Chapter One

Introduction

1.1 Background to the Study

Education is a significant development driver and one of the most effective tools for decreasing poverty, boosting health, gender equality, and promoting peace and stability[1]. The growth in the number of schools, colleges, and universities raises serious concerns about the quality of education provided and the procedures in place to enhance it[2-4]. Education is the socially organized and regulated process of transferring socially meaningful experience from previous generations to subsequent generations. Education is the means by which civilization is passed down from generation to generation[5].

There is no consensus among teachers, psychologists, politicians, or philosophers about the goal of education, or even what constitutes education. If the goal is to train decent citizens, we must contend with the fact that different countries have diverse definitions of what constitutes a good citizen. An endeavor by adult members of a human community to mold the development of the next generation in conformity with their own life ideals. Whatever concept of education and its purpose we accept, it will be influenced by our own personal philosophy of life. Each of us appears to have a need to identify our own ideas and aims[6].

In a broader sense, education is thought to be synonymous with instruction. It is made up of "particular impacts" that are purposefully designed in a school, college, or institution to help a child develop and flourish. From Kindergarten through the University, the term "school" refers to the entire educational system. Because it provides education directly and systematically, the school represents formal education. "The school exists to provide a unique setting for the formative phase of human life," according to John Dewey. School is a purposefully designed

organization whose main purpose is to educate children. This unique setting is required to fully comprehend our complicated culture and civilization.

1.1.1 Definition of Education

The Latin terms 'Educare, Educere, Educo, and Educatum' are used to form the word 'EDUCATION.' 'Educare' means 'to nourish' or 'to bring up,' while 'Educere' means 'to draw forth' or 'manifest.' The Latin term "educo" means "to guide out of.' The term "educum" describes the process of instructing or teaching. Educere is Latin for "to draw out or make evident".Educare or Educere refers to the process of fostering a child's hidden abilities. A child, however, is not aware of these possibilities. It is the duty of the educator or instructor to be aware of these and to employ appropriate methods for fostering such qualities. More than what takes on inside a classroom's four walls is included in education. A child learns from both his experiences outside of school and inside of school based on these factors. The three fundamental types of education are formal, informal, and non-formal.

Formal education, also referred to as formal learning, occurs in the classroom where students may pick up intellectual, practical, or fundamental skills. Although it is common for young children to enroll in a nursery or kindergarten, official education normally starts in elementary school and lasts until secondary school. In most cases, post-secondary education (also known as higher education) is acquired at a college or university that grants an academic degree. It is supplied under a set of guidelines and is connected to a certain occasion or stage.

Formal education is delivered by qualified teachers who are expected to be adept at instructing. Additionally, it adheres to a strict code of behavior. Both the teacher and the student are cognizant of the information and actively engage in the learning process. Knowing full well that a teacher's or instructor's contribution to a student's development and training in school

cannot be overstated, it is critical to assess teacher quality on a continuous basis to ensure that learners are really in the custody of a competent teacher.

1.1.2 Education: A Never-Ending Process

Education is an intentional endeavor to develop and cultivate our innate abilities in a narrower sense. It's also known as knowledge acquisition. Education is the process of acquiring facts or expertise about a subject. However, while information acquisition is not the only or greatest goal of education, it is one of the most significant goals. In a broader sense, education refers to the whole development of a person's personality. Education encompasses all of the events that shape a person's life from birth to death. Education, in its broadest sense, is a never-ending process. It begins with a child's birth and ends with his or her demise. It is an ongoing process. Education is no different from life in that it is a never-ending process of growth and development. An individual learns by his or her experiences, which he or she accumulates over the course of his or her life. Education is more than just a collection of facts. It is the result of life experiences accumulated in the natural and social surroundings. It includes all information and experiences acquired formally or informally throughout infancy, childhood, boyhood, adolescence, youth, manhood, or old age through any kind of education—the press, trips, clubs, nature—during these life stages. As a result, education is defined as the sum of all experiences that a child has both inside and outside of the classroom. Life is education, and education is life in a broader sense. A person gradually adapts to their physical, social, and spiritual settings through education in a variety of ways. It is the development of all of an individual's capacities that will allow him to influence his surroundings and realize his potential. In a broader sense, education is "the transmission of life from the living to the living, through the living, and for the living." In its narrowest meaning, Education is a formal, conservative process that is

primarily restricted to school campuses in order to foster the building of a personality that is harmoniously balanced throughout. Education, within the fullest sense, is a lifetime process that involves the whole development of one's personality. Both of these processes are combined in education as a whole. With a focus on the development of society, of which he is an essential part, the kid will be completely developed in accordance with his natural tendencies. A child who receives this kind of education will rise to greater heights of glory and cultural importance, as will society as a whole.

1.1.3 Education's objectives

Through education, we seek to bring about some desirable changes in children. A purposeful endeavor with clear goals and objectives is education. The curriculum is determined and the student's academic performance are measured in light of these goals. Education without a purpose is akin to a ship without a rudder. The direction of activities is determined by the goals. Education becomes a blind alley when it lacks a goal. Each phase of human evolution has a purpose for living. The goals of education are determined by the goals of life. The objectives of education have evolved over time, making it dynamic in the same manner as the objectives of life have. Education's objectives and their nature We must first comprehend the nature of objectives in order to comprehend the educational goals. The objectives of education are not unchanging, everlasting, or universal. Both of these are movable and variable. The two main life philosophies of idealism and pragmatism can be used to understand the nature of educational goals. Idealism is characterized by absolute, ultimate, eternal, and universal values. It advocates high moral standards, the majority of which have a spiritual bent.. "Knowing for the sake of knowledge," as Idealism puts it. Education is for a person's general and moral development in an idealist society. The goals of education, according to idealism, are

predetermined, unchanging, unalterable, spiritual, and idealistic in nature. Idealist education seeks to realize these inherent, unchangeable, and universal principles. "Education for a full life" is the motto. Pragmatism is concerned with life as it is, rather than as it should be. It's often referred to as a realistic outlook on life. Realistic thinking takes into account existing or recent social, political, and economic conditions of existence. The goals of pragmatic education are determined by the current circumstances of life. Since pragmatism rejects absolute and eternal ideals, life philosophy is constantly reflected in educational objectives. Plato believed that the state's guardians should have lofty philosophical aspirations. "The disciplined and well-ordered mind," Locke emphasized. Emphasizes that the state's glorification and the accomplishment of the absolute will are the utopian goals of education. Marx was a materialist who believed in the existence of the material world. As a result, he stressed the material goal of education, i.e., man's real economic demands. The people's materialistic viewpoint informs educational objectives in a materialist society. Moral or spiritual principles have no bearing on schooling in such a culture. The idealist society works to further such ideals and places a strong emphasis on individual moral development. The goals of education are also determined by socio-political ideology.

1.1.3.1 Democratic View of Education

A democratic government, a fascist government, or a communist government all have their own educational goals and methods. Democratic values of life are malleable and adapt to changing circumstances. The next generation must be educated to fit into the nation's economic and social structure. Every country must consider its economic circumstances when defining its educational objectives. As a result, we discover that educational goals are inherently variable. "As political, social, and economic situations change and new challenges emerge,"

the Secondary Education Commission (1952) writes, "it becomes necessary to re-examine thoroughly and re-state clearly the objectives which education at a specific time should have in mind." Education's Goals Have Changed Over Time The spiritualistic vision of existence was prevalent in Ancient India. The goal of education was defined by one's outlook on life. Thus, the aim of education was self-realization, or the realization of Brahma or the Absolute. In the past, Spartan education was more socialistic than individualistic. The goal of ancient Greek education was to promote a balanced development of a person's physical, intellectual, moral, and artistic faculties. It ensured harmony between the individual and the state, the development of the body and mind, and the relationship between thought and deed. Its main objective was to develop a beautiful mind in a beautiful body. The highly individualized objective of education was rejected by the Greek idealists Socrates, Plato, and Aristotle. Socrates valued attaining eternal and all-encompassing knowledge, or truth. Plato promoted the harmonious development of each person's abilities and made the link between individual happiness and communal harmony. Harmony between intellect and character, theory and practice, and individual and community harmony were all ideals that Aristotle advocated.

1.1.3.2 Roman Concept of Education

The acquisition of merely theoretical knowledge was of no interest to the ancient Romans. Their perspective was purely materialistic. Their biggest aspiration in life was to achieve financial success. Roman education aimed to create a deserving citizen who was competent of exercising citizenship rights and carrying out civic duties. During the Middle Ages, education was solely the responsibility of priests. In every field, mysticism, monasticism, chivalry, and scholasticism ruled. The character of education was strictly formal, with a religious bent. This liberal humanistic education became an artificial and formal system as time went on. Under

the direction of Bacon and Comenius, the realistic movement arose in opposition to this false schooling. They held that ignorance was the root of all wrongdoing. As a result, they advocated for the diffusion of universal and integrated knowledge. Individuality, powers, and interests of the child were given first priority. The rise of a new educational paradigm known as the philosophy of mental or formal discipline was influenced by pedagogical, social, psychological, and religious variables. The historical representative of this new ideology was John Locke. Building a sound mind in a sound body should be the aim of education, in his opinion. All of the faculties, including memory, imagination, perception, and thinking, are to be disciplined through education. In the 18th century, a real individualized educational ideal emerged. J.J. Rousseau rebelled against the unnatural and degraded structure of government that existed at the time. As a result, naturalism became popular in education. Rousseau's concept of negative education stressed nature-based learning. In the sphere of education, the kid was seen as the most significant and central aspect. As a result, the goal of education should be the child's natural self-development in direct contact with nature. The individualistic view of education affected Kant considerably, and he characterized education as the process by which man becomes man by his own independent efforts. In education, Pestalozzi introduced the psychological inclination. He believed that education was the process by which a person's hidden abilities naturally evolved toward perfection. This was Herbart's duty, and he established a systematic psychology of teaching approaches.

1.1.4 Character Development In Education

Character development, sometimes known as moral education, is concerned with a person's overall behavior. "Character education must be envisaged not in a social vacuum, but with reference to the existing socio-economic and political context," the Secondary Education

Commission (1951-52) correctly stated. As a result, we might deduce that education's sole purpose cannot be character development. The Spiritual Objective The highest goal of education, according to idealist thinkers, should be the spiritual growth of an individual. Spiritual values in education were very important to Mahatma Gandhi. The Adjustment Objective Human life is governed by the principle of adjustment. No one can survive if they do not adapt to their surroundings. Life is a constant battle of adjustment. "Education should be man's adjustment to his nature, to his fellows, and to the ultimate nature of the cosmos," Horney writes. "There is no one final goal that subordinates all lower goals to itself," Horney claims. All of these goals have something in common, but none of them have everything." The Goal of Harmonious Development Educationists believe that a child's inherited abilities and capacities should be developed in a balanced and coordinated manner. Gandhiji is a great supporter of peaceful development.

Every human being should receive an education. It enables one to rationally and completely comprehend what is taking place around them. Only those with education have the capacity to make wise choices and timely decisions. Without education, human existence is like to fertile land. Education plays a significant part in developing a person to be a better, more responsible citizen and an engaged member of society. It also helps people use their talents to the fullest and do something positive in the future. An intelligent person with self-assurance and deft movements knows how to change the world. The ladder to success in life is provided by education, which also enables us to make the most of our abilities and capabilities. Therefore, obtaining an education and leading a rich life while acting as a responsible citizen is the primary obligation of an individual.

1.1.5 Performance Evaluation

Teacher evaluation is necessary for effective teaching; nevertheless, before getting into teacher evaluation, what is evaluation? We constantly evaluate everything we come into contact with in our daily lives. But have you ever considered it? Actually, the phrase "evaluation" is not new. According to Daley and Kim (2010), Ellett and Teddlie (2003), Toch and Rothman (2008), and Daley and Kim (2010), evaluation study has been around since the early 1900s. As a more modern technical term used in education, it first appeared in the 1950s (Daley and Kim, 2010; Ellett and Teddlie, 2003; Toch and Rothman, 2008). Boykin (1958). It is evident that several evaluation definitions have been utilized when these research are examined. For instance, evaluation was defined as a procedure that calls for gathering and evaluating data on a particular program in order to assess its efficacy and suggest improvements[7]. In a different article, it was defined as “a means to strengthen development, whether it is human, economic or other forms of development”[8]. Evaluation was also interpreted as a term that is comprised of discovering the facts about the current situation, assessing and correcting-improvement[9]. Additionally, evaluation was defined as "the act of assessing the worth of an educational activity in accordance with particular criteria, as well as gathering and analyzing the material, based on which such assessment may be carried out"[10].

1.1.6 Place of Evaluation in Education

When it comes to educational organizations, it's apparent that the term "growth and development" is at the heart of the evaluation process. Assessment and growth were connected as “evaluation can be an important tool for supporting and improving the quality of teaching”[11]. It was stressed that “Teacher evaluation is, first, about documenting the quality of teacher performance; then, its focus shifts to helping teachers improve their performance as well as

holding them accountability for their work"[12]. Because educational institutions are made up of people—administrators, teachers, and students—it would be incorrect to judge them in a singular way. When it comes to assessing educational institutions, there are a few things to keep in mind. Individual evaluation phases or levels are tied to other aspects of educational development programs, just like other components are[10]. It was emphasized that evaluations should be conducted taking into account all factors, including administrators, instructors, and other human resources[13]. Teachers, as policy practitioners, play an important role in accomplishing the school's goals. In this regard, evaluating teachers becomes even more critical, as teachers play a critical role in students' education.[14] and the goal of teacher evaluation is to raise the quality of education.[14,15,16,17].

In today's world, teacher-student relationships in any educational institution are crucial to the development of both the student and the institute. Students are examined through a process of well-defined examination procedures in order to establish their capabilities. Similarly, a feedback mechanism must be in place to determine the capabilities of teachers, as student feedback is regarded the most effective and trustworthy approach for teacher evaluation[18]. The feedback mechanism method ensures a thorough examination of the teachers' performance in relation to many aspects. Then again, a feedback system must be in place to determine the skills of teachers, as student feedback is considered to be the most effective and trustworthy technique of teacher evaluation[18]. The feedback mechanism system allows for a thorough examination of the teachers' performance in relation to many aspects. The feedback system allows users to choose a specific course for feedback, after which the administrator generates reports. It provides appropriate feedback to the worried instructors, which can lead to positive

outcomes since the concerned teachers will seek to improve their weaker areas, as evidenced by their individual feedback reports.

1.2 Statement of the Problem

Existing systems require student's identity to be revealed via login details. Exposure of student's identity can lead to identity theft, discrimination from teachers towards students, thereby discouraging the use of the system or reduce the effectiveness and performance of the student's feedback evaluation system. A meta-analysis of the experimental literature has demonstrated, through several tests, that a better assurance of confidentiality boots survey response. The man hypothesis is not validated, but the subsidiary hypothesis-that confidentiality assurances increase response when the data being requested are sensitive – is validated. In those conditions, the effect of confidentiality guarantee is minimal but statistically significant. Also, it is robust in the presence of a wide range of control variables.[20] However, how confidentiality might improve a software program that evaluates student feedback is still an open research issue.

1.3 Aim and Objectives

The goal of this research is to develop a more secure student evaluation system that protects students' credentials while also providing maximum confidentiality.

The research's precise goals are as follows:

i. To design the system's user interface.
ii. To develop a database for the collection and storing of data.
iii. To integrate (i) and (ii) above.
iv. To evaluate the system's performance.

1.3.1 Conceptual Design

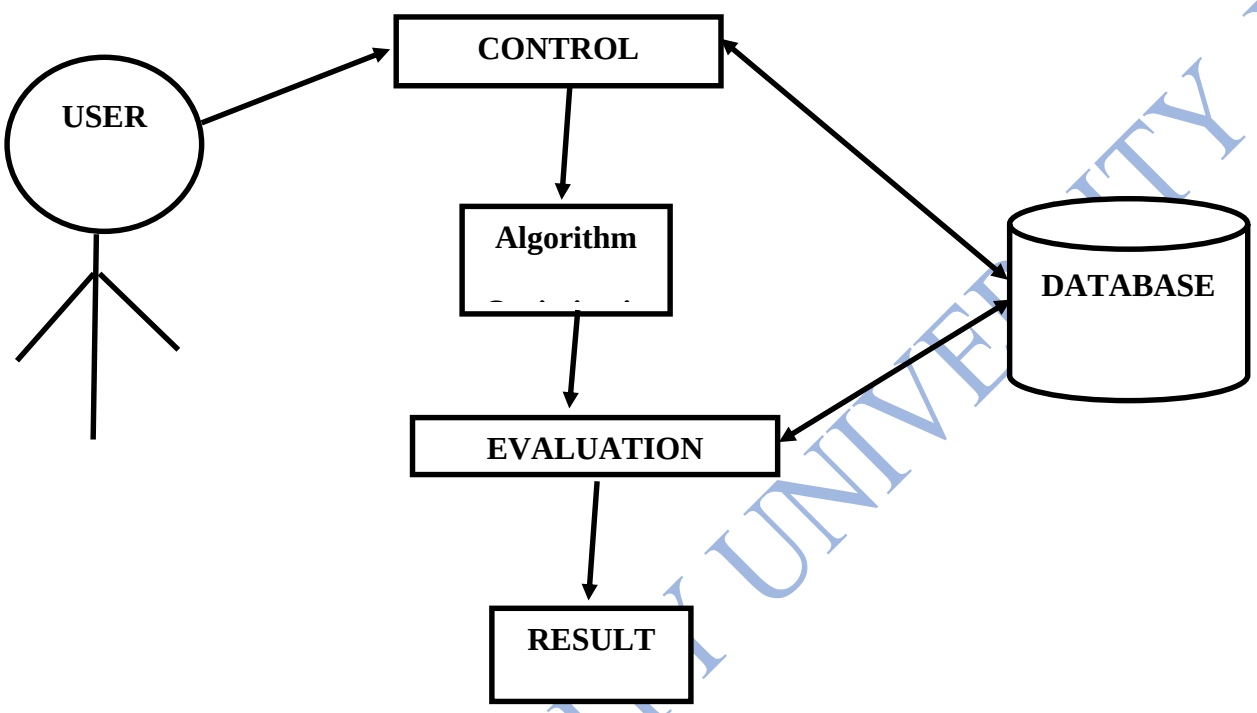

Figure 1.1 Conceptual Diagram (Researcher, Adejuwon F. 2022)

Both the administrator and the student must have control over the system to achieve the aim and objectives stated above. The administrator logs in, sets the evaluating parameters to evaluate the teachers, saves the parameters to the system's database, and then generates a link to be sent to the student to access the system for evaluation. The student accesses the system through the link, retrieves the questions from the database, responds to each one, and then submits. The system then stores his response to the database automatically so that the administrator can later use it for additional executive choices.

