive and deductive coding approach using ATLAS.ti software in order to draw conclusion throughout the themes that have emerged upon the analysis of data. Deductive coding approach is described as the process identifying the code emerged from a set of identified variable that has been predetermined earlier (Braun & Clarke, 2012). While inductive coding approach is describe as the codes from the data that developed by researchers using phrases or terms used by the participants themselves (Linneberg & Korsgaard, 2019). From re-reading the documents, researcher selectively codes any data that relates to the core variable identified.

### ***Interview***

The interview method is one of the main methods in collecting data for survey research which conducted orally. The responses for interview session are normally recorded by the researcher in writing, through video recording, audio recording or through other electronic means. It is defined as two-way conversation with the objective of collecting information. The interviewer and respondent interact face-to-face or via telephones in order to obtain information (Chua, 2012). Interviews will provide researchers with rich and detailed qualitative data for understanding participants' experiences, how they describe those experiences, and the meaning they make of those experiences (Castillo-Montoya, 2016).

In analysing the interview data, all the data gathered from the interview sessions in the form of audio recording were then transcribed by the researcher into



non-verbatim. The researcher transcribed the audio recording right after the interview session conducted and while waiting for the second interview. This is to ensure that the researcher can improve the next interview session from the previous. Through this process, the researcher could attentively listen repeatedly to the audio recording in order to transfer the audio recording into text documents. The exact words of participants were recorded, along with any aspects of non-verbal communication that deems necessary, such as pauses, laughter, or interruptions. These types of communications were noted within parentheses.

After the transcription done, the researcher organizes the text document into computer software that is ATLAST.ti and the transcribed data was analysed through inductive and deductive coding approach using ATLAS.ti software in order to draw conclusion throughout the analysis of data. The data were assigned identification codes to classify it into categories. Finally, researcher has identified the themes for the document analysis and the interviewed data. ATLAS.ti is the Qualitative Data Analysis (QDA) software that had been widely used by qualitative researchers in analysing their qualitative data.

In this study, the interview sessions were conducted by interviewing potential users in *Tarannum* field which include five KKQ teachers, four KKQ students a well as qāri'. The consent letter in (**Appendix B**) was used for teachers and qāri' in order to obtain permission to record conversations during the interview sessions. While the consent letter of parents and guardian in (**Appendix B1**) was used for the students. The interview conducted in order to identify the needs in designing KKQ *Tarannum* mobile apps model and to discover the issues and problems in *Tarannum* teaching and learning. The interview protocol (see **Appendix A**) was used as a guideline for

researcher in order to get the data and information needed. Three interview protocols developed for different types of respondents namely the interview protocol for KKQ teachers, the interview protocol for KKQ students and the interview protocol for qāri' /qāri'ah.

As mentioned in Chapter 1, in Malaysia, KKQ classes are provided in selected schools which are in SMKA, SABK and SMK with *Kelas Aliran Agama* (KAA) stream. Each of the schools manages to have one or two KKQ's teachers to teach KKQ's subject from Form One until Form Five. In order to collect data from the schools under KPM's jurisdiction, researcher had gone through three degrees of permission. Before conducting the interview session, researcher had applied the permission from Educational Planning and Research Division (EPRD) to do the research through online application at <https://eras.moe.gov.my>. Researcher had filled the form and the details needed (**Appendix C: ERAS Application Form**) while preparing to upload all the documents needed such as research proposal, the instrumentations, and list of the schools to conduct the research. Next, researcher had to wait for five working days for application process and the approval letter (**Appendix D: Approval Letter to Conduct Research by KPM**). For the second level, after getting the approval letter, researcher has to refer *Jabatan Pendidikan Negeri* (JPN) and ask for permission to do the data collection. After obtaining the approval letter (**Appendix E: Approval Letter to Conduct Research by JPN**), researcher has to contact the listed schools to gain the necessary permission (**Appendix F: Approval Letter to Conduct Research by schools**) before arranging the interview session with the prospective participants and setting convenient date and time for a face to face interview. If the prospective participants could not commit for the face-to-face interview, researcher will opt for a telephone interview. A Semi-

structured interview questions were asked during the interview session to the participants.

According to (Chua, 2012), a semi-structured interview format lies in between the structured and non-structured interviews. In semi-structured interview, the researcher not only asked a set of formal questions which have been prepared before the interview, but is also given the freedom to query and explore the answers given by the respondents in a more in-depth manner. The interview session is conducted in a semi-formal manner and the researcher is allowed to be more flexible. The questions can be rearranged during the interview session and the sentences and words in the questions can be altered from what was planned. Researcher can also add or drop the questions according to the needs of particular subjects. All the interview sessions were recorded using audio recording and the audio data were transcribed non-verbatim into a written format of transcription.

### **3.3.2 Research Instrument**

This section briefly explained the research instrument used in the analysis phase which is the interview protocol.

#### ***Interview Protocol***

An interview protocol is an interview guide lists for the questions or issues that are to be explored in the field of a study. An interview protocol is prepared to ensure that the same basic lines of inquiry are pursued with each person interviewed. The guide provides topics or subject areas within which the interviewer is free to explore, probe, and ask questions that will elucidate and illuminate that particular subject.

Thus, the interviewer remains free to build a conversation within a particular subject area, to word questions spontaneously, and to establish a conversational style with the focus on a particular subject that has been predetermined. The guide serves as a protocol or checklist during the interview to make sure that all relevant topics are covered (Patton, 2015). The interview question should align based on research questions (Castillo-Montoya, 2016; Pollara, 2011) and relevant literature (Pollara, 2011) therefore, it can increase the utility of interview questions and ensuring their necessity for the study.

In this study, the interview protocols (**Appendix A**) were developed based on the research objective one and research question one and two of the issues and problems in *Tarannum* field and the need analysis in designing a model of KKQ meaning-based *Tarannum* mobile app. The interview protocols consist of three protocols for different respondents which respectively the interview protocol for KKQ teachers, the interview protocol for KKQ students and the interview protocol for qāri' /qāri'ah. The interview protocols themes developed aligned with the research questions and from the literature review which are the issues and problems in *Tarannum* field, approach in teaching *Tarannum* recitation, materials used in teaching and learning, *Tarannum* recitation technique and the needs of *Tarannum* mobile app in assisting the KKQ teaching and learning process. The semi-structured approach of interview questions was used in this study. It is because semi-structured questions give better freedom to question and explore the answers given by respondents in a more in-depth manner (Chua, 2011), as this study explored on *Tarannum* al-Qur'ān field which is fairly studied by others and it need for more information constituents to the topic. Besides that, semi-structured questions allowed for the variation in the

order, phrasing of the questions and any additions to the protocol and the questions were flexible to represent the emergent nature of the interview conversation (Gikas & Grant, 2013). Two types of validation process which is the content validation and the face validation have been done by the researcher in order to make sure the content and language used in the interview protocols is convenient. For the findings, this study had employed the triangulation of data in ensuring the accuracy of the information in the report. The triangulation of the method and the triangulation of the participants were employed in this study

### 3.3.3 Research Sample and Location

In this study, researcher had employed the purposive sampling technique in selecting the participant. According to Chua (2012), Purposive sampling technique is the process whereby a group of subjects is chosen as participants because they have certain characteristics. Subjects without those characteristics will not be selected.

