Design and Development of iAQSA as an Innovative Web Application to Support Qualitative Research

Amnah Salah Majzob AbdelMaged[1] , Emon Hassan Rifat[1] , Norsaremah Salleh[1,*], Ismail Sheikh Ahmad[2], Shukri Nordin[2], Nik Md Saiful Azizi Nik Abdullah[2], Aizad Shamsuddin[2,1]

[1]   Department of Computer Science, Kulliyyah of ICT, International Islamic University Malaysia, 50728 Kuala Lumpur, Malaysia
[2]   Kulliyyah of Education, International Islamic University Malaysia, 50728 Kuala Lumpur, Malaysia

ARTICLE INFO	ABSTRACT
	This paper presents a design and development of a web-based application called iAQSA that can assist and guide novice researchers to embark on a qualitative research method through fundamental stages. The web application serves as a platform in guiding the researchers from the beginning of the proposal to the reporting stage of the research findings. Additionally, it facilitates effective communication and collaboration between researchers and their supervisors. Supervisor can provide feedback, and approve submitted research proposals directly within the platform, enhancing the mentoring process and ensuring the quality of research outputs. iAQSA also provides a functionality to search for Islamic resources (from Al-Quran, Hadiths, and Islamic scholars) to support the research findings. The methodology used for the design and development of iAQSA was Agile Scrum, allowing for continuous feedback and improvements based on user input. Overall, iAQSA aims to streamline the qualitative research process, making it more efficient and manageable for postgraduate students. By providing a structured platform, it helps reduce the complexity and challenges associated with qualitative research process.

1. Introduction

This paper explores the design and development of a web application known as iAQSA to support novice researchers in the conduct of qualitative research. Qualitative research is a multi-method approach that interprets and explores phenomena in natural settings. It involves collecting diverse empirical materials, such as case studies, interviews, and observations, to understand the meanings individuals attribute to their experiences and moments in life [1]. In order to support the various phases of the qualitative research process, researchers have used qualitative data analysis software (QDAS) or computer-assisted qualitative data analysis software (CAQDAS) such as ATLAS.ti [2] or NVivo [3]. QDAS tools have been used mainly for data management and analysis purposes and assist users with tasks such as coding and text interpretation, writing and annotation, content search and several other types of analysis [4-5]. Despite their benefits, the existing tools however, did not

---

provide the functionality to assist users in managing the research process from proposal development to research output, and linking the results with external sources.

Recognizing the challenges faced by novice or beginner researchers, the paper delves into the rationale behind developing a user-friendly platform that facilitates the various stages of qualitative research. iAQSA is intended as a platform that provides the necessary assistance to researchers, particularly beginners, by providing guidance from the initial stages of proposal to the final reporting stages of their work. One noteworthy function is the search feature that enable researchers to perform search on the Islamic resources from Al-Quran Al-Kareem verses, Hadiths, and Islamic scholar works in order to find supporting evidence based on their research findings.

In iAQSA, the resources are stored in an SQL (Structured Query Language) database. SQL is a software tool used for updating and connecting data in relational databases [6]. The database is linked to iAQSA, allowing users to collect references they need by typing relevant titles, keywords, and other search parameters in a search page. Through this development, we aspire to bridge the gap between novice researchers and valuable qualitative research methods, while also promoting the utilisation of Islamic resources. We believe that the prototype has the potential to benefit researchers embarking on qualitative studies, while also preparing the way for further advancements in the field of Islamic research. The main objective of this study is to guide novice researchers with the fundamental skills in conducting qualitative research through a guided qualitative template imbued with Islamization of knowledge (IOK) research elements. Additionally, researchers are guided through key fundamental research stages involving preparation of proposal, piloting and proper field work, collecting interview data, data analysis, critical interpretation and reporting.

By addressing specific needs and concerns of novice researchers, the study aims to enhance their understanding of qualitative methodologies, streamline data collection and analysis procedures, and ultimately contribute to a more accessible and supportive research environment. This study contributes in assisting researchers in conducting the qualitative research process that promotes Islamic research and towards achieving sustainable development goals [7]. The paper discusses the key features, architectural aspects and the user interface considerations guiding the development of iAQSA tool, with the goal of empowering researchers in their qualitative inquiry explorations.

2. Review of Previous Works

The process and steps needed to conduct a qualitative research typically require a longer time to collect data and find resources [8]. In order to facilitate the research process, qualitative research software can be used as a tool specifically to ease the data collection and to facilitate communication among researchers [9]. Despite the many uses of computer software in qualitative research, most of the researchers are not aware about the new features of qualitative research software nor have the time to learn how to use them which affects the benefit of the software [8]. Paulus *et al.,* [8] highlighted that most of the researchers had wrong perception about qualitative research software, in which the software is actually capable of doing more than analysing data.