1.4 Significance of the Study

The relevance of the new system, which is the improvement on current systems that are featured in this system, is outlined below:

i. This system will have a user-friendly front-end that will be the user's point of contact with the system.

ii. Reduce the amount of time spent evaluating teachers.

iii. This system will aid in the improvement of educational teaching quality.

iv. This system empowers students to offer direct and honest criticisms of their lecturers.

v. It aids administrators in making the right decisions concerning educators.

vi. It also reduces teachers' concerns about the system by preventing them from being targeted by evaluators with the system.

vii. It allows the school administration to assess the evaluation instruments to ensure that they meet the institution's standards.

1.5 Scope of the Study

This project's scope will be confined to developing a safe platform for students to rate their teachers without revealing the evaluators' identities to the teachers. This research will be designed and carried out at Lead City University.

1.6 Limitations of the Study

Some of the variables that have posed restrictions to this study include the researcher's time and budget constraints, which have resulted in the study's scope being limited to Lead City University, Ibadan.

1.7 Operational definition of Terms

1. Education: In particular, at a school or university, education is the process of receiving or imparting structured instruction.
2. Evaluation: Making a decision regarding the degree, consistency, or value of something is referred to as evaluating it.
3. Feedback: Feedback is knowledge about how people react to a product, how well someone performs a task, etc. that is used to inform improvement.
4. Evaluator: An evaluator is a person who evaluates something's quantity, scope, or worth.
5. Confidentiality: the act of keeping something private or secret.
6. Credentials: a qualification, accomplishment, quality, or element of a person's history, particularly when used to describe someone's aptitude for a position.

1.8 Endnotes

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Chapter Two

Literature Review

2.1 Introduction

A system is made up of several interconnected or interacting parts that behave in a predetermined way to generate a coherent whole[2]. A system's limits, structure, and purpose, as well as how it functions, all depend on and are influenced by its surroundings. Systems theory and other systems sciences focus on studying systems. The word "system" is derived from the Greek word "systma," which means "a whole thought consisting of various sections or elements, system," or "a literary work." Generally speaking, systems modeling is a fundamental concept in both engineering and the social sciences. The system serves as a representation of the relevant entities. As a result, the modeler's intent determines whether anything is included in or excluded from the system context. No system model will cover every aspect of the actual system under consideration, and no system model is required to incorporate every component of an actual system under consideration. A system is a hardware system, software system, or combination that has components as its structural elements and observable inter-process communications as its behavioral characteristics. Once more, an illustration will be given: There are a variety of library systems, including the Dewey Decimal Classification, as well as systems for counting, such as Roman numerals, filing paperwork, or catalogs. The notion of "components that are joined together" is still applicable here (in this case to facilitate the flow of information). System can also refer to a framework, also known as a platform, whether it be software or hardware, created to enable the execution of software programs. A component or system fault, such as an inaccurate statement or data description, might prevent the component or system as a whole from carrying out its intended function[3].

Providing information, knowledge, and digital products requires the use of an information system, which is an integrated system of parts for gathering, storing, and processing data[1]. Information systems are essential to the operation and management of commercial enterprises as well as other organizations, as well as to communication with clients and suppliers and market competition[1].

2.1.1 Types of Systems

The following are various types of Systems:

1. **Physical System:** A collection of physical things makes up a physical system[3]. It is a region of the physical cosmos that has been picked for study in physics. The environment is everything outside the system. Everything about the environment is ignored besides how it affects the system. The analyst's decision to separate the two is typically made to streamline the analysis. A physical system might include, for instance, a lake's entire water column, just a portion of it, or even a single water molecule. A thermostat is a device that barely interacts with its surroundings. A system in this sense is frequently chosen to correlate to the definition of heat that is more common, such as a specific machine.

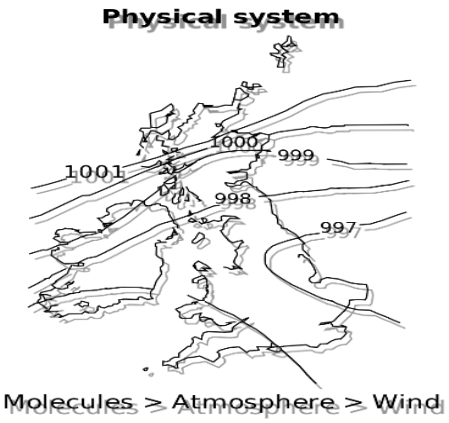

Figure 2.1: An example of a physical system is a weather map.

2. **Conceptual System:** A conceptual system is a system made out of ideas or concepts rather than actual physical objects. A system is understood to be "a linked, interworking set of items" in this context. Conceptual models are conceptual systems. Systems like these could be relevant to anything, from formal science to personal imagination. Conceptual systems can be found in the human mind, in literary and artistic works, and in academic settings. Because it contains a number of connected concepts, this article can actually be thought of as a conceptual system. A conceptual system is referred to as a perspective of the world when it encompasses a variety of values, concepts, and beliefs. An individual's mental representation of the universe is referred to as a conceptual system in psychology and social work. A conceptual system in humans can be viewed as a sort of world metaphor.[4] Laws, hypotheses, and models are just a few examples of the various conceptual systems found in science. These conceptual systems can be created through empirical analysis, deductive reasoning, and inductive reasoning.

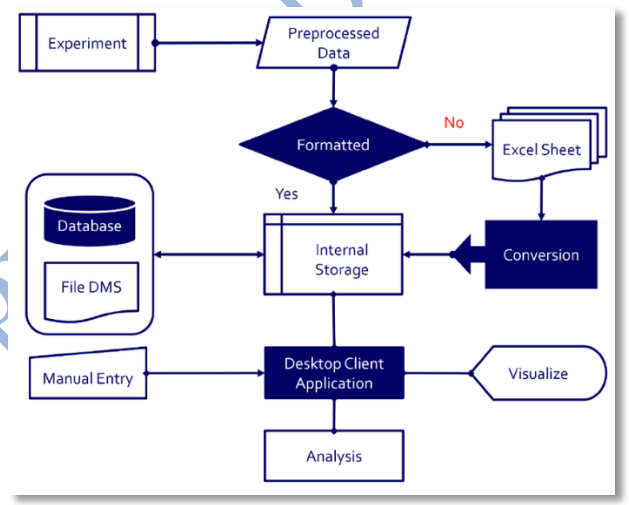

Figure 2.2: *Conceptual System Design of Isotope*[5]

3. **Complex System:** A system with multiple components that could interact with one another is referred to be a complex system. Global climate on Earth, organisms, the human brain, infrastructure like the power grid, communication, or transportation systems, complex software, and electronic systems, social and economic organizations (like cities), ecosystems, living cells, and ultimately the entire universe are examples of complex systems. Due of dependencies, rivalries, relationships, or other forms of interactions between its elements or between a specific system and its surroundings, complex systems have behavior that is inherently challenging to model. These interactions give birth to specific characteristics that define "complex" systems, including nonlinearity, emergence, spontaneous order, adaptation, and feedback loops, among others. These systems are found in a wide range of domains, therefore the similarities between them have given rise to a separate area of study. It is often helpful to depict such a system as a network, where the nodes stand in for the various parts and the links for their interactions.

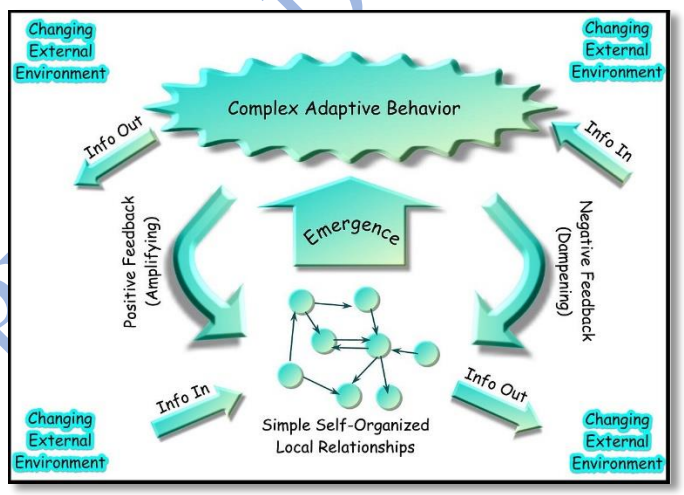

Figure 2.3: *A Complex Adaptive System's Network Representation*

4. **Formal System:** A formal system is an abstract framework that follows a set of rules to derive theorems from axioms. The logical calculus of the formal system is comprised of these principles, which are applied to carry out the inference of theorems from axioms. An "axiomatic system" is essentially a formal system. This can alternatively be described as a language that uses rules to create complex formulas out of smaller ones. If a formula can be created using the formal grammar principles, it is considered to be well-formed. A decision process is frequently needed in order to determine whether a formula is well-formed.
5. **Information System:** A formal, sociotechnical, organizational structure called an information system (IS) is intended to gather, process, store, and disseminate information[6]. Information systems are made up of four elements from a sociotechnical perspective: task, people, structure (or roles), and technology[7]. Information systems are an integration of elements for data collecting, storage, and processing, where the data is utilized to produce digital products that help with decision-making as well as to provide information and add to knowledge[1].

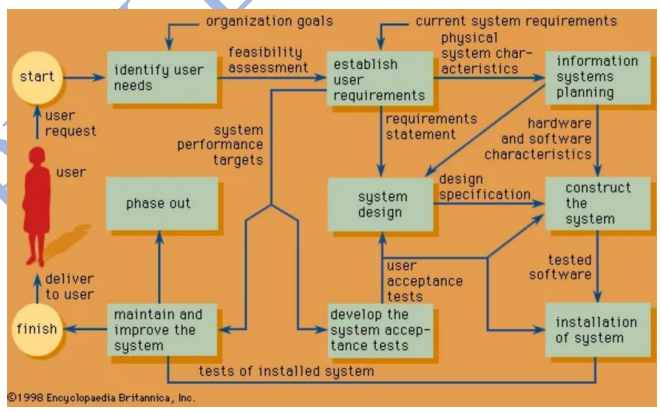

Figure 2.4: *The life cycle of an information system*

2.2 Information System

A computer information system is one that processes or interprets information using both people and computers[8]. On occasion, a computer system with software is sometimes referred to by the phrase. A second system-based academic discipline is known as "information systems," which expressly refers to information systems and the accompanying networks of computer hardware and software that individuals and organizations use to collect, filter, analyze, produce, and distribute data[9].

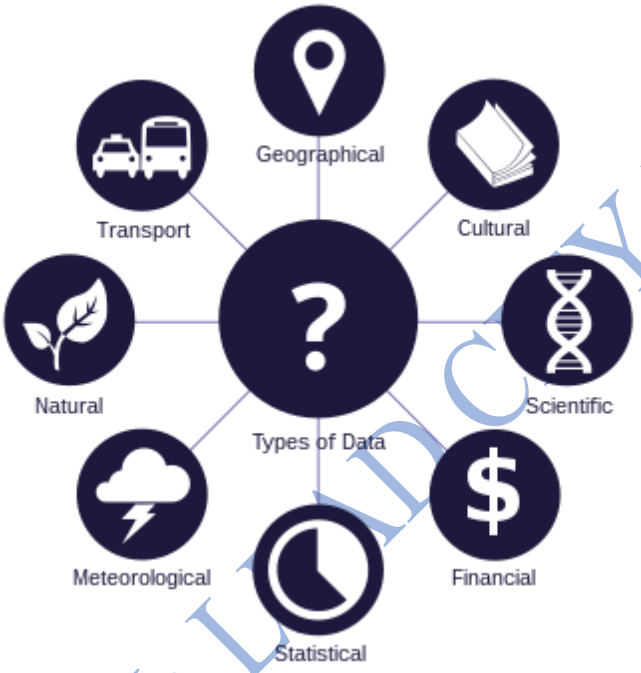

Figure 2.5: *several kinds of data that can be assessed using a computer device*

The significance of an information system with distinct users, processors, storage, inputs, outputs, and the aforementioned communication networks is emphasized. Every information system makes an effort to support management, operations, and decision-making[11].

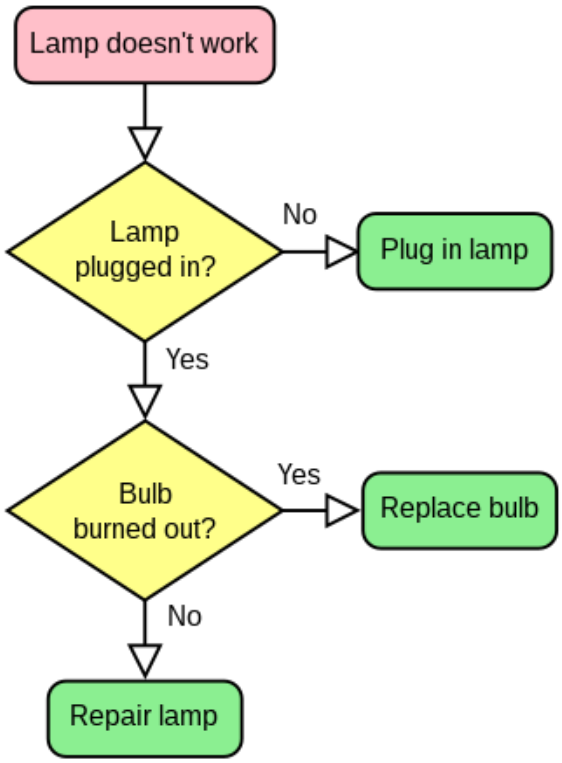

Figure 2.6: *An exemplary flowchart of a decision-making process when dealing with a non-working lamp.*

For businesses and other organizations to run and manage operations, communicate with customers and suppliers, and participate in market competition, information systems are crucial. Information systems are used to handle interorganizational supply networks and electronic markets. For instance, firms use information systems to manage their human resources, handle their financial accounts, and promote to potential customers online. Many significant firms are based on information systems. These include Alibaba, a business-to-business e-marketplace, eBay, and Google, a search engine company that derives the majority of its revenue from keyword advertising on Internet searches. One of these is Amazon, which provides cloud computing services and has a developing electronic mall. Governments use information technology to provide services to citizens at a fair price. Information systems are

utilized to provide online services like gaming and social networking as well as digital goods like electronic books, video products, and software. The majority of a person's personal life is managed by information systems, most of which are Internet-based. This includes shopping, banking, socializing, and entertainment. When major new means for acquiring and processing information were created over the centuries, new skills evolved and people acquired power. Examples include Johannes Gutenberg's invention of the printing press in the middle of the 15th century and Blaise Pascal's development of the mechanical calculator in the 17th century. These inventions had a profound impact on how information and knowledge might be stored, processed, transmitted, and accessed. Additionally significant changes in people's daily lives, corporate structures, and political systems resulted from this. When major new means for acquiring and processing information were created over the centuries, new skills evolved and people acquired power. Examples include Johannes Gutenberg's invention of the printing press in the middle of the 15th century and Blaise Pascal's development of the mechanical calculator in the 17th century. These inventions had a profound impact on how information and knowledge might be stored, processed, transmitted, and accessed. Additionally significant changes in people's daily lives, corporate structures, and political systems resulted from this. The UNIVAC I, which was placed at the U.S. Bureau of the Census in 1951 for administrative use and at General Electric in 1954 for commercial usage, was one of the first computers used for such information processing. Personal computers first made some of the advantages of information systems accessible to people and small enterprises in the late 1970s. Beginning in the same decade, the Internet began to take on the role of the global network of networks. In order to access the interconnected data stored in the geographically dispersed computers connected by the Internet, Tim Berners-Lee developed the World Wide Web in 1991. It gained

popularity very quickly and became the main service provided by the network. The widespread usage of the Internet and the Web has made it feasible to link individuals and organizations on a previously unheard-of scale, as well as to access information and other resources. The growth of electronic commerce through the Internet has led to an expansion in digital interpersonal contacts (through e-mail and social networks), product distribution (software, music, e-books, and movies), and corporate transactions (buying, selling, and advertising on the Web). As a result of the growing usage of smartphones, tablets, laptops, and other computer-based mobile devices that are all connected by wireless communication networks, information systems have been enlarged to accommodate mobility as the innate human condition. Information systems had a significant impact on society by facilitating a wide range of human activities. These systems sped up daily activities, enabled people to establish and maintain fresh, frequently more fulfilling relationships, changed the make-up and structure of organizations, changed the types of things people bought, and changed the nature of work. Information and knowledge are becoming crucial economic resources. However, along with the tremendous promise, the reliance on information technologies also brought forth new threats. Intense industry innovation and academic research continuously offer new opportunities while seeking to control the hazards.

2.2.1 Component of Information System

The bulk of information systems are composed of computer hardware, software, communications, databases, data warehouses, human resources, and processes. Business management and operations are becoming more and more entwined with information technology (IT), which includes hardware, software, and telecommunications. The input, processing, output, feedback, and control are all included in this five-part system.

