# Cloud-Based Outsourcing Framework for Efficient IT Project Management Practices

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***Abstract*—The optimum utilization of human resources is one of the crucial exercises in IT organizations. To provide a well-organized and cohesive working environment, organizations need to review their work culture in reference to newly evolved tools and techniques. To reduce the development cost of the IT projects and the optimum utilization of human resources, organizations need to review and redesign the project development processes. The significant challenges faced by IT organizations are the rapid switch-over (attrition) of IT professionals, physical migration or deployment, and redeployment of the human resources. This research paper is an effort towards the multilateral exploration of the techniques to adapt and improve the ICT enabled project management practices in an outsourced environment. This research is an effort with special reference to developing countries such as Ethiopia, where an acute shortage of high skilled IT human resources and their physical migration from one project location to another project location is a costly and challenging task. Ethiopia as a developing country and its IT industry is challenged by several issues like the capacity of ICT infrastructure and the skilled human resources. In such situations, IT projects are either challenged, impaired, or completed failed due to lack of IT human resources with desired skills and ultramodern up to date IT infrastructure. In this research paper, cloud computing technology is assumed as a key to the solution. For this, a systematic and careful investigation using mixed data analysis approach was used to adopt cloud-based outsourcing in IT project management practices i.e. design, development, and testing over outsourced systems by outsourced IT human resources. The major findings of this paper are to investigate and analyze how these cloud-based resources can be explored without physical movement or migration. For the novel improvement in the existing IT project management practices, the salient stakeholders' views were collected and analyzed for designing cloud-based outsourcing IT project management framework for the Ethiopian IT industry. The framework was functionally tested over the cloud-based Bitrix24 platform.**

***Keywords*—Outsourcing; project management; cloud; IT industry; framework**

## I. INTRODUCTION

Cloud computing is established as one of the computing technology which can provide the IT resources as and when needed and supports the real-time availability, scalability, and reliability using pay per use model. It is a model that enables convenient, and on-demand access to the IT resources over a wide area network. These resources are auto-configurable pooled computing resources such as networks, servers, storage, applications, and services that can be rapidly provisioned and released with minimal management efforts or interaction with the service providers. It involves shifting the costs from capital expenditures (i.e. buying and installing servers, storage, networking, and related infrastructure) to an operating expense model, where one can pay for the usage of these resources. As a general standard a project can be defined as a temporary endeavor designed to produce a unique product, service or result with a defined beginning and end undertaken to meet unique goals and objectives, typically to bring about beneficial change or added value. The temporary nature of the projects stands in contrast with repetitive, permanent, or semi-permanent functional activities to produce products or services. In the context of computing or IT, project management is the application of expertise skills, IT infrastructure tools, and advanced techniques to a set of interconnected activities to meet the requirements of the IT projects [1] [2]. In general, the main goal of any project management effort is to manage the resources assimilated in such a way that the project is completed on time, within budgeted cost, and according to the desired functionalities or scope with promised quality expectations of the sponsor.

IT Projects have a terrible track record of their success and failure in the past couple of decades [3]. The1995 Standish Group study (CHAOS) found that only 16.2% of projects were successful in meeting only scope, time, and cost goals, and over 31% of projects were canceled before completion [4]. A Price water house coopers study revealed that half of all the projects were failed and the success was only 2.5% where they met their targets for scope, time, and cost goals.

The IT industry of Ethiopia has been facing several challenges such as acute shortage of skilled human resources with the latest technology skill sets, modernized ICT infrastructure, platforms, tools, and techniques [5] [6].

How to ensure the optimum utilization of IT resources via emerging Medias such as the cloud is only an assumption? IT industry organizations of the developing countries are still lagging behind in sharing, deploying, and redeploying the IT human resources without physical migration from one physical location to another. The principal question in the mind is; how to explore and ensure the optimum utilization of IT human resources and infrastructure through a cloud based outsourcing techniques in project design, development, test, and management? How to investigate and explore the possibility of the cost reduction, time optimization, skills or expertise outsourcing, flexible outsource partner selection with frequent

provisioning and re-provisioning towards enhancement of the quality and the success of the projects? Ethiopia is a developing country located in the horn of Africa where most of the IT industries are focusing only on localized business and related IT projects and partners. These projects have salient limitations like quality, timeliness, scalability, robustness, flexibility, and high security of the project code and solutions with current practices of IT project management. Based on the thorough observation and preliminary study, the following research questions are set for the aforementioned problems:

- What are the basic issues and challenges that often make IT projects fail in the IT industry of Ethiopia?
- Which emerging tools and technologies can be explored to ensure the success of IT project management in the Ethiopian IT industry?
- Which Cloud-enabled IT project management outsourcing practices the framework can be a key instrumental to alleviate such issues and challenges?

