A Cloud-Based Enterprise Resource Planning Architecture for Women’s Education in Remote Areas

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Abstract: This research provides an approach to exploring a suitable enterprise resource planning system using cloud management architecture for the educational environment. It enables enterprises to get into the competition. Enterprise resource planning for educational firms provides an approach to address the targeted female population. To achieve this goal, a system has been established that has an infrastructure basis on governments, nongovernment organizations (NGOs), universities, and other social service providers. This paper helps to present the architecture of cloud computing for the overall educational environment concerns around the world. This research aims to contribute to women’s education with respect to modern technology. It ensures that technology is cost-efficiently available for women’s education in view of the availability and consistency of the system and in accordance with goals. An architecture is proposed to solve and take over the limitations that have been faced and are the reasons for the failure of the available systems. After designing the architecture, a survey questionnaire was designed and conducted with students and professionals of Air University, Bahria University, and Preston University.

Keywords: ERP; cloud computing; network management; cloud architecture; women’s education; higher education

1. Introduction

Software is designed to optimize and integrate business process functions covered by the enterprise resource planning (ERP) system, including manufacturing, distribution, accounting, financial management, human resources, project management, inventory management, services, transportation providing accessibility, maintenance, and visibility across the enterprise’s consistency. ERP systems identify and plan to scale corporate resources required to make, manufacture, distribute, deliver, and account for customer orders. The cost of ERP implementation and maintenance is very high, generally ranging from 15 to 50 million dollars [1].

According to the authors of [2], an ERP system automates and fully integrates core enterprises’ business processes and business management systems. An ERP system covers functional areas of an
enterprise such as logistics, finance, human resource, accounting, and production. An ERP system is a type of information system with a central database. According to the authors of [3], cloud computing systems provide a large number of interfaces with dynamic delivery capabilities. The entire virtual machine (VM) openly accesses the hosted software services. IT resources are defined and can be moved from one place to another on-demand. Cloud computing provides rational performance; therefore, the need for cloud integration with the conceptual ERP Web model emerges. Other authors have suggested that clouds make it possible for companies to release their potential for modernization through creativity, flexibility, greater intelligence, and efficiency with reasonable cost [4].

The Google App Engine (GAE) has been presented in [4,5]. This app engine is a high-performance and scalable cloud computing application framework. It uses storage and computational infrastructure commonly available to web developers of enterprises to provide a modular platform open for experimental instrumentation. With GAE, web developers intend to implement an enterprise resource planning (ERP) web model in cloud infrastructure while providing a common framework for system integration.

The different roles involved in cloud computing are [6]: Cloud Consumer, Cloud Provider, Cloud Broker, Cloud Auditor, and Cloud Carrier

The authors of [7,8] suggested that cloud computing is not only a technology but an approach that tackles the force of servers by dividing a single server into various virtual machines. There are numerous organization models accessible for executing cloud computing. Cloud clients are shown in Figure 1.

![Cloud Clients Diagram](image_url)

**Figure 1.** Cloud clients.

2. Materials and Methods

The Cloud Station solution, presented in [2], contains the following components: Cloud Station Web Client, Cloud Command and Control Server, High Availability Server, Data Replication Server, APIs, Recovery Kits, and Deployment Kits.

2.1. Considerations for Enterprise Migration to Cloud Computing

Current frameworks are being created to regulate and organize services. The processes of higher education services are mainly related to infrastructure as a service (IaaS). There are many appropriate frameworks for improving IT-environment-based services, such as cloud computing [3].

High availability and reliability, agility, scalability, and high multisharing services in pay-per-use modes are the key considerations for enterprises to migrate toward cloud computing. These are discussed while outlining the characteristics of cloud computing [4].

2.2. Support for All Service-Oriented Applications

Authors consider cloud computing as a fifth essential utility after water, electricity, gas, and telephony. They argue that, with cloud infrastructure, all types of businesses and every state of
users become capable of accessing related or required applications from around the world at any time. Consequently, the strategy of the computing world is promptly heading toward developing software for millions to consume as a service, empower consumers to run those applications on their individual computers [4].

2.3. Cloud Computing Models

Cloud computing can be categorized as Public Cloud, Private Cloud, and Hybrid Cloud, as depicted in Figure 2, which defines various models of cloud computing [7].

