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Developing a Technical Support Management Solution for Enhanced Service Delivery at Accra Technical University

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Abstract :- This study explores the implementation of a Technical Support Management System (TSMS) designed to enhance operational efficiency at Accra Technical University. The study addresses the challenges faced by the institution's technical support operations, including inefficiencies in managing support requests, technician assignments, and reporting processes. The proposed TSMS aims to streamline these functions by integrating a centralized system that automates and manages support workflows. The study involves a comprehensive analysis of the existing technical support framework at the university, identifying key areas for improvement. The implementation of the TSMS is evaluated through its impact on operational metrics such as response times, task completion rates, and overall service quality. Additionally, the study examines the effects of the TSMS on user satisfaction, focusing on how the system enhances communication, accelerates issue resolution, and provides transparent reporting. The results suggest that the TSMS significantly enhances operational efficiency by automating routine tasks, facilitating real-time monitoring of support activities, and generating detailed performance reports. The system's deployment leads to a more organized and responsive support environment, benefiting both the technical staff and the end-users. This study underscores the value of a well-designed technical support management system in optimizing support operations and contributing to a more efficient and effective service delivery model at Accra Technical University.

Keywords:- *Automation; Customer Satisfaction; Efficiency; ICT; Management System; Technical Support; Technician; Database; Workflow.*

I. INTRODUCTION

A. Research Background

Information Communication Technology (ICT) has progressively transformed how individuals think, work, and live, permeating various sectors including manufacturing industries, Non-Governmental Organizations (NGOs), educational institutions, and service-providing organizations. As public awareness of ICT's potential expanded, computers and technology applications became increasingly embedded in society [1], [2]. In the past, organizations were eager to adopt what was often seen as a daunting innovation in ICT. Today, however, ICT is an indispensable tool across all sectors of the economy, enhancing efficiency in businesses, improving teaching and learning in educational institutions, and optimizing productivity in both manufacturing and service organizations [3]. Currently, higher educational institutions such as universities and colleges, have integrated ICT into their core operations to maximize its benefits, and Accra Technical University (ATU) is no exception.

Located in the central business district of Accra, Tudu, Ghana, and adjacent to the Ghana Trade Union Congress (TUC) headquarters and Novotel Hotel, Accra Technical University, which was founded in 1949 as a technical school, was subsequently renamed Accra Polytechnic in 1963 under the supervision of President Dr. Kwame Nkrumah. The university was instrumental in the country's industrialization process. The Polytechnic was granted tertiary status under the PNDC Law of 1992 in 1993/1994, which enabled it to issue Higher National Diplomas (HNDs) through the National Board for Professional and Technical Examination (NABPTEX). In 2007, the Polytechnic Act (Act 745) repealed PNDC Law 321 of 1992, thereby enabling polytechnics to confer HNDs, diplomas, certificates, and other degrees that have been accredited by the National Accreditation Board.

In 2016, Accra Technical University was converted to Technical University status, aiming to enhance technical training and produce world-class graduates in diverse technical programs. The university currently has five faculties and 24 departments [4]. The primary rationale for integrating ICT into educational institutions is to enhance student learning and improve management efficiency [5]. Therefore, examining the effectiveness of ICT in supporting technical operations within such institutions is crucial.

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B. Research Problem

The technical support department at Accra Technical University is responsible for several core activities, including providing services to the institution and residential computer end-users, maintaining networks, and repairing faults. These tasks involve a team of more than twelve technicians daily. Despite the crucial role ICT plays across all sectors of the economy, where organizations, regardless of size, are reaping the benefits of technology. Accra Technical University's technical support department continues to rely on manual processes for managing records, categorizing work assignments, conducting staff appraisals, and other related activities. This reliance on manual methods has resulted in various inefficiencies, including poor productivity, reduced cost-effectiveness, inadequate time management, and ineffective staff appraisal processes [6]. Additionally, improper record-keeping practices have further exacerbated these issues. Due to these constraints, there is a pressing need for a scientific study to develop and implement a computerized system to enhance work control and efficiency within Accra Technical University's Technical Support Department.

C. Research Purpose

Efficient workforce utilization is vital for maintaining productivity and cost efficiency within organizations [7]. A study conducted by [7] indicates that inefficiencies in labor productivity often stems from poor management practices, particularly in the areas of site management, performance measurement, and daily work scheduling. A well-designed Technical Support Management System could significantly improve the stewardship of core data within the university's technical support department while delivering multi-faceted support processes and solutions. In light of the widespread use of mobile phones and social media, the implementation of a 24-hour user hotline service through mobile communications could also help mitigate challenges in scheduling the department's growing workforce [8]. Given the existing constraints, it is imperative to consider adopting a customized workforce management system to replace the current manual system.

D. Research Objectives

➢ *The Specific Objectives of this Study are as Follows:*

- To improve work scheduling processes for the technical support team.
- To ensure proper and accurate record-keeping for completed tasks.
- To develop a tool for appraising technical staff performance.

E. Research Significance

This research, focusing on the development of a technical support management system, aims to enhance the operational efficiency of Accra Technical University's technical support department. The system is designed to forecast hourly demand calls from computer end-users, facilitating the estimation of user requirements and the scheduling of daily rosters. Additionally, the system will enable rapid rescheduling while satisfying a greater number of scheduling constraints.