To answer the aforementioned questions and design a solution framework; this research paper proposed to investigate and analyze the issues and challenges that lead to fail the IT projects before completion and design a cloud-enabled IT project management outsourcing practices framework for Ethiopian IT industries.

The following specific objectives of the study were also formulated with intermediate activities to achieve the goal of the research.

*1)* To investigate and analyze the issues and challenges affecting the success of the IT Projects in the IT industry of Ethiopia.

*2)* To identify, and explore the possible applications of cloud-enabled outsourced IT project management tools and technologies for improving success and the productivity of the IT projects.

*3)* To design and develop a contextualized Framework for Outsourcing in IT project management over cloud platforms.

*4)* To evaluate the Performance and Productivity of the Framework towards optimum utilization of IT resources in outsourced environments.

### *A. Scope of the Research Study*

The main boundary of this study was to delimit the discovery of cloud-enabled tools, techniques, and their applications in outsourcing practices of IT projects in Ethiopian IT industry. The final contribution proposed was to design, develop, and demonstrate a framework for the IT project management related outsourcing practices overcloud. The major management practices considered were resource allocation and re-allocation, monitoring, control, deployment, re-deployment, follow-up meeting, instant reminders, rewards, computing, communication, collaboration, and ensuring the optimum utilization of resources over cloud-enabled platforms. The study covers only Ethiopian IT industries and IT-related projects.

### *B. Significance of the Study*

The proposed research is significantly important for effective resource utilization, success rate enhancement, quality improvement, and cost reduction for the IT industry of Ethiopia. It explores the possible usage of cloud-enabled tools and techniques in computing, communication, and collaboration practices and opportunities worldwide for IT professionals. The IT professionals can share their knowledge, intelligence, and skills in the worldwide collaborative environment even without physical migration. The proposed cloud-enabled framework will be an essential instrumental to facilitate the outsourcing of almost everything in an inter or intra-organizational environment.

The main contribution of this research paper is the cloud-enabled framework which tried to advance the alleviation mechanism of the issues and challenges in traditional IT project management practices. The prototype developed, demonstrated, and evaluated with selected features evidently justified the improvements in cloud-enabled IT Project Management practices. The prototype demo and the user acceptance clearly validated the new knowledge contribution of cloud-based outsourcing of IT Project Management. Practices. Thus the framework promises to improve the salient features of project activities such as computing, communication, collaboration, monitoring, and control of human resources in anytime, anywhere over any-device with cost-effectiveness, reliability, scalability, optimum utilization, and all-time availability. The framework devised a new idea to establish a new pattern for IT Project managers where they can be on-site away from the site or in their offices away from the offices.

The paper is framed based on a scientific sequence of steps and pedagogy. The introduction of this research paper covers the basic background of the research domain, problem statement, research gap, research questions, objective, and contributions. In the review of the literature part, the selected concepts related to the problem domain are covered with some background reports of the world agencies such as the World Bank. The review of literature critically reviewed the selected papers to find out the research gaps, and to justify the research initiative with worth solving claim. In the research methodology part, basic ideas about research design type, research tools, and research method selection criteria are explained with parametric suitability assessment and analysis. In the data collection section the sample size, sampling technique, and the types of primary data collection methods and tools are explained. After the collection of data using three methods i.e. survey, interview, and technical observation, the framework is designed and explained with detailed functionality of each component. To demonstrate and validate the framework, a prototype is designed using the cloud-based Bitrix24 platform. The designed prototype is demonstrated before salient stakeholders and users to collect user acceptance and explained in detail using tables and charts. Finally, the summary of the research findings and contributions are covered in the conclusion part and the recommendation are also forwarded in the last section for future research directions.

## II. Review of Literature

The rigorous review of literature was done to understand the gaps in the existing state of art researches towards addressing the issues and challenges in IT project management practices in general and developing countries such as Ethiopia as a specific case. The main focus of the review of literature was to understand and analyze the existing issues and challenges in the IT Project management practices in IT industry of the world vs. Ethiopia. The paper for the rigorous review were selected from the peer review journals, conference proceedings, and research project reports.