![Cloud computing model](image)

**Figure 2.** Cloud computing model.

2.4. Factors That Drive the Adoption of ERP Systems in the Cloud

Certain factors drive the adoption of cloud computing services, among which are cost, flexibility, and scalability [9]. Here, the author emphasizes the importance of identifying consumer preferences for the attributes of cloud services and reveals the relative importance of different attributes of cloud services. Other authors discussed the benefits and risks from a user’s perspective that the adoption of Software as a Service (SaaS) could be analyzed on the basis of three theoretical perspectives: transaction cost theory, a resource-based view, and the theory of planned behavior [9].

2.5. Physical Location of ERP System Data

The physical location of the hardware that virtually enables cloud computing is unknown to users. Users do not have a technical need to be aware of which server is running on which host to deliver the required services, nor where the hosting devices are located. However, the physical location of hardware is currently a decisive factor for the decision to use cloud computing for enterprises. Companies prefer service providers within their own country [10].

The ERP SaaS provider Scope Visio, for example, has put significant effort into building a “trustworthy” environment that is physically placed in the Frankfurt banking cluster [9–12]. Among the various concerns expressed by potential adopters and monitors of cloud computing security, concerns about privacy and data protection are prominent. Furthermore, organizations can be further restrained by local laws in the countries where they work that restrict certain categories of information to be preserved off-shore.

Problems of jurisdiction might arise where the cloud crosses jurisdictional boundaries. Even where sufficient information is gathered somehow by a user regarding a privacy breach, they will probably face difficulties while initiating and pursuing actions in the jurisdictional locations where the
breach occurred [13]. Other risks that are attributed to physical location include whether organizations can make sure that the quality of services is really achieved when outsourcing IT services to a third party [14].

2.6. Cloud Computing for Rural Development

The use of information technology in collaboration with the internet and the addition of cloud computing is required to deliver information to the poorest people. There are many areas for discussion, such as Aadhaar (Unique Identification of People), healthcare, agriculture, and implementing cloud computing in the education system [15].

2.7. Using Cloud Computing in Higher Education

The authors of [16,17] discussed the potential and competence of using cloud computing in higher education, which has been recognized by many universities such as Washington State University’s School of Electrical Engineering and Computer Science, the University of California, and higher education institutions in the UK, Africa, U.S, and others. The advantages are highlighted in Table 1. Cloud computing offers universities the possibility to focus more on teaching and research jobs rather than complex IT configuration and software systems through fast IT implementation. Cloud solutions can be used to support cooperative learning and computer technology can be used to support cooperative methods of instruction.

| Benefits                                      | Limitations                                                                 |
|-----------------------------------------------|-----------------------------------------------------------------------------|
| An easy approach to applications without boundaries | Various applications are unable to run in the cloud                          |
| Learning and teaching supported               | Security of data and accounts management is not riskless                    |
| Some software are free whereas some are pay-per-use | Require organizational support                                              |
| Infrastructure and content are accessible 24 h a day | Spreads politics, scholarly property                                         |
| Opens the door to businesses and a cutting-edge research environment | Security and safeguarding of sensitive data are compromised               |
| Protection of the environment by using green technology | Maturity of solutions                                                     |
| Increases opportunities for students to use new technology to access with openness | Confidence deficiency                                                      |
| Functional competencies surge                | Adherence to standards                                                     |
| Usage of resources offline with advance synchronization prospects | Slow internet speeds can affect job methods                                |

North Carolina State University reached a considerable reduction in overheads by anticipating the services of the cloud with software licensing and simultaneously diminished the campus IT staff to 3 instead of 15 employees with a full working schedule. The limitations are given in Table 1.

The author of [18] discussed how institutions can develop their own cloud, the so-called “private cloud,” by making use of their existing resources. Multiple universities can come together and develop a hybrid cloud called “educational cloud” in which they can share all the available resources from various universities. The private cloud makes use of local networks whereas the educational cloud makes use of the public network to access the services provided by the cloud. Both private and educational clouds that are developed for education have to specify the services provided by them.

2.8. Risks of Cloud Computing in Education

Deploying cloud services can provide major benefits to the future of institutions; however, some computing services personnel are challenged because they may fear the consequent outsourcing of their roles. Universities and schools should consider the relevant challenges and risks prior to transferring to the cloud [19,20].