Dollah *et al.,* [10] has conducted a study to explore NVivo software, which is one of the most used software for qualitative research. According to their study, NVivo was released more than 30 years ago and has many advantages such as time efficiency, clarity, and the capability to handle large volumes of both quantitative and qualitative data. The data can manifest in various formats, spanning from Word documents to videos and social media content, and across different languages. Their findings also indicated the three advantages of NVivo: ability of dealing with a high volume of data, identifying themes, generating relationships between themes and managing them successfully. A sample interface for NVivo can be seen in Figure 1.
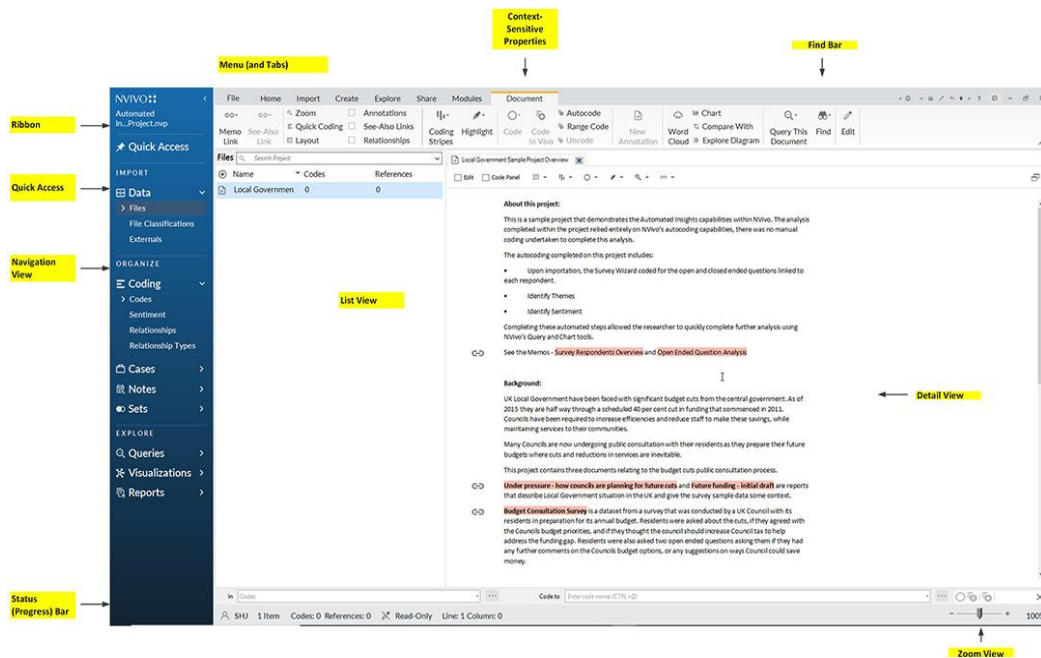
Fig. 1. NVivo workspace for Windows [11]

Oliveira *et al.*, [12] studied the differences between two qualitative research software: MAXQDA and NVivo. They focused on thematic content analysis and how to simplify and categorise themes. MAXQDA and NVivo use open coding to highlight concepts and characteristics to generate codes, followed by axial coding to classify and arrange them. They stated that using software for data analysis can help in preventing errors caused during the encoding process, which will not only speed up the process but also increase the accuracy, provide flexibility, and simplify the change. The main functions of MAXQDA and NVivo are coding, text access, memos, and visualising results. They added that the MAXQDA software package for qualitative data analysis has an interface based on Windows. Their study indicated that both software have similar features when defining and categorising codes; but the main differences are: interface, analysing process, and visualising results. A sample interface of MAXQDA can be seen in Figure 2.
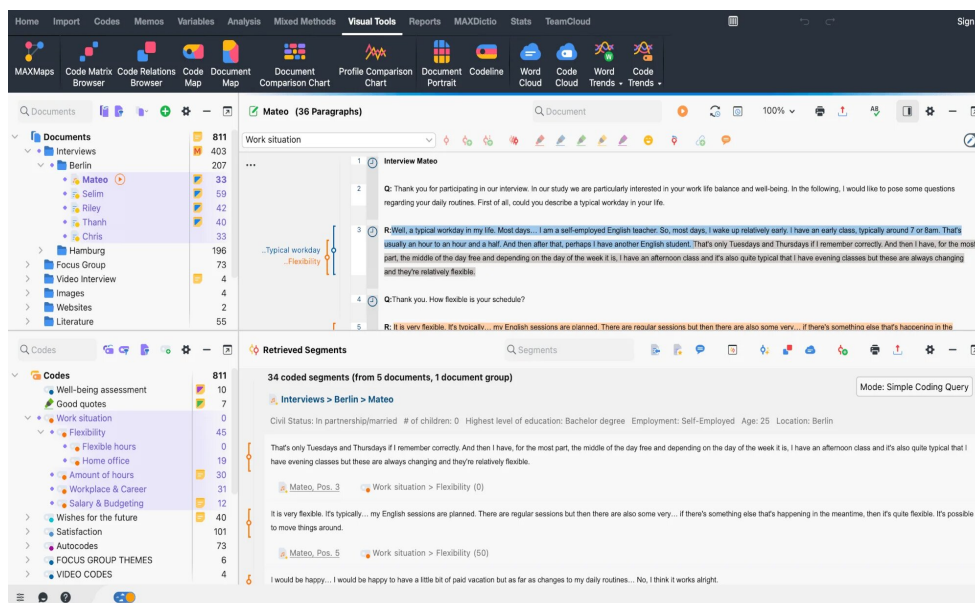

Fig. 2. MAXQDA 24 workspace [13]

Friese [14] described the features of ATLAS.ti, which is one of the most powerful qualitative research software that supports multi-languages. The user is allowed to add documents, create codes, work in teams, open an existing project, and write comments on the project. The software can analyse different types of data such as Twitter data, Endnotes, data from Excel, and multimedia data. The author concludes that the app is fast and easy to navigate. A sample interface of ATLAS.ti can be seen in Figure 3.
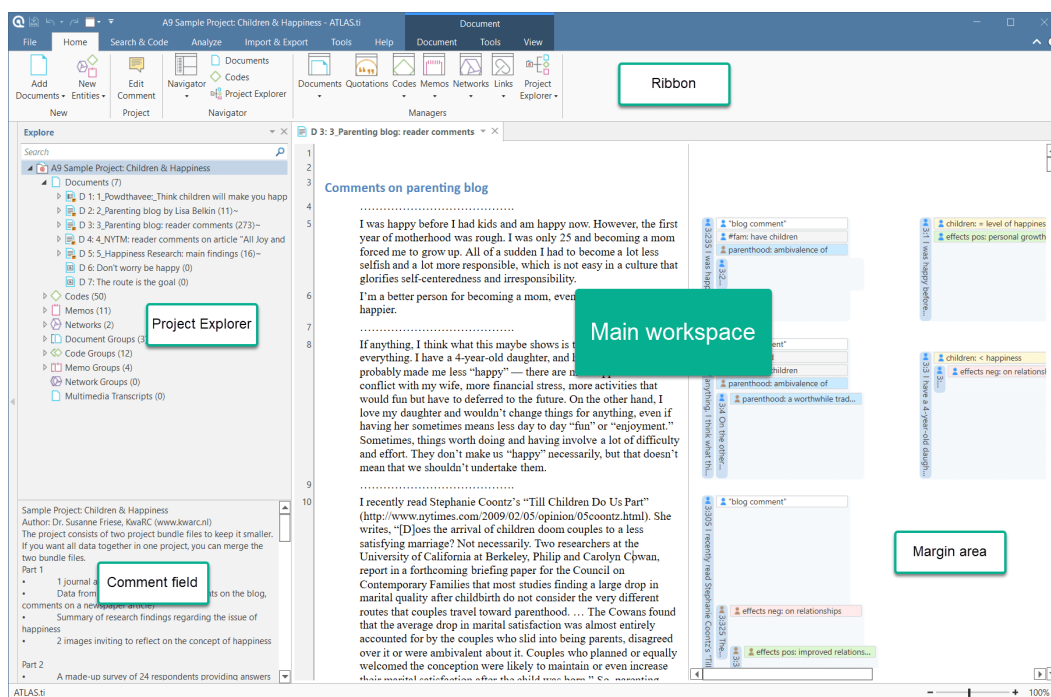