2.2.1.1 Computer Hardware

Hardware refers to devices like tools and machines. In a modern information system, this category includes the computer and all of its auxiliary hardware. The support equipment also includes storage, communications, and input and output devices. Ledger books and ink could be used as hardware in pre-computer information systems. Nowadays, a lot of houses and even the smallest companies all around the world possess or rent computers. People may own many different types of computers, including smartphones, tablets, and other wearable gadgets. Large corporations typically employ distributed computer systems, which can range from powerful parallel-processing servers located in data centers to widely dispersed personal computers and mobile devices connected to the corporate information systems. More and more sensors are being incorporated into the physical and biological environment. These sensors are used to gather data and, in many cases, to operate systems using actuators. Together with auxiliary components like input-output units, telecommunications equipment, and magnetic or solid-state storage disks, these make up the hardware of information systems. Hardware costs have steadily and swiftly decreased while processor power and storage capacity have significantly increased. This evolution has been taking place in accordance with Moore's law, which states that the power of the microprocessors at the heart of computing systems has been doubling roughly every 18 to 24 months. The environment's impact and the amount of electricity that technology consumes are, nevertheless, concerns that designers are taking into account. More increasingly, shared facilities that can be accessed via telecommunications networks, or the cloud, are being used to provide computer and storage services.

2.2.1.2 Computer Software

Software refers to computer programs and any related documents. Computer programs are machine-readable instructions that explain how to operate to the hardware parts of the system's circuitry so they can derive useful information from data. On an input/output medium, which is commonly a disk or tape, programs are typically preserved. Column headings in the ledger book, for example, were used as the "software" for pre-computer information systems to prepare the hardware for usage (the guidebook for a card catalog). The two basic types of computer software are system software and application software. The primary piece of system software is the operating system. It gives the user access to the controls while simultaneously managing the hardware, data, programs, and other system resources of the computer, often via a graphical user interface (GUI). Applications, often known as software, are created to carry out certain tasks for users. People now frequently use smartphone apps to access information systems. Other examples include "vertical" applications that are tailored to a certain industry sector, such a program that plans, routes, and tracks package deliveries for an overnight delivery service, as well as general-purpose application suites with its spreadsheet and word processing programs. Larger firms use licensed software developed and maintained by specialized software companies, customizing it to meet their particular needs while also developing other programs in-house or through outsourcing. Software-as-a-service (SaaS) solutions that are delivered from the cloud over the Internet may also be used by businesses. Proprietary software, which is provided by and supported by its vendors, is under threat from open-source software, which is made available on the Web for free use and modification under a license that guarantees its continuous availability.

2.2.1.3 Telecommunication

Information is transmitted through the use of telecommunications to network or connect computer systems, mobile phones, and other wearable tech. Connections can be made through wired or wireless media. Coaxial cable and fiber optics are two examples of wired technology. Wireless technologies, which are primarily focused on the transmission of microwaves and radio waves, underpin mobile computing. Omnipresent information systems have been created as a result of the incorporation of computing technology onto a wide range of physical objects. As an item moves through the supply chain, sensors like radio frequency identification devices (RFIDs) can be added to it to track its location and evaluate its quality. Wireless sensor networks that are linked to the Internet can provide enormous amounts of data that can be used to monitor environmental conditions or figure out how to boost productivity. Different computer network designs are conceivable depending on the needs of an organization. Local area networks (LANs), which connect computers, are common in places like office buildings and university campuses. Metropolitan area networks (MANs), which serve a particular, densely populated area, provide the electrical infrastructure of "smart cities." Wide area networks (WANs) connect dispersed data centers, which are typically run by different businesses. Peer-to-peer networks offer massive material exchange without the need for a centralized authority. Through a network of networks, the Internet links billions of computers that are dispersed throughout every continent. Through networking, users can connect with other individuals, such as coworkers, clients, friends, and people who share their hobbies or vocations, as well as information sources, such as huge databases. For internal use only, some intranets that are browser-based may provide internet-like services. For instance, an intranet may be deployed as an access portal to a shared corporate document base. Extranets are

developed as so-called virtual private networks (VPNs) by encrypting the messages in order to establish private and secure connections with business partners over the Internet. A vast "Internet of things" has developed as a result of the widespread distribution of sensors and actuators in the physical environment, which are providing data on things like the blood pressure of an individual, the speed of a moving vehicle, and the acidity of a square yard of soil. The availability of such information permits both sustained decision-making based on analysis of the enormous accumulated data and prompt response when necessary. The expanding adoption of cloud computing is supported by a robust networking infrastructure. Since multiple businesses share the same information-system resources, this sharing results in improved utilization and geographical versatility for data centers. Software-defined networking offers flexible control of telecommunications networks by using algorithms that are sensitive to real-time demands and resource availability.

2.2.1.4 Database and Data Warehouse

The main function of many information systems is to distribute data from databases. A database is a grouping of linked material that has been arranged to allow retrieval of specific records or sets of records in response to specific criteria. Employee data and product catalogs are common instances of databases. Databases help an organization's management and operational tasks. Archival data that has been gathered over time and stored in data warehouses can be mined for information to help develop and promote new goods, provide better service to current consumers, or connect with prospective new customers. These data collections cover everybody who has ever made a credit card purchase, whether it was in person, by mail, or online. Big data is a broad endeavor that refers to the massive collecting and processing of quantitative, or structured, data as well as textual data that is frequently obtained online.

Making judgments based on the information provided by big data might have numerous advantages. Examples include prescribing evidence-based treatments, conserving resources by reducing waste, and recommending new goods (like books or movies) in accordance with a user's preferences. Big data supports new business models. For instance, a business might crowdsource (get information from various unaffiliated persons) the prices of things using smartphones all over the world. As a result of the early price movement information provided by the aggregated data, decision-making is now more responsive than it was in the past. Automated sentiment analysis for marketing, competitive intelligence, new product development, and other decision-making purposes is made possible by the processing of textual data. Reviews and opinions posted by users on blogs, discussion forums, and social networks are examples of textual data.

2.2.1.5 Human Resources and Procedure

For a system to be effective, individuals are a must. People are arguably the part of the system that is most frequently disregarded and has the most impact on the success or failure of information systems. "Not only the users, but also those who operate and maintain the computers, those who maintain the data, and those who support the network of computers" are included in this. Procedures are the rules that control how an information system operates. The role of procedures in a system is commonly described by the adage "procedures are to people what software is to hardware." Any information system must have qualified personnel. Development and operations managers, business analysts, systems analysts and designers, database administrators, programmers, computer operators, and computer security experts are examples of technical personnel. All employees inside a company must also receive training on how to make the best use of information system capabilities. As they use the Web, billions

of individuals worldwide are learning about information systems. The documentation for an information system includes instructions for how to use, run, and maintain it. To execute a payroll program, for instance, protocols must be specified, including when to run it, who is permitted to run it, and who has access to the output. As part of the autonomous computing program, data centers operate more and more independently thanks to procedures that are built into the software that manages them.

2.2.2 Types of Information System

Information systems aid in the management, operations, and knowledge work of businesses. Cross-functional systems created to support full business operations, such order processing or staff administration, have frequently replaced functional information systems that support a specific organizational function, like marketing or production. These systems have the potential to be more effective in the creation and distribution of the company's products and may be evaluated more closely in terms of the business outcomes. There are numerous application programs that can be used to implement the information-system categories outlined here. Three layers make up information systems: operational support, knowledge work support, and management support.[12] Operational support, which includes multiple transaction processing systems for product and service creation, marketing, production, and delivery, is the foundation of an information system. The middle layer, which incorporates components for information-sharing within an organization, supports knowledge work. The top layer, management support, provides subsystems for managing and assessing an organization's resources and objectives. Even while it benefits both small and large businesses, organizational growth has a number of drawbacks. With growth come additional responsibilities, the need for strategic planning, and the requirement for improved communication. It is crucial to have an

information system in place that employs artificial intelligence to enable employees and management to communicate, collaborate, and efficiently handle transactions in light of these new needs.

Furthermore, adopting various information systems that aid each division in making structured judgments and improving problem-solving abilities can be advantageous for both a developing and an established organization.

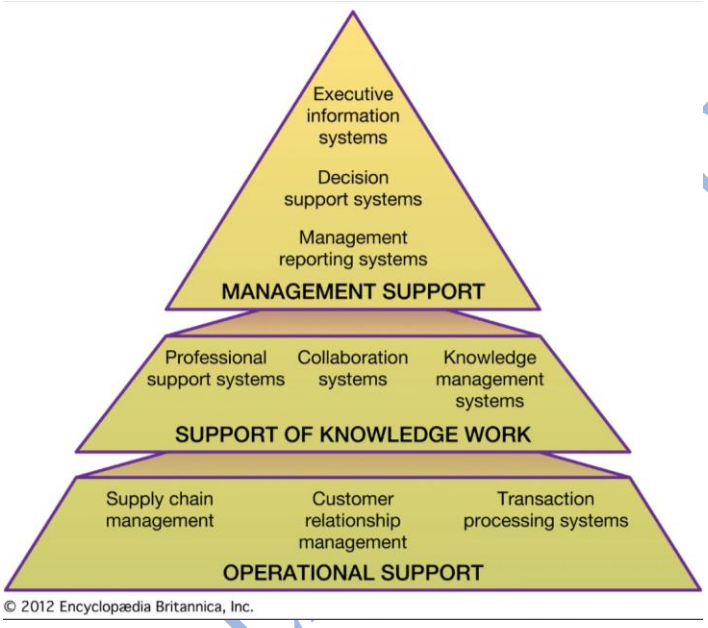

Figure 2.7: *structure of organizational information systems*

2.2.2.1 Operational Support

Systems for transaction processing provide support for the activities involved in product design, marketing, production, and delivery. Large, interconnected systems, or "enterprise systems," are frequently utilized in larger businesses to execute transactions. In this instance, the enterprise resource planning (ERP) system—the main type of business system—

incorporates the information systems that support multiple functional units, including sales and marketing, production, finance, and human resources[12]. The value chain, which is the comprehensive set of tasks or procedures that a business performs to add value to its products, is assisted by ERP systems. For instance, using a technique known as mass customisation, a person or another business may submit a special order over the Internet that immediately begins just-in-time manufacture in accordance with the customer's needs. In order to ensure that input materials arrive precisely on time for a batch of bespoke manufacturing runs, customers' orders are delivered to the company's warehouses and maybe to suppliers. After making the necessary adjustments to financial accounts, delivery logistics and billing are started. Transaction processing solutions can assist in integrating not just a company's own value chain but also the organization's broader supply chain. From the procurement of raw materials to the product's delivery, this covers all businesses involved in the design, production, marketing, and delivery of the goods and services[12]. The transfer of goods, information, money, and data along the whole supply chain—which starts with raw material suppliers, continues through the middle tiers of processing enterprises, and ends with distributors and retailers—is controlled by a supply chain management (SCM) system. For instance, when a customer buys something at a large retailer, It produces more than simply a cash register receipt. A restocking order is also immediately sent to the relevant supplier, which may then request orders from that supplier's suppliers. Suppliers can remotely access an online retailer's inventory record using an SCM system to plan efficient and timely deliveries in the appropriate quantities. The third kind of enterprise system, customer relationship management (CRM), assists in interacting with customers in marketing, sales, service, and new product development. By offering a unified perspective of each client and its interactions with them, a

CRM system enables a business to maintain a consistent and proactive relationship with each one. Through cocreation activities, customers may be involved in the development of the brand's new products. Many transaction processing systems support electronic commerce over the Internet. Systems for online banking, trading in securities, and shopping are a few of these[12]. Other systems offer on-demand access to information, educational resources, and entertainment. Yet other systems facilitate the discovery of prices (for instance, through an auction) and the delivery of digital goods as well as the search for goods with desired characteristics (such as software, music, movies, or greeting cards). In order to support consumer communities and individuals as they express their thoughts, develop new ideas, and are exposed to promotional messages, social networking sites like Facebook and LinkedIn are an effective tool. As a worldwide electronic commerce infrastructure has developed, a wide range of specialized services and information-based goods are being offered by diverse businesses on the Web. The data required by databases and data warehouses for higher-level information systems is gathered by transaction processing systems. Additionally, enterprise systems include the software components required to carry out many of these higher-level tasks[12].

2.2.2.2 Support of Knowledge Work

Instead of producing, producing, or supplying actual items directly, a significant portion of work in an information society entails manipulating abstract information and knowledge (defined in this context as an organized and comprehensive structure of facts, relationships, theories, and insights). It is known as knowledge work. Such knowledge labor is supported by information systems from three broad categories: platforms for collaboration, information management, and professional support[12].

Systems of professional support give the resources necessary to carry out duties unique to a particular profession. For instance, utilizing virtual reality systems and computer-aided engineering (CAE) software, automobile engineers build and test new models as electronic prototypes for fuel efficiency, handling, and passenger protection before creating physical prototypes. Later, they create and evaluate physical tests using CAE. Biochemists use sophisticated three-dimensional modeling software to visualize the molecular structure and potential effects of novel drugs before investing money on time-consuming clinical tests. Investment bankers typically utilize financial software to calculate the potential risks and anticipated returns of different investment strategies. Today, the vast majority of jobs have access to specialized support systems[12].

The primary goals of collaboration systems are to promote collaboration and teamwork both within and across organizations. A workflow system, a sort of collaboration system, is used to automatically route pertinent papers to all suitable people for their inputs. The process of creating, quoting, and approving a commercial insurance policy could be made better by such a system. A different class of collaboration tools enables multiple people to work on the same project at once. These systems, also referred to as groupware, achieve this by enabling regulated shared access to work objects like business ideas, fresh designs, or developing digital products, frequently across an intranet[12]. Worldwide collaboration is possible, and in some international corporations, a project is worked on continuously. Other examples of collaboration systems include enhanced email and videoconferencing systems, frequently with telepresence using participant avatars. Wikis are another sort of collaborative tools that let numerous users add and change content. On these platforms, some online encyclopedias are created. Systems for cooperation can be put up in virtual worlds or on social networking

websites. In order to anticipate future outcomes or co-create new products, the open innovation program may, upon request, involve members of the general public as well as present and potential customers[12].

Systems for managing knowledge provide organizations with a mechanism to gather and make use of the data that has accumulated across the enterprise. Examples of this information could include texts, images, and commentary found in patents, design techniques, best practices, competitive intelligence, and other sources. By indexing and cross-referencing all of the organization's papers and communications, rich search capabilities are made feasible. The implementation of such systems is facilitated by a variety of application tools, including Microsoft's SharePoint. These systems must also direct users to employees who have specific expertise because organizational knowledge is typically tacit rather than explicit[12].

2.2.2.3 Management System

Systems for managing knowledge provide organizations with a mechanism to gather and make use of the data that has accumulated across the enterprise. The texts and visuals found in patents, design techniques, best practices, competition intelligence, and other sources, along with the elaboration and commentary, may be examples of this information. By indexing and cross-referencing all of the organization's papers and communications, rich search capabilities are made feasible[12]. The implementation of such systems is facilitated by a variety of application tools, including Microsoft's SharePoint. These systems must also direct users to employees who have special expertise because organizational knowledge is typically tacit rather than explicit.

Information systems support all levels of management, from those in charge of short-term schedules and budgets for small work groups to those worried about long-term plans and

budgets for the entire company. Management reporting systems deliver frequent, in-depth, and comprehensive information reports suited to each manager's areas of responsibility. These systems are widely used by first-level supervisors[12]. Such reports typically don't forecast future performance, instead concentrating on past and present operations. Reports may only be automatically delivered in rare cases or at a manager's express request in order to minimize information overload. Even though decision-making is a function of all information systems, decision support systems were built particularly to facilitate it. As more and more systems are created to analyze enormous data volumes, they are known as business intelligence or business analytics programs (also known as big data). The two primary forms of decision support systems are model-driven and data-driven[12]. In a model-driven decision support system, a preprogrammed model is applied to a relatively small data set, such as a sales database for the most recent quarter. During a session, an analyst or sales manager will often interact with this decision support system by presenting several what-if scenarios. For instance, while choosing a selling price for a new product, the sales manager may use a marketing decision support system. It has a model that links numerous factors, including the product's price, the cost of products, and the cost of marketing through various channels, to the predicted sales volume over the product's first five years on the market. By supplying the model with a range of product prices, management can compare results and select the most profitable selling price. The primary objective of data-driven business intelligence systems is to perform data mining on enormous data sets that have been amassed over long periods of time in data warehouses[12]. Data mining looks for important patterns that can be used to guide decisions, like sequences (buying a new house followed by buying a new dining room set), clusters, and correlations (big families and van sales). Predictive analytics aims to calculate likely outcomes in the future

based on the identified trends[12]. Data-driven decision support systems may employ artificial intelligence techniques such as expert systems, neural networks, and machine learning. It is common practice to mine both text and quantitative data from large aggregates of unstructured data, such as the content of social media, which includes social networks, wikis, blogs, and microblogs. For instance, text mining used in online commerce helps with fraud detection, ad targeting, and the identification of purchase trends. A group of decision makers can work together using several essential decision support technologies without necessarily being present at the same time or place. These group decision-making systems employ software tools for idea development and consensus. Using digitalized maps, geographic information systems, a distinct category, can help with data processing and visualization. Digital mapping of various locations is a continuous endeavor for numerous corporate companies. Quick judgments are facilitated by this type of data visualization. Examining the geographic distribution of mortgage loans is one way to immediately spot a trend of discrimination. 12

Executive information systems provide a variety of important data easily accessible in a highly simplified and useful manner through the use of a graphical digital dashboard. However, formal, computerized information systems can only offer limited assistance because senior managers usually rely heavily on a variety of unofficial sources of information. However, the chief executive officer, senior and executive vice presidents, and the board of directors require this assistance in order to monitor the company's performance, assess the business environment, and develop long-term strategic objectives. These executives must, in particular, analyze global economic trends and compare their company's performance to that of its competitors. Executive information systems, which are usually customized and rely on a

variety of media types, give its users the opportunity to "dig down" from summary information to increasingly focused specifics[12].