The research involves five teachers and four students from KKQ classes and two qāri'. All the participants were chosen accordingly based on their characteristics in this study. As this research is regarding to *Tarannum* education and the practices in Malaysia, the sample were purposely selected as the participants for this research in order to get data, information and feedback. Other than that, this research studied on ten samples of *Tarannum* mobile apps that are available in Google play store to figure out the components of *Tarannum* learning, the features of the apps and the multimedia elements that were applied in the existing *Tarannum* mobile apps.

The study was conducted in two Malaysian states, Johor and Pahang. Both locations were chosen since there was never any research done in these states. Besides that, Johor and Pahang are among the highest number of schools that teaches KKK classes in Malaysia based on the data.gov.my portal ([https://www.data.gov.my/data/ms\\_MY/dataset/senarai-sekolah-yang-melaksanakan-kelas-aliran-agama-kaa](https://www.data.gov.my/data/ms_MY/dataset/senarai-sekolah-yang-melaksanakan-kelas-aliran-agama-kaa)) which was provided by KPM. This research was conducted in Segamat, Johor and Pekan, Pahang.

### **3.3.4 Data Analysis and Interpretations**

To analyzing the findings from document analysis and interview, this study made use of the thematic analysis technique.

#### ***Thematic Analysis***

Thematic analysis is a type of qualitative analysis (Alhojailan & Ibrahim, 2012). According to Braun and Clarke (2012), the thematic analysis is a method for systematically identifying, organizing, and offering insight into patterns of meaning (themes) across a data set. Through focusing on meaning across a data set, thematic analysis allows the researcher to see and make sense of collective or shared meanings and experiences. While, Guest, MacQueen, and Namey (2014), explained that the thematic analyses require more involvement and interpretation from the researcher. It move beyond counting explicit words or phrases and focus on identifying and describing both implicit and explicit ideas within the data, that is, themes. Codes are then typically developed to represent the identified themes and applied or linked to raw data as summary markers for later analysis. Such analyses may or may not

include the following: comparing code frequencies, identifying code co-occurrence, and graphically displaying relationships between codes within the data set.

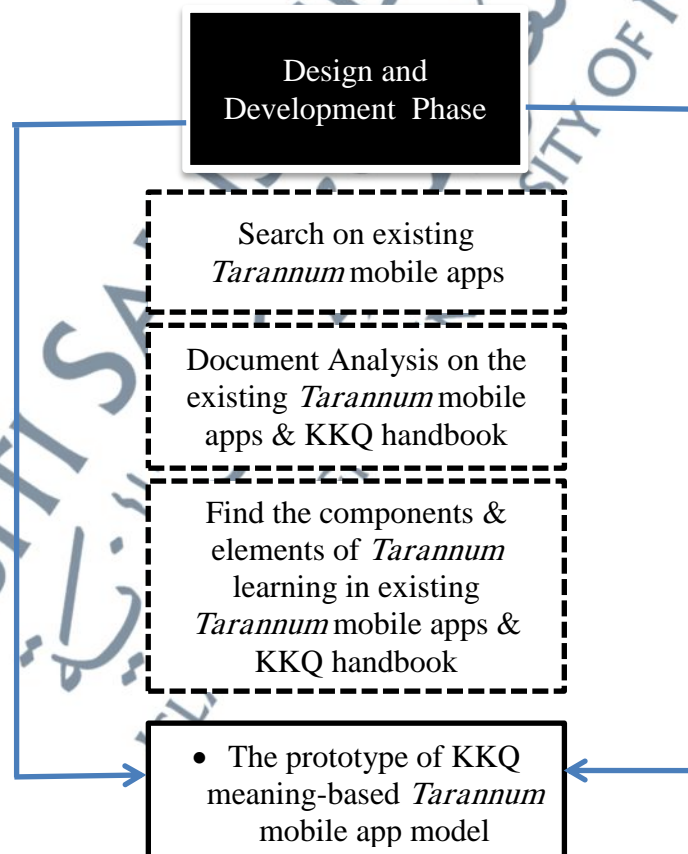
As the thematic analysis offers the flexibility (Alhojailan & Ibrahim, 2012; Braun & Clarke, 2012) for starting data analysis at any time during the project, where there is no association between the data gathered and the result of the process itself. Moreover, it provides a comprehensive process for a researcher to identify numerous cross-references between the evolving themes and the entire data. By using thematic analysis, it is possible to link the various concepts and opinions of participants and compare them with the data that has been gathered in different situation at different times from other or the same participants during the project. In this case, the potential for interpretation becomes infinite. Through the collection of qualitative data in this study, researcher had employed thematic analysis in analysing for both document analysis data and interview transcripts.

The documents are sorted and the texts are deductively and inductively coded based on the research questions. The data from document was analysed through inductive and deductive coding approach using ATLAS.ti software in order to draw conclusion throughout the themes that have emerged upon the analysis of data. Deductive coding approach is described as the process identifying the code emerged from a set of identified variable that has been predetermined earlier (Braun & Clarke, 2012). While inductive coding approach is describe as the codes from the data that developed by researchers using phrases or terms used by the participants themselves, rather than using the theoretical, vocabulary of the researcher (Linneberg & Korsgaard, 2019). From re-reading the documents and transcripts, researcher selectively codes any data that relates to the core variable identified. This process involved the coding of text data which is the process of segmenting and labelling text

to form descriptions and broad themes in the data. Then, the similar codes were grouped into categories. From categories, the data were grouped into themes as final findings for these qualitative methods.

### 3.4 Phase 2 : Design and Development Phase

This section explained the design and development phase conducted by the researcher. The explanation includes how the data collection and procedures for the study, the research instruments used, and the applied data analysis for this section. Figure 3.3 outline the flowchart of the design and development phase mentioned.



**Figure 3.3:** The Design and Development Phase Flowchart



In Figure 3.3, the flowchart had depicted the flow of design and development occurred in this phase. Before designing the *Tarannum* mobile app model for the use of KKQ classes, the researcher had done a searching on the existing *Tarannum* mobile app in the Google App online market. After choosing the app, researcher had documented the existing *Tarannum* mobile app in order to find the components and elements of *Tarannum* learning. At the same point, the document analysis towards KKQ handbook was also conducted. Finally, researcher had developed the prototype of KKQ meaning-based *Tarannum* mobile app model.

#### **3.4.1 Data Collection and Procedures**

In design and development phase, this study had focused on document analyses in design before developing a model of KKQ meaning-based *Tarannum* mobile app. The document analysis on the existing *Tarannum* mobile app as well as the KKQ handbook was performed to identify several components and elements present in *Tarannum* learning. Section below describes the detail of data collection and procedures applied in design and development phase, which is the document analysis.