Fig. 3. Atlas.ti main workspace [2]

A comparison between MAXQDA, NVivo, and ATLAS.ti is reported by Delve [15]. He highlighted the complex user interface in existing systems, which make it challenging for user to navigate effectively to utilise the available features. Based on the existing works we highlighted some limitations of the existing tools:

- Learning Curve: Many users perceived the existing tools require significant effort to learn to use them effectively. This learning curve can be a barrier for users who are unfamiliar with the tools and may discourage their adoption [8].
- Cost and Limited Usage: Some existing tools may come with high costs, making them inaccessible for users with limited financial resources.
- Trustworthy Islamic Resources: While existing tools may be useful for qualitative research in general, they often lack access to trustworthy Islamic resources. This means that the researcher must rely solely on their own expertise and judgement when accessing the information, which can introduce biases and inaccuracies.
- Complex User Interface: The user interfaces of existing applications can be overwhelming, as they often include a wide range of tools and features, but it can be a disadvantage since the user may not be entirely aware of the meaning of the tools.

In response to these limitations, we are proposing a web application that can assist users in their qualitative study particularly to linking their research with Islamic resources available online. The functionalities of the app shall benefit not only the postgraduate students as users, but also the

supervisor (academic staff) to monitor the progress of research. Furthermore, clear guidelines will be provided to help users navigate the qualitative research process effectively and efficiently.

3. Methodology

The main objectives of this study are to design and develop a web-based application called iAQSA to assist novice researchers in conducting a qualitative research. Web-based applications are programs generated by users with the purpose of executing a particular function through a browser [16]. In this study, we have used Agile Scrum as our process model (See Figure 4).
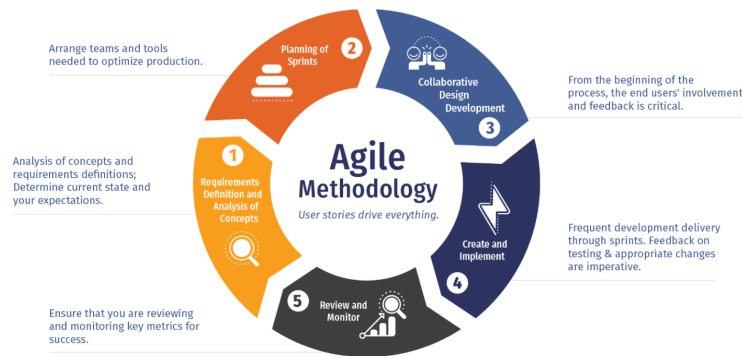

Fig. 4. Agile Scrum Methodology [17]

The model allows teams to work swiftly and in small increments, this allows developments to be made and incremented very fast [18]. Our methodology follows a well-defined process flow involving a collaborative process of planning, sprinting, daily scrum meetings, and development. The team collaborates with the stakeholders (postgraduate students and lecturers) to establish clear goals, objectives, and requirements. Each sprint, lasting 2-4 weeks, focuses on delivering a set of prioritised backlog items. Daily scrum meetings help share progress, identify obstacles, and strategize for the next day's tasks. The team works diligently to accomplish tasks and user stories, adhering to the sprint backlog. At the end of each sprint, the team reviews the work to ensure alignment with the project's vision. A retrospective meeting identifies areas for improvement and devises strategies for future sprints. The project iterates with renewed vigour, ensuring steady progress towards the research-based app's completion. By embracing the Agile principles within the Scrum framework, it helps deliver an effective and innovative solution, tailored to meet our stakeholders' needs and expectations.

3.1 Requirements Gathering

During the initial stage, we had meetings with the stakeholder to collect data about the qualitative research process, the difficulties the researchers face, and the expected features and assistance the app should offer. Based on the collected data, the requirements of the app were refined. The first meeting was held with three academic staff from the faculty of Education. The meeting lasted for one and a half hour. The meeting focused on understanding the point of view of an academic staff (as supervisor), the scope of the project, and the resources and its validity. The second meeting was conducted to obtain the materials required for development of iAQSA. The meeting identified nine (9) research templates or steps that are required to complete the proposal of a qualitative research as outlined below:

Step 1: Research Proposal – the template consists of 6 columns comprising the major constructs: Central Phenomenon, Issues, Central Research Question(s), sub-questions and interview questions for each of the sub-questions, and the Islamisation of Knowledge (IOK).

Step 2: Interview transcription – consists of the detail transcription (verbatim) of each participant

Step 3: Transcription analysis – consists of columns representing interview question, keywords, key points/ideas, elaboration, occurrence of ideas, frequency of occurrence, and the discourse unit.

Step 4: Generating themes – extract key points from each informant. Several main ideas can be identified using different terms but leading to the same theme.

Step 5: Identify inter-rater agreement – analyse the consistency of ideas for each informant.