2.3 Decision Support System (DSS)

Decision-making, the procedure and reasoning used by people to make decisions. Different decision-making models produce analyses and forecasts that are vastly different from one another. There are many different theories of decision-making, ranging from objective rational decision making, which presupposes that people will make the same choices given the same information and preferences, to the more subjective logic of appropriateness, which presupposes that certain institutional and organizational context have an impact on people's decision-making. A decision support system (DSS) is a computer program application that helps businesses make better decisions. It examines a lot of information and gives a business the best options available. Decision support systems combine information and expertise from several fields and sources to give users information beyond the standard reports and summaries. Making educated decisions is the goal of this. A group of computerized information systems called decision support systems (DSS) provide assistance for decision-making processes. Interactive computer-based systems and subsystems called DSS are designed to support decision makers in using data, documents, knowledge, and/or models to carry out decision process activities. A decision support system may use an expert system or artificial intelligence to convey information graphically (AI). A group of knowledge workers or business executives could be its target audience.

A decision support system collects, analyzes, and then synthesizes data to produce comprehensive information reports. A DSS is an informational application, as opposed to a normal operations application, which just collects data. The DSS can be totally powered by

computers or by people. Both may be used in different situations. The best systems analyze data and make choices on the user's behalf. They at least enable human users to take action more swiftly and intelligently. The DSS can be used by operations management and other planning departments inside a corporation to collect information and data and then synthesize it into useful intelligence. In fact, these platforms are primarily used by mid- to upper-level management. For example, a DSS may be used to project a company's earnings for the following six months based on recent projections for product sales. Due to the many factors that affect predicted income data, this is not a straightforward calculation that can be performed manually. However, depending on the company's past data on product sales and current circumstances, a DSS may combine all the different elements and produce a result as well as other results. The main goal of using a DSS is to give clients information that is easy to understand. Because it may be set up to generate a variety of reports based on user needs, a DSS system has an advantage. For instance, the DSS can generate data and present that data either in written form or graphically, such as in a bar chart that shows projected income. As technology progresses, large, bulky mainframe computers are no longer required for data analysis. Since a DSS is essentially an application, most desktop and laptop computers can support its installation. A few DSS applications can be accessed on mobile devices as well.

Large volumes of data are analyzed and synthesized by decision support systems (DSS) in businesses to aid in decision-making. It generates reports using this data that could project sales, manage inventories, or forecast revenue. Based on the company's historical data and present inputs, a DSS can generate a variety of distinct results by integrating several variables. Decision support systems are employed by many different industries, including agriculture and medical. A medical professional may employ a computerized decision support system for

diagnostics and prescriptions to assist in diagnosing a patient. A decision support system may help a doctor diagnose a patient by combining clinical inputs and earlier electronic health information. In general, decision support systems assist in making better decisions. Decision support systems are frequently used by upper and mid-level management to make actionable decisions or provide several alternative outcomes based on current and historical corporate data. At the same time, decision support systems can be used to generate reports for clients that are simple to understand and can be modified in accordance with user requirements.

2.3.1 Types of Decision Support System

Based on their principal information sources, decision support systems can be divided into different groups.

2.3.1.1 Data Driven DSS

A data-driven DSS is a computer program that makes decisions based on data from either internal or external databases. A data-driven DSS often use data mining techniques to find patterns and trends that enable it to predict future outcomes. Businesses routinely employ data-driven DSSs to assist in decision-making regarding inventories, sales, and other company operations. Some, including forecasting the likelihood of future criminal activity, are utilized to aid in decision-making in the public sector. The majority of data-driven DSSs target managers, employees, and suppliers of goods and services. In order to find specialized solutions for particular needs, it is utilized to query a database or data warehouse. It can be installed using a mainframe system, a client/server connection, or the internet. Examples include computer-based databases with a query system that can add value to old databases by incorporating new data.

2.3.1.2 Communication Driven DSS

Multiple individuals can work on the same activity concurrently using a communication-driven and group decision support system that uses a variety of communication channels, such as voice chat, instant messaging, or email. This type of DSS aims to increase user-system interaction while also boosting the system's overall effectiveness and efficiency. The majority of DSSs that are communications-driven are aimed towards internal teams, including partners. Its functions include facilitation of meetings and user collaboration. A web or client server is the most widely utilized technology for deploying the DSS. Examples include chat and instant messaging programs, web collaboration tools, and online meeting platforms.

2.3.1.3 Document Driven DSS

A document-driven DSS is an information management system that uses documents to retrieve data. Using document-driven DSSs, users can perform searches on webpages, databases, or for specific search terms. A document-driven DSS may have access to documents including company records, policies & procedures, and meeting minutes. More often used DSSs that target a variety of user groups are document-driven DSSs. Such a DSS is used to search web pages and locate documents based on a certain collection of keywords or search queries. Typically, a client/server system or the web are used as the technology to build up such DSSs.

2.3.1.4 Knowledge Driven DSS

A knowledge management system continuously updates and maintains the knowledge base that houses the data used to power this type of decision support system. Users of a knowledge-driven DSS get information that is consistent with the company's business practices and domain knowledge. The term "knowledgebase" or "knowledge-driven DSSs" refers to a broad category of systems that might involve both internal users of the organization setting up the

system and external users such as customers of a business. It is primarily used to select goods and services or to offer management suggestions. In most cases, client/server systems, the web, or applications running on standalone PCs are used to deploy such systems.

2.3.1.4 Model Driven DSS

To assist in the analysis of diverse circumstances that meet these requirements, model-driven decision support systems are developed in accordance with a predetermined set of user needs. These systems are constructed on a decision-model foundation. For example, a model-driven DSS could be useful in scheduling or producing financial statements. Model-driven DSSs are intricate programs that aid in decision analysis or option selection. Depending on how the model is built up, these are utilized by managers and staff members of a firm, or people who engage with the organization, for a variety of purposes, such as scheduling, decision analyses, etc. The software/hardware in standalone PCs, client/server systems, or the web can be used to install these DSSs.

2.4 Feedback System

When a system's outputs are used as inputs once again to close a circuit or loop, this is known as feedback[13]. Feedback is also the communication of evaluation or remedial information regarding a process, event, or action to the initiating or controlling source

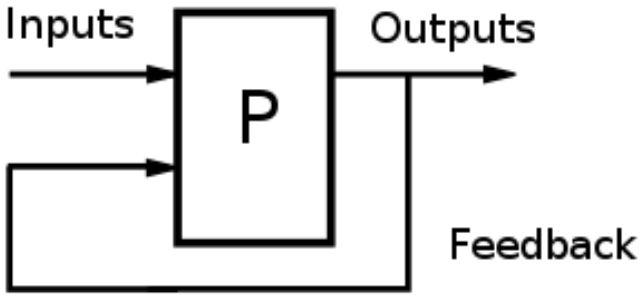

Figure 2.8: *A feedback loop where all outputs of a process are available as causal inputs to that process*

"The name "feedback" comes from the field of engineering known as cybernetics, which studies self-regulating systems. In its most basic form, feedback is a self-stabilizing control system like the Watt steam governor, which manages a steam engine's speed, or a thermostat, which manages a room's or oven's temperature[14]. Feedback is essentially the idea of using output as input to either improve the system's development or achieve the intended output. A good example is feedback used in assembly lines, which, when an output does not reach the minimum quality or quantity defined by the system, adjusts itself by either speeding up production or, in the case of significant deviations in the output, by stopping automatically. To make a circuit perform as intended, feedback is frequently employed in electronics. The most straightforward illustration would be an operational amplifier that modifies its "operation" by altering its characteristic output through feedback. In essence, the op-output amp's is sent back into one of its two inputs. Depending on how the feedback loop is set up, the feedback can adjust the op-gain amp's or cause it to function as a sort of signal conditioner, removing signal distortions from the system. In this instance, specified mathematical equations are applied with feedback as a purely quantitative element. We can define feedback as a system where the

sender receives the recipient's answer or reaction after the recipient has read and understood the message.

Figure 2.9: *Feedback in communication*

2.4.2 Importance of Feedback

Feedback is the receiver's response or behavior after recognizing or comprehending the message. It enables the sender to assess the message's efficiency. In the case of two-way communication, it is unavoidably necessary. Two-way communication is useless or insufficient without feedback. Feedback is the only means to get a response from the recipient, and the sender can take additional action based on the feedback. The feedback process in organizational or commercial communication is crucial. However, the requirement or significance of feedback is covered below from many angles:

1. **Collection of Information:** The only means to obtain information from the recipient is through feedback; if the recipient does not provide feedback to the sender, no information can be obtained. Feedback enables the company (Sender) to get data from many sources (Receivers).
2. **Completion of Entire Communication Process**: The final and most crucial phase in any communication process is feedback. Through obtaining feedback, the sender can

discover the response or feeling of the recipient. It is an essential step without which communication cannot continue. Therefore, two-way communication calls for feedback.

3. **Measuring the Effectiveness of Communication**: The only method to learn the recipient's answer or reaction is through feedback. It enables the sender to ascertain both the effectiveness of his communication and the intended audience. The sender of the message can assess the response, whether positive or negative, to ascertain the effectiveness of communication and its limitations. The only way to judge whether two-way communication was successful is through feedback.
4. **Taking proper Decision**: Feedback aids in decision-making for the sender. The sender cannot make a decision on something if the recipient does not provide his opinion or response. For instance, the management may occasionally communicate plans, decisions, or regulations to the subordinates for evaluation. The supervisors can make better decisions if the subordinates communicate them their options, suggestions, complaints, and reactions. Feedback therefore aids managers in making wise and effective decisions.
5. **Problem Solving**: An company may experience a variety of issues that need to be handled properly and quickly. In order to address the issue and offer a solution, two-way communication is helpful. For instance, employees of a company might declare a strike starting the day after tomorrow if their salaries are not paid on time. After receiving the communication, the organization's management chooses to satisfy their request without informing the workforce. Problem will choose to satisfy their desire

but fails to alert the staff. Since the employees were not given the management's feedback, the issue will still exist.

6. **Getting the Reactions of Receiver**: The sender might learn the replies or reactions of the recipient of his communication through feedback. The sender can gauge how effectively the recipient has comprehended his message from the response and determine whether any clarifications are necessary.

2.4.3 Types of Feedback

There are numerous motives and methods for providing feedback. Feedback may come in the form of a single item, such as informal remarks made by a teacher about a student's comprehension of a subject during class, or it may take the shape of a combination of items, such as formal, formative remarks made by peers on a first-stage assessment task. Courses should, whenever possible, provide chances for a variety of feedback kinds since each type of feedback has a role to play in fostering and enhancing student learning.

1. **Informal Feedback**: Informal feedback can occur at any time since it emerges spontaneously in the moment or during an action. Therefore, informal feedback asks for the establishment of rapport with students in order to successfully motivate, coach, or counsel them in daily management and decision-making for learning. This could occur in person, on the phone, online, or in a virtual environment.
2. **Formal Feedback**: A formal feedback process is set up and scheduled on a regular basis. Formal feedback, which is commonly tied to assessment tasks, frequently include information about standards of achievement, competences, or marking criteria. Both the student and the organization have documentation to support their claims.

3. **Formative Feedback**: Formative assessment strives to monitor student progress and offer ongoing feedback that both learners and teachers can use to improve their lessons. As a result, it's critical to offer formative feedback early on in the course, before final exams. Students who get constructive criticism are better able to reflect on their errors and prevent recurrence. Feedback may occasionally be necessary before students can go on to the next stage of the evaluation or feel ready to do so.
4. **Summative Feedback**: Summative assessments are intended to evaluate student learning by comparing it to a benchmark or standard at the conclusion of a unit of instruction. Summative feedback therefore includes extra constructive criticism on how the work could be improved as well as comprehensive remarks pertaining to certain elements of their work and a clear explanation of how the mark was calculated using the given criteria.
5. **Student Peer Feedback**: Instructors are no longer required to be the exclusive subject-matter authorities in a course. Students can learn to provide high-quality feedback, which is highly valued by peers, with some basic education and regular coaching. Regular opportunities for students to provide and receive peer evaluation enhances their educational experiences and strengthens their professional skill set.
6. **Student Self-feedback**: The ultimate objective of feedback for learning is this. In addition to giving the students direction throughout the feedback process, teachers have the chance to explicitly model and train the students on how to develop goals and conduct self-evaluations, which will help the students become more independent[14]. Teachers should provide guided chances for self-feedback, teach students how to use feedback to determine next steps and create goals, and openly identify, communicate,

and clarify learning goals and success criteria. They can also give students time for self-feedback and reflection.

7. **Constructive Feedback**: This type of feedback is specific, issue-focused and based on observations. There are four types of constructive feedback:
    - **Negative feedback** – correctional remarks regarding previous actions. focuses on actions that weren't effective and shouldn't be taken again.
    - **Positive feedback** – positive remarks on earlier actions. focuses on actions that have been effective and should be kept up.
    - **Negative feed-forward** – corrections regarding upcoming performance. focuses on actions that ought to be avoided going forward.
    - **Positive feed-forward** – positive predictions about future behavior. centered on actions that will lead to future performance gains.

2.4.4 Feedback In Education

Giving useful feedback is a complex process that needs expertise, practice, and dexterous execution. Effective feedback may have a significant impact on the productivity of the workplace, employee engagement, and the bottom line if it is implemented effectively. In order to influence employees and enhance the learning process, managers must gain a thorough understanding of what makes good feedback. In the end, supervisors must comprehend that every employee has a distinctive point of view and that this viewpoint permeates every encounter at work. Giving feedback in the appropriate manner encourages kindness and builds a teachable environment within your business in addition to making it more productive for employees. Improved employee engagement results from improved staff communication, which enhances customer interactions throughout the entire organization. The advantages of

successful feedback begin with involvement, according to a LinkedIn article on the subject. People might feel more invested in their roles, respected by their leaders, and included as members of the team when they receive honest feedback and direction from their leaders. A large body of evidence suggests that feedback promotes success. Feedback is information provided to the learner regarding their performance in relation to the learning objectives or results. It should want to (and be able to) improve pupils' academic performance. Feedback reroutes or refocuses the learner's actions in order to accomplish a goal by connecting activity and effort with a desired result. It may be about the task's output or result, the task's process, how the student manages their learning or self-control, or it may be about them as a person (which tends to be the least effective). Feedback is information provided to the learner regarding how well they are meeting their objectives or achieving their results. It should try to boost pupils' learning and be able to do so. By coordinating effort and activity with an outcome, feedback reroutes or refocuses the learner's efforts to attain a goal. It could be about the product or result of the task, the method of the task, how the student manages their learning or self-control, or it could be about them as a person (which tends to be the least effective). It's important that our country has excellent instructors in the classrooms. It is difficult to contest this reality, even in the face of other concerns that plague public schools, such as poverty, class size, difficulty in families, mental health issues, violence, and a lack of funding. But it is a challenging issue that we have been wrestling with for well over two centuries: evaluating teachers and their work. Understanding the fundamentals of teacher evaluation, including WHY we evaluate teachers, WHAT constitutes quality teaching and teacher performance, and HOW we can successfully implement good teacher evaluation systems, can help to improve this critically important area of education and ensure the most qualified individuals are in our

classrooms. First, there is a strong correlation between instructor quality and student learning.[15] This is the main justification for the design, implementation, and ongoing improvement of teacher evaluation systems. The United State of America has always had trouble reaching agreement on what constituted "teacher quality" and how to quantify it. Early 19th-century educators were considered effective if they adhered to the community's set curriculum, maintained proper child discipline, and kept the physical facilities of the classroom and school in good condition[16]. Today, when we talk about a teacher's quality, we take into account things like: experience and education; whether or not classroom settings are particularly favorable for learning and achieving at a high level; ability to establish trusting ties with students; planning instruction effectively using assessment; the capacity to adapt teaching methods to engage and educate pupils from diverse linguistic and cultural backgrounds and those who are experiencing learning and behavioral issues; communicating to all pupils the high expectations for their performance; communication with family members and cooperation with coworkers; taking part in professional education of the highest caliber. Accountability is a supplementary justification for effective teacher assessment systems. The evaluation procedure is expected to enhance teachers' performance and effectiveness, which will enhance learning and achievement for students. In some cases, teacher assessment techniques have raised the caliber of the instructional staff[17]. "Evaluation reforms, when properly implemented, can significantly increase teacher quality, foster teacher trust, and help to the improvement of a variety of educational institutions, including teacher training programs." Nevertheless, "fully implemented" is more difficult stated than done, especially considering the many responsibilities and demands on both teachers' and administrators' time[18].

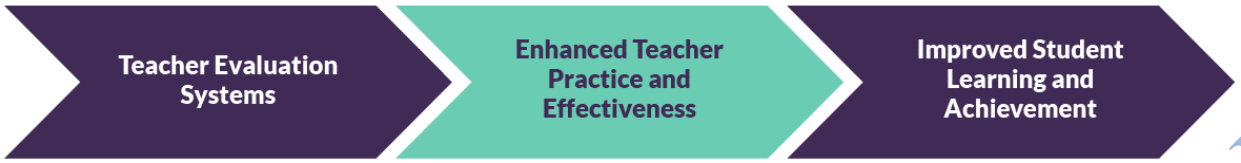

Figure 2.10: Theory of change for a Teacher Evaluation System

We must first understand evaluation before we can define teacher evaluation. Whether we are evaluating a person, a program, a process, a product, or even a policy, all evaluations are ultimately judgements, appraisals, or assessments. A typical evaluation is built around one or more important issues the evaluator needs to investigate, as well as the gathering and analysis of pertinent data to aid in providing answers. The conclusions drawn from the data are then utilized to guide decisions.