A study of Stephen Cacciola and Robert Gibbons [7] was conducted to investigate the outsourcing IT to improve the organizational performance. This study is an exploratory research which reveals how the cloud systems facilitate the services and improve the productivity that was envisioned but often not realized by organizations implementing old computing models, and allow for further productivity improvements in organizations that have benefited from previous technologies. In this research, the main focus was on the performance improvements parameters without any consideration of the project management practices in detail, specifically an exploration of offshoring or outsourcing in developing countries.

Research of Muhammad Younas Imran Ghani et al. [8] contributed the major benefits due to the amalgamation of agile software development methodology and cloud computing. This research tried to explore the efficient facilitation of global agile software development in the cloud environment. The researchers tried to explore the infrastructure features required for agile development in a distributed environment. This research is relevant to the proposed dimension of our research paper but the tools, methodologies, approach, and analysis didn't outline anything in the outsourcing of the agile development approach during project execution and management practices in IT industries or organizations.

Another important study of Mihret Abeselom Teklemariam and Ernest Mnkandla [9] was done for Software project risk management practice in Ethiopia. The major findings of this research study were focused on identifying uncertainties by project managers on risk management processes that whether they are carried out in the project implementation or not. This articulates a gap in the ability of project managers to adequately manage project activities. This research describes the insignificant relationship between risk management practices and project success. It suggests the presence of other factors that can play significant roles in the success or failure of projects but they are not definitely outsourcing related parameters. The proposed study tries to investigate the factors affecting the success of IT projects during the development phase. The study does not cover issues such as how outsourcing via the cloud can support in minimizing the failure possibilities in general and developing countries like Ethiopia as a special case where capacities of skilled human resources and ultramodern ICT infrastructure are typically challenged.

Research by Faith Shimba [10] was confined to investigate the successful adoption of cloud computing as a key to the realization of benefits promised by cloud computing technologies. As organizations need the high processing capabilities, large storage capacity, IT resource scalability, and high availability, at the lowest possible cost. In this context, cloud computing becomes an attractive alternative media. The study explains that how an emphasis on collaboration between clients and vendors is essential for the successful adoption of cloud computing. This research is relevant to the proposed research because one of the dimensions of the proposed study is to adopt cloud computing in IT project management for outsourcing activities. This study motivates how outsourcing practices can be migrated over the cloud in the next generation of IT project management practices.

Jianfeng Wang, and Xiaofeng Chen [11] conducted a survey on Efficient and Secure Storage for Outsourced Data. This research study is the best benchmark for the proposed research. The study explored the support by providing the concept of outsourced efficient and secure infrastructure for the storage. This research focuses only on the efficient and effective use of cloud-based storage.

Gyöngyvér Husztáné Acsai [12] reveals the new knowledge about the qualitative inquiry of the project management of the Virtual Teams. This research study is focused on the advantages and challenges in the project management of virtual teams compared to the academic cyclorama. The study revealed four new advantages. The two challenges not yet identified and studied in the project management of virtual teams. Furthermore, a research gap at the cross-section of virtual project management and cloud computing is investigated studied in this study. The results of this study indicate that cloud computing tools are indispensable for virtual collaboration and benefits have been gained due to the adoption and usage of cloud computing tools in virtual project management. This research paper recommended that the future work of virtual project management and its connection with cloud computing can offer several choices for further research areas and our proposed study is focusing on that. The researcher recommended that widening this research, a case study about the perceived effects of a new, cloud-based project management software in virtual teams can give better outputs. And this is what our proposed study contributed a new idea for next-generation services towards better support from the global community of experts and services providers in the true globalization of the IT industrial revolution. The researcher focused only on qualitative analysis of advantages and challenges but didn't develop or propose a solution as a new knowledge contribution.

A paper of Sunil Patil and Y.S. Patil [13] conducted a review on outsourcing with a special reference to telecom operations. This paper was focused on outsourcing IT management and explores relevance to telecom operations. In the case of telecom operators, it is observed that the basic set of parameters influencing the decision of outsourcing is the same as the rest of the industry. It is observed that telecom operators have extended this model by outsourcing the management of network infrastructure, management of towers, billing systems, marketing, etc. This is creating new working models and relationships. This research is an effort that provides a direction for outsourcing concepts with a new dimensional thrust towards the exploration of the possibilities to share different

infrastructure now and then. And also helps with the trend in outsourcing is multi-sourcing, collaborative innovation needs to happen where all the vendors work together, innovate together with the client team and implement innovations. Innovations can be in different domains such as technology, processes, products and services, and forward-looking areas. This study didn't address the challenges faced by IT Project Management leaders during the development phases like scope creep, technology creeps, and scalability issues both in terms of infrastructure and human resources in the developing country industries.