As a result, valuable workforce information will be generated, allowing for better understanding of completed work, ongoing projects, and the tracking of work schedules for each team member over time. The computerization process will foster improved collaboration between technicians and end-users, helping both parties to navigate scheduling constraints and explore possible solutions in anticipation of future changes or repairs to ICT equipment. This system is expected to significantly streamline operations, thereby improving overall service delivery.

F. Chapter Outline

Chapter One of this report includes the Introduction, Research Background, Problem Statement, Research Objectives, and Research Significance. Chapter Two provides a review of relevant literature, including topics such as Workforce Systems, Service Desk and ICT Support, Cyclic Maintenance Work Schedule Table Preparation Systems, and Workforce Systems. It also discusses the implications of this study and provides a chapter summary. Chapter Three delves into System Analysis and Design, covering an Introduction, Analysis of the Current System, Analysis of the Proposed System, Requirements Gathering, Functional Requirements, Non-Functional Requirements, and a Domain Dictionary. This chapter also includes a Description and Analysis of the Old System, highlighting its inadequacies, as well as a Description and Analysis of the Proposed New System. The chapter concludes with an Analysis of the New System using UML, deployment, an implementation plan, and summary.

II. LITERATURE REVIEW

A. Introduction

This chapter provides a review of relevant literature, including studies on workforce systems, service desk and ICT support, cyclic maintenance work schedule table preparation systems, and workforce management systems.

B. Service Desk and ICT Support

The implementation and management of an in-house IT Service Desk can be a substantial investment for institutions [9]. The required resources and technical expertise for certain projects may not always be available internally, leading many institutions to consider outsourcing their IT support to third-party organizations [10]. Outsourcing can be done either full-time or on-demand, enabling institutions to complete ICT projects on time and within budget. This approach is often more cost-effective due to economies of scale and offers additional benefits such as guaranteed service levels and extended hours of support. For instance, the University of London Computer Centre (ULCC) Service Desk serves as the central hub for ULCC ICT support and currently manages services for over 300 clients [11], [12]. The advantages of third-party IT support have been widely acknowledged in the literature, particularly in terms of cost-efficiency and enhanced service quality [13], [14].

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C. Cyclic Maintenance Work Schedule Table Preparation System

A cyclic maintenance work schedule table preparation system is designed to streamline the scheduling of maintenance tasks within a specific period. This system includes a display unit that shows boxes defined by dates within the desired period, alongside the names of individual workers [15]. Additionally, it features a worker data memory that stores scheduled work information and the qualifications of individual workers. A building data memory stores details such as the names of buildings, work specifics, last maintenance dates, and contracted maintenance frequencies. A processor is used to determine the working dates within the period for the buildings stored in the building data memory. Another processor allocates the names of the buildings based on the complexity of the tasks, using data from the worker data memory, building data memory, and the scheduling processor [16]. This system, as described by [16], is essential for ensuring that maintenance work is efficiently scheduled and that tasks are assigned to qualified personnel. Contemporary studies have highlighted the importance of such systems in optimizing maintenance schedules and improving workforce productivity [17].

D. Workforce Systems

Workforce systems are essential for managing an organization's fundamental data and providing complete business process solutions. personnel management is a planned institutional process aimed at optimizing performance levels and improving the proficiency of an organization's personnel. This process includes several operations crucial for sustaining a productive workforce, such as field service management, human resource management, performance and training management, data gathering, recruitment, budgeting, forecasting, scheduling, and analytics [18].

Workforce management systems offer a uniform array of performance-oriented tools and software to assist corporate management, front-line supervisors, store managers, and employees across diverse industries including manufacturing, distribution, transportation, and retail operations. These systems are occasionally designated as Human Resource Management Systems (HRMS), Workforce Asset Management, or elements of Enterprise Resource Planning (ERP) systems [19]. Workforce management has transitioned from conventional staff scheduling methods centered on enhancing time management to a more integrated and demand-driven strategy, with the objective of optimizing staff scheduling. Alongside demand orientation and optimization, contemporary workforce management systems frequently integrate numerous essential aspects, including:

- Forecasting workload and required staffing levels
- Involving employees in the scheduling process
- Managing working times and accounts
- Analyzing and monitoring the entire process [20], [21].

Effective workforce management is predicated on the precise delineation of essential jobs, employing specified standards and optimal methodologies to guarantee that each activity is executed with maximum efficiency and safety. Utilizing this foundation and demand-driven projections, personnel are scheduled, responsibilities are allocated, performance is evaluated, feedback is delivered, and incentives are computed and distributed [21].

Furthermore, online training and supervisor-led coaching are provided to guarantee that all employees attain the necessary competency standards. staff management is an extensive strategy designed to optimize staff efficiency, minimize labor expenses, and improve customer service [21]. [22] examined technology and computer-based methodologies for labor management. Their study encompassed procedures including the receipt of a support request with a designated location, the transformation of the support request into a work ticket, the classification of the work ticket, the allocation of the work ticket to an operative from a pool of operatives, the transmission of a request for a map incorporating data from the work ticket, the receipt of a map image pertinent to the work ticket, and the transmission of the map image along with the relevant data to the field operative [23].

E. Implication for This Study

This study aims to address and eliminate the challenges associated with improper record-keeping, time and resource wastage, control of routine work, and the assignment of tasks to technicians. By improving these areas, the proposed system seeks to enhance the efficiency and effectiveness of the technical workforce.

