CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter outlines the methods and procedures employed in the development and implementation of the Student Project and Dissertation Management System for the CSM Department at Ardhi University. It describes the research design, data collection techniques, system development approach, and tools used throughout the study. The methodology is structured to ensure that the system meets the functional requirements identified during the problem analysis phase while maintaining reliability, usability, and scalability. Each step taken in the development process is guided by best practices in software engineering and informed by stakeholder needs.

3.2 Selected methodology

The development of the Student Project and Dissertation Management System adopted the Iterative Model, specifically following agile principles, to ensure flexibility, continuous improvement, and active stakeholder involvement throughout the project lifecycle. This approach involves breaking the system development into smaller, manageable modules or iterations, with each iteration delivering a functional component of the system. Feedback from users such as students, supervisors, and administrative staff was collected at the end of each cycle to refine features, improve usability, and address emerging needs. The Agile approach was particularly suitable for this project due to its adaptability, emphasis on collaboration, and capacity to accommodate changes without significant delays or disruptions. It also allowed the development team to prioritize critical features early and respond promptly to challenges as they arose.

The model has an initial phase, planning phase, requirement phase, Analysis and descends development phase, testing phase and evaluation phase. Below is a simple diagram of the model used in the system

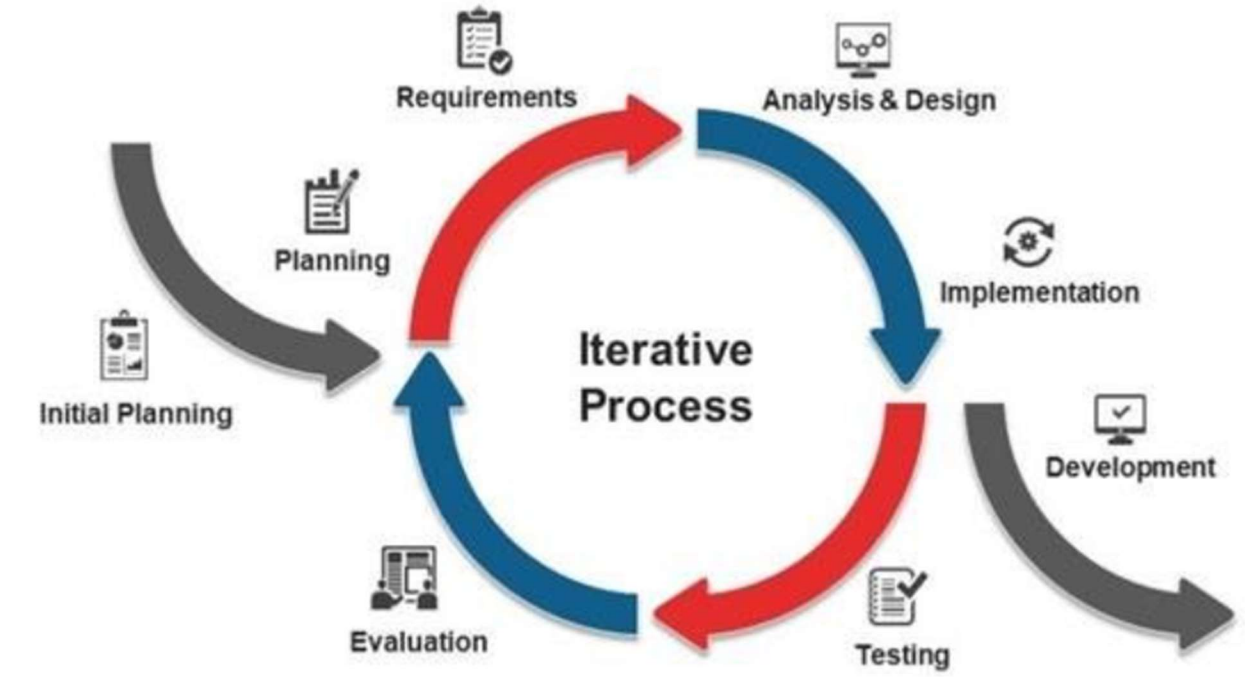

Figure 3.1 Iterative Model

Initial Phase: This phase involved understanding the project's goals and identifying key stakeholders like students and faculty. It helped establish the need for a centralized dissertation management system. Initial feasibility and scope were also evaluated.

Planning Phase: In this phase, the project roadmap, timeline, and resources were defined. Tasks were broken down into manageable iterations. Agile planning ensured flexibility to accommodate changes.

Requirement Phase: User needs and system functionalities were gathered through discussions and feedback. Requirements were documented in user stories for clarity. Prioritization helped focus on essential features first.

Analysis and Design Phase: System workflows and architecture were designed based on gathered requirements. Mock-ups, diagrams, and data models were developed. This phase ensured technical alignment before development.

Development Phase: Functional modules were coded and integrated in iterative cycles. Continuous testing and stakeholder feedback refined features. Agile sprints allowed for fast adaptation and progress tracking.

Testing Phase: Each module was tested individually and as part of the whole system. User feedback identified bugs and usability issues. Testing ensured system stability and performance.

Evaluation Phase: Final assessments were made to ensure the system met all requirements. Stakeholders evaluated usability and feature completeness. Lessons learned were documented for future improvements.

3.3 Study population

Study population refer to the subset of the target population from which sample is selected. It is where conclusion are drawn from the specific group that the data were collected from (Majid, 2018). The study population of this project was about50% of entire students of CSM department and 20% of total lecturers within the university.