Another research of Muhic et al. [14] reviewed was related to the next generation outsourcing overcloud. This case study exposed new knowledge that cloud sourcing reduces cost and complexity in the advantage of increased labor productivity. This study reveals some motivational benefits such as cost, complexity, and increase in productivity of human resources.

Stephan Schneider and Ali Sunyae [15] conducted research and discussed the determinant factors that are inherent to the particular sourcing option such as the risk of losing access to data and the benefits of increased scalability. Researchers have investigated a rich array of technical characteristics as determinant factors of IT Sourcing decisions, predominantly concerning the risks or benefits of the desired sourcing option. This study is an important review but focuses on contribution to the practice, as the determinant factors of cloud-sourcing decisions. This serves as a basis for practitioner -oriented guidelines and best practices regarding how to select and offer cloud services rather than discussing the management of the outsourcing service over the cloud environment.

A research study [16] discusses the Open Clouds for Research Environments consortium by putting in place an easy adoption route. It was estimated that numerous European research and education institutes will be able to directly consume these offerings via the European Open Science Cloud service catalog, through ready-to-use agreements. This research provides a new dimension of open source cloud usage. Other researches tried to encourage trust, security and transparency using different techniques such as MLP neural network and particle swarm optimization algorithm to detect intrusion and attacks. Such research is the efforts towards strengthening the security tire of the computing systems when we talk about the project management over virtualized cloud platforms [17] [18] [19] [20].

The rigorous analysis of several research studies focused and relevant to the proposed research, it was clearly identified and observed that "designing a framework for outsourced IT project management practices over the cloud" can be a new and innovative idea for new knowledge contribution to the domain.

## III. Research Design and Methodology

### A. Research Design

The proposed research study is the mixed version of constructive and applied research design. The research paper used a mixed research approach i.e. qualitative & quantitative both for data collection and analysis. The detailed data collection methods and tools are illustrated in Fig. 1.

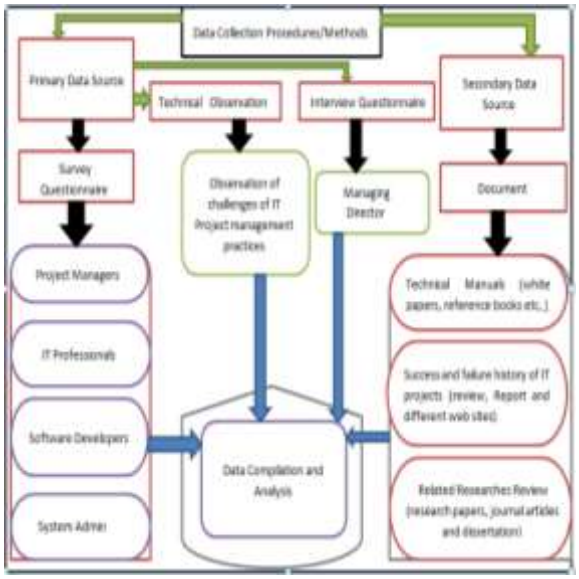


Fig. 1. Data Collection Procedures.

### B. Data Sampling Strategy

The sample size for this research was seventy (70) and determined based on the mixed version of the online sampling tool i.e. Rao soft and the purposive sampling technique. The sample size was selected based on certain criteria set and the conditions. The open-ended Interview and Online Questionnaire-based Survey were considered for the detailed factual findings. Since the research study focuses on the scientific inputs from numerous stakeholders and observations of the researchers and therefore applied and constructive design strategy was followed. This strategy implied that the sample size seventy (70) is sufficiently representative for generalization of the results in the domain-specific user community.

### C. Survey Questionnaire

The survey research questionaries' were prepared and distributed to the numerous stakeholders such as project manager, IT professionals, software developer, system admin, and the end-users of the project management. This process was done for collecting the real facts about issues and challenges in existing IT Project Management practices in the IT industry/software companies. The responses of the respondents were collected by the researcher in a single folder. The collected data were processed using the Google data analysis tool for revealing the hidden insights.