F. Chapter Summary

This chapter has reviewed literature in the areas of workforce systems, service desk and ICT support, cyclic maintenance work schedule table preparation systems, and workforce management. The reviewed studies address similar challenges that the proposed system intends to resolve. However, they do not sufficiently narrow their focus to the technical workforce, which is the primary focus of this study.

III. SYSTEM ANALYSIS AND DESIGN

A. Introduction

The methodology section outlines the systematic approach adopted to design, develop, and implement the proposed Technical Support System. The process follows structured phases to ensure the successful transition from the current manual operations to an automated system that addresses the identified issues.

- Research Design: The study employs a combination of descriptive and experimental research designs. The descriptive aspect involves documenting the existing processes and challenges, while the experimental design is used to develop, test, and validate the new system.

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- Data Collection: To understand the current processes and gather requirements for the proposed system, the following data collection methods were employed: Interviews: Conducted with technical staff, supervisors, and end-users to gather insights into the challenges faced in the current system and their expectations from the new system. Observation: Direct observation of the technical support operations to understand the workflow, bottlenecks, and areas that require improvement. Document Analysis: Review of existing forms, reports, and logs maintained by the technical department to assess the current documentation practices.
- Requirements Analysis: The requirements analysis phase involved translating the data collected into functional and non-functional requirements. This process included: Identifying the core functionalities required, such as fault reporting, technician assignment, progress tracking, and report generation. Defining non-functional requirements such as system performance, reliability, and user-friendliness. Developing use case diagrams to visualize the interactions between the system and its users.
- System Design: The system design phase focused on creating a blueprint for the proposed system, incorporating both logical and physical designs: Logical Design: Use of Unified Modeling Language (UML) diagrams, including class diagrams, activity diagrams, and sequence diagrams, to model system workflows and interactions and development of data flow diagrams (DFDs) to illustrate the flow of information within the system. Physical Design: Identification of the hardware and software requirements for system implementation and designing a relational database schema to store and manage records of service requests, technician assignments, and reports.
- System Development: The system development phase involved the implementation of the design into a functional system: Programming: The system was developed using a modern programming language (e.g., Python, Java) and a web framework for a user-friendly interface. Database Integration: A relational database (e.g., MySQL, PostgreSQL) was created to store and manage all data, ensuring consistency, security, and accessibility. Notification Module: A module for sending automated notifications to technicians and end-users was incorporated to streamline communication.
- System Testing: Testing was conducted in two stages to ensure the reliability and effectiveness of the system: Unit Testing: Individual components of the system were tested to verify their functionality. System Testing: The entire system was tested in a simulated environment to ensure seamless integration of all modules. User Acceptance Testing (UAT): End-users and technical staff were involved in testing the system to confirm that it meets their expectations and requirements.
- System Implementation: The implementation phase included the deployment of the system in the technical support department: Pilot Implementation: The system was initially deployed on a small scale for selected technical staff and end-users to identify and rectify potential issues. Full Implementation: After successful pilot testing, the system was deployed department-wide, replacing the manual processes.
- Training and Documentation: Comprehensive training sessions were conducted for all users of the system: Technical staff were trained on how to use the system for logging and managing tasks. End-users were provided with guides on how to report issues through the system interface. Additionally, detailed user manuals and system documentation were created for reference.
- Evaluation and Maintenance: Post-implementation evaluation was conducted to assess the system's performance and user satisfaction: Feedback from users was collected to identify areas of improvement. Regular maintenance schedules were established to ensure the system remains operational and up-to-date. This methodology ensures a structured approach to addressing the limitations of the current manual processes, resulting in an efficient and reliable Technical Support System.

B. Analysis of the Current System

Currently, the technical support staff are responsible for providing a range of services to both the organizations and residential computer end-users. These services include the installation of computer hardware and software, network setup and maintenance, fault repair, and other technical support activities. The technical staff, including technicians, are the primary personnel involved in these operations. The current method for reporting and addressing technical issues involves direct, in-person reporting, phone calls, or text messaging. End-users utilize any of these communication channels to report issues to the available technical staff. The technical staff then follow the complainant to their office to diagnose and resolve the problem.

A similar process is used when end-users require training or assistance with software applications. Occasionally, end-users may collect a form from the technical department, fill in the details of their issue, and submit it to the head or supervisor, who then assigns a technician to address the problem. These manual processes for work distribution and departmental activities have several drawbacks. The lack of proper documentation and record-keeping impedes the department's ability to track completed work, ongoing tasks, and pending assignments. This situation not only affects the quality of service but also results in unequal work distribution among staff, inefficient time management, and a lack of accountability.

The absence of proper records to monitor the progress of work within the department is a significant concern. Therefore, this study proposes the development of a Technical Support System aimed at eliminating these constraints. The proposed system will replace the manual processes with an automated system, thereby addressing the issues associated with the current methods.

C. Analysis of the Proposed System

The proposed system will replace the manual operations currently in use within the technical department with an automated, web-based system that streamlines all user support operations. This system will be accessible to

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both end-users and technicians, allowing for a more efficient and organized approach to handling technical support tasks. The new system will enable technicians to be assigned to user complaints, track user complaints and their resolutions, maintain records of completed work, and monitor the work history of technicians. Additionally, the system will keep track of ongoing tasks. The major high-level functions of the system are described in the following sections, highlighting its capabilities in improving the efficiency, transparency, and effectiveness of technical support operations within the department.