Figure 2.11: basic Timeline of an Evaluation

These techniques can be used to evaluate teachers:

1. Self-Evaluation

   Self-evaluation is the practice of methodically scrutinizing, assessing, and enhancing one's own performance. Self-evaluation happens on an individual level as well as at the organizational or departmental levels. This approach specifically entails assessing one's own professional accomplishments in the workplace. The process of self-evaluation allows staff members in a school to take stock of their performance and pinpoint areas that could use improvement in both student and professional learning. Self-assessments give teachers

the chance to consider and articulate their objectives for teaching and learning as well as their difficulties and successes. Self-assessments can take a variety of forms, such as reflective comments, activity reports, defining and tracking annual goals, or even using an instrument like the Wieman Teaching Practices Inventory. The team at the Teaching Center can provide individual teachers with comments on their self-evaluations and suggestions for how to use the results to enhance instruction. The Teaching Center may assist schools and departments with the selection, creation, and instruction of self-assessment instruments for teachers.

2. Peer Observation

   Teachers can learn from one another by observing each other's practice during peer observation. It aims to encourage the exchange of best practices and increase awareness of the effects of your own instruction. Peer observation is a type of peer evaluation in which one instructor (the observer) watches another instructor (the subject) teach and offers feedback on the subject's areas of strength and areas for improvement. Focusing on teachers' individual needs and providing them with the chance to learn from and provide feedback to peers is an essential part of building a professional community. Building collective efficacy can support teachers as they continue to develop their practice in ways that better support student learning. Peer observation highlights your teaching strengths to boost your self-assurance and solidify your abilities; outlines areas you should concentrate on to improve your teaching, which will enhance your rapport with students and help them succeed; offers you individualized, focused peer feedback that you can utilize to build your teaching portfolio; raises consciousness of teaching and learning; enhances opportunities for communication and connection with coworkers.

Related Works

In order to provide recommendations for a proper and adequate teacher evaluation, this study aims to determine the views of administrators working at private schools in Kahramanmaraş and Gaziantep. This study investigates issues such how administrators feel about adopting assessment results, whether or not there should be a system of teacher competency-based differentiation in the evaluation process, and how teacher performance evaluation systems affect teachers' professional growth. Semi-structured interview forms were used to collect the data, which was then analyzed using the content analysis methodology[19].

Students' ratings of teachers are frequently the most important indicator of the caliber of teaching departments, courses, and instructors for determining how students would react to curricula changes. This investigation looks for biases caused by background factors. If so, student evaluations as a reliable measure of a teacher's efficacy for the purposes of quality assurance and improvement may be in doubt. The goals of the study are to I understand the applicability of business student evaluations in evaluating teaching performance and (ii) investigate the constraints of present practices when using student assessment as the main tool used by universities to evaluate teaching effectiveness. Finally, this study is utilized to make suggestions about how to use feedback to improve classroom effectiveness[20].

The functional departments of the school may be able to accurately evaluate the performance of the teaching staff and ongoing teaching operations with the aid of a classroom teaching quality evaluation system. According to the specifications for developing high-caliber talents, intended to encourage teacher appointments, educational reforms and the expansion of the teaching staff must be implemented. strengthening the system makes the hiring process more scientific by paying close attention to each teacher's unique features while appointing them to

similar positions. The system encourages a passion of teaching, a high level of academic performance, a high level of instruction, and competitive instruction. The rapid advancement of deep learning and artificial intelligence in recent years has led to numerous colleges and universities are encouraged to promote the goal of campus digitization and educational information technology. Throughout the teaching and learning process, the condition of the classroom is a crucial reference point for assessing both the teaching effectiveness and the level of student acceptance. However, at the moment, the majority of classroom status analyses are done manually, which is less accurate and distracts teachers. There is consequently significant research value in developing a technique that can increase the effectiveness of classroom status analysis. To read each class's video recording and analyze it from the perspectives of students' behavior and attendance, this study employs the deep neural network method. The system can recognize class behavior and ultimately evaluate the course quality used to encourage teachers to improve teaching and overall educational quality[21].

Feedback is essential for an educational institution's efficient and quality improvement. A properly functioning feedback mechanism causes an institute's growth rate to increase. The feedback system assists in addressing flaws and enhancing strengths. By ensuring that a robust feedback mechanism is in place, it is possible to perform a SWOT analysis on an institution. A proper feedback system cannot be manually managed by a big Institute, necessitating the use of an automated feedback mechanism system[22].

A web-based tool called Online Feedback Analysis System gives colleges a platform to collect student feedback online. This online system is the most effective way to acquire feedback analysis and maintain security. It is the ideal place to find feedback reports that meet requirements such feedback provided by different types of individuals and so on. Students will

use a template to complete online feedback. Security is also maintained in this project so that only authorized users may see the feedback's results. An essential component of effective and efficient teaching and learning is online feedback. It may be a potent way to boost & improve student learning[23].

The classroom management skills required to serve students with impairments are a challenge for many teachers. A potential strategy for assisting instructors in using classroom management techniques is teacher evaluation. The authors assess the types of classroom management themes that were covered in the rubrics as well as the amount to which classroom management was covered in state teacher assessment rubrics. They discover that although classroom management was associated to one-fifth of standards and indicators, there was significant state-to-state variation. While proactive strategies were emphasized in classroom management rubrics, it was frequently missing specific evidence-based techniques that may aid teachers in honing their classroom management abilities. Very few rubrics made any mention of how to deal with students' bad behavior. The authors emphasize the significance of providing high-quality criteria and indicators about classroom management to support teachers of children with disabilities in light of these findings[24].

The Widget Effect by The New Teacher Project (TNTP) showed the failure to acknowledge and address variations in teachers' efficacy. By gathering teacher performance evaluations from 24 states that implemented significant changes to their teacher evaluation systems, we review these findings. The proportion of instructors who are rated unsatisfactory is still less than 1% in the great majority of these states. With 0.7 percent to 28.7 percent ranked below Proficient and 6 percent to 62 percent rated above Proficient, the whole distribution of grades varies significantly across states. We show unique survey data from a city district to

demonstrate that more than three times as many instructors are perceived by evaluators to be below proficient in their schools as they rate as such. Principal interviews turn up a number of plausible reasons for these tendencies[25].

In order to improve the Student Evaluation of Teaching (SET) procedure, this research aims to ascertain how faculty and students see students' evaluations of teachers' instruction. Investigating the disparities between professor and student perceptions of SET is the goal of this study. The data was gathered from faculty members and students in the undergraduate and master's programs at the Institute of Management Sciences in Peshawar, Pakistan, using quantitative and qualitative methods. An online survey was used to gather information on 14 different SET process-related topics. The sample consists of 239 BBA, MBA, and MS-Management students as well as 36 full-time faculty members. Data analysis methods include t-test procedures along with descriptive statistics and inferential statistics. Results showed considerable differences in how students and instructors perceived several SET process elements. In general, academic staff members seem to view students as primarily uninterested in the SET process. According to the research, students are more concerned about the absence of SET recommendations in the formulation and application of policy. The findings revealed differences across all stakeholders, indicating that the SET process's adoption by institutions needs to be given more attention[26].

The principal is emphasized as being crucial to teacher evaluation in the research literature. Principal reports, however, don't give enough details to prove how good a teacher is. Multiple data sources, which vary by instructor and environment, such as client surveys, peer assessments of materials, and student accomplishment data, should be included in a good teacher evaluation. Principals need to learn about student gains and evaluation costs. The issue

of the ineffective teacher and the sociology of teacher evaluation External audiences can be reassured that schools are operating effectively by teacher assessment[27].

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Chapter Three

Research Methodology

This chapter outlines the design process that will be utilized to create an online system for teachers to provide feedback from students while also ensuring that the system meets both functional and non-functional needs. In the sections that follow, the project's techniques for achieving its goals will be outlined, along with the system architecture.

3.1 Research Approach

Research approach is a strategy and process that includes broad hypotheses up to specific techniques for data gathering, analysis, and interpretation. Therefore, it depends on the type of research problem being addressed. Quantitative, qualitative, and mixed methods are the three most popular types of research methodology. This study will employ a quantitative research methodology.

3.1.1 Functional Requirements

The functional requirements list the fundamental tasks that the system must be able to complete. The functional requirements include:

- Admin Login Page
- Student Feedback Page

3.1.2 Non-Functional Requirements

Nonfunctional requirements are tasks that the system must not accomplish but which, if carried out, would improve its functionality and security. Some of the nonfunctional requirements include:

- Security
- Reliability
- Usability
- User friendliness
- Fast performance

3.2 System Design

3.2.1 Software Requirements

The following are requirements that will be needed for the online student feedback system to be designed:

1. SQL: A database's data can be stored, manipulated, and retrieved using a structured query language. Modifying the database table and index structure requires the use of SQL. Data rows can be added, updated, and deleted. obtains a subset of data from the database for applications that require transaction processing and analysis[1].
2. The language used to build web pages is called HTML, or hypertext markup language. Programs developed in scripting languages like JavaScript can be embedded in HTML, changing the way that web pages behave and what they contain. The use of CSS determines how web pages are designed and displayed[2].
3. PHP: An effective tool for developing dynamic and interactive web pages is the server scripting language known as Hypertext Preprocessor. This general-purpose programming language was created with the intention of being used for web development[4].
4. JavaScript is a dynamic, prototype-based language that supports object-oriented, declarative (like functional programming), and imperative programming paradigms.

Event-driven, functional, and imperative (including object-oriented and prototype-based) programming paradigms are supported by JavaScript[5].

3.3 Research Methods

This system employs object-oriented analysis and design as its methodology. It is a structured approach to system analysis, object-oriented system design, and the creation of a collection of graphical system models throughout the software development life cycle.

In the system, The Basic Steps for online student feedback system includes:

i. E-R diagram is used to implement the document repository, often known as the database.

ii. To design the feedback system

iii. For the purpose of carrying out the designs' analysis and implementation. Implementing the algorithm and completing objectives ii and iii, which call for the establishment of feedback systems, respectively, entails employing

HTML & CSS for design

PHP for connecting

3.3.2 Flow Diagram

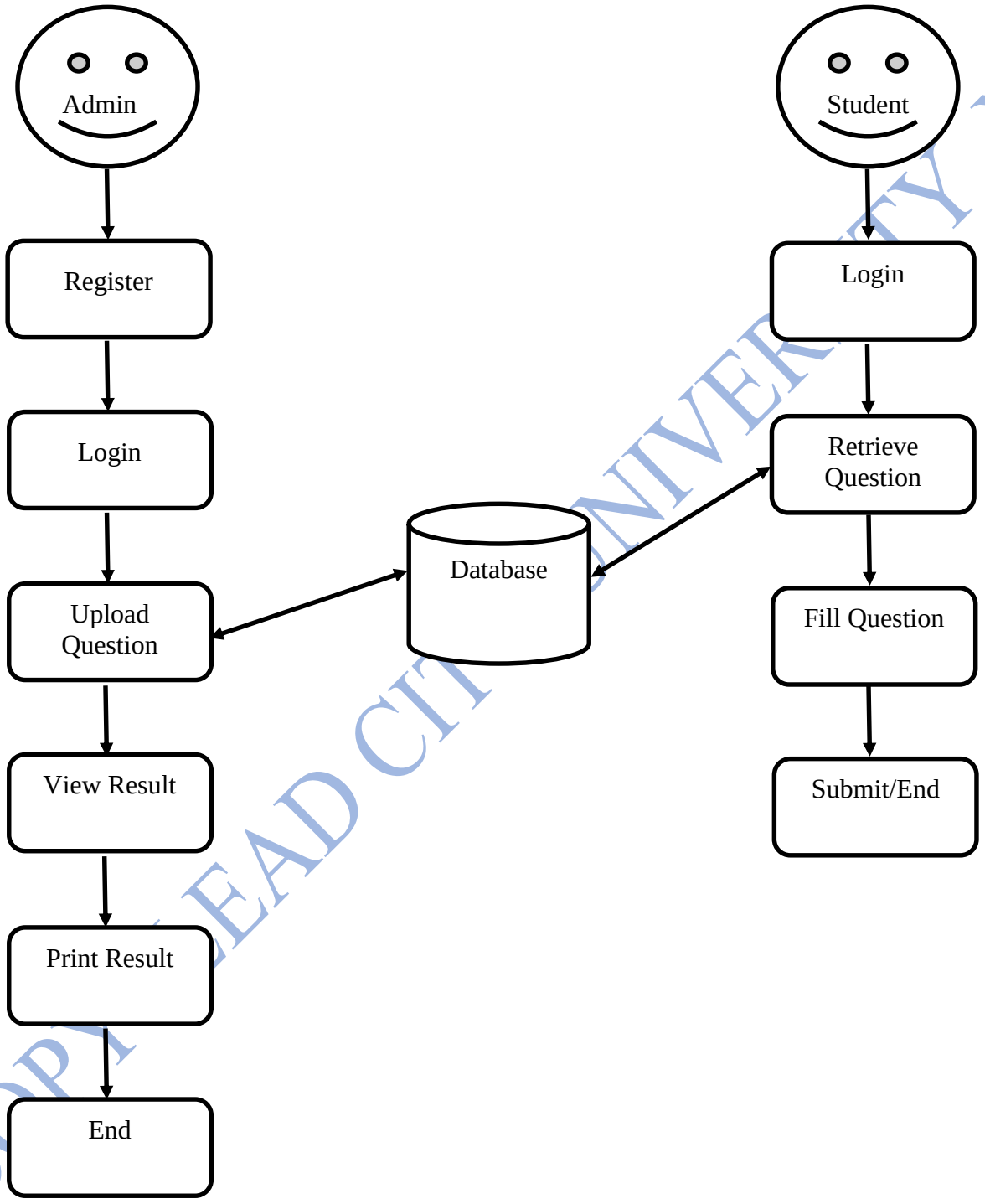

Figure 3.1: A flow diagram representing the activities of the feedback system (Researcher, Adejuwon F. 2022)

The system architecture of the online feedback evaluation system is shown in the figure above. The system enables the administrator to register and create login information, log in and upload evaluation questions, and then produce and send a link to the student for evaluation. The student logs in via the link, completes the system's evaluation questions, and then submits. The administrator then returns to check the results and prints them out for additional documentation.

3.3.3 Activity Diagram for the System

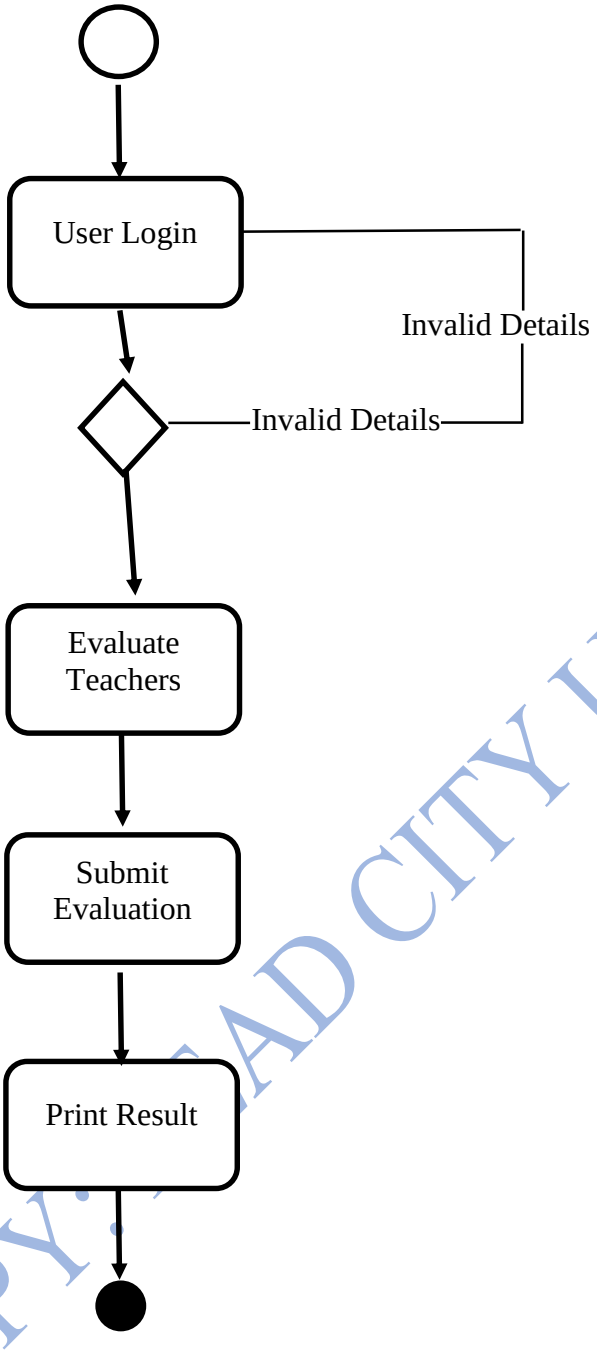

Figure 3.2: Activity Diagram (Researcher, Adejuwon F. 2022)

The user (students) must get a login link from the administrator in order to access the system. The system then allows the user to log in via the link and evaluates the teacher using the admin-provided questionnaire. The response is then saved by the system in its repository (database).