The major risks in cloud establishment for education include: Cloud Service Failure, Compliance Regulations, Data Privacy, and Assurance to the Service Provider.
2.9. Multiple Clouds

The authors of [21] concluded that to moderate the risks related to unreliable cloud services, educational organizations can select to use multiple clouds for achieving suitable fault tolerance. This system has the ability to continue operations properly even if a single failure or multiple failures occur in some of its modules.

Multiple clouds could be a number of public clouds or a couple of public and private clouds that, together, will make a single hybrid cloud [22]. Furthermore, authors have discussed that clouds for businesses are not designed under well-defined standards and, consequently, businesses deal with multiple unique interfaces, resulting in difficulties in fault tolerance [23].

3. Experimental Results

The research approach used in this work depends on the nature of the problem at hand. The problems highlighted in this study do not allow the adoption of anything other than a qualitative approach. This approach is exploratory in nature: researchers study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them.

The quantitative approach involves the collection and analysis of data that can be measured. This approach is descriptive in nature. A descriptive approach presents data in a meaningful form that helps in understanding the characteristics of a group in a given situation.

In this research, various architectures are critically examined and new architecture is introduced for the education environment, especially for women’s education.

This research is the first step to introduce the idea of cloud computing in such a way that it becomes easy to decide whether adopting it is suitable. The methodology (i) presents the results obtained in other countries, (ii) identifies their advantages and disadvantages so as to find the optimal way to implement it in the education system, and (iii) presents the best solution for women’s education in the cloud.

The demonstration of efficiency, high cost, and relief from the responsibility of managing cloud systems releases business owners from the task of managing their own configuration or purchasing expensive hardware and software.

This research shows that the acquisition of a private ERP system is expensive for the business. The impact of the cloud makes companies eligible in a race with competitors and puts them on the same page. This research shows that the cloud is the best choice when comparing the effectiveness and cost of purchasing system accessories (hardware and software) in contrast with obtaining cloud services from third parties, where one can get huge storage, licensed applications/software, and much more flexibility in private transactions, such as pay for consumption.

3.1. Developed Architecture

The architecture shown in Figure 3 focuses on controlling the budget required to acquire the facility. It provides availability in remote areas to enhance women’s literacy rates and solves the consistency problem of the cloud. Most educational organizations are unable to establish their own system for storing data, use the latest technology, or buy costly software.

The architecture is interactive from the dual side and includes the top-to-bottom and bottom-to-top approaches. It is attractive for the consumer and provider because of the capability and flexibility it retains. In the bottom-to-top approach, this architecture acts as an organization that enrolls users with different types and capabilities. Although the top-to-bottom approach delivers services to enrolled providers and consumers, these services are indexed for proper handling.

This architecture contains a number of modules that work together in a way that enhances women’s education in remote areas. The main component of the architecture is its distributed environment. The distributed cloud is centrally controlled for members in the shape of consumers, providers, and hybrids. The enrolment module distinguishes member identity and the type of membership.
enrolls users with different types and capabilities. Although the top-to-bottom approach delivers services to enrolled providers and consumers, these services are indexed for proper handling. This architecture contains a number of modules that work together in a way that enhances women's education in remote areas. The main component of the architecture is its distributed environment. The distributed cloud is centrally controlled for members in the shape of consumers, providers, and hybrids. The enrolment module distinguishes member identity and the type of membership.

The clouds are also of different types such as public clouds, personal clouds, and hybrid clouds. Each cloud is fully equipped and provides services in the environment for which it is designed. Each cloud is self-prominent in the proposed architecture.

The centrally controlled module works by indexing and locating the members, especially hybrid handling, which grants and revokes the use of services, and provides resources. Their account is detailed in both ways.

Table 2 summarizes the features that are provided by the proposed architecture to the institutions and their students.

| Institute Activities | Student Activities |
|----------------------|--------------------|
| Move from paper documents to a digital system | Access information from anywhere |
| Better contact with alumni | Improve productivity |
| Organize events easily | Save money and the environment |
| Industry-ready students | Record scenarios and play anytime |
| Improve reputation | Share experience with others |
| Record events and share these with students | Globalize information that helps to learn |
| Improve the evaluation system and database | Collaborate with peers from anywhere |

3.2. Institute Side

The following describe the introduction of the architectural features shown in Figure 3:

- Move from paper to a digital system: As we have seen in the past, in every office, educational institute, or other kinds of departments, all documents and files had to be in paper form. Then, the communication system shifted from paper to digital form. The exam system became digital along with notes and books.
- Better contact with alumni: As the system and communication system become faster and more efficient, the cloud-designed architecture, with its advanced level of application, enables the organization/institute to communicate with and contact alumni effectively, promptly, and in a timely manner.
- Organize events easily: Different events require scheduling in institutions and must be scheduled on time. Sometimes, events are organized without any preplanning. Therefore, assistance is required to easily and in a timely manner inform the members of any event in advance. The organization of the required tools, equipment, and accessories are managed to ensure availability.
Industry-ready students: The researcher noticed and faced the problem of a requirement to fulfill the experience criterion for job eligibility, which is the most prevalent problem. This is because, during their study tenure, students are far away from industries and practical work. The designed model helps to solve this problem for both students and industries so that every fresh candidate is purely ready for industry.

Improved reputation: Institutions will have state-of-the-art and advanced appliances, tools, and resources. These resources will enable them to stay in pace with the world, which will improve the reputation of institutions enormously.

Record and share events with students: Technology facilitates and enables institutions to have direct contact and synchronous communication with students. They can deliver their required recorded events to students in a timely manner and with a low budget. All students would benefit from the information/knowledge delivered in these events, even if they don’t attend physically.

Improve the evaluation system and database: The exam system, tests, quizzes, presentations, and assignments will be enhanced. Improvements in the evaluation system are some of the key benefits of the designed model. Purity and transparency highly improve the evaluation system. Regardless of how old the record is, the evaluation will be correct and unbiased.

3.3. Student Side

The following points describe the introduction of architectural features discussed from the view of students:

- Access information from anywhere: The designed model enables students to have access to their lectures, notes, resources, and tools from anywhere and when required. Needs-based access, needs-based availability, needs-based charges, and needs-based involvement are necessary goals and achievements. This model frees students from the tough schedules and rushing to not be late, and provides freedom from time constraints.

- Improve productivity: This model makes advanced resources available for the students, as mentioned in the institute side. Due to this feature of the model, there will be a significant increase in the quantity and international-market-level quality of the products.

- Save money: The developed model consists of many modules, one of which is the hybrid model. This module enables the system to act as a hybrid. Members who are providers could be consumers and vice versa. This feature of the model saves money. Students benefit from this module and save money indirectly. They have access to economical processing tools and large storage devices, which were not previously available to individuals.

- Record scenarios and play anytime: The developer can record the scenarios and working steps of their newly developed application or software for the customer and upload them to the cloud. The user can play the recorded scenarios at any time or when facing any problem during use. Students from around the world may not be aware of using advanced-level applications and tools. To address this issue, institutions can record the scenarios and ensure the availability of recorded scenarios for students.

- Share experiences with others: The designed model contains features where video/audio conferencing can take place between students also with the expert teams of the institution. This enables students to share data and experiences with their peers from around the world. All members can contact experts in the relevant field. Organizations can share their features/resources to enhance quality.

- Collaborate with peers from anywhere: Colleagues from different institutions and candidates from nonrelated fields can collaborate with each other. The central controller helps with requests between peers. The consistency problem with the database and servers is solved by collaboration and installing a central controller.
3.4. Workings of the Architecture

3.4.1. Bottom to Top

A brief overview of “bottom to top” is that, here, enrolments start from the user side. This means that members of the system will be accepted here and any optional category will be selected by the new member.

There are three types of enrolment facilities in the distributed environment of cloud computing. These are:

- Provider;
- Consumer;
- Hybrid.

Members enroll via the enrolment module to be the part of the distributed environment of the cloud accordingly. They specify their type and complete the sign-up form. The central controller compensate the form with the required cloud and given indexing number. Then, members have defined attributes of their own.

3.4.2. Top to Bottom

This is the package that is offered by the system. Every member is defined with the grants it has and the revokes are also mentioned. The grants and revokes of the members create boundaries and distinguish between them in the categories defined for them.

3.5. Distributed Environment Cloud Central Controller

The proposed architecture contains a module of a distributed environment cloud central controller, which is called the master controller of enrolled members. The controller works by indexing the members’ queries from consumers and locating services in the newly made cloud that the providers offer. The central controller distinguishes the consumers for the areas they belong to and also considers their gender priorities.

The central controller is responsible for controlling the consistency of problems and fulfilling the queries of the consumers. It is also responsible for selling the services offered by the hybrid on a priority basis.