D. Requirements Gathering

➢ *Functional Requirements*

- **Receiving End-User Information:** When an end-user requires technical support, they will log into the Technical Support Management System (TSMS) and input their information. This includes details such as the end-user's name, phone number, and location (a combination of building, block, and room number). The end-user will also provide a description of the problem. To facilitate accurate reporting, the system will offer a list of common issues from which the end-user can select. After completing the form, the end-user submits it online. Upon submission, a notification is automatically sent to the head of the department and unit supervisors. Using the TSMS, the head or supervisor assigns a technician to the task, incorporating all the information provided by the end-user. A subsequent notification is then forwarded to the assigned technician with the relevant details.
- **Assessing the Problem:** Based on the information provided by the end-user, the assigned technician will assess the situation. The technician will diagnose the issue and implement the necessary solution. Once the task is completed, the technician logs into the TSMS and records details such as the diagnosis performed, possible causes, repairs undertaken, the status of the work (e.g., pending, completed, or obsolete), parts used or needed for replacement, the date of completion, the duration of the task, and any recommendations.
- **Logging and Reporting:** The heads of departments or supervisors can utilize the TSMS to input technician details such as name, unit, and rank. They can generate reports that include each technician's workflow, parts used, dates and times of completed work, and detailed information on weekly, monthly, or yearly tasks completed by each technician.
- **Tracking and Monitoring:** This functionality allows heads of departments, supervisors, and technical staff to track the status of ongoing work, identify which staff members are assigned to specific jobs, and determine their locations at any given time. Once a job is completed, the system automatically notifies the supervisor of its execution.
- **Manage Users:** This functionality enables the head of the department or the system administrator to maintain the TSMS by adding, removing, or updating technician profiles. Each technician will be assigned a unique username and password for system access. However, end-users will log in using their existing institutional ERP credentials.
- **External Systems Integration:** The TSMS will integrate with external systems such as the institution's ERP, LAN, and the internet. This will allow end-users to contact the technical department at any time and provide technicians with real-time access to necessary information.

➢ *Non-Functional Requirements*

- **Usability**: The Technical Support Management System (TSMS) shall provide intuitive mouse and keyboard navigation. It will be easy to navigate, utilizing clear language, menus, and drop-down lists. A user manual will accompany the system to guide users.
- **Reliability**: The TSMS shall be available 24 hours a day to ensure continuous access for application users.
- **Performance**: The system shall not take longer than 30 seconds to respond to a page request, assuming the end-user is connected to the internet or LAN.
- **Supportability**: The TSMS program must be compatible with current equipment, including computers, monitors, and printers.
- The **software installation** will occur in a single deployment to provide a seamless transition from the manual to the automated system.
- The TSMS must be available via online **browsers** including Internet Explorer 5 or above, Google Chrome, and Firefox. The system must furthermore provide printer-friendly outputs for reports, allowing users to effortlessly acquire printed copies of the documents.
- **Packaging**: The application is designated solely for internal departmental utilization and will not be packaged or marketed as a retail product.

E. Description and Analysis of the Old System: Inadequacies

In the existing system, end-users request technical services through various channels such as phone calls, SMS, and face-to-face interactions. These methods are informal and can lead to inefficiencies in communication and service delivery. The current system employs a designed form that requires the end-user to provide specific details, including their name, location, date, and a description of the complaint. Once completed, this form is submitted to a supervisor, who then assigns a technician to address the complaint. However, this manual process is fraught with limitations. The old system lacks the capability to effectively manage and control work schedules, assign tasks efficiently, and monitor staff movement. Additionally, it does not support the generation of up-to-date reports, which hinders effective management and decision-making. The reliance on manual processes for these critical functions results in delays, errors, and a lack of accountability in service delivery.