### D. Technical Interview

An Open-ended Interview questionnaire was designed for professionals/expert stakeholders. An open-ended interview questionnaire for IT Industry Professionals was distributed via a cloud-based Google Form to collect the detailed professional inputs from the professionals. Therefore, this interview questionnaire was considered to collect the general and managerial facts in detail for cross-validation of the input facts about the project management practices. In this process, the features and benefits of the cloud-enabled outsourced IT project management practices were compared with classical/traditional management practice and the research questions were framed accordingly.

### E. Technical Observation

In this section' a detailed technical observation was done by the researchers themselves. The technical observation was based on a checklist to collect and cross-validate the primary facts collected via survey and interview about the issues, challenges, features, performance, and other attributes of the existing state of art practices in the IT Project Management domain.

### F. Selection of Research Demo and Validation Tools

Cloud technologies have salient platforms/tools available in the IT market for computing, communication, and collaboration. As presented in Fig. 2, this research paper selected the tools based on the suitability assessment. These tools were used for framework designing, prototype development, and the functional demonstration of the research outcomes of the outsourced IT project management practice framework over the cloud. The outcomes of the research i.e. Framework was validated using two-fold methods i.e. 1) Functional demonstration, and 2) user/professional acceptance with the selected parameters as presented in the chart.

*1) The Bitrix24:* Bitrix24 is a free cloud service technology platform that provides over 30 handy tools, including online file storage and sharing, document management, real-time communications, and human resources management system. The best of all Bitrix24 is available as a self-hosted software platform for on-premise deployment that comes with API and open-source code. This can migrate from cloud to the user's server any time the user wants. Bitrix24 comes with free online workflow automation and business process management tools that can shoot the productivity of the users through the roof while eliminating the need to perform routine tasks manually. The system is industry independent and can be used to establish, standardize, and monitor processes and workflows in any IT department of the industry. After the overall suitability assessment, the Bitrix24 was found to be the most suitable tool and platform for the functional demo of the prototype of the outsourced IT Project Management Framework over the cloud.

*2) The Only-office:* The interface of the only office is divided into several modules: Documents, CRM, Projects, Mail, Community, Calendar, and Talk. The mail module combines a mail server for creating own-domain mailboxes and a mail aggregator for centralized management of multiple mailboxes. The calendar module allows planning and monitoring of personal and corporate events, task deadlines in Projects and CRM, sending and receiving invitations to events. A calendar can be integrated with the third-party calendars that support it. The community module offers corporate social network features: polls, corporate blogs and forums, news, orders, announcements, and messenger. According to this study, it is one of the supporting tools for project management practice over the cloud but it has limited features related to bitrix24. Because of this, the researcher preferred to use the bitrix24 for some demonstrations of the project management activities.

**Selection of the Research Tools and Technologies**

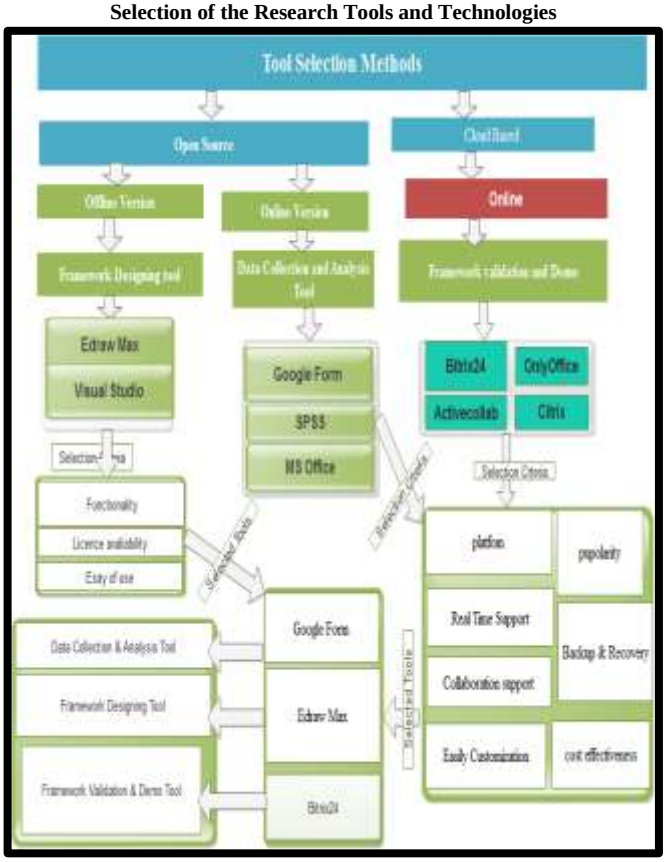


Fig. 2. Tool Selection Procedures.