3.3.4 System Architecture

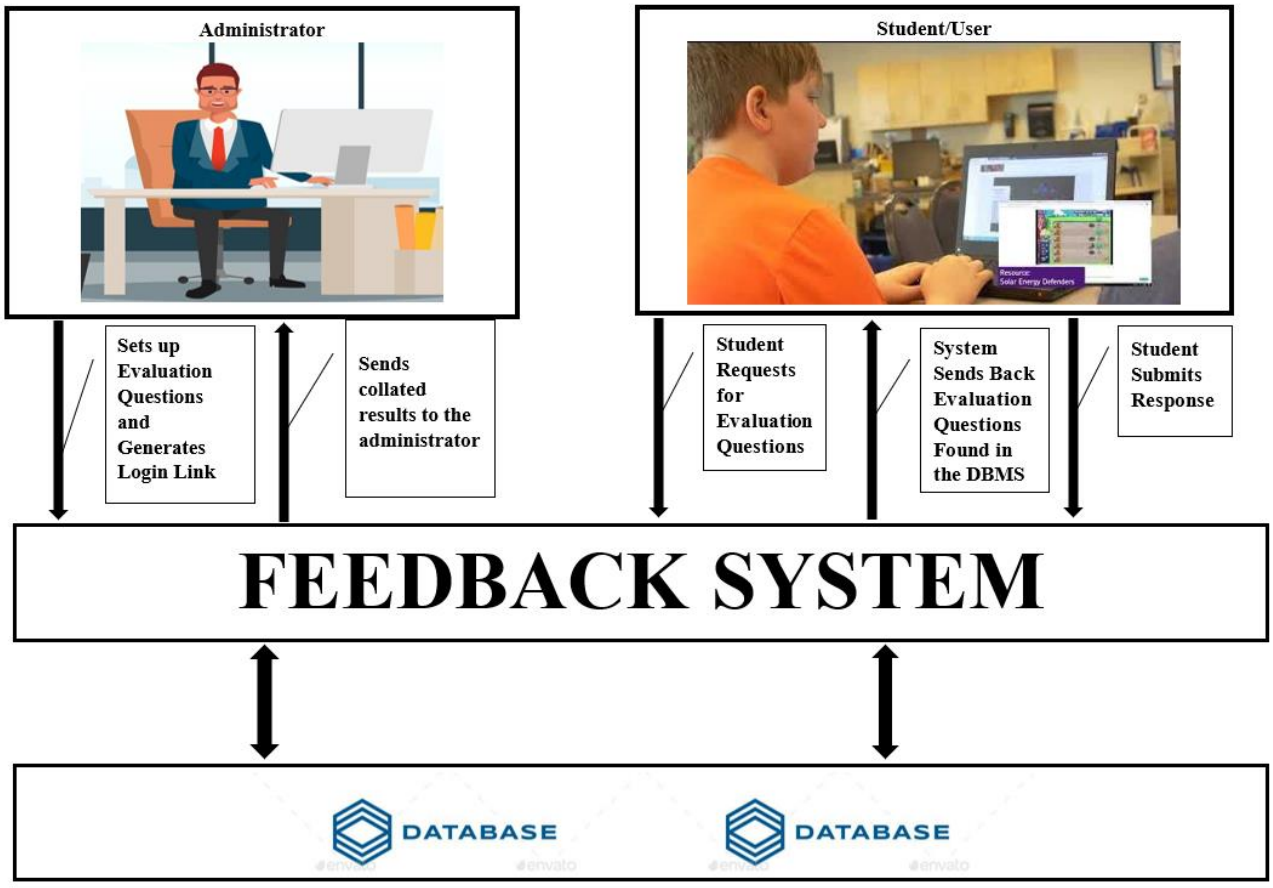

Figure 3.3: System Architecture (Researcher, Adejuwon F. 2022)

Endnotes

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CHAPTER 4

Implementation and Evaluation

4.1 Introduction

This section presents the outcome of the developed Feedback Management System for a Confidential Evaluation of Teachers' Performance. The outcomes of the areas the system is focusing on are shown in this chapter.

4.1.1 Login Page

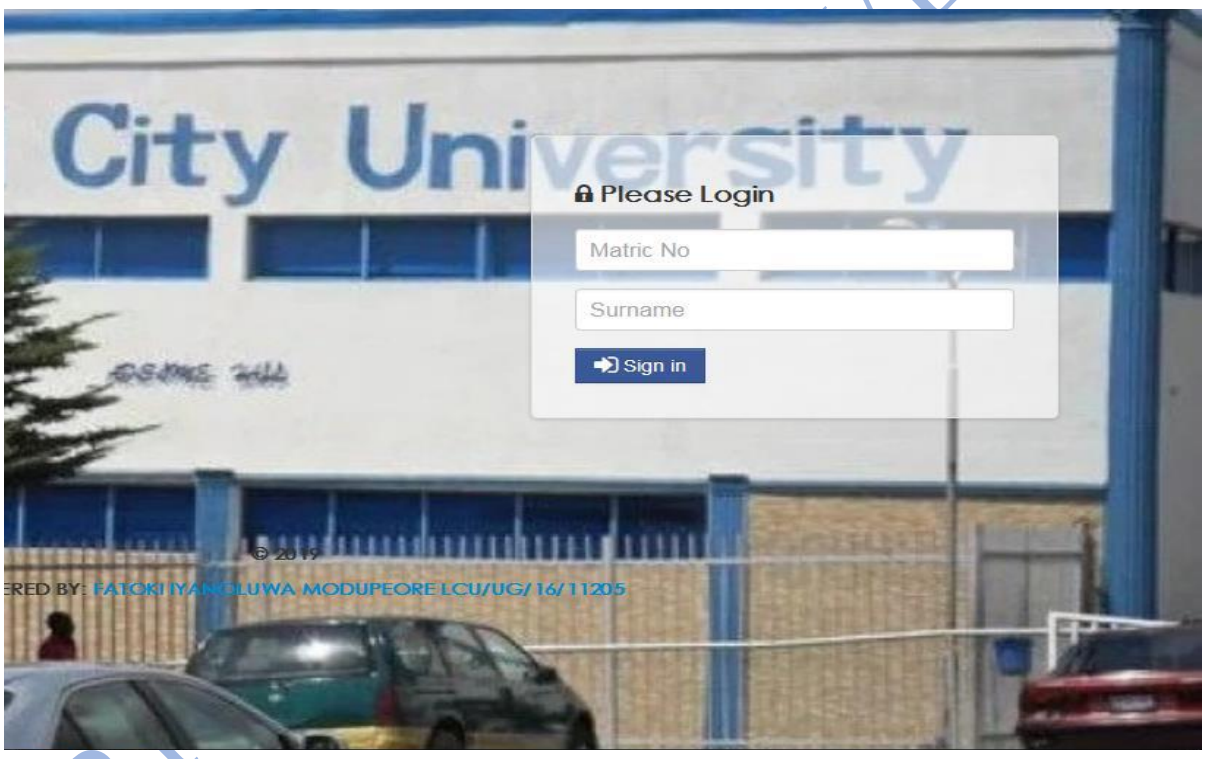

Figure 4.1 Login Page (Researcher, Adejuwon F. 2022)

The Feedback Management System's home page is depicted in figure 4.1. The system administrator can log in from this page. The administrator enters in to the system and configures the feedback evaluation criteria that the students will utilize. Using "admin" as both

the username and password, the admin logs into the system. The admin can modify their password on the website as well.

4.1.2 Home Page

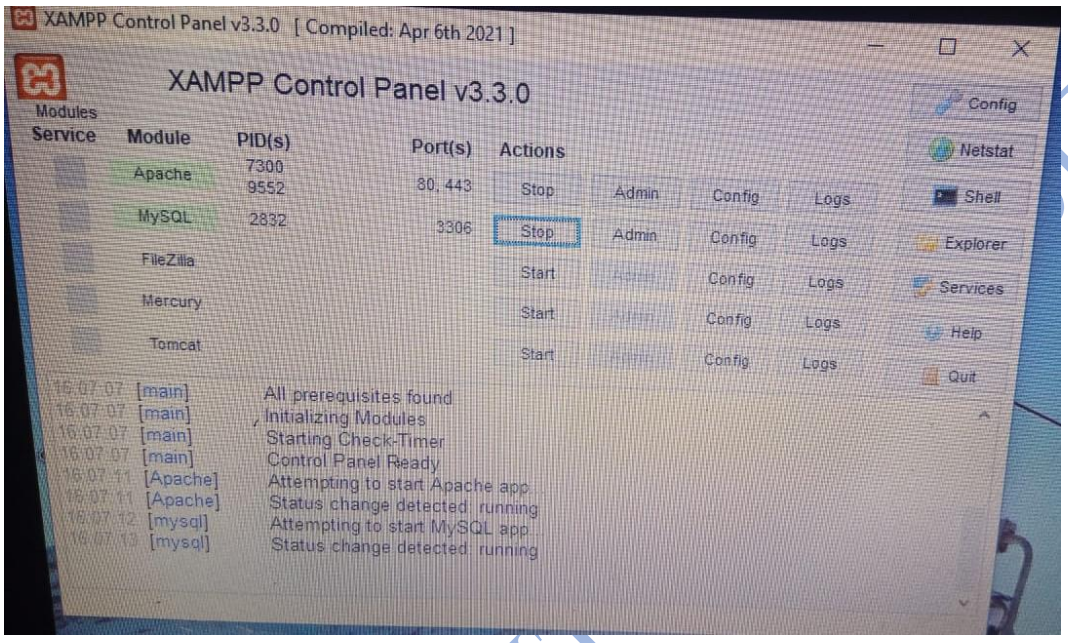

Figure 4.2 Home Page (Researcher, Adejuwon F. 2022)

The evaluation system's main page can be seen in the screenshot in figure 4.1.2. The webpage lists the tasks that the system administrator can complete.

4.1.3 Database

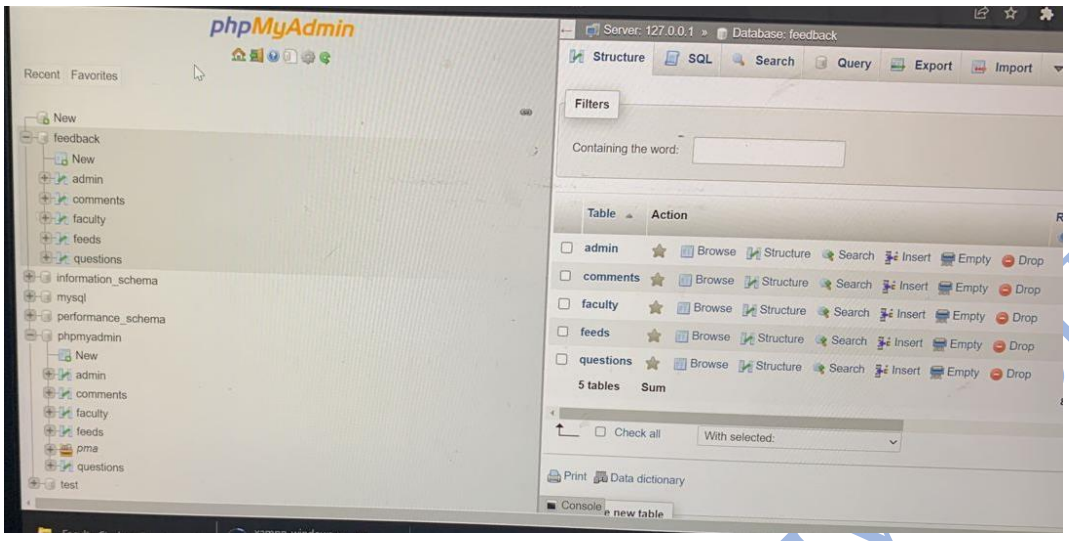

Figure 4.3 Database (Researcher, Adejuwon F. 2022)

The database page of the evaluation system is shown in the snapshot in figure 4.1.3. This page displays the system's storage paradigm for user and administrator-provided data. After the user downloads the questions from the database to evaluate teachers, the information is automatically saved and then retrieved by the administrator for further administrative purposes. The database can only be changed by the admin.

4.1.4 Evaluation Interface

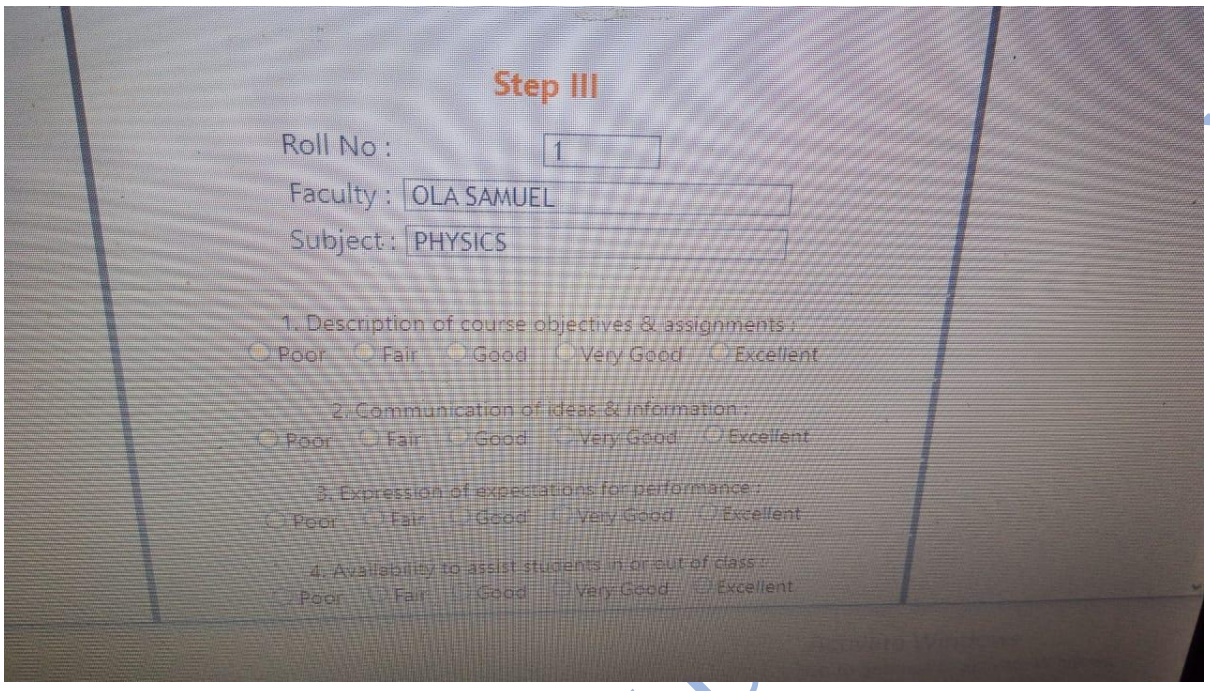

Figure 4.4 Evaluation Interface (Researcher, Adejuwon F. 2022)

The system's student evaluation interface is seen in the screenshot in figure 4.1.3. Here, the student enters their grade level, their school, and the subject for which they want to rate the instructor. The evaluation questions automatically appear after the necessary fields have been completed, and once filled out, the user submits.

4.1.5 Result Page

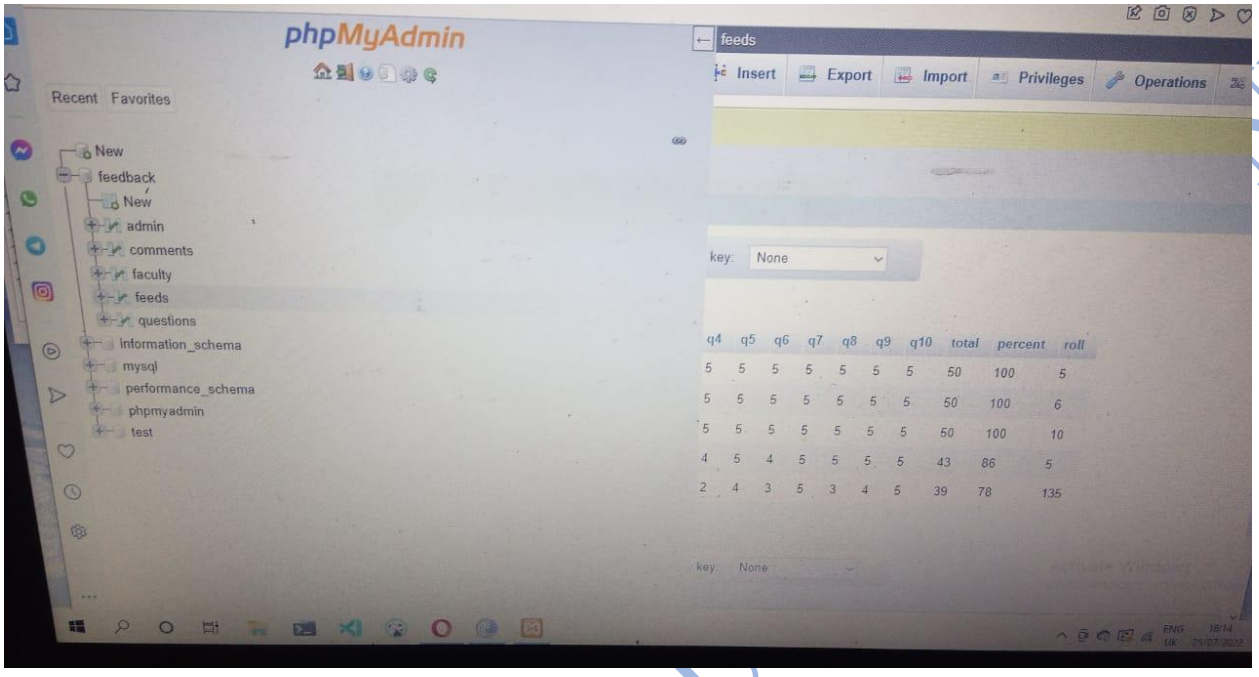

Figure 4.5 Result Page (Researcher, Adejuwon F. 2022)

When the students' comments was collected, the assessment system produced the snapshot in figure 4.1.3.

4.2 Chapter Summary: System Evaluation and Performance Metrics

Finding the essential elements of the parameters from our thesis entails checking the previously created feedback assessment system. The following conditions apply to this:

- Response Time
- Efficiency
- Accuracy

A system software called "Pi Evaluate" is used to carry out comparison tests for the feedback evaluation system. Pi Evaluate is a system that collects student input and might also be used to collect consumer feedback inside of businesses.

Using the Pi Evaluate method, it takes roughly 15 to 30 minutes to respond to about 20 evaluating questions, but using our Feedback Evaluation system, it takes roughly 5 to 10 minutes to respond to about 30 evaluating questions.