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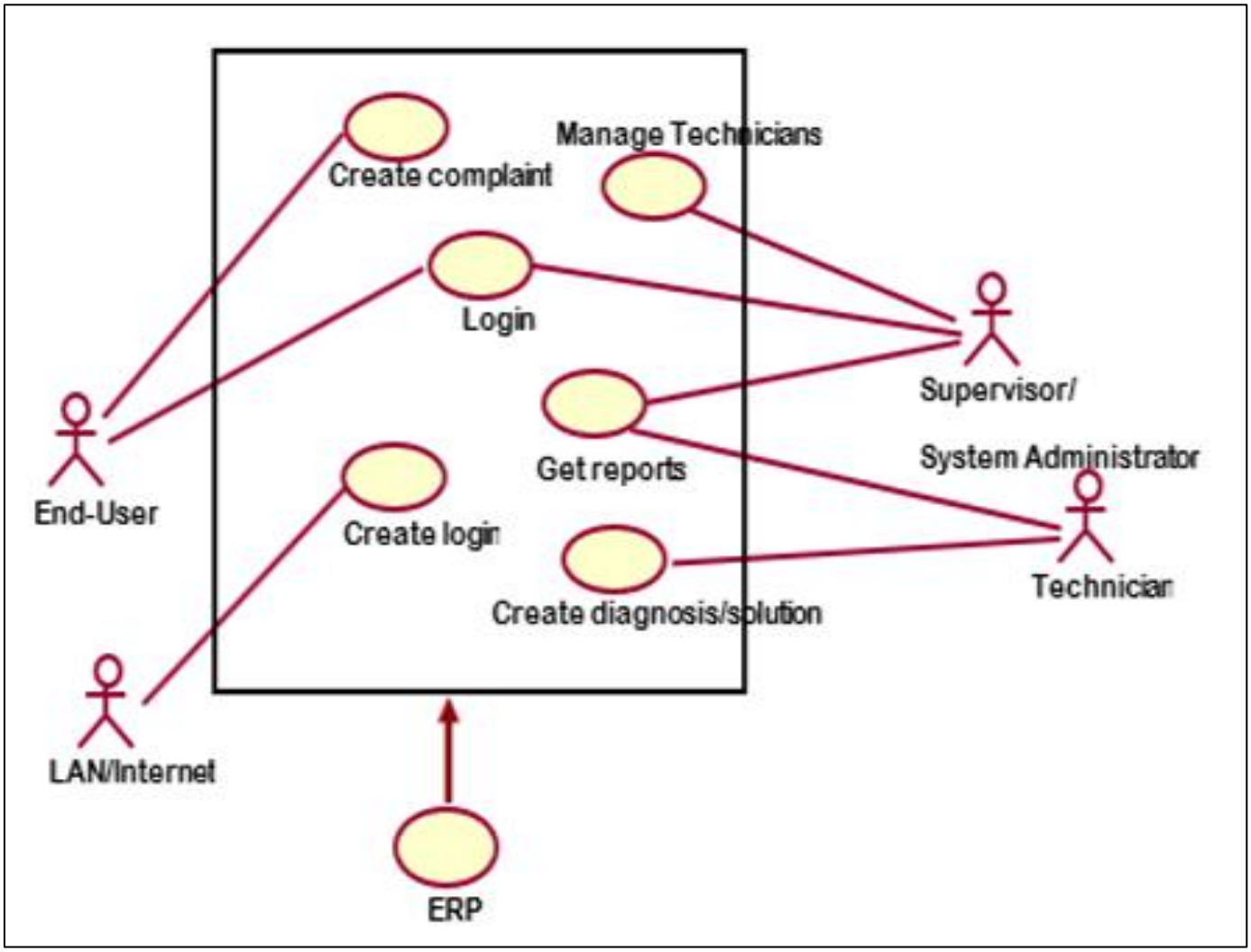

Fig 1: Use Case Diagram of the Proposed System

F. Description and Analysis of the Proposed New System

The proposed system introduces a more robust and efficient approach to managing technical service requests. This new system is designed to streamline the process of assigning technicians to user complaints, tracking the progress of these complaints, and maintaining detailed records of work completed and technician work history. Moreover, it includes features that allow for real-time monitoring of ongoing tasks, providing supervisors with the ability to oversee work more effectively. One of the key aspects of the new system is the use of evolutionary prototyping to develop the final product. Evolutionary prototyping is a method that involves continuous refinement of the system based on user feedback and evolving requirements. This approach requires the commitment of customer resources for evaluation and refinement of the prototype, as well as timely decision-making regarding requirements. Evolutionary Rapid Prototyping (ERP) is particularly advantageous for this project as it ensures a more accurate specification of system requirements and functionalities.

G. The Use Case model for the TSMS

The ERP process involves the creation of a project plan and a software evolution plan from the outset, which minimizes the amount of throwaway code typically associated with the spiral model of software development. Despite some risks, such as the potential for premature delivery or the tendency to prioritize production efficiency over product modifiability, the ERP process is deemed appropriate for this project due to its focus on iterative development and continuous improvement. As illustrated in Fig. 2, the use case diagram designates the high-level role of the technical support system. It also defines the different actors interacting with the system.

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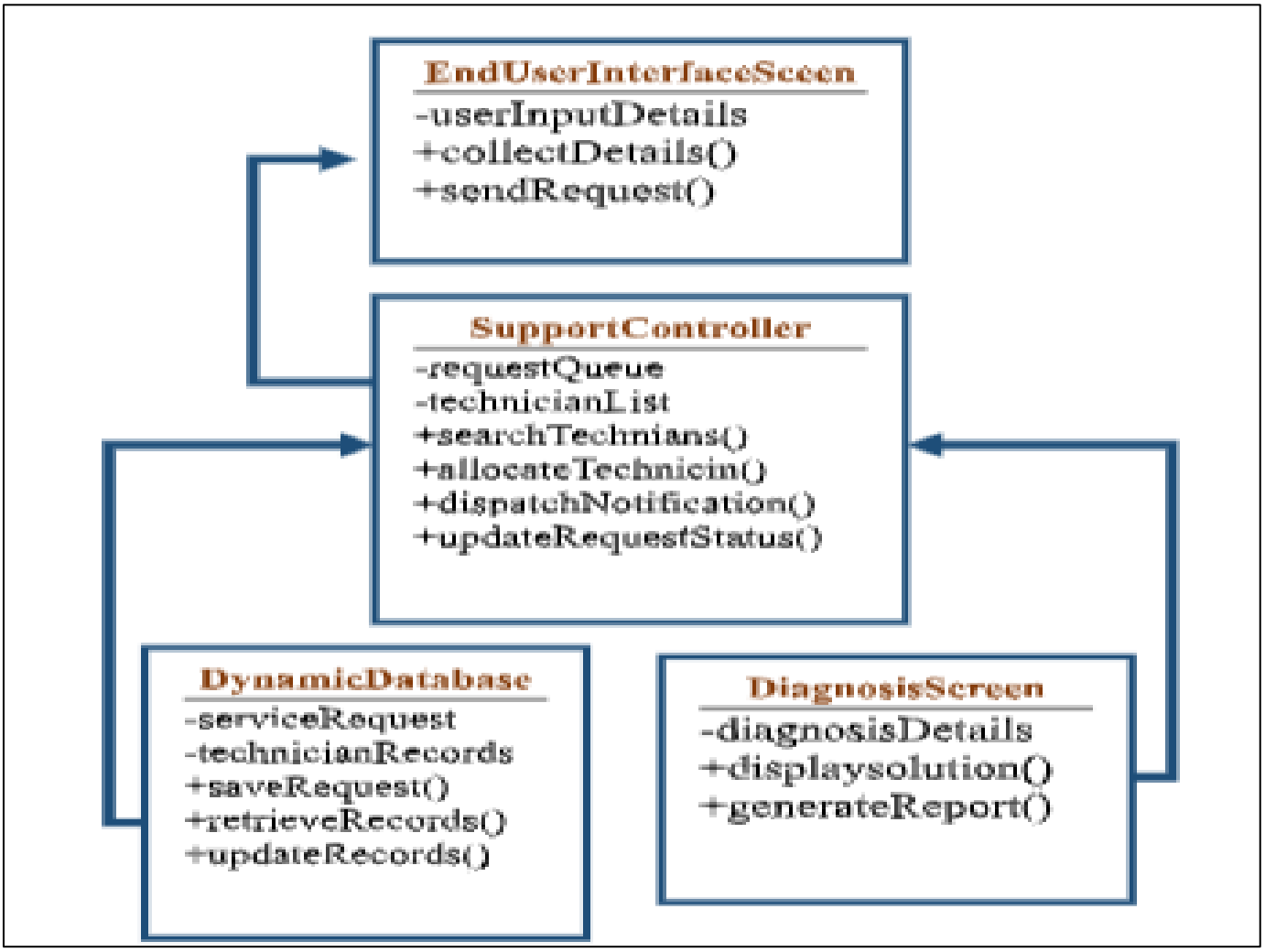