##### ***Document Analysis***

As described in the previous section, the document analysis is a systematic procedure for reviewing or evaluating documents in both printed and electronic (computer-based and internet-transmitted) materials. Document analysis requires that data be examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge (Bowen , 2009). Based on this study, researcher had

conducted a search towards the *Tarannum* mobile apps in Google Play Store marketplace. From that search, researcher had listed ten *Tarannum* mobile apps that are available in the marketplace based on the relevance keyword search which are “*Tarannum* al-Qur’ān”, “*Maqamat* al-Qur’ān”, and “*Tilawah* al-Qur’ān”. Researcher had selected ten *Tarannum* mobile apps based on the suitability of the learning style of KKQ students at the secondary school level, that have the interactive elements whereby it is convenient at the age of the students. The researcher then documented each of the *Tarannum* mobile apps’ content each pages and navigation before tabulated for the document analysis purpose. These processes were necessary in order to find the components and elements of *Tarannum* learning in the existing *Tarannum* mobile apps (see **Table 5.4 – Table 5.13**). The document analysis on the KKQ handbook was also made with the same purpose. Based on this document analyses, researcher had developed the matrix analyses to summarize and analyze qualitative data into a table presented in Chapter 5.

### **3.4.2 Research Instrument**

The instrumentation used in design and development phase is the matrix analysis. Researcher had developed the matrix analysis in analyzing the data and information based on the document analysis resulted on the existing *Tarannum* mobile apps and KKQ handbook.

#### ***Matrix Analysis***

A matrix analysis is a way of summarizing and analyzing qualitative data in the form of table rows and columns. It allows for both cross-case as well as sorting

data by theme. For the research purpose, the compilations were made through documenting and analyzing the existing *Tarannum* mobile apps in the Google play marketplace into a matrix table.

The matrix analysis had been developed in a table and the elements of the matrix analysis had been extracted based from the document analysis conducted. Through this method, researcher listed ten *Tarannum* mobile app in the market to be analyzed into four different scopes. The first matrix analysis was the components of *Tarannum* learning in the existing *Tarannum* mobile apps (see **Table 5.14**). The second matrix analysis is the components of *Tarannum* learning in KKQ Handbook (see **Table 5.15**). The third matrix analysis is the elements of multimedia in the existing *Tarannum* mobile apps (see **Table 5.16**). The last matrix analysis which is the fourth one is the *Tarannum* mobile apps features which can be further categorized into; *Tarannum* mobile apps features based on education category (see **Table 5.17**), *Tarannum* mobile apps features based on music and audio category (see **Table 5.18**), and lastly *Tarannum* mobile apps features based on book and reference category (see **Table 5.19**). Researcher had analyzed the *Tarannum* mobile app in a category table in order to compare all the contents and features in each of the mobile apps. The contents and features found in mobile apps are the elements for developing the KKQ meaning-based *Tarannum* mobile app model. Content validity for the matrix analyses had been validated by experts from KKQ teacher and the software engineer background. Researcher had prepared a document of the matrix analyses to be validated by these experts.

### 3.4.3 Data Analysis and Interpretations

This section explained the data analysis and interpretation for design and development phase. In this phase, the thematic analyses were applied in interpreting the data gathered.

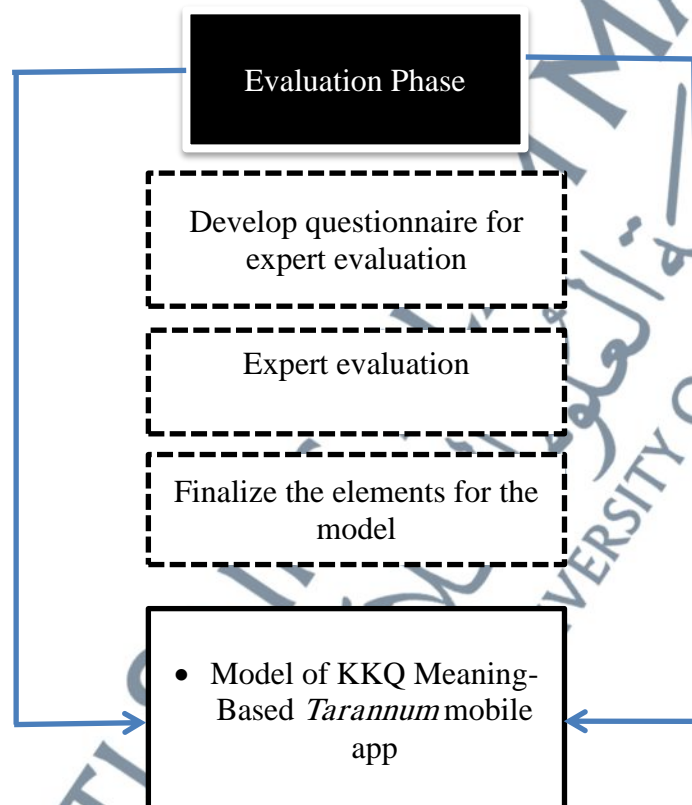
#### *Thematic Analysis*

As describe in the previous section, the thematic analysis is one of the type of qualitative analysis (Alhojailan & Ibrahim, 2012) whereby this method is systematically used for identifying, organizing, and offering insight into patterns of meaning which is themes; across tha data set. It allows the researcher to see and make full sense of collective or shared meanings and experiences (Braun and Clarke, 2012).

While, Guest, MacQueen, and Namey (2014), explain that the thematic analyses require more involvement and interpretation from the researcher. It move beyond counting explicit words or phrases and focus on identifying and describing both implicit and explicit ideas within the data, that is, themes. Codes are then typically developed to represent the identified themes and applied or linked to raw data as summary markers for later analysis. In this study, researcher had documented ten existing *Tarannum* mobile apps into tables. Each page of each existing *Tarannum* apps were describes in details of its contents. Then, researcher extracted the components of *Tarannum* learning and the elements of multimedia from the existing *Tarannum* mobile apps and arranged in a form of matrix analysis table (see **Table 5.14, 5.15** and **5.16** in Chapter 5) and the themes from the matrix analysis table were described in details in paragraphs in Chapter 5.

### 3.5 Phase 3 : Evaluation Phase

This section explained the evaluation phase conducted by the researcher. The explanation includes how data collection and procedures for the study, the research instruments used and the data analysis applied in this phase. Figure 3.4 depicted is the flowchart of the evaluation phase occurred.



**Figure 3.4:** The Evaluation Phase Flowchart

Based on Figure 3.4, it shows on the evaluation process occurred throughout the evaluation phase. In the early stages of the evaluation phase, researcher had developed questionnaires for experts to evaluate the prototype model. The questionnaires were developed based on the document analysis conducted in phase II, the design and development phase. There are ten experts had been appointed to be

involved in this study. The experts were appointed based on their experience in Islamic Studies field and Al-Qur'ān field. The questionnaire had been distributed after the experts agreed to take part in this research (**Appendix G**). The questionnaire distributed by using courier service as requested by the expert and through online means that is by email. The experts need to evaluate the model of KKQ meaning-based *Tarannum* based on the questionnaire given which comprises of three sections. Section A is the demographic information, section B is the evaluation on the elements that are suitable with the KKQ meaning-based *Tarannum* mobile app model and section C is the evaluation on the overall usability of the model developed. In analyzing the questionnaire, the Fuzzy Delphi method had been applied and this study had finalized the elements of the model of KKQ meaning-based *Tarannum* mobile app.