The feedback evaluation system uses the RSA Algorithm to encrypt user credentials, allowing for greater security and improving performance.

The feedback system analyzes and produces results using Monte Carlo Simulation analytical techniques. This will enhance the system's RSA algorithm by improving the correctness of the system.

4.2.1 Feedback Evaluation Tools and Features

Evaluation Tool	Features
Feedback Evaluation System	• Uses 5 - 10 minutes for execution of the program • Uses RSA algorithm to increase the efficiency and the efficiency is rated 78% • Uses Monte Carlo Simulation Analysis Techniques to increase accuracy and the efficiency is rated 70% • Uses an offline and online database
Pi Evaluate	• Uses 15 – 30 minutes for execution of the program • Uses an online database

- The accuracy is rated 50% and the efficiency is rated 45% using factor analysis

Table 4.1 Feedback Evaluation Tools and Features

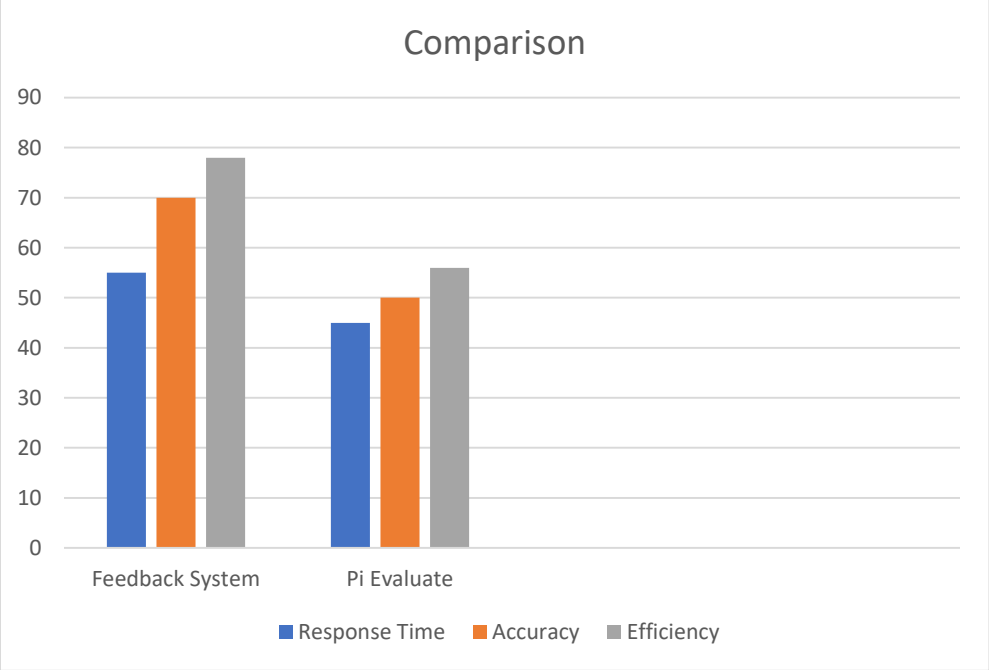

Figure 4.6 Comparison Chart (Researcher, Adejuwon F. 2022)

The systems use the RSA approach to encrypt credentials in order to promote student usage, which in turn improves the system's usability and efficiency. use both offline and internet databases. Accuracy is one of the performance indicators used to gauge the system's effectiveness.

CHAPTER 5

Conclusion

5.1 Summary

The purpose of this software is to increase our leadership and usefulness. It provided us with information about our consumers' feedback, and the information allowed us to improve and restructure our management. It makes it easier for us to accomplish our organizing objectives. Unique technique to obtain input. It gives you a special opportunity to facilitate conversation between managers and employees. I want to recommend this program to all CEOs and corporate managers.

The MFS gives Leaders feedback in real time, unlike other technologies, so they don't have to wait weeks for results.

5.2 Conclusion

The Student Feedback System portal was created to make it simple for educational institutions to process feedback. This takes a lot of time, work, and paper to do manually. Additionally, you are free to provide your feedback without any reluctance.

The data shown above shows that student feedback surveys are commonly recognized as significant stakeholders in higher education, that these surveys are established components of evaluation procedures, and that student feedback has the ability to increase the standard of teaching and learning. While research shows that some surveys are trustworthy, valid, multidimensional, and useful for formative and summative purposes, it also shows that many of them are poorly conceived and designed; they produce data sets that cannot be validated;

they are used for inappropriate purposes; they are not communicated to the students; or they are ignored by those who could benefit from taking action as a result of the feedback. Overall, the results support the need for institutions to develop systems that are customized for specific goals, are developed with input from stakeholders, encourage staff and student engagement with the process, facilitate continuous improvement, and contribute to a more varied but holistic approach to evaluating learning and teaching. This is true despite the fact that many of the findings are relevant in both theory and practice for the redesign of various aspects of internal feedback surveys.

5.3 Contribution to knowledge

A web-based tool called the feedback management system will assist in protecting user credentials from unauthorized users or evaluation-related parties. Users of this application won't have to worry about the other party venting their annoyance on them when they leave a comment; users can access the system without registering their login information.

5.4 Suggestions for Further Studies

The study's goal was to create a web-based feedback evaluation system that safeguards students' credentials; however, creating a system application in this area can also be studied in future studies and tried at different institutions.

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Appendix

```
<?php

$servername = "localhost";

$username = "username";

$password = "password";



// Create connection

$conn = new mysqli($servername, $username, $password);



// Check connection

if ($conn->connect_error) {

  die("Connection failed: " . $conn->connect_error);

}

echo "Connected successfully";

?>
```

Note on the object-oriented example above:

$connect_error was broken until PHP 5.2.9 and 5.3.0. If you need to ensure compatibility with PHP versions prior to 5.2.9 and 5.3.0, use the following code instead:

```
// Check connection
if (mysqli_connect_error()) {
  die("Database connection failed: " . mysqli_connect_error());
}
```

Example (MySQLi Procedural)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
// Create connection
$conn = mysqli_connect($servername, $username, $password);
// Check connection
if (!$conn) {
  die("Connection failed: " . mysqli_connect_error());
}
echo "Connected successfully";
```

```
?>
```

Example (PDO)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
try {
  $conn = new PDO("mysql:host=$servername;dbname=myDB", $username, $password);
  // set the PDO error mode to exception
  $conn->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);
  echo "Connected successfully";
} catch(PDOException $e) {
  echo "Connection failed: " . $e->getMessage();
}
?>
```

Note: In the PDO example above we have also specified a database (myDB). PDO require a valid database to connect to. If no database is specified, an exception is thrown.

Tip: A great benefit of PDO is that it has an exception class to handle any problems that may occur in our database queries. If an exception is thrown within the try{ } block, the script stops executing and flows directly to the first catch(){ } block.

Close the Connection

The connection will be closed automatically when the script ends. To close the connection before, use the following:

MySQLi Object-Oriented:

```
$conn->close();
```

MySQLi Procedural:

```
mysqli_close($conn);
```

PDO:

```
$conn = null;
```

PHP Create a MySQL Database

A database consists of one or more tables.

You will need special CREATE privileges to create or to delete a MySQL database.

Create a MySQL Database Using MySQLi and PDO

The CREATE DATABASE statement is used to create a database in MySQL.

The following examples create a database named "myDB":

Example (MySQLi Object-oriented)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
// Create connection
$conn = new mysqli($servername, $username, $password);
// Check connection
if ($conn->connect_error) {
  die("Connection failed: " . $conn->connect_error);
}
// Create database
$sql = "CREATE DATABASE myDB";
if ($conn->query($sql) === TRUE) {
  echo "Database created successfully";
} else {
  echo "Error creating database: " . $conn->error;
```

```
}

$conn->close();

?>
```

Note: When you create a new database, you must only specify the first three arguments to the mysqli object (servername, username and password).

Tip: If you have to use a specific port, add an empty string for the database-name argument, like this: new mysqli("localhost", "username", "password", "", port)

Example (MySQLi Procedural)

```
<?php

$servername = "localhost";

$username = "username";

$password = "password";



// Create connection

$conn = mysqli_connect($servername, $username, $password);

// Check connection

if (!$conn) {

  die("Connection failed: " . mysqli_connect_error());

}
```

```
// Create database
$sql = "CREATE DATABASE myDB";
if (mysqli_query($conn, $sql)) {
  echo "Database created successfully";
} else {
  echo "Error creating database: " . mysqli_error($conn);
}
mysqli_close($conn);
?>
```

Note: The following PDO example create a database named "myDBPDO":

Example (PDO)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
try {
  $conn = new PDO("mysql:host=$servername", $username, $password);
  // set the PDO error mode to exception
```

```
  $conn->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);
  $sql = "CREATE DATABASE myDBPDO";
  // use exec() because no results are returned
  $conn->exec($sql);
  echo "Database created successfully<br>";
} catch(PDOException $e) {
  echo $sql . "<br>" . $e->getMessage();
}
$conn = null;
?>
```

PHP MySQL Create Table

A database table has its own unique name and consists of columns and rows.

Create a MySQL Table Using MySQLi and PDO

The CREATE TABLE statement is used to create a table in MySQL.

We will create a table named "MyGuests", with five columns: "id", "firstname", "lastname", "email" and "reg_date":

```
CREATE TABLE MyGuests (
id INT(6) UNSIGNED AUTO_INCREMENT PRIMARY KEY,
firstname VARCHAR(30) NOT NULL,
```

lastname VARCHAR(30) NOT NULL,

email VARCHAR(50),

reg_date TIMESTAMP DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP

)

Notes on the table above:

The data type specifies what type of data the column can hold. For a complete reference of all the available data types, go to our Data Types reference.

After the data type, you can specify other optional attributes for each column:

NOT NULL - Each row must contain a value for that column, null values are not allowed

DEFAULT value - Set a default value that is added when no other value is passed

UNSIGNED - Used for number types, limits the stored data to positive numbers and zero

AUTO INCREMENT - MySQL automatically increases the value of the field by 1 each time a new record is added

PRIMARY KEY - Used to uniquely identify the rows in a table. The column with PRIMARY KEY setting is often an ID number, and is often used with AUTO_INCREMENT

Each table should have a primary key column (in this case: the "id" column). Its value must be unique for each record in the table.

The following examples shows how to create the table in PHP:

Example (MySQLi Object-oriented)

```
<?php

$servername = "localhost";

$username = "username";

$password = "password";

$dbname = "myDB";

// Create connection

$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection

if ($conn->connect_error) {

  die("Connection failed: " . $conn->connect_error);

}

// sql to create table

$sql = "CREATE TABLE MyGuests (

id INT(6) UNSIGNED AUTO_INCREMENT PRIMARY KEY,

firstname VARCHAR(30) NOT NULL,

lastname VARCHAR(30) NOT NULL,

email VARCHAR(50),
```

```
reg_date TIMESTAMP DEFAULT CURRENT_TIMESTAMP ON UPDATE
CURRENT_TIMESTAMP
)";
if ($conn->query($sql) === TRUE) {
  echo "Table MyGuests created successfully";
} else {
  echo "Error creating table: " . $conn->error;
}
$conn->close();
?>
```

Example (MySQLi Procedural)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "myDB";
// Create connection
$conn = mysqli_connect($servername, $username, $password, $dbname);
// Check connection
```

```
if (!$conn) {
  die("Connection failed: " . mysqli_connect_error());
}
// sql to create table
$sql = "CREATE TABLE MyGuests (
id INT(6) UNSIGNED AUTO_INCREMENT PRIMARY KEY,
firstname VARCHAR(30) NOT NULL,
lastname VARCHAR(30) NOT NULL,
email VARCHAR(50),
reg_date TIMESTAMP DEFAULT CURRENT_TIMESTAMP ON UPDATE
CURRENT_TIMESTAMP
)";
if (mysqli_query($conn, $sql)) {
  echo "Table MyGuests created successfully";
} else {
  echo "Error creating table: " . mysqli_error($conn);
}
mysqli_close($conn);
?>
```

Example (PDO)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "myDBPDO";
try {
  $conn = new PDO("mysql:host=$servername;dbname=$dbname", $username, $password);
  // set the PDO error mode to exception
  $conn->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);
  // sql to create table
  $sql = "CREATE TABLE MyGuests (
  id INT(6) UNSIGNED AUTO_INCREMENT PRIMARY KEY,
  firstname VARCHAR(30) NOT NULL,
  lastname VARCHAR(30) NOT NULL,
  email VARCHAR(50),
  reg_date TIMESTAMP DEFAULT CURRENT_TIMESTAMP ON UPDATE
CURRENT_TIMESTAMP
  )";
```

```
  // use exec() because no results are returned
  $conn->exec($sql);
  echo "Table MyGuests created successfully";
} catch(PDOException $e) {
  echo $sql . "<br>" . $e->getMessage();
}
$conn = null;
?
```

PHP MySQL Insert Data

Insert Data Into MySQL Using MySQLi and PDO

After a database and a table have been created, we can start adding data in them.

Here are some syntax rules to follow:

The SQL query must be quoted in PHP

String values inside the SQL query must be quoted

Numeric values must not be quoted

The word NULL must not be quoted

The INSERT INTO statement is used to add new records to a MySQL table:

INSERT INTO table_name (column1, column2, column3,...)

VALUES (value1, value2, value3,...)

To learn more about SQL, please visit our SQL tutorial.

In the previous chapter we created an empty table named "MyGuests" with five columns: "id", "firstname", "lastname", "email" and "reg_date". Now, let us fill the table with data.

Note: If a column is AUTO_INCREMENT (like the "id" column) or TIMESTAMP with default update of current_timesamp (like the "reg_date" column), it is no need to be specified in the SQL query; MySQL will automatically add the value.

The following examples add a new record to the "MyGuests" table:

Example (MySQLi Object-oriented)

```
<?php

$servername = "localhost";

$username = "username";

$password = "password";

$dbname = "myDB";

// Create connection

$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection

if ($conn->connect_error) {
```

```
  die("Connection failed: " . $conn->connect_error);
}
$sql = "INSERT INTO MyGuests (firstname, lastname, email)
VALUES ('John', 'Doe', 'john@example.com')";
if ($conn->query($sql) === TRUE) {
  echo "New record created successfully";
} else {
  echo "Error: " . $sql . "<br>" . $conn->error;
}
$conn->close();
?>
```

Example (MySQLi Procedural)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "myDB";
// Create connection
```

```
$conn = mysqli_connect($servername, $username, $password, $dbname);

// Check connection

if (!$conn) {

  die("Connection failed: " . mysqli_connect_error());

}

$sql = "INSERT INTO MyGuests (firstname, lastname, email)

VALUES ('John', 'Doe', 'john@example.com')";

if (mysqli_query($conn, $sql)) {

  echo "New record created successfully";

} else {

  echo "Error: " . $sql . "<br>" . mysqli_error($conn);

}

mysqli_close($conn);

?>
```

Example (PDO)

```
<?php

$servername = "localhost";

$username = "username";
```

```
$password = "password";
$dbname = "myDBPDO";
try {
  $conn = new PDO("mysql:host=$servername;dbname=$dbname", $username, $password);
  // set the PDO error mode to exception
  $conn->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);
  $sql = "INSERT INTO MyGuests (firstname, lastname, email)
  VALUES ('John', 'Doe', 'john@example.com')";
  // use exec() because no results are returned
  $conn->exec($sql);
  echo "New record created successfully";
} catch(PDOException $e) {
  echo $sql . "<br>" . $e->getMessage();
}

$conn = null;
?>
```

PHP MySQL Get Last Inserted ID

Get ID of The Last Inserted Record

If we perform an INSERT or UPDATE on a table with an AUTO_INCREMENT field, we can get the ID of the last inserted/updated record immediately.

In the table "MyGuests", the "id" column is an AUTO_INCREMENT field:

```
CREATE TABLE MyGuests (
id INT(6) UNSIGNED AUTO_INCREMENT PRIMARY KEY,
firstname VARCHAR(30) NOT NULL,
lastname VARCHAR(30) NOT NULL,
email VARCHAR(50),
reg_date TIMESTAMP DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
)
```

The following examples are equal to the examples from the previous page (PHP Insert Data Into MySQL), except that we have added one single line of code to retrieve the ID of the last inserted record. We also echo the last inserted ID:

Example (MySQLi Object-oriented)

```
<?php

$servername = "localhost";

$username = "username";

$password = "password";

$dbname = "myDB";



// Create connection

$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection

if ($conn->connect_error) {

  die("Connection failed: " . $conn->connect_error);

}



$sql = "INSERT INTO MyGuests (firstname, lastname, email)

VALUES ('John', 'Doe', 'john@example.com')";



if ($conn->query($sql) === TRUE) {

  $last_id = $conn->insert_id;
```

```
 echo "New record created successfully. Last inserted ID is: " . $last_id;
} else {
 echo "Error: " . $sql . "<br>" . $conn->error;
}

$conn->close();
?>
```

Example (MySQLi Procedural)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "myDB";

// Create connection
$conn = mysqli_connect($servername, $username, $password, $dbname);
// Check connection
```

```
if (!$conn) {
  die("Connection failed: " . mysqli_connect_error());
}

$sql = "INSERT INTO MyGuests (firstname, lastname, email)
VALUES ('John', 'Doe', 'john@example.com')";

if (mysqli_query($conn, $sql)) {
  $last_id = mysqli_insert_id($conn);
  echo "New record created successfully. Last inserted ID is: " . $last_id;
} else {
  echo "Error: " . $sql . "<br>" . mysqli_error($conn);
}

mysqli_close($conn);
?>
```

Example (PDO)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "myDBPDO";

try {
  $conn = new PDO("mysql:host=$servername;dbname=$dbname", $username, $password);
  // set the PDO error mode to exception
  $conn->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);
  $sql = "INSERT INTO MyGuests (firstname, lastname, email)
  VALUES ('John', 'Doe', 'john@example.com')";
  // use exec() because no results are returned
  $conn->exec($sql);
  $last_id = $conn->lastInsertId();
  echo "New record created successfully. Last inserted ID is: " . $last_id;
} catch(PDOException $e) {
  echo $sql . "<br>" . $e->getMessage();
```