Step 6: Calculate inter-rater reliability agreement

Step 7: Audit trail of interview

Step 8: Consent form – signed by participant

Step 9: Informed Consent Form

4. Results and Discussion

4.1 Logical Design

Building upon the insights gained from the problem analysis and requirements gathering stages, the abstract concepts were translated into structured representations. Through the utilization of various modelling techniques such as use case diagram, activity and class diagram, the system's functionality, interactions and data structure are defined accordingly. Based on the use case diagram (see Figure 5) there are two types of users: Student and Supervisor. The student can sign up and log in, have access to the application, have access to the guidelines, edit their profile, submit proposals, and search for Islamic resources. Supervisor can sign up, log in, and edit their profile. In addition, the supervisor can also access the supervisor dashboard and give feedback on students' submissions.
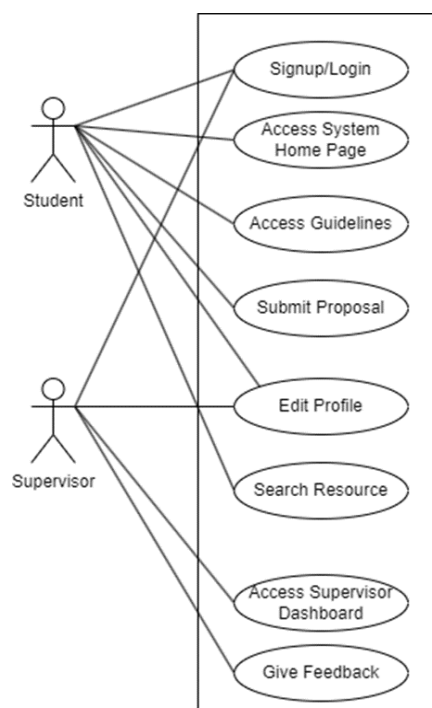

Fig. 5. Use Case Diagram

The design of iAQSA can be seen from the class diagram in Figure 6. There are seven (7) classes involved as listed below:

i. User:
  - Description: Represents individuals who are registered on the web system. Users provide their essential information for system access.
  - *Attributes: Fname, Lname, emailAddress, phoneNumber, password, and role.*
  - *Functions:*
      a. *signUp():* Registers new users by storing their information in the database.
      b. *logIn():* Verifies user credentials by checking the database for existing accounts.

ii. Student:
  - Description: Refers to individuals utilising the system for academic purposes. Students can access guidelines, submit proposals, and retrieve resources.
  - *Attributes: studentId.*
  - *Functions: updateProfile():* Enables students to manage their personal information and account settings.

iii. Guidelines:
  - Description: Provide examples and instructions to guide students through the process of completing proposal steps.
  - *Attributes: GuidelineTitle.*
  - *Functions: openGuide():* Grants access to examples and instructions for completing proposal steps.

iv. Resources:
  - Description: Provides access to various Islamic resources based on user-defined keywords.
  - *Attributes: keyword1, keyword2, keyword3, keyword4, and keyword5.*
  - *Functions:*
      a. *search():* Triggers a search in the database based on the provided keywords.
      b. *results():* Presents search results as clickable links within the application.

v. Proposal:
  - Description: Includes a step-by-step process for students to complete and submit proposals to their supervisors.
  - *Attributes: QualitativeResearchProposal, InterviewTranscription, TranscriptionMainIdeas, GenerateThemes, Inter-raterReliabilityAgreement, Inter-raterAgreementCalculator, InterviewProtocol, and ParticipationConsent.*
  - *Functions:*
      a. *submitProposal():* Allows students to submit proposals after completing the required step.
      b. *editProposal():* Allows students to make changes to their submitted proposal before the final review.

vi. Supervisor:
  - Description: Refers to the faculty member overseeing and managing student submissions and providing feedback.

- *Attributes: staffId.*
- *Functions: updateProfile():* Allows supervisors to manage their personal information and account settings.

vii. Dashboard:
- Description: A centralised platform for supervisors to review student submissions and provide feedback.
- *Attributes: CheckSubmission.*
- *Functions: sendFeedback():* Enables supervisors to provide feedback to students via email drafts.
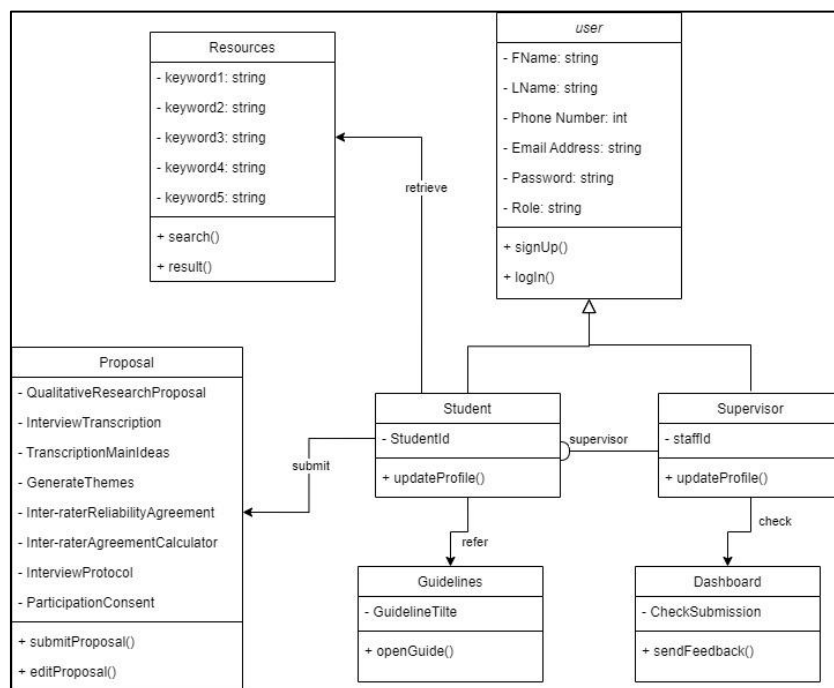
Fig. 6. Class Diagram

The flow of iAQSA can be seen in the activity diagram shown in Figures 7-8. For student, they must first register prior to login using their email address and password. The app will verify to check whether the password matches the email address. Once logged in, the student can submit a proposal, search resources, check guidelines, edit profile, and logout from the app. Under the search resources page, the user can enter keywords related to the topic of their research and press the search button. A function will run to check the number of keywords entered, which should be a minimum of three keywords. A function will trigger the links of the resources to be retrieved from the database and displayed to the user. The proposal page has a few steps for the user to follow and each step has a form to be filled up, submitted to the supervisor, and stored in the database. The student can also view the guidelines page and view filled examples of each step. At the profile page, the user can update their information.