Fig 2: Use Case Model Diagram

➢ *Login Use Case Description:*

The Login Use Case serves as a fundamental entry point into the Technical Support System (TSS). It outlines the procedure through which an end-user gains access to the system by providing authentication credentials.

Table 1: Login Use Case Data Flow

Login	Brief Description	Flow of Events
	This use case defines how an End-user logs into the Technical Support System (TSS).	Basic Flow: This use case starts when the actor wishes to Login to the Technical Support System (TSS). The system requires the end-user to provide their name and password. The user inputs their name and password. The system authenticates the provided username and password, thereby granting the user access.

- Basic Flow: The login process begins when an end-user initiates the login action to access the TSS. At this stage, the system prompts the user to input their username and password. This request is a standard security measure designed to authenticate the user's identity.

  Upon receiving the login credentials, the system performs a validation check. It validates whether the provided username and password match the records stored in the system's database. If the credentials are correct, the system successfully logs the user in, granting them access to the various functionalities of the TSS. This successful login allows the user to proceed with their intended tasks within the system.
- Alternative Flow: In cases where the end-user inputs invalid login credentials, an alternative flow is triggered. If the system detects an incorrect username or password, it responds by displaying an error message to the user. This message informs the user of the failed login attempt and typically provides guidance on how to correct the issue, such as re-entering the credentials or seeking assistance if the problem persists.
- Post-Conditions: The outcome of the login use case is dependent on the success of the authentication process. If the login attempt is successful, the end-user is granted

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access to the system, and their session begins. In contrast, if the login attempt fails due to incorrect credentials, the system remains unchanged, and the user is not granted access. The state of the system, therefore, reflects the result of the login attempt either a successful entry into the system or the continuation of the pre-login state. Overall, the login use case is designed to ensure secure and efficient user authentication, providing a clear pathway for authorized users to access the Technical Support System while managing and responding to authentication errors effectively.

➢ *Create Complain Use Case Description*

The "Create Complain" use case is designed to facilitate the process of submitting complaints by end-users. This process is essential for ensuring that user issues are recorded and can be addressed by the support team effectively.

- **Basic Flow:** The use case begins when an end-user decides to create a complaint within the TSS. To initiate this process, the user must enter their details into the designated system

forms. These forms are designed to capture relevant information such as the nature of the complaint, contact details, and any other necessary data required to address the issue. The user inputs this information into the system, which then prepares it for further processing.

Table 2: Creating A Complain Use Case Data Flow

Create Complain	Brief Description	Flow of Events
	The use case is designed to capture details about the end-user.	Basic Flow: The end-user enters his or her details into the system forms. Alternative Flow: The details are verified by the system and entered into the database.

- **Alternative Flow:** Once the end-user has submitted their complaint details, the system performs a verification process. This involves checking the accuracy and completeness of the information provided. After verification, the details are entered into the system's database. This step ensures that all submitted complaints are properly recorded and can be accessed by the support team for follow-up and resolution. Overall, the "Create Complain" use case ensures that user complaints are systematically captured and stored within the Technical Support System. The basic flow outlines the user's role in providing complaint details, while the alternative flow emphasizes the system's responsibility for verifying and recording this information. This structured approach helps in managing and addressing user issues efficiently.

➢ *Create Diagnosis Use Case Description*

The "Create Diagnosis or Solution" use case in table 3 outlines how technicians provide and record their findings and solutions related to user complaints within the Technical Support System (TSS). This process is essential for maintaining a comprehensive record of all technical interventions and solutions provided.