Some clouds are well equipped for delivering resources. However, some are not fully equipped and are inefficient. To improve these clouds the central controller overcomes the limitations by using the services offered by the hybrid on a charge-per-use basis. The clouds are placed in a distributed environment so that each act dominantly. The problems of availability and consistency are efficiently overcome in such an environment.

3.6. Enrolment Module

In this module, there is an enrolment form to become a member of the system. The form contains the membership types that are offered by the system, which assigns the member to their category and guides them in indexing. After the sign-up procedure, the member is titled “new member” with the necessary information required for the central controller.

There are three categories of members that are defined in the enrolment form: the Provider, Consumer, and Hybrid. These are briefly defined below. The enrolment form authenticates the members for security based on the given information and privileges it contains in the established system, as well as the specifications of the targeted/interested areas.

Some organizations enroll as required. They are also entertained so that the universality of the system is retained. The enrolment module is directly responsive and connected to the head controller.
3.6.1. Consumer

The end-user of the cloud is named Consumer. The consumer hires the resources and services of a cloud. Whatever the cloud contains is fully available and granted to the consumer on specified charges.

The idea of the cloud is presented to facilitate the consumer. This whole system works on one mission, which is to achieve a maximum market share. The targeted market is the consumer or end-user of the cloud. The consumers of the cloud are those who cannot establish their own cloud or those who can establish their own cloud but make wise decisions when investing.

Here, one thing is well understood, which is that the consumer is the main acting player of the team and a focused player for the opposition. The system’s flexibility and efficiency attract consumers: as the number of consumers increases, the assets of the system also increase.

3.6.2. Provider

Providers provide cloud services partly or full-fledge but their primary function is to provide cloud based services. The proposed model contains a module called the Provider. This module separates the providers based on their types. In the architecture, the Provider module contains the vendors that build customers based on the services they offer. The vendor catches the consumers with cost and service efficiency. The vendor invests in improving services for the clients so that they can receive a good share of the market.

The vendor is a key player in the proposed architecture. As the market demand increases, the vendor makes arrangements to fulfill any requirements. However, the condition appears awkward in rural areas. The demands of the market are based on economic status, cultural norms, and lifestyle. This architecture involves the providers in the education system for women in underprivileged areas. The provider is the investor in areas that require significant attention, including the attention of government and social welfare organizations.

3.6.3. Hybrid

This module contains both providers and consumers, but they are limited in the acquisition and provision of services.

Insufficiency in the services forces the provider to enroll in a Hybrid module so that they are available to cooperatively provide services. This is also the case with consumers in situations where the consumers demand to partly acquire the services.

The provider and consumers are sometimes the same and form part of the system by mutual understanding. There are many types of such hybrid actors in the system. These are discussed below:

- A situation when the enrolled hybrid actor offers IaaS and demands SaaS and Platform as a Service (PaaS).
- A situation when the actor offers SaaS and PaaS but only demands IaaS.
- A state when the actor offers PaaS but demands both SaaS and IaaS.
- The next stage is when the actor offers SaaS and IaaS but demands PaaS.
- The second-to-last condition is one when the offered services are IaaS but the demands are PaaS and SaaS.
- The last condition is when PaaS and SaaS are offered but IaaS is the only demanded service.

The hybrid-enrolled members have a dual role in that they are both buyers and sellers. The ratio of selling and buying services plays a significant role in the average expenses of these members.

Different clouds are observed in this research and their attributes are valued against the designed model in Table 3. Common cloud computing for education is discussed and categorized in terms of the attributes in Table 4.
Table 3. Comparison of cloud models.

| Variables     | Available Models | Designed Model |
|---------------|------------------|----------------|
| Cost          | High             | Low            |
| Infrastructure| Yes              | No             |
| Accessibility | Yes              | Yes            |
| Compatibility | Yes              | Yes            |
| Scalability   | Limited          | Unlimited      |
| Maintenance   | Yes              | No             |

Table 4. Common cloud computing attributes for education.

| Attributes                              | Common Clouds                  | Proposed Cloud for Education |
|-----------------------------------------|--------------------------------|------------------------------|
| Hardware costs                          | The high cost of maintenance   | Low cost of maintenance      |
| Storage capacity                        | Fixed capacity                 | Dynamic capacity             |
| Requires specialized knowledge          | Using the system technician    | User friendly                |
| Implementation period                   | Very long but fixed            | Continuous                   |
| Processing power                        | Initial and fixed              | In terms of demand           |
| Security, Trust, and Related Issues     | Internal maintenance more      | External maintenance reduces security and trust. External security protocols. |
|                                         | security and trust             |                              |
| Overall costs                           | The initial investment, pay-per-use | Pay-per-use and receive-per-use |