For supervisor user, they must first register prior to login by using their email address and password. After logging in they can access the dashboard and edit profile page. In the dashboard the supervisor can review all the students' submissions and they can provide feedback accordingly. The feedback will be entered by pressing a button next to the submitted form that will transfer the supervisor to an email draft that includes the email address of the student and title based on the chosen form.
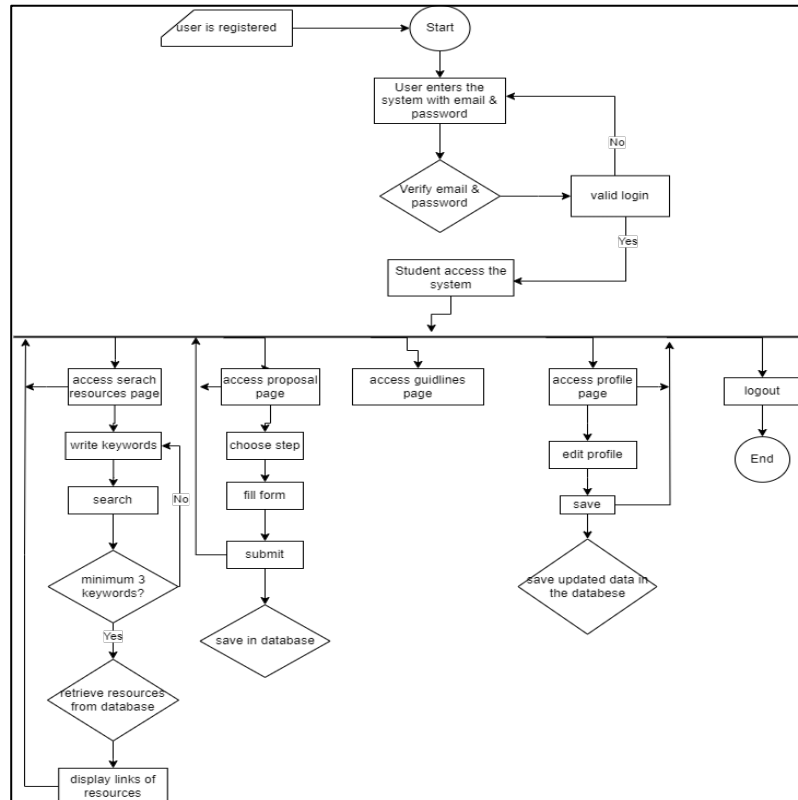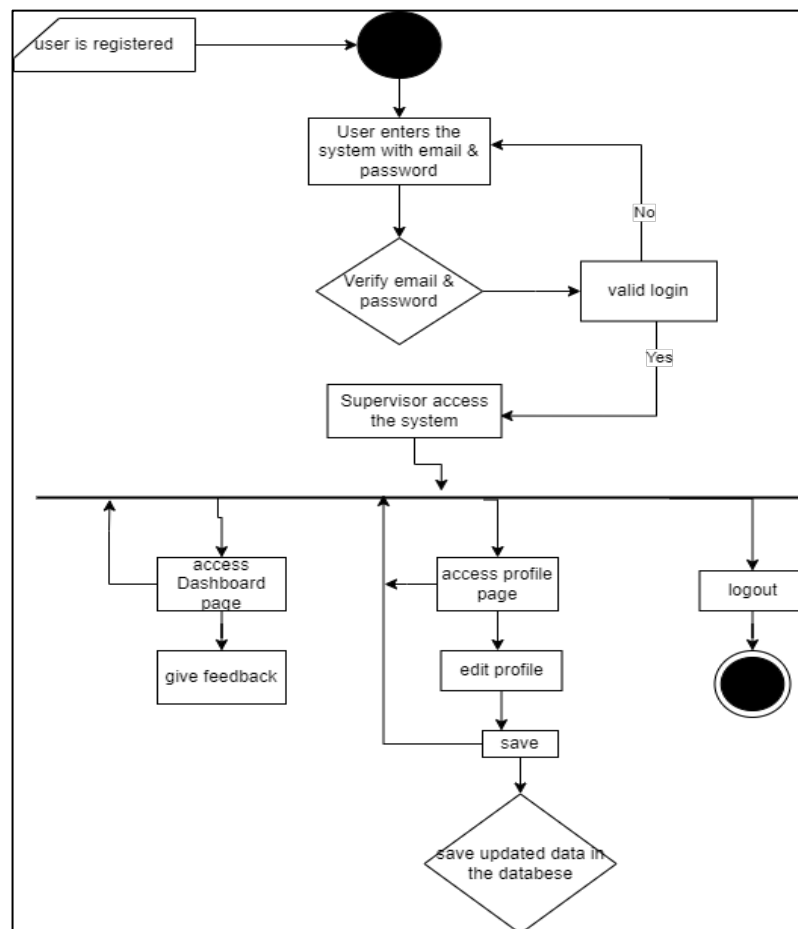
Fig. 7. Student Activity Diagram

Fig. 8. Supervisor Activity Diagram

4.2 Prototype Development

During the development phase, we prioritized iterative development and continuous feedback to align closely with user needs and preferences. The user interface design was a critical component of this process, where we adopted a comprehensive approach to ensure an intuitive and responsive experience for the users. We initiated the development by drafting a prototype that encompassed nine key interface pages: the starting page, sign-up page, login page, home page, search page, proposal page, guidelines page, about us page, and the profile page. The prototype underwent multiple enhancement cycles—specifically, more than three iterations—refined through user feedback. Our objective was to cater to researchers' requirements; hence we optimized the application for web browsers on desktop environments. For the development environment, Visual Studio Code (VSC) served as our primary IDE, facilitating the coding process. The foundational structure of the application was built using HTML, which was augmented by CSS for styling and JavaScript (JS) for dynamic interactions. This combination ensured a seamless and engaging user interface. In addition, PHP played a crucial role in integrating the application with our database, enabling dynamic content management and user interactions. The development cycle was iterative, allowing for constant refinement based on testing and feedback.