### **3.5.1 Data Collection and Procedures**

In collecting the data in evaluation phase, researcher had employed the Fuzzy Delphi Method to obtain the experts consensus in evaluating the prototype model developed. The questionnaire for the expert consensus had been developed by the researcher based on the document analyses done in design and development phase. Below is the detail explanation on Fuzzy Delphi Method and its procedures in collecting the data.

#### ***Expert Evaluation (Fuzzy Delphi Method (FDM))***

Expert evaluation is one of the methods that were used in this research in evaluating the *Tarannum* mobile app model as well as to seek the agreements with the

appointed experts. In ensuring the design model of KKQ meaning-based *Tarannum* mobile apps is well developed, researcher had verified the design model with the experts by using the expert evaluation form. The Fuzzy Delphi method was employed in this research to obtain the agreement from the experts. The experts in the evaluation phase of this research consist of KKQ *Tarannum* teacher, lecturers and qāri'. Throughout this phase, researcher had appointed ten experts in evaluating the model designed.

Fuzzy Delphi is one of the methods of collecting the data and it is widely used by the researcher in order to obtain the agreement and consensus of experts. The Fuzzy Delphi Method (FDM) is the technique that has been revised from the traditional Delphi technique. It is a combined method between a classical Delphi with a fuzzy numbering set and it used to overcome some of the ambiguity in finding the agreement from Delphi panel. The FDM technique is first introduced by Murray, Pipino and Gigch in 1985. It is the modification method of former classic Delphi method developed by two scientists, Olaf Holmer and Norman Dalkey, which has been used widely to get the expert opinions via survey (Mohd Ridhuan & Nurulrabihah, 2020; Ramlan & Ghazali, 2018). The FDM is an analytical method based on the Delphi method that encompasses the fuzzy theoretical ideas. It is a modification and improvement of the classical Delphi method and it has been extensively studied since 30 years ago.

In order to conduct the study by using the Fuzzy Delphi Method, there are few steps the researcher needs to follow. Based on Mohd Ridhuan and Nurulrabihah (2020); Ramlan and Ghazali (2018), in their book, the steps of FDM are described as follows:

### **Step 1:** Develop the Fuzzy Delphi questionnaire

In developing the research instrument for FDM, there are several approach can be applied by the researcher. The formation of an expert questionnaire was based on the following approaches:

- 1) Literature Review
- 2) Expert interview
- 3) Focus group
- 4) Adaptation from the existing questionnaire
- 5) Document Analysis (Habibah @ Artini, 2017)

Through this study, researcher had developed the questionnaire based on the expert interview and also from the document analysis (Habibah @ Artini, 2017) which is researcher gain the elements in the questionnaire based from the KKQ handbook and also from the existing *Tarannum* mobile app .

### **Step 2:** Experts selection and data dissemination

Through this step, a number of experts are selected based on the justification and needs of a study conducted. A number of experts are invited to determine the importance, needs and priorities for evaluation criteria on the variables to be measured with linguistic variable. The researcher can choose to meet face to face with the experts who have been selected and have been identified to facilitate the process of discussion and explanation of issues that may exist in the items, elements and content of a study and so on. The criteria of the expert as described in the table 3.2 below.



**Table 3.2:** The Expert Criteria

<b>Criteria</b>
Expertise
Certification
Individual characteristic
Discriminant ability
Consistent and reliability
Knowledge and experience with the issues under investigation
Capacity and willingness to participate
Sufficient time to participate in the Delphi
Effective communication skills

Source: Ramlan &amp; Ghazali (2018)

After identifying the experts, the researcher also needs to determine the number of experts who will participate in the study. The appropriate number of experts can be determined through various literatures and also according to the suitability of the research objectives which has been prescribed by the researcher. The total number of experts that can participate in a study is determined based on the literature in the following Table 3.3.

**Table 3.3:** Numbers of Experts' Sample

Number of Samples	Studies	Criteria of the Samples
7 and above	Linstone (1978) Mullen (2003)	
7 – 10 samples	Philip (2000)	
8 – 12 samples	Cavalli-Sforza & Ortolano (1984)	
15 – 50 samples	Turoff (1970)	
10 – 20 samples	Hsu & Standford (2007)	
10 – 15 samples	Delbecq, Van de Ven and Gustafson (1975) Adler & Ziglo (1996) Clayton (1997)	
5 – 10 samples	Clayton (1997)	Heterogenous
10 – 35 samples	Gordon (1994)	Heterogenous

Source: Ramlan &amp; Ghazali (2018)

Once researcher had appointed the experts to be part of the research, through this step, researcher will gain the data and information from the experts depending on researchers' initiative. The following are some of the methods or ways to obtain data from the experts:

- 1) Physical face-to-face meeting with the experts. It can be done by conducting a seminars or workshops and invite the experts involved at a designated place.
- 2) Virtual face-to-face meetings with the experts. It can be done by conducting the meetings with the group of experts in an online platform such as (zoom, webex, Google Meet, Microsoft Teams etc.).
- 3) Meet face-to-face each of the expert individually either in person or virtually.
- 4) Disseminate the instrument through online platform such as via email to identified experts.

**Step 3: Determining linguistic variable**

This process involves the process of converting all linguistic variables into Triangular Fuzzy Numbering. The Triangular Fuzzy Number used to generate fuzzy scales for the purpose of translating linguistic variables into fuzzy numbers.

Assume that the fuzzy  $r_{ij}$  number is the variable for each criterion for expert  $K$  for  $i = 1, \dots, m, j = 1, \dots, n, k = 1, \dots, k$  and  $r_{ij} = 1 / K (r^1_{ij} \pm r^2_{ij} \pm r^k_{ij})$ .

The table 3.4 shows the the linguistic variables for seven (7) scales and Table 3.5 shows the the linguistic variables for five (5) scales where it displays the measurement statement for an item and the fuzzy scale value it represents. The different between these two tables is, the higher the number of scales the more precise

and accurate the data obtained. The linguistic variable can be changed according to the research objectives and research questions that have been established by the researcher.

**Table 3.4:** The 7-point Linguistic Variable and Fuzzy Scale

Linguistic variables	Fuzzy Scale
Extremely Disagree	(0.0, 0.0, 0.1)
Strongly Disagree	(0.0, 0.1, 0.3)
Disagree	(0.1, 0.3, 0.5)
Simply Agree	(0.3, 0.5, 0.7)
Agreed	(0.5, 0.7, 0.9)
Strongly Agree	(0.7, 0.9, 1.0)
Extremely Agree	(0.9, 1.0, 1.0)

**Table 3.5:** The 5-point Linguistic Variable and Fuzzy Scale

Linguistic variables	Fuzzy Scale
Strongly Disagree	(0.0, 0.0, 0.2)
Disagree	(0.0, 0.2, 0.4)
Simply Agree	(0.2, 0.4, 0.6)
Agreed	(0.4, 0.6, 0.8)
Strongly Agree	(0.6, 0.8, 1.0)

Below is an example of linguistic scale that have been converted into Fuzzy scale in Microsoft Excel developed by Mohd Ridhuan and Nurulrabihah (2020).