4. Discussion

4.1. Survey from Educational Institutions

A questionnaire-based survey was conducted in three universities: Air University, Bahria University, and Preston University. In the survey, there were direct and indirect questions, and after the survey was conducted, survey graphs were created based on the participants’ responses. The questionnaire contained 40 questions consisting of four options for each question. Participants had to select only one option according to their opinion. The data were categorized into four groups. Each group is described in detail in this section.

4.1.1. Group I Based on Questions 1–6

In a group-wise survey, we made four groups/sections. The first section contained six questions. These questions were about education and especially women’s education ratio. The survey responses from the participants are shown in Table 5. A critical analysis of user responses shows cumulatively that the poor ratio of education, and especially a low higher education ratio, for women is a problem. This problem reduces production, exports, and the quality of products. Uneducated women may be considered a burden on economies of any nation.

Table 5. Group I based on Questions 1–6.

| Q. No. | Excellent | Good | Average | Poor |
|--------|-----------|------|---------|------|
| 1      | 5         | 7    | 6       | 32   |
| 2      | 1         | 6    | 4       | 39   |
| 3      | 1         | 9    | 38      | 2    |
| 4      | 3         | 15   | 7       | 25   |
| 5      | 0         | 12   | 36      | 2    |
| 6      | 2         | 11   | 31      | 6    |
| Total  | 12        | 60   | 122     | 106  |
| Percentage | 4% | 20% | 40.66% | 35.33% |
4.1.2. Group II Based on Questions 7–15

This section of the comparison is based on nine questions. Respondents’ feedback is presented in Table 6, which contains the attributes “excellent,” “good,” “average,” and “poor.” The questions were serially selected from the perspective of the type of questions and indirect data that were gathered against them.

| Q. No. | Excellent | Good | Average | Poor |
|--------|-----------|------|---------|------|
| 7      | 5         | 12   | 25      | 8    |
| 8      | 5         | 5    | 5       | 35   |
| 9      | 3         | 4    | 38      | 5    |
| 10     | 1         | 11   | 13      | 25   |
| 11     | 3         | 3    | 40      | 4    |
| 12     | 3         | 7    | 32      | 8    |
| 13     | 2         | 17   | 17      | 14   |
| 14     | 11        | 7    | 15      | 17   |
| 15     | 5         | 32   | 8       | 5    |
| Total  | 38        | 98   | 193     | 121  |
| Percentage | 8.11% | 21.77% | 42.88% | 26.88% |

This table contains data belonging to the individual table’s data for each question. From each singular table, the attributes considered were “good,” “excellent,” “average,” and “poor.” For each instance, data were entered randomly based on the participants’ feedback. After updating the new table for each instance, the results were summed up and converted into percentages. A new comparison graph was drawn from the comparison table and the data were selected in percentages.

Statistics show that most participants selected the “average” and “poor” options. This means that the existing environment for women’s education is not optimized and the concept of cloud computing was not available at the time of designing the old system. From the survey, it is also concluded that cloud computing is in its infancy and unknown to the education sector.

The graph in Figure 4 shows that women’s education requires a cloud-based environment to enhance the quality of education and guarantee education as a basic need for all women. Poor existing distance learning methods, less than 46% of e-learning options and a total education ratio of less than 45%, require substantial researcher involvement. The survey also revealed a low number of experts for the cloud system and the absence of a platform that works for women’s higher education. The platform should rely on cloud architecture to provide women with higher education at their doorstep. In addition, the survey showed that lack of maintenance deteriorates efficiency of existing environment.

4.1.3. Group III Based on Questions 16–24

Group III of the survey made by the researcher contains nine questions. In this section, Questions 16 to 24 were taken and each question was separately analyzed. Then, the graph was scanned for statistics. Each individually designed graph of the individual tables contained direct feedback from the participants. Based on these graphs, the data were entered into a new graph table in percentage form. These separate graph data were taken directly from the field.