The prototype encompasses a total of 20 screen interfaces, catering to different user perspectives. The student's view includes 15 screen interfaces, while the supervisor's view comprises 3 screen interfaces. The remaining two are shared by both types of users, providing a cohesive experience. The user will have to sign up before using the system. This can be done by clicking on the "create new account" button. For existing user, they can click on "Already have an account" to go to the log in interface. Once the user has successfully logged in, they will be transferred to the main page. The main page shows the dashboard for student user (see Figure 9). The navigation bar has links to the *Home page*, *Search*, *Proposal*, *Guidelines*, *About Us*, and a button that leads to edit profile and logout options. Figure 10 shows the dashboard for a supervisor. The main purpose is to allow the supervisor (lecturer) to give feedback regarding student's submission in a more convenient way. They can view all the submissions of the students from the menu labelled by the steps. When there is no available submission, a message will be displayed to inform the supervisor user. The Guidelines page (see Figure 11) will help the user to understand how to answer the questions in each step by providing images of solved examples. The student can view the samples of each step along with explanations. When the user clicks on the picture a new window will open with the actual size of the picture.
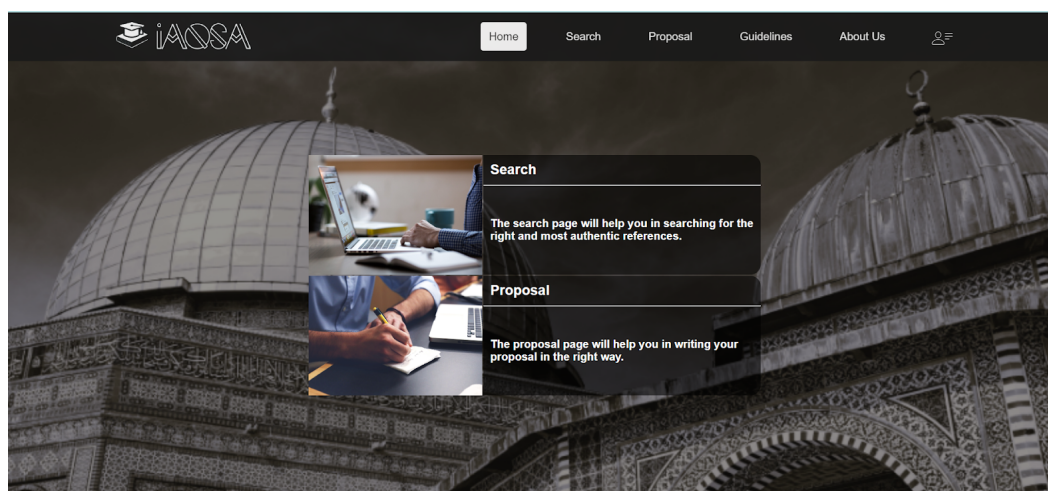

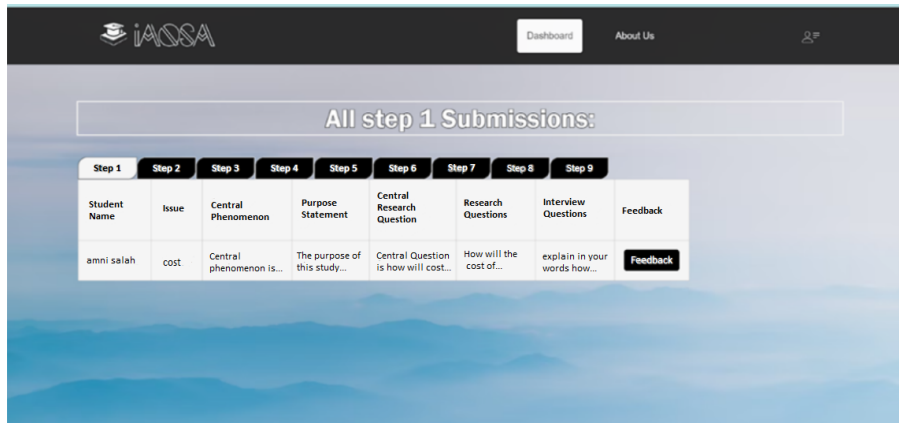**Fig. 9.** Main page for the student
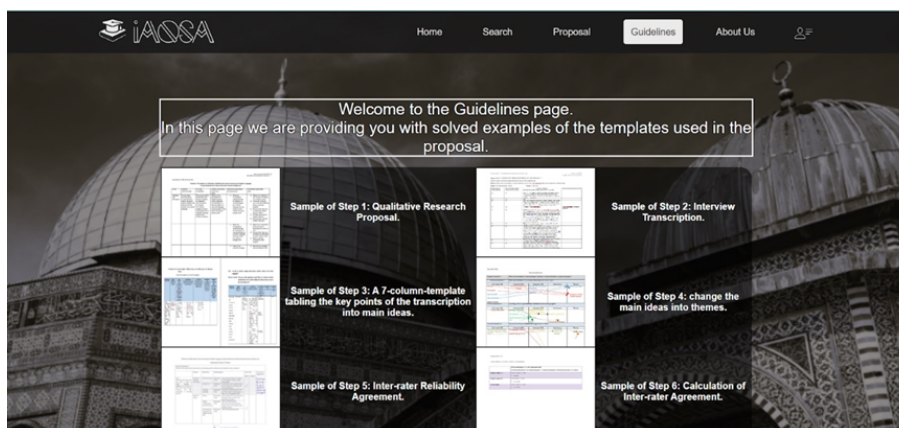
Fig. 10. Supervisor's Dashboard