EXPERTS	ITEMS											
	1	2	3	4	5	6	7	8	9	10	11	12
P1	7	7	7	7	6	7	7	7	7	7	7	6
P2	5	5	5	3	5	3	5	5	5	5	5	5
P3	7	7	7	4	7	4	7	7	7	7	7	1
P4	6	6	7	5	6	6	6	7	7	7	5	4
P5	6	6	5	3	5	3	5	5	5	5	5	5
P6	6	6	7	5	5	5	6	6	5	6	4	5
P7	6	6	6	6	6	6	6	5	6	5	5	5
P8	7	7	7	7	5	7	7	7	7	7	7	2
P9	6	6	6	6	5	7	6	5	6	7	6	6
P10	7	5	6	4	6	5	6	5	5	7	3	5

**Figure 3.5:** The Example of Linguistic Scale

Figure 3.5 above show the example of linguistic scale which have been selected or evaluated by the experts and were inserted into Microsoft Excel. After this

process, the data were automatically converted into Fuzzy scale as depicted in Figure 3.6.

Experts	ITEMS														
	1			2			3			4			5		
P1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.7	0.9	1
P2	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.1	0.3	0.5	0.5	0.7	0.9
P3	0.9	1	1	0.9	1	1	0.9	1	1	0.3	0.5	0.7	0.9	1	1
P4	0.7	0.9	1	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1
P5	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.1	0.3	0.5	0.5	0.7	0.9
P6	0.7	0.9	1	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9
P7	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1
P8	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9
P9	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9
P10	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.3	0.5	0.7	0.7	0.9	1
Average	0.760	0.920	0.990	0.720	0.890	0.980	0.760	0.910	0.980	0.500	0.680	0.820	0.620	0.810	0.950
	m1	m2	m3	m1	m2	m3	m1	m2	m3	m1	m2	m3	m1	m2	m3

Figure 3.6: The Example of Fuzzy Scale

**Step 4:** The process of determining the threshold value

After successfully acquiring and get all the data and information from the group of experts, the researcher must convert all the likert scale into fuzzy scale. All the data and information were analyzed by using Fuzzy Delphi template in Microsoft Excel. Once the data are ready, the threshold value (d) will be calculated by using the template from Microsoft Excel.

The use of vertex method was carried out to calculate the distance between the average rij. The threshold value (d) of the two (2) fuzzy numbers m = (m1, m2, m3) and n = (m1, m2, m3) are calculated using the following formula:

$$d(\bar{m}, \bar{n}) = \sqrt{\frac{1}{3} [(m_1 - n_1)^2 + (m_2 - n_2)^2 + (m_3 - n_3)^2]}$$

Figure 3.7: The Formula to Obtain Threshold Value, (d)

**Step 5:** The first condition (the threshold value (d))

In this step, the determination of the first condition must be complying by each researcher who uses the Fuzzy Delphi Method as a measurement tool in the study conducted. There are three (3) conditions that may be used in verifying on each of the item, issue, element, variable etc. which are agreed upon by a group of experts whether the item is removed or accepted based on the expert agreement. The conditions are described in the next heading; data analysis and interpretation.

As the data analysis is based on the triangular fuzzy number where it aims to get threshold value (d). The first condition to be followed is threshold value (d) must be less or equal to 0.2 (Cheng & Lin, 2002). Therefore, all experts are considered to have reached the agreement and made a consensus.

**Step 6:** The second condition (the percentage of experts' agreement)

In this process, the determination of the second condition is done where determining the percentage value of the expert agreement is executed. The second condition that needs to be observed is that the percentage of experts' agreement must be equal to or greater than 75.0% (Chu & Hwang, 2008; Murry & Hammons, 1995). If the items or the constructs are not achieve the agreed percentage, whether the items or constructs were removed or the second round needs to be executed (Chang, Hsu, & Chang, 2011; Cheng & Lin, 2002).

### Step 7: Aggregate the fuzzy evaluations

The aggregate calculation process is a fuzzy evaluation process to determine the value of the fuzzy score and the position or ranking of each item, element, issue, etc. as follows:

$$\bar{A} = \begin{bmatrix} \bar{A}_1 \\ \bar{A}_2 \\ \vdots \\ \bar{A}_m \end{bmatrix}$$

$i = 1, \dots, m$

The calculation and determination of this fuzzy evaluation process is through the fuzzy score formula,  $A_{\max} = \frac{1}{4}(m_1 + 2m_2 + m_3)$ . The resulting fuzzy score value is a number that is in the range 0 to 1. A value less than 0 is not a fuzzy number, as well as values greater than 1 are also not a fuzzy number. Clearly, the fuzzy number is from 0 to 0.99999 or 1.

### 3.5.2 Research Instrument

In collecting the data and information for evaluation phase, researcher had developed the expert evaluation form as the research instrument. The instrument was developed based on the analyses done in design and development phase. The expert evaluation form was briefly explained below.

#### *Expert Evaluation Form*

The expert evaluation form (**Appendix H**) was developed based on the analyses done in phase II; the design and development phase. This expert evaluation

form was used in evaluation phase in order to seek consensus among the experts on the designed model. This form was developed by the researcher in the questionnaire form to evaluate the designed model of KKQ meaning-based *Tarannum* mobile app with ten experts in Quranic studies, Islamic Education studies, KKQ teachers and also qāri'/qāri'ah.

The expert evaluation form was divided into three sections namely section A is the demographic information, section B is the evaluation on the elements that are suitable with the KKQ meaning-based *Tarannum* mobile app model and section C is the evaluation on the usability of the overall model. The instrument was distributed to the experts face to face, by email and by post (courier service). Most of the experts used to answer the questionnaire through online using Google Form platform due to the pandemic, Covid-19. The appointment letter was given to the experts who had involved in this study (**Appendix I**).

### **3.5.3 Data Analysis and Interpretations**

In this section, researcher explains on the process to analyse the data by using Fuzzy Delphi Method. The data from the questionnaire has been keyed in by the researcher into Microsoft Excel which is the Fuzzy Delphi template of analysis. Researcher had discussed on the process in analyzing the FDM and its interpretations below.