- **Basic Flow:** The use case begins when a technician, having completed the analysis or repair work, enters the details of their findings into the system. This step involves inputting specific information about the diagnosis of the problem and the solution implemented. The details are entered into the system's database, ensuring that the information is accurately recorded and can be accessed for future reference.
- **Pre-Conditions:** Before a technician can utilize this use case, they must be logged into the system. This pre-condition ensures that only authorized personnel can enter diagnostic and solution information, thereby maintaining the integrity and security of the data entered into the system. In summary, the "Create Diagnosis or Solution" use case ensures that all diagnostic and solution-related information is systematically captured and stored in the Technical Support System. The basic flow emphasizes the technician's role in entering detailed work information, while the pre-condition highlights the necessity of system authentication to maintain data security and accuracy.

Table 3: Create Diagnosis Data Flow

Create Diagnosis Or Solution	Brief Description	Flow Of Events
	The Use Case Gets the Diagnosis and Solution Information from Technician.	Basic Flow: Technician Enters Details of Work to The System Database Pre-Conditions: The Technician Should Be Logged into The System Before Using the Use Case.

➢ *Manage Technicians Use Case Description*

The "Manage Technicians" use case focuses on how information regarding technicians is captured and managed within the Technical Support System. This process is essential for keeping accurate records of technician activities, assignments, and performance.

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Table 4: Technical Report Data Flow

Manage Technicians	Brief Description	Flow of Events
	The use case gets detail information of technician from supervisor/system administrator.	Basic Flow: supervisor or system administrator enters details of work to the system database Pre-Conditions: The supervisor or system administrator should be logged into the system before using the use case.

- Basic Flow: The process begins when a supervisor or system administrator needs to update or enter details about a technician's work into the system. The supervisor or administrator inputs this information directly into the system's database. This data entry includes details such as work assignments, performance metrics, and any other relevant information about the technician's activities. By doing so, the supervisor or administrator ensures that the technician's records are current and accurately reflect their work.
- Pre-Conditions: To access and utilize this use case, the supervisor or system administrator must be logged into the system. This pre-condition is essential to ensure that only authorized individuals can manage technician information, thereby protecting the integrity and confidentiality of the data.

In summary, the "Manage Technicians" use case is designed to facilitate the accurate and secure entry of technician-related information into the Technical Support System. The basic flow outlines the role of the supervisor or system administrator in updating the system, while the pre-condition underscores the importance of system authentication for maintaining data security.

➢ *Generate Report Use Case Description*

The "Generate Report" use case focuses on the output of detailed reports related to diagnoses and solutions within the Technical Support System. This use case is crucial for summarizing and reviewing the results of technical support activities.

Table 5: Report Data Flow

Generate Report	Brief Description	Flow Of Events
	The use case gives out output of the diagnosis and solution report.	Basic Flow: Supervisor gets details report of work from the system database

- **Basic Flow:** The process begins when a supervisor needs to generate a report that provides detailed information about diagnoses and solutions recorded in the system. The supervisor accesses the system and retrieves the relevant data from the system's database. The system then compiles this information into a structured report format, which is presented to the supervisor. This report includes comprehensive details about the technical issues addressed, the diagnoses made, and the solutions implemented. In summary, the "Generate Report" use case facilitates the creation of detailed reports that summarize the outcomes of technical support activities. The basic flow emphasizes the supervisor's role in retrieving and reviewing detailed information from the system database to generate comprehensive reports on diagnoses and solutions.

H. Analysis of the New System using UML

The class diagram features an end-user interface screen designed to facilitate interaction between the system and the end-user. This screen collects all necessary details from the caller, which enables the system to dispatch a technician based on the specified requirements. The functionality of notification management is handled by the SupportController class. This class is responsible for searching, allocating, and dispatching notifications to appropriate technicians. The SupportController ensures that all requests are processed and technicians are assigned efficiently based on the incoming details. A dynamic database supports the system by maintaining comprehensive records of all transactions. This database is integral for tracking and managing service requests and technician assignments.

Upon resolution of a technical issue, a report is generated to document the solution. The DiagnosisScreen class interacts with the Support Controller to display the technical solutions derived from the system's analysis. This information is then presented on the report screen, providing a detailed account of the solutions and actions taken to address the problems reported by the end-users. This structured approach ensures that all aspects of the service request process from initial notification to final reporting are managed efficiently and transparently.

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IV. PROPOSED SYSTEM DEPLOYMENT