Fig. 11. Guidelines page

In the proposal page, the student will be provided with forms that will help them go through all the 9 steps of writing the proposal (see Figure 12). They can access each step by clicking on the title or the image. Inside each step, there will be a form, submit button, and a back button. There are 3 types of forms: question and answer, upload file, and calculator. The submit button will save all user entries in the database. Finally the back button will allow the user to go back to the proposal page.
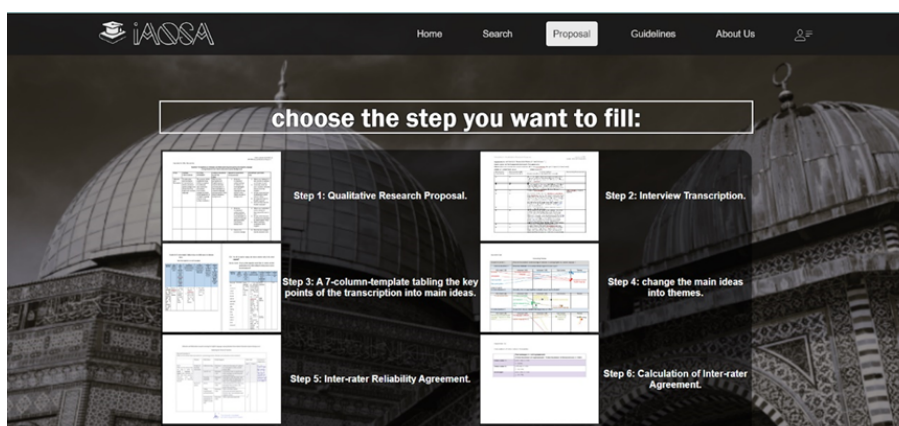

Fig. 12. Proposal development

The search page allows user to search for Islamic related resources (see Figure 13). User can enter at least three (3) keywords and at most five (5) keywords, before pressing the search button. The result will be displayed in the form of references related to the keywords they entered. They can

refer to the resources listed to further enhance the understanding and interpretation of their research findings. The Islamic resources can be in the form of Hadith, Quran verses and other Islamic content such as video link.
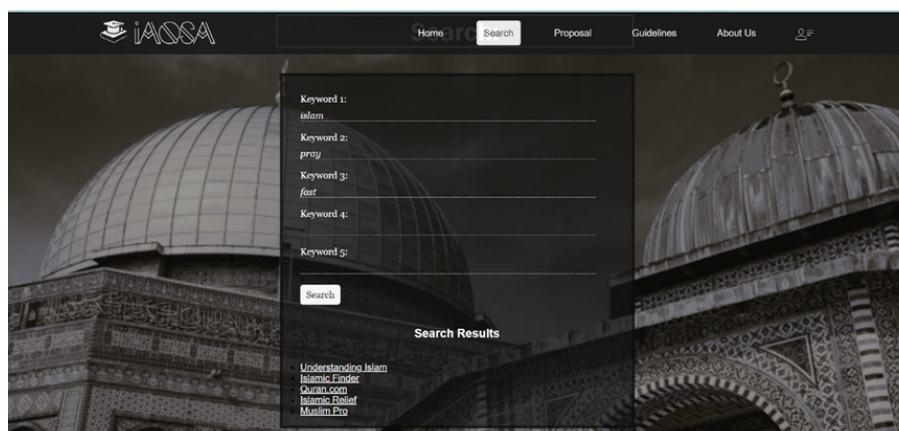
Fig. 13. Result of Searching

4.3 Discussion

Comparing the advantages and disadvantages of iAQSA with existing applications helps in getting better insight into the unique features that iAQSA is offering. The development of iAQSA has brought the following advantages:

i. Searching of Islamic Resources: iAQSA uniquely identified Islamic resources, such as Al-Quran verses, Hadiths, and Islamic scholars providing a comprehensive platform for researchers in qualitative studies. This feature sets it apart from existing apps, since many researchers find it challenging when it comes to religious resources moderation and the language of the resources that often are written in Arabic that in many cases is wrongly translated to other languages [19]. We collected few authentic resources for the prototype demonstration purposes.

ii. Guidance for Novice Researchers: The step-by-step guidance provided by iAQSA is especially beneficial for novice researchers, filling a gap in existing apps that may assume a higher level of research expertise. iAQSA's structured approach offers valuable support in navigating the complexities of qualitative research.

iii. User-Friendly Interface: iAQSA is designed with a more user-friendly and easy-to-navigate interface. This aspect could be a significant advantage over existing apps that may have complex interfaces, contributing to a smoother user experience for researchers with low IT skills which fosters the increase engagement with the app.

Despite the advantages, we also acknowledge several disadvantages of the prototype as below:

i. Limited Resources: At present, we utilized only few Islamic resources for demonstration and proof-of-concept purposes. For future work, there is a need to establish authentic Islamic resources that can be referred to by any researcher.

ii. Limited Language Scope: The prototype initially focuses on English Islamic research. This limitation may restrict its immediate utility for researchers working in other languages such as Arabic.

iii. Design Improvement Needed: While some users appreciated the design, there were suggestions for improvements. Comparatively, existing apps with matured designs and

continuous updates might have a more polished appearance [20]. The user interface should be acceptable for all types of users to make their experience easier and more comfortable.

iv. Absence of AI Integration: In comparison to some existing apps like ATLAS.ti, the iAQSA prototype currently lacks integration with advanced artificial intelligence tools. AI can enhance the research process by providing intelligent recommendations, automated analysis, and personalised assistance. The absence of AI features might limit the prototype's capability to offer cutting-edge support, potentially putting it at a disadvantage in terms of efficiency and advanced functionalities. Future versions of iAQSA could explore integrating AI to stay competitive with evolving research tools; but as for now there is a limitation in the platform and the computing power.