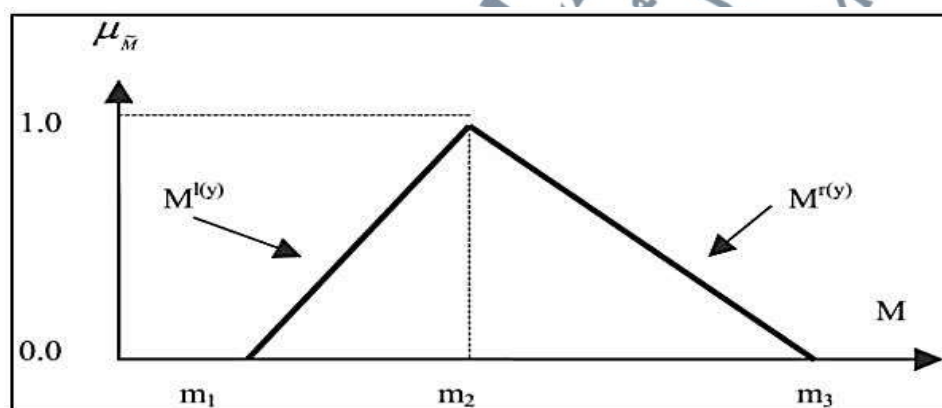
#### ***Fuzzy Delphi Method of Analysis***

In this research, the FDM were analysed by using the Fuzzy Delphi analysis template in a Microsoft Excel software which was developed by Mohd Ridhuan and

Nurulrabihah, 2020). According to them, there are two main things in analyzing through Fuzzy Delphi.

1. The Triangular Fuzzy Numbers
2. Fuzzy Evaluation process

**Triangular Fuzzy Numbers** consists of the average value of a fuzzy number that is  $m_1, m_2, m_3$  and is often represented in the form of  $(m_1, m_2, m_3)$ . The  $m_1$  represent the minimum value,  $m_2$  represent the most plausible value while  $m_3$  the represent the maximum value. All three values in these triangular fuzzy numbers can be represented in the Figure 3.8 which shows the mean triangle graph against the triangular value.



**Figure 3.8:** The Mean Triangle Graph against the Triangular Value

The rationale for the use of these three numbers is to show that for each scale agreed in a fuzzy scale is not at a fixed value as in the likert scale (scale 1 to 7). Table below showed the difference of likert scale and fuzzy scale for seven points.



**Table 3.6:** The Differences of Likert Scale and Fuzzy Scale for 7-points

Likert Scale		Level Scale		Fuzzy Scale
7	←	Extremely Agree	→	(0.9, 1.0, 1.0)
6		Strongly Agree		(0.7, 0.9, 1.0)
5		Agreed		(0.5, 0.7, 0.9)
4		Simply Agree		(0.3, 0.5, 0.7)
3		Disagree		(0.1, 0.3, 0.5)
2		Strongly Disagree		(0.0, 0.1, 0.3)
1		Extremely Disagree		(0.0, 0.0, 0.1)

The Table 3.6 above indicates that when using a likert scale, each choice by experts or respondents were only selection based on a whole number. The number is fixed and the interpretation is a one-way only. This means, if the experts or respondents choose 1 in the likert scale, then it shows the responses and data from expert or respondents can only be ‘Extremely Disagree’.

For Fuzzy scale, if the expert or respondents choose a value in likert scale in the questionnaire, when the data is converted into a Fuzzy scale, the conversion of the selected scale will be broken down into three values namely the minimum value ( $m_1$ ), the plausible value ( $m_2$ ), and the maximum value ( $m_3$ ). This indicates that by the conversion of data into Fuzzy scale it is not of a single value. This is what distinguishes the use of Fuzzy scale compared to Likert scale in a study conducted.

The Table 3.7 shows the example of Fuzzy scale interpretation for an expert who chooses a 7 -point likert scale that is ‘Extremely Agree’. The Table 3.8 shows the interpretation of Fuzzy scale if the experts chooses the scale 1 of likert scale which is ‘Extremely Disagree’

**Table 3.7:** Interpretation Differences between Likert Scale and Fuzzy Scale for Selection of Scale 7

Expert Selection	Likert Scale	likert scale interpretation	Fuzzy Scale	Fuzzy Scale interpretation
Experts have chosen a scale of 7 in the likert scale	7	Extremely Agree	0.9 Minimum Value (m <sub>1</sub> )	The value of agreement is possibly to be on a scale of 0.9 or <b>90% Agree</b>
			1.0 Plausible Value (m <sub>2</sub> )	The value of agreement is possibly to be on a scale of 1.0 or <b>100% Agree</b>
			1.0 Maximum Value (m <sub>3</sub> )	The value of agreement is possibly to be on a scale of 1.0 or <b>100% Agree</b>

**Table 3.8:** Interpretation Differences between Likert Scale and Fuzzy Scale for Selection of Scale 1

Expert Selection	Likert Scale	likert scale interpretation	Fuzzy Scale	Fuzzy Scale interpretation
Experts have chosen a scale of 1 in the likert scale	1	Extremely Disagree	0.0 Minimum Value (m <sub>1</sub> )	The value of agreement is possibly to be on a scale of 0.0 or <b>100% Disagree</b>
			0.0 Plausible Value (m <sub>2</sub> )	The value of agreement is possibly to be on a scale of 0.0 or <b>100% Disagree</b>
			0.1 Maximum Value (m <sub>3</sub> )	The value of agreement is possibly to be on a scale of 0.1 or <b>90% Disagree</b>

As shown from the tables above, each selected likert scale value will gives three different values in the Fuzzy scale. This is the difference between the likert scale and the Fuzzy scale when the analysis process is carried out. The value of ambiguity can be identified when we conduct a study using the Fuzzy Delphi Method.

**Fuzzy Evaluation Process** is the process to determine the priority or ranking of each variable and sub -variables, elements, issues, items, etc. It is also known as the Fuzzy score. The purpose of this process is to assist the researcher to obtain the level of need, agreement, importance, suitability, and other level of a variable required in the study conducted. This ranking process will help the production of data that is analyzed according to the need of the study based on the consensus of experts in the study. The symbol for Fuzzy evaluation or Fuzzy score is  $A_{max}$ .

In gaining the value for Fuzzy score, there are three formulas that can be used. Thus, researchers can choose any of these three formulas to determine the ranking in their study. The three formulas in this process are as follows:

- i.  $A_{max} = 1/3 * (m_1 + m_2 + m_3)$
- ii.  $A_{max} = 1/4 * (m_1 + 2m_2 + m_3)$
- iii.  $A_{max} = 1/6 * (m_1 + 4m_2 + m_3)$

These three formulas are essentially the same. This can be proved by inserting the value 1 into each value for  $m_1$ ,  $m_2$ , and  $m_3$ , and it will produce the same Fuzzy score ( $A_{max}$ ) value.

#### ***Fuzzy Delphi Method of Interpretation***

In FDM, there are three (3) conditions that may be used in verifying on each of the item, issue, element, variable and etc which is agreed upon by a group of experts whether the item is removed or accepted based on the expert agreement. The researchers can use these three condition or requirements in the conducted study based on the research findings. The condition 1 and 2 are bound to each other because they

are in part of Triangular Fuzzy Numbers, which is it serves as a process in obtaining the expert agreement on a particular construct and item only. While for the third condition, it lies in the part of Fuzzy evaluation process which works in order to see the value of the score in determining the priority or ranking of a construct or item. The third condition that needs to be observed is whether a construct or item is accepted or rejected based on the agreement of the experts by comparing the value of the Fuzzy score with the value of  $\alpha$  – cut.