Finally, parameter based suitability assessment of the different tools and technologies, the following tools and methods were selected for the different activities carried out in this research:

- Data Collection Methods: Survey Questionnaire, Interview Questionnaire, and Technical Observation.
- Data collection & Analysis: Google Form (GF) & SPSS but the research preferred to use the GF.
- Framework designing: Edraw Max Platform.
- Framework Demo & Validation: Bitrix24 Platform.

## IV. Data Analysis and the Discussion of Results

### A. Primary Data Collection and Analysis

In this phase, responses were collected using a structured questionnaire for survey and interview from the domain-specific professionals and the stakeholders (i.e. Project manager, IT professionals, Network Admin, Software developers, and related professional knowledge holders). The collected facts were then analyzed and summarized for investigating the issues and challenges in the current status and the practices in the existing state of the art of IT project management. It was critically analyzed in comparison with outsourced IT project management over the cloud.

Most of the developing countries like Ethiopia and its organizations having a lack of IT professionals were critically reviewed and analyzed for the existing state of art practices. The organizations status were also analyzed for managing the services effectively and efficiently to encourage the intervention or the adoption of cloud computing in the IT industry, and software development. Also, human resource, time, and cost management towards the betterment of the business process, project control and effective communication were considered in the fact-finding and analysis process.

One of the anomalous issues observed during the fact-finding phase was the usage of emerging technologies for the computing and management of the resources. Also, it was observed that the cost management, and schedule management with follow up of the activities within the prescribed timeframe were found to be delayed and the projects were failed. The study used a purposive sampling technique for the survey, interview, and technical observation. The sample size selected was 70, for the survey and 6 for the professional's interview. The researcher also conducted a self-technical observation using a checklist. From the target sample of seventy, only forty respondents participated in the fact-finding phase and forwarded their responses. The fact findings data analysis were as follows.

*1)* What is the status of cloud technology adoption in Ethiopia?

The prime aim of this research was to investigate the current status of IT project management practices in the IT industry of Ethiopia. It was aimed to investigate and analyze the cost-effectiveness of IT projects, issues, and challenges in terms of time, quality, resource capacity, remote computing, communication, ease of anytime collaboration, discussion, agility, setting priorities, smartness in IT project management practices.

Also, it was envisioned to know how to adapt the newly evolved technologies like a cloud in project management practices to improve the above-mentioned features and create a new environment of outsourcing practices so as to alleviate the acute shortage of high skilled human resources in developing countries such as Ethiopia.

The responses of the respondents revealed that the adoption or intervention of such kinds of cloud-enabled IT Project Management practices is very low in the Ethiopian IT industry. As presented in Fig. 8, the 62.5% of responses indicate that the project management practices in the Ethiopian IT industry is still very low. As presented in Fig. 3, the 37.5% responses indicated that the cloud adoption or intervention in the IT industry project management practices is very low. The same facts were validated during the interview of the technical/managerial experts in the selected IT organizations and technical observation of the researcher. Maximum IT project managers accepted that they still not explored the possible usage of cloud-based project management practices. During the technical observation, it was verified that the managers are equipped with only managerial skills i.e. they are lagging behind in technology adoption tactics for becoming a techno-savvy professional. It was revealed that they still use traditional IT project management practices. These two analytical facts indicate that there is either an acute shortage or lack of access to the cloud-based IT project management practices in Ethiopian IT organizations or IT project managers are not aware of such technologies. They need awareness of the smart adoption of the newly evolved technologies like a cloud for facilitating the exchange of information/data, advanced management, and real-time communication in IT project management activities.

Also, it was observed that the adoption of cloud-enabled IT project management practices can minimize the cost of the project, minimize the time of development, and improve the quality of the project outcomes. The analysis of the responses discovered that cloud-enabled technology if properly adopted and practiced; can improve the probability of the project success and mitigate the higher possibility of the project failures before completion in the IT industry of Ethiopia.

*2)* What types of remedial action/strategy have you adopted to overcome such challenges?

Currently IT-related technologies have created salient types of emerging management practices such as how to control and communicate in remote environments and information distribution within a short period of time in IT companies/ industries.