In summary, the comprehensive analysis of iAQSA's advantages and disadvantages underscores its distinctive strengths, as outlined above. However, challenges such as limited resources, language scope, design enhancements, and the absence of AI integration highlight areas for improvement. As iAQSA refines its platform, addressing these aspects will be pivotal in establishing its strong presence within the realm of qualitative research applications. This research is in line with the Sustainable Development Goal 4 (Quality Education) that aims to promote equal access to quality education for everyone and encourage continuous learning opportunities throughout life [21].

5. Conclusions

In conclusion, despite the availability of numerous tools that assist in qualitative research, the primary challenge lies in accessing Islamic resources, and finding related evidence to support the research findings. This project aims to address the challenges faced by researchers conducting qualitative research, specifically in linking their research findings with Islamic resources. The goal is to guide novice researchers in the conduct of qualitative research from writing a proposal to receiving feedback and approval from their supervisor.

Our long-term vision for this research is to create a comprehensive platform that supports researchers from diverse backgrounds and facilitates research in multiple languages. By acknowledging the current limitations and actively seeking opportunities for growth, we are targeting to creating a valuable resource that serves the wider research community and contributes to the advancement of knowledge in this field. For future enhancements, iAQSA will incorporate additional features to further support researchers. One such feature is a live chat system, enabling students and supervisors to engage in real-time discussions. Another feature is linking the app with the authentic Islamic resources database. Additionally, the system will expand its language support to include Malay and Arabic as interface languages and offer resources in these languages. These future enhancements will enhance the overall functionality and usability of the system, making it a comprehensive platform for a qualitative research.

References

[1] Denzin, Norman K., and Yvonna S. Lincoln, eds. *The Sage handbook of qualitative research*. Sage, 2011.

[2] *Atlas.ti .2023. Mater your research project with the power of AI.*

[3] *NVivo 14*. Lumivero. 2023.

[4] Woods, Megan, Trena Paulus, David P. Atkins, and Rob Macklin. "Advancing qualitative research using qualitative data analysis software (QDAS)? Reviewing potential versus practice in published studies using ATLAS. ti and NVivo, 1994–2013." *Social science computer review* 34, no. 5 (2016): 597-617. https://doi.org/10.1177/0894439315596311

[5] Freitas, Fábio, Jaime Ribeiro, Catarina Brandão, Luís Paulo Reis, Francislê N. de Souza, and António Pedro Costa. "Learn for yourself: The self-learning tools for qualitative analysis software packages." *Digital Education Review* 32 (2017): 97-117.

[6] Rockoff, Larry. *The language of SQL*. Addison-Wesley Professional, 2021.

[7] Khan, Foyasal, and Mohamed Aslam Haneef. "Religious responses to sustainable development goals: An islamic perspective." *Journal of Islamic Monetary Economics and Finance* 8, no. 2 (2022): 161-180. https://doi.org/10.21098/jimf.v8i2.1453

[8] Paulus, Trena M., Lester, Jessica N., & Dempster, Paul G. 2014. Digital Tools for qualitative research (1st ed.). SAGE.

[9] Pagan, Victoria , "Digital Tools for Qualitative Research", *Qualitative Research in Organizations and Management*, Vol. 10 No. 1, (2015): 82-84. https://doi.org/10.1108/QROM-07-2014-1244

[10] Shalin, H.J. 2024. Using NVivo: An Unofficial and Unauthorized Primer.

[11] Syarifuddin, Dollah, Abduh Amirullah, and Rosmaladewi Rosmaladewi. "Benefits and drawbacks of NVivo QSR application." (2017): 61-63. https://doi.org/10.2991/icest-17.2017.21

[12] Oliveira, Mirian, Claudia Bitencourt, Eduardo Teixeira, and Ana Clarissa Santos. "Thematic content analysis: Is there a difference between the support provided by the MAXQDA® and NVivo® software packages." In *Proceedings of the 12th European Conference on Research Methods for Business and Management Studies*, pp. 304-314. 2013.

[13] MAXQDA. 2023. *New in MAXQDA 24*.

[14] Friese, Susanne. "Qualitative data analysis with ATLAS. ti." (2019): 1-344.

[15] Delve. 2023. *MAXQDA vs. NVivo vs. delve: Comparing top QDA software*.

[16] Sulistijono, Sulistijono, Mahir Pradana, Diki Wahyu Nugraha, R. Habibi, and I. Hasbi. "Web-based application of high school laboratory administration: Case study at sma pasundan 8, Bandung, Indonesia." In *Proceedings of the International Conference on Industrial Engineering and Operations Management*, pp. 3007-3015. 2020.

[17] *Nvisia learn. 2020. The agile process 101: Understanding the benefits of using agile methodology*.

[18] Srivastava, Apoorva, Sukriti Bhardwaj, and Shipra Saraswat. "SCRUM model for agile methodology." In *2017 International Conference on Computing, Communication and Automation (ICCCA)*, pp. 864-869. IEEE, 2017. https://doi.org/10.1109/CCAA.2017.8229928

[19] Riadi, Septa, Ahiruddin Ahiruddin, Kuswarak Kuswarak, and Husna Purnama. "Challenges Of Islamic Religious Higher Education In Indonesia: Qualitative Analysis Using NVivo Software." *Journal Corner of Education, Linguistics, and Literature* 1, no. 2 (2021): 114-121. https://doi.org/10.54012/jcell.v1i2.10

[20] Darejeh, Ali, and Dalbir Singh. "A review on user interface design principles to increase software usability for users with less computer literacy." *Journal of computer science* 9, no. 11 (2013): 1443. https://doi.org/10.54012/jcell.v1i2.10

[21] *Sustainable development goals*. UNDP. *2023. Goal 4 Quality Education.*