Table 7 contains the data of 10 graphs. These graphs were analyzed for different variables. The security system for women’s education in the existing environment was found lacking shorting protocols and security precaution tools. The responses of the participants were found to be positive for the contents available in the proposed architecture. The maximum number of respondents responded that the proposed architecture will efficiently ensure the availability of content for women’s education.
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Table 7 contains the data of 10 graphs. These graphs were analyzed for different variables. The security system for women's education in the existing environment was found lacking shorting protocols and security precaution tools. The responses of the participants were found to be positive for the contents available in the proposed architecture. The maximum number of respondents responded that the proposed architecture will efficiently ensure the availability of content for women's education.

Table 7. Group III based on Questions 16–24.

| Q. No. | Excellent | Good | Average | Poor |
|--------|-----------|------|---------|------|
| 16     | 15        | 26   | 6       | 3    |
| 17     | 10        | 29   | 7       | 4    |
| 18     | 10        | 20   | 14      | 6    |
| 19     | 16        | 22   | 4       | 8    |
| 20     | 25        | 9    | 8       | 8    |
| 21     | 6         | 34   | 8       | 2    |
| 22     | 7         | 28   | 8       | 7    |
| 23     | 10        | 34   | 2       | 4    |
| 24     | 32        | 8    | 8       | 2    |
| Total  | 131       | 210  | 65      | 44   |
| Percentage | 29.11% | 46.66% | 14.44% | 9.777% |

Feedback shows that resource planning in the existing architecture was found improper and good in the proposed architecture. The transparency of the proposed architecture satisfied the candidates and the budget was declared impossible for individuals to arrange. It is difficult for an individual to ensure the availability of up-to-date tools and advanced technology in the cloud. This budget problem has been solved in the proposed architecture. The newly designed architecture provides economically advanced tools. The graph shows that the proposed architecture enriched the cloud as compared to the existing clouds shown in Figure 5.

The researcher analyzed the statistics of the new graph and found that 46.66% of the participants after comparison selected “good,” 29.11% selected “excellent,” and 14.44% selected “average.”

4.1.4. Group IV Based on Questions 25–40

The comparison in Table 8 contains data from Questions 25 to 40 and the feedback of the participants was selected accordingly. A comparison was made based on these 16 different types of indirect and direct results collected during the survey and the results were presented as a single graph. In this section, participants’ views on the proposed architecture are considered.
Participants provided feedback on different aspects of the proposed cloud architecture, such as whether the architecture is user-friendly or not. Most of the candidates were satisfied; 95% of candidates declared “yes, absolutely” regarding whether the new environment is easy to use and actions can be easily performed. This architecture is designed so that it provides financial services and can be built on a low budget. Its hybrid features increase users’ and providers’ interest to enroll in the system. This ensures the availability of content in a transparent, timely, and accessible manner for each student.

The feature of authentication-based enrolment enhances the system’s security and resource planning services in the proposed architecture are excellent according to the responses of the survey. Of the candidates, 90% strongly agree that this architecture enhances the quality of women’s education. The provision of data to students should be abruptly and promptly performed. The candidates stated that the consistency problem is settled up to 84% better than the current system. The members controlling and organizing the system are the best; if any maintenance is required in the system, the friendly environment helps in maintaining it easily. The survey results
support these variables. Uploading and downloading data and learning materials from all sides is very simple. The features of mutual understanding and central control encourage candidates to vote for the proposed architecture and “strongly agree.” Therefore, this environment is highly recommended for women’s education.

The results are shown in Figure 6. It can be concluded that the majority of candidates recommend the new proposed architecture of the cloud and ERP for women’s education.

4.1.5. Overall Survey Results

All four categorical tables are merged and shown in Table 9, which contains conclusive data of the percentages from all the four tables. Based on this, a new graph emerged, which is shown in Figure 7. This graph shows the conclusions of the conducted survey. The statistics represent the number of each group as a percentage. Series 1 of the graph in Figure 7 displays the results of Group I, which contains data from a survey conducted on the education ratio and a higher women’s education ratio. In this survey, 40.66% of the participants selected the “average” option and 35.33% selected the “poor” option. Based on these statistics, the researcher concluded that the proposed architecture needs to be implemented into the education system, which is a requirement of the current era.

Graph Series 2 represents the data of Group II, which contains data taken from a group-wise display of the conducted survey where the researcher’s objective was to gather statistics on e-learning and the distance learning status of women’s higher education. Based on the statistics, where 42.88% of candidates selected “average” and 26.88% of candidates selected “poor,” the researcher concluded that they have an optimized and better-equipped distance and e-learning education system. Therefore, it is obligatory to shift toward cloud-based systems for women’s higher education.