```
}

$conn = null;

?>
```

PHP MySQL Insert Multiple Records

Insert Multiple Records Into MySQL Using MySQLi and PDO

Multiple SQL statements must be executed with the mysqli_multi_query() function.

The following examples add three new records to the "MyGuests" table:

Example (MySQLi Object-oriented)

```
<?php

$servername = "localhost";

$username = "username";

$password = "password";

$dbname = "myDB";
```

```
// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);
// Check connection
if ($conn->connect_error) {
  die("Connection failed: " . $conn->connect_error);
}


$sql = "INSERT INTO MyGuests (firstname, lastname, email)
VALUES ('John', 'Doe', 'john@example.com');";
$sql .= "INSERT INTO MyGuests (firstname, lastname, email)
VALUES ('Mary', 'Moe', 'mary@example.com');";
$sql .= "INSERT INTO MyGuests (firstname, lastname, email)
VALUES ('Julie', 'Dooley', 'julie@example.com')";


if ($conn->multi_query($sql) === TRUE) {
  echo "New records created successfully";
} else {
  echo "Error: " . $sql . "<br>" . $conn->error;
```

```
}


$conn->close();

?>
```

PHP MySQL Prepared Statements

Prepared statements are very useful against SQL injections.

Prepared Statements and Bound Parameters

A prepared statement is a feature used to execute the same (or similar) SQL statements repeatedly with high efficiency.

Prepared statements basically work like this:

Prepare: An SQL statement template is created and sent to the database. Certain values are left unspecified, called parameters (labeled "?"). Example: INSERT INTO MyGuests VALUES(?, ?, ?)

The database parses, compiles, and performs query optimization on the SQL statement template, and stores the result without executing it

Execute: At a later time, the application binds the values to the parameters, and the database executes the statement. The application may execute the statement as many times as it wants with different values

Compared to executing SQL statements directly, prepared statements have three main advantages:

Prepared statements reduce parsing time as the preparation on the query is done only once (although the statement is executed multiple times)

Bound parameters minimize bandwidth to the server as you need send only the parameters each time, and not the whole query

Prepared statements are very useful against SQL injections, because parameter values, which are transmitted later using a different protocol, need not be correctly escaped. If the original statement template is not derived from external input, SQL injection cannot occur.

Prepared Statements in MySQLi

The following example uses prepared statements and bound parameters in MySQLi:

Example (MySQLi with Prepared Statements)

<?php

```
$servername = "localhost";

$username = "username";

$password = "password";

$dbname = "myDB";



// Create connection

$conn = new mysqli($servername, $username, $password, $dbname);



// Check connection

if ($conn->connect_error) {

  die("Connection failed: " . $conn->connect_error);

}



// prepare and bind

$stmt = $conn->prepare("INSERT INTO MyGuests (firstname, lastname, email) VALUES (?,

?, ?)");

$stmt->bind_param("sss", $firstname, $lastname, $email);



// set parameters and execute
```

```
$firstname = "John";

$lastname = "Doe";

$email = "john@example.com";

$stmt->execute();



$firstname = "Mary";

$lastname = "Moe";

$email = "mary@example.com";

$stmt->execute();



$firstname = "Julie";

$lastname = "Dooley";

$email = "julie@example.com";

$stmt->execute();



echo "New records created successfully";



$stmt->close();
```

```
$conn->close();

?>
```

PHP MySQL Select Data

Select Data From a MySQL Database

The SELECT statement is used to select data from one or more tables:

```
SELECT column_name(s) FROM table_name
```

or we can use the * character to select ALL columns from a table:

```
SELECT * FROM table_name
```

To learn more about SQL, please visit our SQL tutorial.

Select Data With MySQLi

The following example selects the id, firstname and lastname columns from the MyGuests table and displays it on the page:

Example (MySQLi Object-oriented)

```
<?php
```

```
$servername = "localhost";

$username = "username";

$password = "password";

$dbname = "myDB";



// Create connection

$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection

if ($conn->connect_error) {

  die("Connection failed: " . $conn->connect_error);

}



$sql = "SELECT id, firstname, lastname FROM MyGuests";

$result = $conn->query($sql);



if ($result->num_rows > 0) {

  // output data of each row

  while($row = $result->fetch_assoc()) {
```

```
    echo "id: " . $row["id"]. " - Name: " . $row["firstname"]. " " . $row["lastname"]. "<br>";
  }
} else {
  echo "0 results";
}
$conn->close();
?>
```

Code lines to explain from the example above:

First, we set up an SQL query that selects the id, firstname and lastname columns from the MyGuests table. The next line of code runs the query and puts the resulting data into a variable called $result.

Then, the function num_rows() checks if there are more than zero rows returned.

If there are more than zero rows returned, the function fetch_assoc() puts all the results into an associative array that we can loop through. The while() loop loops through the result set and outputs the data from the id, firstname and lastname columns.

The following example shows the same as the example above, in the MySQLi procedural way:

Example (MySQLi Procedural)

```
<?php

$servername = "localhost";

$username = "username";

$password = "password";

$dbname = "myDB";



// Create connection

$conn = mysqli_connect($servername, $username, $password, $dbname);

// Check connection

if (!$conn) {

  die("Connection failed: " . mysqli_connect_error());

}

$sql = "SELECT id, firstname, lastname FROM MyGuests";

$result = mysqli_query($conn, $sql);
```

```
if (mysqli_num_rows($result) > 0) {
  // output data of each row
  while($row = mysqli_fetch_assoc($result)) {
    echo "id: " . $row["id"]. " - Name: " . $row["firstname"]. " " . $row["lastname"]. "<br>";
  }
} else {
  echo "0 results";
}

mysqli_close($conn);
?>
```

PHP MySQL Use The WHERE Clause

Select and Filter Data From a MySQL Database

The WHERE clause is used to filter records.

The WHERE clause is used to extract only those records that fulfill a specified condition.

SELECT column_name(s) FROM table_name WHERE column_name operator value

To learn more about SQL, please visit our SQL tutorial.

Select and Filter Data With MySQLi

The following example selects the id, firstname and lastname columns from the MyGuests table where the lastname is "Doe", and displays it on the page:

Example (MySQLi Object-oriented)

```
<?php

$servername = "localhost";

$username = "username";

$password = "password";

$dbname = "myDB";


// Create connection

$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection

if ($conn->connect_error) {
```

```
 die("Connection failed: " . $conn->connect_error);
}

$sql = "SELECT id, firstname, lastname FROM MyGuests WHERE lastname='Doe'";
$result = $conn->query($sql);

if ($result->num_rows > 0) {
 // output data of each row
 while($row = $result->fetch_assoc()) {
   echo "id: " . $row["id"]. " - Name: " . $row["firstname"]. " " . $row["lastname"]. "<br>";
 }
} else {
 echo "0 results";
}
$conn->close();
?>
```

Code lines to explain from the example above:

First, we set up the SQL query that selects the id, firstname and lastname columns from the MyGuests table where the lastname is "Doe". The next line of code runs the query and puts the resulting data into a variable called $result.

Then, the function num_rows() checks if there are more than zero rows returned.

If there are more than zero rows returned, the function fetch_assoc() puts all the results into an associative array that we can loop through. The while() loop loops through the result set and outputs the data from the id, firstname and lastname columns.

The following example shows the same as the example above, in the MySQLi procedural way:

Example (MySQLi Procedural)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "myDB";
```

```
// Create connection
$conn = mysqli_connect($servername, $username, $password, $dbname);
// Check connection
if (!$conn) {
  die("Connection failed: " . mysqli_connect_error());
}


$sql = "SELECT id, firstname, lastname FROM MyGuests WHERE lastname='Doe'";
$result = mysqli_query($conn, $sql);


if (mysqli_num_rows($result) > 0) {
  // output data of each row
  while($row = mysqli_fetch_assoc($result)) {
    echo "id: " . $row["id"]. " - Name: " . $row["firstname"]. " " . $row["lastname"]. "<br>";
  }
} else {
  echo "0 results";
}
```

```
mysqli_close($conn);

?>
```

Example (MySQLi Object-oriented)

```
<?php

$servername = "localhost";

$username = "username";

$password = "password";

$dbname = "myDB";


// Create connection

$conn = new mysqli($servername, $username, $password, $dbname);

// Check connection

if ($conn->connect_error) {

  die("Connection failed: " . $conn->connect_error);

}
```

```
$sql = "SELECT id, firstname, lastname FROM MyGuests WHERE lastname='Doe'";

$result = $conn->query($sql);



if ($result->num_rows > 0) {

  echo "<table><tr><th>ID</th><th>Name</th></tr>";

  // output data of each row

  while($row = $result->fetch_assoc()) {

    echo                                    "<tr><td>".$row["id"]."</td><td>".$row["firstname"]."
".$row["lastname"]."</td></tr>";

  }

  echo "</table>";

} else {

  echo "0 results";

}

$conn->close();

?>
```

Select Data With PDO (+ Prepared Statements)

The following example uses prepared statements.

It selects the id, firstname and lastname columns from the MyGuests table where the lastname is "Doe", and displays it in an HTML table:

Example (PDO)

```
<?php
echo "<table style='border: solid 1px black;'>";
echo "<tr><th>Id</th><th>Firstname</th><th>Lastname</th></tr>";

class TableRows extends RecursiveIteratorIterator {
  function __construct($it) {
    parent::__construct($it, self::LEAVES_ONLY);
  }

  function current() {
    return "<td style='width:150px;border:1px solid black;'>" . parent::current(). "</td>";
  }

  function beginChildren() {
    echo "<tr>";
```

```
  }


  function endChildren() {
    echo "</tr>" . "\n";
  }
}


$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "myDBPDO";


try {
  $conn = new PDO("mysql:host=$servername;dbname=$dbname", $username, $password);
  $conn->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);
  $stmt = $conn->prepare("SELECT id, firstname, lastname FROM MyGuests WHERE
lastname='Doe'");
  $stmt->execute();
```

```
  // set the resulting array to associative
  $result = $stmt->setFetchMode(PDO::FETCH_ASSOC);
  foreach(new TableRows(new RecursiveArrayIterator($stmt->fetchAll())) as $k=>$v) {
    echo $v;
  }
}
catch(PDOException $e) {
  echo "Error: " . $e->getMessage();
}
$conn = null;
echo "</table>";
?>
```

PHP MySQL Use The ORDER BY Clause

Select and Order Data From a MySQL Database

The ORDER BY clause is used to sort the result-set in ascending or descending order.

The ORDER BY clause sorts the records in ascending order by default. To sort the records in descending order, use the DESC keyword.

SELECT column_name(s) FROM table_name ORDER BY column_name(s) ASC|DESC

To learn more about SQL, please visit our SQL tutorial.

Select and Order Data With MySQLi

The following example selects the id, firstname and lastname columns from the MyGuests table. The records will be ordered by the lastname column:

Example (MySQLi Object-oriented)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "myDB";

// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);
```

```
// Check connection
if ($conn->connect_error) {
  die("Connection failed: " . $conn->connect_error);
}

$sql = "SELECT id, firstname, lastname FROM MyGuests ORDER BY lastname";
$result = $conn->query($sql);

if ($result->num_rows > 0) {
  // output data of each row
  while($row = $result->fetch_assoc()) {
    echo "id: " . $row["id"]. " - Name: " . $row["firstname"]. " " . $row["lastname"]. "<br>";
  }
} else {
  echo "0 results";
}
$conn->close();
?>
```

Code lines to explain from the example above:

First, we set up the SQL query that selects the id, firstname and lastname columns from the MyGuests table. The records will be ordered by the lastname column. The next line of code runs the query and puts the resulting data into a variable called $result.

Then, the function num_rows() checks if there are more than zero rows returned.

If there are more than zero rows returned, the function fetch Assoc () puts all the results into an associative array that we can loop through. The while () loop loops through the result set and outputs the data from the id, firstname and lastname columns.

The following example shows the same as the example above, in the MySQLi procedural way:

Example (MySQLi Procedural)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
```

```
$dbname = "myDB";


// Create connection
$conn = mysqli_connect($servername, $username, $password, $dbname);
// Check connection
if (!$conn) {
  die("Connection failed: " . mysqli_connect_error());
}


$sql = "SELECT id, firstname, lastname FROM MyGuests ORDER BY lastname";
$result = mysqli_query($conn, $sql);


if (mysqli_num_rows($result) > 0) {
  // output data of each row
  while($row = mysqli_fetch_assoc($result)) {
    echo "id: " . $row["id"]. " - Name: " . $row["firstname"]. " " . $row["lastname"]. "<br>";
  }
} else {
```

```
 echo "0 results";
}

mysqli_close($conn);
?>
```

PHP MySQL Delete Data

Delete Data From a MySQL Table Using MySQLi and PDO

The DELETE statement is used to delete records from a table:

```
DELETE FROM table_name
WHERE some_column = some_value
```

Notice the WHERE clause in the DELETE syntax: The WHERE clause specifies which record or records that should be deleted. If you omit the WHERE clause, all records will be deleted!

To learn more about SQL, please visit our SQL tutorial.

Let's look at the "MyGuests" table:

id	firstname	lastname	email	reg_date
1	John	Doe	john@example.com	2014-10-22 14:26:15
2	Mary	Moe	mary@example.com	2014-10-23 10:22:30
3	Julie	Dooley	julie@example.com	2014-10-26 10:48:23

The following examples delete the record with id=3 in the "MyGuests" table:

Example (MySQLi Object-oriented)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "myDB";

// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);
// Check connection
if ($conn->connect_error) {
```

```
  die("Connection failed: " . $conn->connect_error);
}

// sql to delete a record
$sql = "DELETE FROM MyGuests WHERE id=3";

if ($conn->query($sql) === TRUE) {
  echo "Record deleted successfully";
} else {
  echo "Error deleting record: " . $conn->error;
}

$conn->close();
?>
```

PHP MySQL Update Data

Update Data In a MySQL Table Using MySQLi and PDO

The UPDATE statement is used to update existing records in a table:

UPDATE table_name

SET column1=value, column2=value2,...

WHERE some_column=some_value

Notice the WHERE clause in the UPDATE syntax: The WHERE clause specifies which record or records that should be updated. If you omit the WHERE clause, all records will be updated!

Let's look at the "MyGuests" table:

id	firstname	lastname	email	reg_date
1	John	Doe	john@example.com	2014-10-22 14:26:15
2	Mary	Moe	mary@example.com	2014-10-23 10:22:30

The following examples update the record with id=2 in the "MyGuests" table:

Example (MySQLi Object-oriented)

```
<?php
$servername = "localhost";
$username = "username";
$password = "password";
$dbname = "myDB";
```

```
// Create connection
$conn = new mysqli($servername, $username, $password, $dbname);
// Check connection
if ($conn->connect_error) {
  die("Connection failed: " . $conn->connect_error);
}

$sql = "UPDATE MyGuests SET lastname='Doe' WHERE id=2";

if ($conn->query($sql) === TRUE) {
  echo "Record updated successfully";
} else {
  echo "Error updating record: " . $conn->error;
}

$conn->close();
?>
```

Biodata

Personal Data

1. Full Name: ADEJUWON Feranmi Emmanuel

   Address: Plot F, Block 8, Falade Lay-Out, Lagos, Nigeria.

   E-mail: adeferanmi@gmail.com

   Phone No: 07037373828

2. Date and State of Origin: September 30, 1998, Osun State, Nigeria
3. Nationality: Nigerian
4. Name and address of Next of kin

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   Assistant Lecturer;

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Academic Qualifications

- MSc Computer and Information science / Lead City University, Ibadan **IN PROGRESS**
- BSc (Ed) Computer Science / Lead City University, Ibadan 2019
- West African School Certificate / David Joel Model College

  2015

Professional Qualifications

- Teachers Registration Council of Nigeria 2019

- Institute of Personality Development & Customer Relationship Management IPD-CRM 2019

Certifications

- International Computer Driver's License 2020
- Google Digital Marketing Skills 2020
- Customer Relationship Management/ New Horizon 2019
- Pro-Chancellors Community Service / Lead City University, Ibadan 2019
- Entrepreneurship Day / Lead City University, Ibadan 2019
- The Speakers' Lounge 2018
- CompTIA Project Management / New Horizons 2018
- Computer Engineering and Maintenance / Young Black Entrepreneur 2014

Key Skills

- Good Computer Operating Skills
- Ability to learn new computer Skills
- Able to adapt lesson plans to different learning styles
- Willing to support the management team and to carry out administrative duties
- Excellent Communicator

Work Experience

- ICDL Facilitator at Meed Network 2020
- ISP Intern at ITX Telecoms, Wuse Zone 5, Abuja Nigeria. 2020

Computer Instructor at the following institution:

- Government Secondary School, Ngoot-Long, Jos, Nigeria. 2019 - 2020
- King Immanuel Schools, sawmill, Ibadan, Nigeria. 2017 - 2019
- St Anne's Girls College, Molete, Ibadan, Nigeria. 2017 & 2018

Focus

- To bring the desired progress and improvement to the organization through the impact of my know-how while cooperating with existing members of staff.
- To maximize my potentials and harness my wealth of experience for possible output within the organization.
- To carry out any assigned task dutifully and competently and make a good impression of the organization in any given task, place or event as occasion demands.

Interest and Activities

- Teaching
- Net Surfing
- Trying out New computer Software
- Researching
- Field Trip

- Engaging People Intelligently

Referee

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University Compliance Form

This is to certify that this thesis by Adejuwon Feranmi Emmanuel with Matriculation Number LCU/PG/002008 in the Department of Computer Science, Faculty of Natural and Applied Sciences, Lead City University, Ibadan is in full compliance with the approval of the University's format and style.

…… ……..

Signature Date