### Condition 1- Using the Threshold Value, d

Researchers who use the threshold value (d) should use the formula in Figure 3.9 in obtaining the experts agreement. The Table 3.9 below shows the interpretation for the first condition of Fuzzy Delphi Method.

**Table 3.9:** Interpretation for First Condition

Threshold Value (d)	Description	Interpretation
$d \leq 0.2$	If the threshold value (d) is less or equal to 0.2	Item were accepted
$d > 0.2$	If the threshold value (d) is more than 0.2	Item were rejected OR second round will be executed towards disagree experts

### Condition 2 – Based on the Traditional Delphi Method

Based on the Traditional Delphi Method, it states that if the expert consensus is more than 75%, then each item is accepted either discarded or applied in the study.

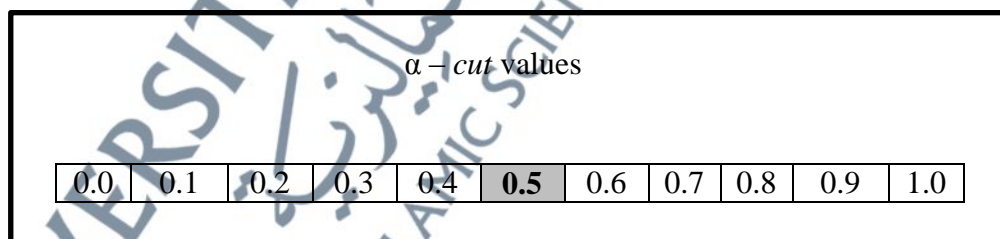
Table shows an example of the use on condition 2.

**Table 3.10:** Data Interpretation for Second Condition

Number of experts	Number of experts agreed	Number of experts disagree	Percentage of expert Agreement	Interpretation
15	11	4	73%	Item rejected OR OR second round will be executed towards disagree experts
	12	3	80%	Item Accepted
	13	2	87%	Item Accepted
	14	1	93%	Item Accepted
	15	0	100%	Item Accepted

**Condition 3- Based on  $\alpha - cut$  value**

The  $\alpha - cut$  value is the middle value or median between the fuzzy number (0 – 1), therefore, the  $\alpha - cut$  value is 0.5. The  $\alpha - cut$  values can be used in the Fuzzy evaluation process. If the Fuzzy score values ( $A_{max}$ ) is more than 0.5, then it shows that the measured construct or item was accepted based on the experts’ agreement. If the value is less than 0.5, then the measured construct or item was rejected based on the experts agreement in the research conducted. The Figure 3.9 below shows the position of  $\alpha - cut$  values in the Fuzzy numbers.



**Figure 3.9:** The Position of  $\alpha - cut$  Value in Fuzzy Numbering

Table 3.11 shows the example of Fuzzy score values ( $A_{max}$ ) on the accepted and the rejected item based on the consensus of experts in a study.

**Table 3.11:** Data Interpretation for Third Condition

Experts	Item 1			Item 2			Item 3		
1	0.9	1	1	0.7	0.9	1	0	0	0.1
2	0.7	0.9	1	0.5	0.7	0.9	0	0	0.1
3	0.7	0.9	1	0.7	0.9	1	0	0	0.1
4	0.9	1	1	0.7	0.9	1	0	0	0.1
5	0.7	0.9	1	0.7	0.9	1	0.1	0.3	0.5
6	0.7	0.9	1	0.7	0.9	1	0.3	0.5	0.7
10	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1
<b>Fuzzy score values (<math>A_{max}</math>)</b>	0.870			0.850			0.227		
<b>Interpretation (<math>\alpha - cut = 0.5</math>)</b>	Item accepted, Fuzzy score value ( $A_{max}$ ) $\geq 0.5$			Item accepted, Fuzzy score value ( $A_{max}$ ) $\geq 0.5$			Item rejected, Fuzzy score value ( $A_{max}$ ) $< 0.5$		

### 3.6 Validity and Reliability

In quantitative research, the validity and reliability is the most frequently standard used for a good and convincing research. But, in qualitative research, it is differ from quantitative research in which the focus more on how well the researcher provide evidence, the descriptions and analysis represent the reality of the situations and persons studied. Some qualitative researchers argue with the use of traditional terms of validity and reliability as they preferred to use credibility and dependability. The contrast is a matter of institutional and/or personal preferences (Bloomberg & Volpe, 2008).

In this research, researcher used validity and reliability (Creswell & Poth, 2018; Merriam, 2009; Silverman, 2013) terminology. According to Silverman (2013), in qualitative research, validity is interpreted as the extent to which an account accurately represents the social phenomena to which it refers. Creswell and Poth (2018), had described nine strategies frequently used by qualitative researchers during

the process of validation which are by corroborating evidence through triangulation, discovering a negative case analysis or disconfirming evidence, clarifying researcher bias or engaging in reflexivity, member checking or seeking participant feedback, having a prolonged engagement and persistent observation in the field, collaborating with participant, enabling external audits, generating a rich, thick descriptions and lastly by having a peer review or debriefing of the data and research process.