As presented in Fig. 4, maximum i.e. 55.6% of respondents indicated that they are looking for an alternative mechanism or technology to resolve such aforementioned issues and challenges to optimizing the possibility of success and to minimize the failure rates. The 22.2% respondents responses indicated that projects are challenged or over-budgeted because of traditional project management practices, and only 11.1% revealed a critical question on success and responded that IT projects were canceled before completion and the reasons were unknown. The rest of the 11.1% responses indicated that they refuse to take projects because of the shortage of skilled human resource on the latest technologies and the unavailability of the infrastructure capacities in Ethiopia. As a matter of fact, IT project management requires focused and deep-rooted technical skills and knowledge in the areas of specializations.

This implies that; the Ethiopian IT industry needs a wide range adoption of cloud supported IT project management practices that are not yet adopted in Ethiopia. It can definitely help in alleviating such issues and challenges which are the main and root causes of the high rates of project failure or project rejection. This will make the IT project management practices more effective and efficient.

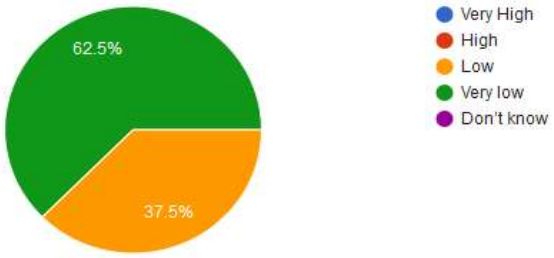


Fig. 3. Status of the cloud-based Technology Adoption in the Ethiopian Organization.

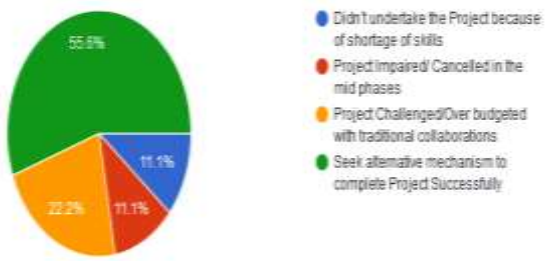


Fig. 4. What Types of Remedial Action/Strategy have you Adopted to Overcome Such Challenges?

*3)* Which technology from the following will be secured, robust, and most suitable for IT Project management?

Features such as suitability, robustness, and other managerial issues are very important to be assessed for the adoption of cloud in IT project management practices. As presented in Fig. 5 the maximum i.e. 66.7% responses of the respondents revealed that cloud-based outsourcing is better and suitably robust for improved IT project management activities. This indicates that the cloud can be one of the most suitable platforms for the assurance of a high success rate and to minimize failure possibilities. The 22.2% responses of the respondents revealed that traditional project management practices are better and easy as Ethiopia has poor internet connectivity. Only 11.1% responses of the respondents advised that cloud-based offshoring instead of outsourcing can be better of project management. The data analysis clearly justifies that there is an acute shortage of such practices and Ethiopia is lagging behind. Also, there is an acute shortage of research studies that can help in enquiring the suitability assessment of cloud-based outsourcing techniques in IT project management.

In the personal interview phase, when the same questions were asked to the IT managerial and technical staff for collecting the subjective inputs; their responses were somehow similar but they add few points like issues of the internet the speed which is the key to ensure the success of a cloud-based IT project management practices. The researcher also observed that technical and managerial staff are not well aware with such kinds of outsource practices over cloud but they are very much inspired and motivated to adopt.

*4)* Which is the most Challenging Factors that leads to fail the IT projects before completion in IT industries of Ethiopia?

To investigate the existing status of the IT resource management and paybacks of the cloud-enabled outsourcing in IT projects, the selected participants, professionals, and experts were asked to participate in the survey and detailed interview process along with technical observation of the researcher. As presented in Fig. 6 the maximum i.e. 50% respondent's responses revealed some hidden facts about the resources. It was revealed that the success of the IT projects is typically affected by the availability of the essential resources. As presented in Fig. 6, 25% of respondents were concerned about the budget as a major issue while the other 25% on the schedule of the project. Thus, the maximum i.e. 50% of respondents provided a clear picture and recommended that the cloud-based outsourcing of the resources (Human and IT), and their management practices can significantly improve the IT project's success. The researcher's personal observation not only verified but strongly recommended that not only resources but the cloud-based resource sharing can significantly reduce the overall budget and time of the IT projects. This can lead to higher success in the project.