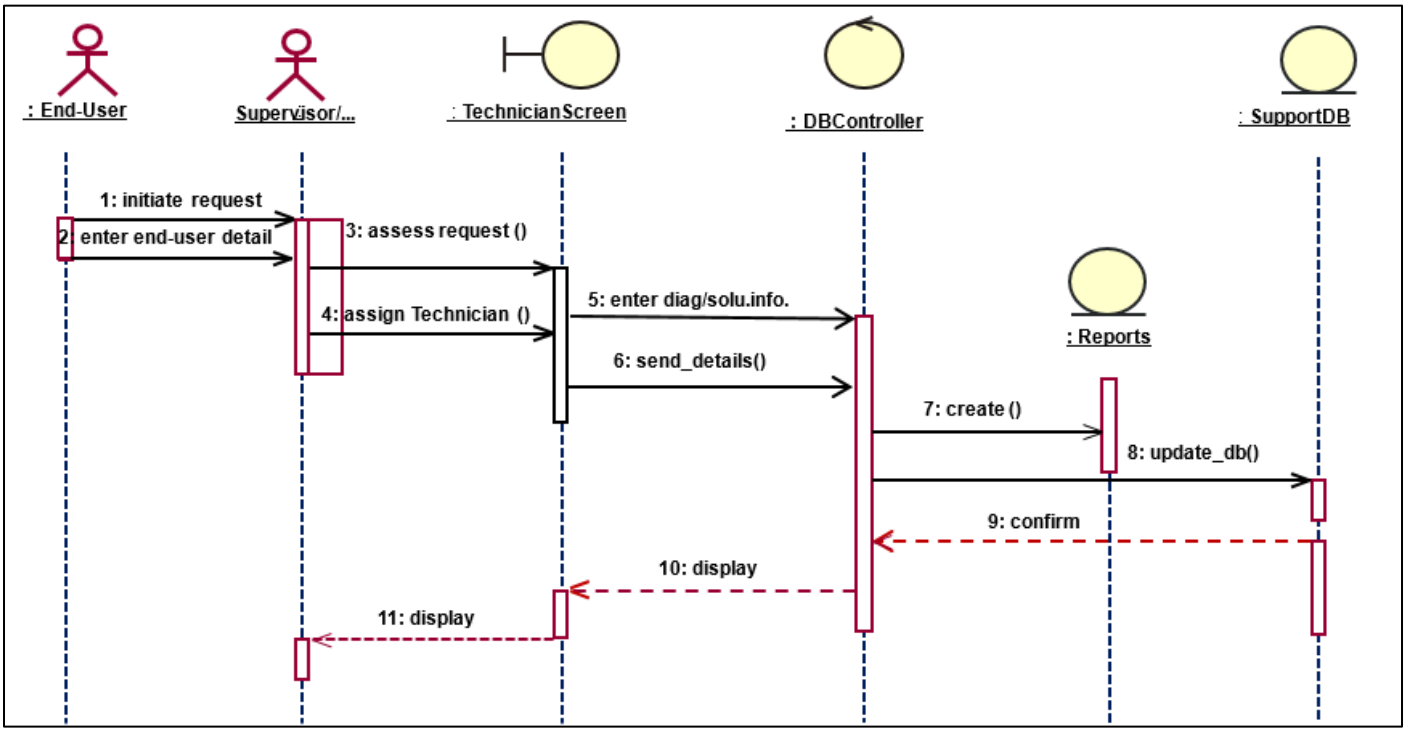

Fig 3: UML Process

A. System Deployment Assumptions

➢ *The Development and Deployment of the Proposed System are Based on Several Key Assumptions:*

- *Technician Assignment:* The system will be equipped with functionality to assign technicians to user complaints based on detailed information provided by the end-users. This feature assumes that the system will effectively match technician skills and availability with the specific needs outlined in the complaints.
- *Complaint Tracking:* The system will offer comprehensive tracking of user complaints from initial reporting through to resolution. This includes monitoring the status of each complaint and ensuring timely updates and feedback are provided to users.
- *Record Keeping:* Accurate and detailed records of all completed work will be maintained by the system. This includes logging each task performed, the time taken, and the outcome, ensuring transparency and accountability in service delivery.
- *Technician Work History:* The system will track and store the work history of each technician, including the types of tasks performed, frequency of assignments, and performance metrics. This historical data will be crucial for performance evaluations and decision-making.
- *Ongoing Work Monitoring:* Real-time tracking of ongoing work will be facilitated, allowing supervisors and managers to monitor progress, identify potential issues, and ensure that tasks are completed within the stipulated timeframes.

B. Implementation Plan

➢ *The Implementation Plan Outlines the Approach and Considerations for Deploying the Proposed System:*

- *Deployment Environment:* The system will be installed on the institution's file server, providing centralized access through the local network and the internet. This setup ensures that authorized users can access the system from various locations, enhancing flexibility and accessibility.
- *Schedule:* Development of the software, which will utilize Microsoft Access, will be carried out in-house. To minimize disruption to daily operations, the implementation process is scheduled for weekends. This approach allows the technical team to focus on development and deployment without interfering with regular work activities.
- *Resource Availability and Skill Sets:* The successful implementation of the system relies on the availability of qualified personnel and their skill sets. The institution will leverage its existing staff expertise to manage the development process and ensure that the system meets the specified requirements.
- *Reusability:* The project will take advantage of existing software and technology where feasible. This approach includes reusing current tools and platforms to reduce development time and costs, while also ensuring compatibility with existing systems.
- *Budget:* The implementation of the system does not require additional budgetary allocations. The development and deployment will be managed using

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existing resources and infrastructure, making it a cost-effective solution for the institution.

V. SUMMARY

This detailed analysis and development of a proposed technical support management solution to enhanced service delivery at Accra Technical University has highlighted its anticipated impact on Accra Technical University. The implementation of the system is expected to bring several benefits: Firstly, Enhanced Work Management by streamlining the process of assigning and tracking technician tasks, the system will improve overall work management efficiency.

Secondly, Increased Time Efficiency to enhance automated tracking and reporting features will reduce the time spent on manual administrative tasks, allowing staff to focus on more critical activities. Thirdly, Simplified Staff Appraisal that provides the system's capability to record and analyze technician performance data will facilitate easier and more accurate staff appraisals. Finally, Cost Savings to improve the use of existing resources and technology, combined with the system's efficiency improvements, will result in significant cost savings for the institution. Overall, the proposed system is poised to enhance operational efficiency, support effective decision-making, and contribute to the institution's cost management efforts.

Fig 4: TSMS Projected Impact

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