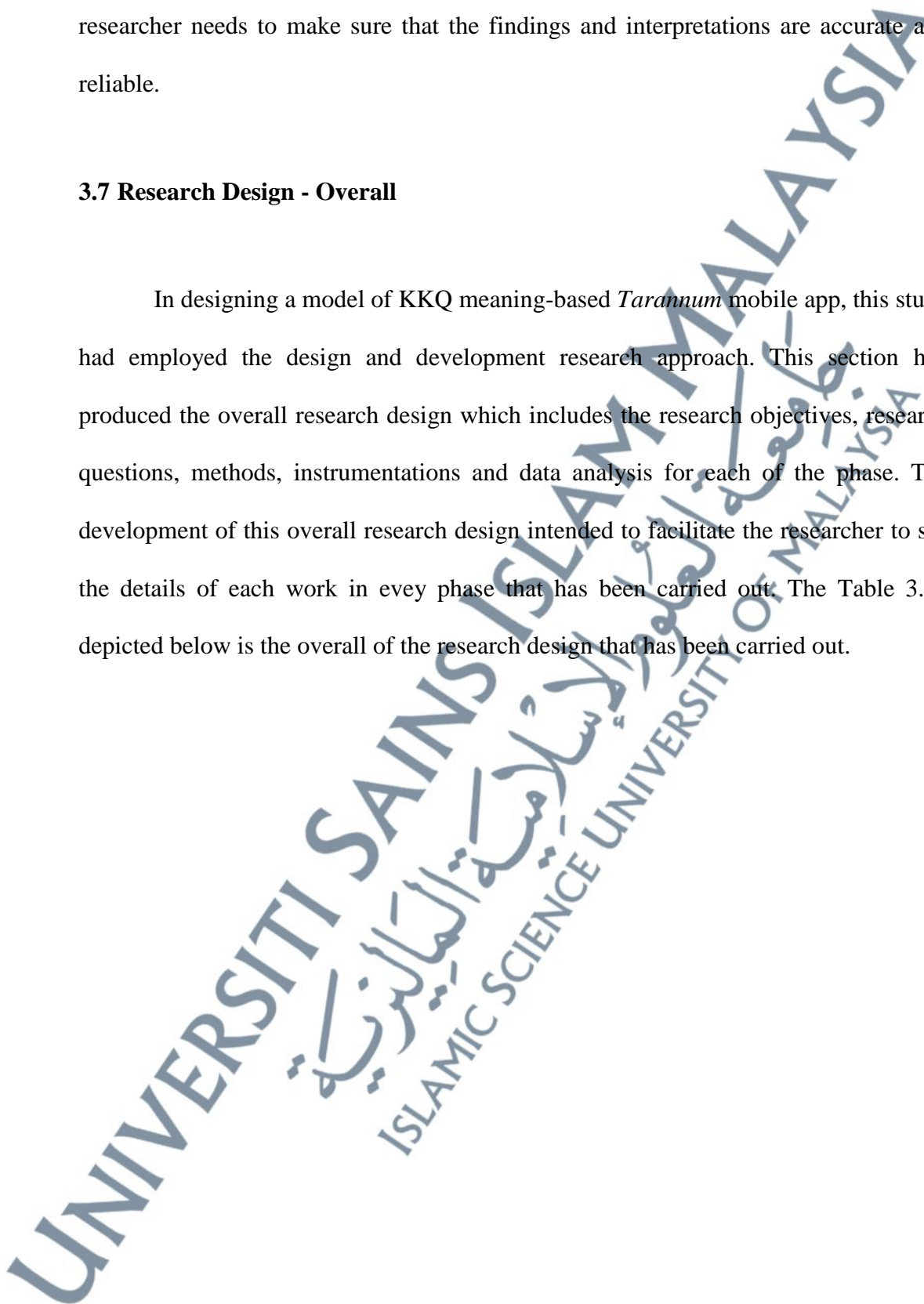
Based on these nine strategies, researcher had implemented the triangulation strategy. Corroborating evidence through triangulation of multiple data sources which means that the researcher makes use of multiple or different sources, methods, investigators, and theories to provide corroborating evidence to shed light on a theme or perspective and use these insights in the interpretation and writing (Creswell & Poth, 2018). Besides, the multiple sources of data and participant perspectives enabled researcher to triangulate emergent findings, thereby enhancing the reliability and validity of the results (Mouza & Barrett-Greenly, 2015). So, in this research, researcher had utilized multiple methods in collecting the data which are by interviewing and analysis of document. Besides that, researcher also made used of multiple sources by interviewing with different participants that is teachers, students and *Tarannum* practitioners (qāri' and qāri'ah) to gain data and information.

While reliability in qualitative research refers to the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions (Silverman, 2013). According to Creswell and Poth (2018), in qualitative research, reliability are often refers to the stability of responses to multiple coders of data sets. It is called inter-coder or inter-rater agreement. Whereby, it is the process where researchers seek agreement based on

codes, themes, or both codes and themes or also item. Throughout this study, researcher needs to make sure that the findings and interpretations are accurate and reliable.

### **3.7 Research Design - Overall**

In designing a model of KQ meaning-based *Tarannum* mobile app, this study had employed the design and development research approach. This section had produced the overall research design which includes the research objectives, research questions, methods, instrumentations and data analysis for each of the phase. The development of this overall research design intended to facilitate the researcher to see the details of each work in every phase that has been carried out. The Table 3.12 depicted below is the overall of the research design that has been carried out.





**Table 3.12:** Overall Research Design

	<b>RESEARCH OBJECTIVES</b>	<b>RESEARCH QUESTIONS</b>	<b>METHODS</b>	<b>INSTRUMENTATIONS</b>	<b>DATA ANALYSIS</b>
<b>PHASE 1</b>	1) To identify the issues and problems in <i>Tarannum</i> field.	<b>1) What are the issues and problems in <i>Tarannum</i> field?</b> <i>1.1 What are the general issues and problems in <i>Tarannum</i> field?</i>	• Doc. Analysis	-	• Thematic Analysis
		<i>1.2 What are the issues and problems in KKQ <i>Tarannum</i> education?</i>	• Document Analysis • Interview (teachers, students and qāri' /qāri'ah)	• Interview protocol	• Thematic Analysis
	2) To analyse the needs in developing a model of KKQ meaning-based <i>Tarannum</i> mobile app.	<b>2) What are the needs in developing KKQ meaning-based <i>Tarannum</i> mobile app model?</b> <i>2.1 How was the approach in teaching <i>Tarannum</i> recitation?</i>	• Interview	• Interview protocol	• Thematic Analysis
		<i>2.2 What are the materials used in teaching and learning KKQ <i>Tarannum</i>?</i>	• Interview	• Interview protocol	• Thematic Analysis
		<i>2.3 How was the technique in reciting the <i>Qur'ān</i> with <i>Tarannum</i>?</i>	• Interview (teachers and qāri' /qāri'ah)	• Interview protocol	• Thematic Analysis
		<i>2.4 If there is a <i>Tarannum</i> mobile app available for KKQ, will it help in teaching and learning process?</i>	• Interview (teachers and students)	• Interview protocol	• Thematic Analysis

PHASE 2	3) To design and develop a KKQ meaning-based <i>Tarannum</i> mobile app model.	<b>3) How to design and develop a KKQ meaning-based <i>Tarannum</i> mobile app model?</b> <i>3.1 What are the components of <i>Tarannum</i> learning in the existing <i>Tarannum</i> mobile apps?</i>	• Doc analysis	• Matrix Analysis	• Thematic Analysis
		<i>3.2 What are the components of <i>Tarannum</i> learning in KKQ handbook?</i>	• Doc analysis	• Matrix Analysis	• Thematic Analysis
		<i>3.3 What are the elements of multimedia included in the existing <i>Tarannum</i> mobile apps?</i>	• Doc analysis	• Matrix Analysis	• Thematic Analysis
		<i>3.4 What are the features of the existing <i>Tarannum</i> mobile apps?</i>	• Doc analysis	• Matrix Analysis	• Thematic Analysis
PHASE 3	4) To evaluate the KKQ meaning-based <i>Tarannum</i> mobile app model.	<b>4) What is the level of experts' agreement in evaluating the designed model?</b>	• Expert evaluation (Fuzzy Delphi Method)	• Expert evaluation form (questionnaire)	• Fuzzy Delphi

### 3.8 Summary

In conducting the research, one should have a systematic guide in order to ensure the research is on the track. In this chapter, the explanations regarding to methodology in conducting the research were described in detail. Started from phase 1: need analysis phase, phase 2: design and develop phase; and lastly phase 3: evaluation phase. In every phase, researcher had explained in detailed the instruments used, the procedure on how to collect the data and the analysis and interpretations of research findings.