3.4 Data collection Methods

Data refers to the collection of unorganized facts. Data collection is defined as the process of gathering, evaluating and analyzing precise understandings for research using typical authenticated methods (Mazhar, 2021). Previously objectives specifies the project was identifying and gathering user requirements of specific objectives which entail and elaborate the methods used to collect, and the following those methods used to gather data for this dissertation;

3.4.1 Questionnaire

Questionnaires were used as a primary data collection tool to gather information from students, supervisors, and administrative staff regarding the existing challenges and user requirements for the Student Project and Dissertation Management System. The questionnaires were designed with both closed-ended and open-ended questions to capture quantitative data for analysis and qualitative insights into user experiences and expectations. This method was chosen due to its efficiency in reaching a large number of respondents within a short time frame and its ability to

provide standardized data that supports the system design process. The responses helped identify key functional needs, usability preferences, and areas for improvement in current project management practices. The questionnaire of this study was supplied and conducted through Google forms

3.4.2 Interview

Interviews were conducted as a complementary data collection method to gain deeper insights into the specific needs and challenges faced by stakeholders involved in academic project and dissertation management. These semi-structured interviews targeted key individuals such as academic supervisors, departmental coordinators, and select students, allowing for more detailed discussions and clarification of responses. Unlike questionnaires, interviews provided an opportunity to explore opinions, experiences, and suggestions in depth, enabling the collection of rich qualitative data. This method was particularly useful for understanding workflow gaps, communication issues, and expectations for the proposed system's functionality. The information gathered through interviews played a crucial role in shaping system requirements and ensuring that the final product addressed real-world problems effectively.

3.4.3 Focus Group Discussion

Focus group discussions were employed to facilitate interactive dialogue among groups of students and faculty members, aimed at identifying shared challenges and expectations related to project and dissertation management. This method allowed participants to build on each other's ideas, leading to a broader range of insights and potential solutions that might be obtained through individual responses. The discussions were guided by a set of open-ended questions, encouraging participants to freely express their views on existing processes, system requirements, and desired features. Focus group discussions proved valuable in detecting group dynamics, common frustrations, and user priorities, which informed the design of a more user-centered and collaborative system. The collective input gathered helped validate findings from the questionnaires and interviews, strengthening the overall data collection process.

3.4.4 Literature review

A literature review was conducted to gather secondary data and gain a deeper understanding of existing systems, best practices, and common challenges in the management of academic projects and dissertations. This involved reviewing scholarly articles, case studies, and technical reports related to project management systems in higher education, with a particular emphasis on solutions implemented in contexts similar to Ardhi University. The literature review helped identify gaps in current systems, such as limited multi-year functionality and weak integration of supervision and communication features. It also provided a theoretical foundation for selecting appropriate development methodologies and system features. The insights drawn from the literature review complemented the primary data collected through questionnaires, interviews, and focus group discussions, ensuring that the proposed system was informed by both practical needs and existing academic knowledge.

3.5 Model of Data Analysis

A model of analysis is a structured approach used to examine data, identify key components, and understand relationships in order to design or evaluate a system effectively (Pane & Sarno, 2015). The design of the Student Project and Dissertation Management System was guided by the Object-Oriented Analysis and Design Methodology (OOADM), which focuses on modeling the system based on real-world entities and their interactions. OOADM was chosen for its ability to promote modularity, reusability, and scalability key requirements for building a robust and maintainable system. During the analysis phase, the system's functional requirements were identified and represented through use case diagrams, highlighting the interactions between users (students, supervisors, and administrators) and the system. In the design phase, class diagrams, sequence diagrams, and other object-oriented models were developed to illustrate system structure and behavior. This approach ensured a clear alignment between user requirements and system components, facilitating a smooth transition from design to implementation.

3.6 Testing and Evaluation Method

It refers to the process by which the system and component are compared against requirements and specification by testing (Madaus et al., 1992). To ensure the reliability, functionality, and usability of the Student Project and Dissertation Management System, a combination of black-box

testing and user-based evaluation was employed. Black-box testing was conducted at each iteration to validate system functions against specified requirements without considering internal code structure, allowing the development team to detect issues such as input errors, incorrect outputs, or interface failures. After the implementation of each major feature, system prototypes were tested by a group of selected end-users including students, supervisors, and administrative staff who provided feedback based on real-world scenarios and usage patterns. This user-driven evaluation method was instrumental in identifying usability issues, ensuring that the system met user expectations, and guiding necessary refinements. The iterative testing process, combined with stakeholder feedback, supported the agile methodology by enabling continuous improvement and ensuring the system was both functional and user-friendly upon deployment.

The different methodologies used in Student project and dissertation system are as follows in the table with their specification below;

Table 3.1 Methodology

SN	SPECIFIC OBJECTIVE	METHODOLOGY	TOOL	DELIVERABLE
1.	To gather user requirements for project and dissertation management system	-Survey -Interview -Focus Group Discussion -Literature review	-Questionnaire (Google forms) -Face-to-face(oral) -Group Discussion	System Requirement specification (SRS)
2.	To design project and dissertation management system	Object Oriented Analysis and Design (OOAD)	Star UML, draw.io	System design document (SDD)
3.	To implement the project and dissertation management system	Dynamic System Development Methodology (DSDM)	Language: Javascript, Python, CSS and SQL as a query language	Project and dissertation management system

4.	To test and validate the project and dissertation management system	Functional test	Computer	Testing for project and dissertation management system