Table 9. Summarized table of all four categorical tables.

| Categories | Excellent | Good | Average | Poor  |
|------------|-----------|------|---------|-------|
| Group I    | 4%        | 20%  | 40.66%  | 35.33%|
| Group II   | 8.11%     | 21.77%| 42.88%  | 26.88%|
| Group III  | 29.11%    | 46.66%| 14.44%  | 9.77% |
| Group IV   | 43.50%    | 33.50%| 14.38%  | 8.63% |
"excellent" was selected and the frequency of the best for each group was calculated, after which a percentage was calculated. Based on the resultant percentages, new statistics arise. The cumulative statistics show 26.45% selected "excellent," 31.8% selected "good," 24.75% selected "average," and 17% selected "poor." After indirectly evaluating and analyzing these statistics, the researcher concluded that the existing clouds do not meet the requirements of women's higher education.

Series 4 represents Group IV of the combined survey analyzed. The graph given in Figure 7 presents the opinions from 16 questions. This category was developed to get suggestions on the proposed architecture. The participants were frequently asked direct and indirect questions in this category about the efficiency of the proposed architecture, evaluating attributes such as transparency, security, availability, budget problems, consistency, behavior, and control. According to the recorded statistics, 43.0% of candidates fully recommended the proposed architecture and responded with "excellent." A further 33.50% responded with "good" and only 8.33% were dissatisfied. The researcher concluded that the majority of the participants were satisfied, with more than 90% of the participants recommending the establishment of the proposed architecture to solve women's higher education problems.

Table 10 is based on additional results from the group-based categories of the conductive survey. Data were scanned from the categorical comparison table and summarized, after which conclusive entities were updated in the table. Each attribute was summarized. For example, the respond "excellent" was selected and the frequency of the best for each group was calculated, after which a percentage was calculated. Based on the resultant percentages, new statistics arise. The cumulative statistics show 26.45% selected "excellent," 31.8% selected "good," 24.75% selected "average," and 17% selected "poor."

| Categories | Excellent | Good | Average | Poor |
|------------|-----------|------|---------|------|
| Group I    | 12        | 60   | 122     | 106  |
| Group II   | 38        | 98   | 193     | 121  |
| Group III  | 131       | 210  | 65      | 44   |
| Group IV   | 348       | 268  | 115     | 69   |
| Total      | 529       | 636  | 495     | 340  |
| Percentage | 26.45%    | 31.8%| 24.75%  | 17%  |

Table 10. Summarized table based on the categorical comparison table.
The data in Table 10 represent some pieces of information. Of the data, 529 are the total opinions of the participants who selected “excellent,” out of which 348 voted for Group IV, which represents the proposed architecture. This means that 65.7% of the “excellent” option belongs to the fourth category and 34.3% belongs to the remaining three groups.

The number of selections recorded for “good” in the overall survey is 636, of which 268 selections were received from the feedback of Group IV, and 42.1% of votes were recorded for the “good” group (Group IV). This analysis confirms the recommendations for the proposed architecture in view of the conducted survey.

5. Conclusions

Information technology plays a vital role in the education system. In developed countries, discrimination and ignorance exist between communities and societies. Turning the discussion to developing countries, it is clear that there is discrimination against people living in remote areas. In this research, the focus was to highlight and suggest improvements for these disadvantaged areas. Particular attention was paid to women’s education and remote areas.

The limitations in the existing system are not suitable for remote areas. The researcher proposed a cloud architecture to solve the problems faced by women in remote areas to increase their level of education. There is a need for equality between communities around the world. Improvements are required to bring about equality, and this architecture is conducive to equality.

There are numerous areas that are enhanced such as the availability of services, consistency and cost-efficiency of services in remote areas, etc. The distribution of cloud environments and their dominance in each sector has totally changed the environment. Such an environment is unbiased due to its central control and distribution of dominant clouds.

The proposed architecture contributes to and supports women’s education in disadvantaged areas. There are many educational institutions in which it is difficult to access modern world technology, educational tools, and accessories. This architecture helps to manage all this expensive equipment to the level of the international education system. The hybrid module plays a significant role in making the education system efficient. This architecture will bring efficiency to the education system in terms of cost, availability, and consistency.

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