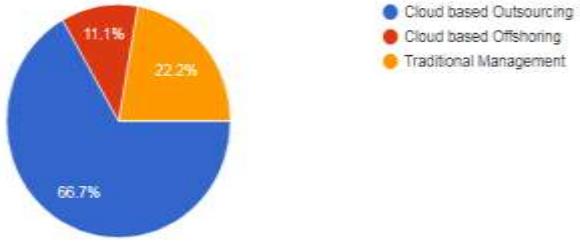


Fig. 5. Suitability, Robustness and Managerial Issues with the cloud Computing.

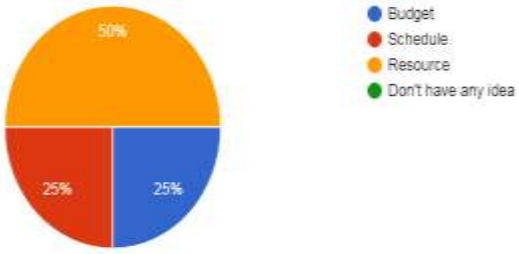


Fig. 6. The Resource Management in IT Project Management Practice Paybacks to Outsourcing.

## V. Proposed Framework for Outsourced IT Project Management Practices over Cloud

In this phase, the gathered data and their analysis was used as an input to design the most viable framework for outsourced IT project management practices overcloud.

Moreover, this research answered the research questions: What are the basic issues and challenges that often make IT projects fail in the IT industry of Ethiopia? Which emerging tools and technologies can be explored to ensure the success of IT project management in the Ethiopian IT industry? Which Cloud-enabled IT project management outsourcing practices the framework can be a key instrumental to alleviate such issues and challenges?

To manage and control the resources during the project control and management process, different types of computing, communication, and collaboration technologies like email, telephone, postal services, traditional boards, and filing cabinets with paper-based heavy weight manual files are used. In today context, it was clearly revealed that these techniques are obsolete and there is a strong need to exploit and adopt advanced technologies such as the cloud in the developing countries like Ethiopia to improve the IT project management practices.

To migrate towards the advanced practices in IT project management, the researchers proposed a new contextualized framework- Durga Prasad Sharma-Mesfin Alemu-Abel Adane (DPS-MA-AA) for the effective utilization of the outsourced IT resources and support services over cloud. This framework

as presented in Fig. 7 was proposed to improve or replace the current state of art practices in IT project management. To check the validity of the localized contextual framework for the Ethiopian IT industry, we validated the framework by two-fold methods i.e. 1) Functional demonstration with limited features, and 2) stakeholder validation after the demo to check that how it can be a great instrumental towards the alleviation of the identified issues and challenges that adversely affect the success of the IT projects.

An outsourcing environment can support IT projects with a wide variety of services like 1) ease of access to domain-specific experts worldwide without their physical migration, 2) the entirety of the IT function, 3) support to easily defined functions of the project (designing, coding, testing, disaster recovery etc.), 4) network services, and 5) software component design, development, and testing. Different organizations realize to adopt the outsourcing for a number of reasons, and the most of them are based on the effective management and business profitability to the high rate of success of the projects.

## VI. Design of the Cloud based DPS-MA-AA Framework for Outsourced IT Project Management Practices

To explore and exploit the knowledge of the emerging technologies; the features of proposed next generation systems need to be studied and analyzed for their pros and cons.

This study designed a Cloud-enabled IT Project Management Outsourcing Practice framework named as DPS-MA-AA as presented in Fig. 7. This framework is a dynamic enabler to the IT project management practices and activities. This framework enables users to perform all the project related activities such as assigning tasks, monitoring, management, control, coordination, communication, sharing, deployment, redeployment, migration, computation, calendaring, and scheduling overcloud. These all the services can be supervised, managed, and controlled by the IT project manager. The cloud service providers (CSPs) can provide infrastructure and software platforms to transform this framework into reality.

To access the service over the cloud, clients need to sign-up first with their genuine and verifiable digital credentials overcloud. Afterward, the client can be invited by the organization (outside/inside) and follow the link of the cloud governance instructions. They can find the tasks or activities assigned to perform within a given time frame in relation to the agreement of the organization or assignee with the client.

In the case of IT organization; if users want to access the service or need to use the infrastructure of the cloud service provider (CSP); they should specify that what the users want to access it anytime, anywhere over any device.

The main aim of the proposed localized and contextualized Outsourcing IT Project Management Framework was to help and support the project management practices overcloud. These new ways of performing project-related tasks and rendering services are measured as the next generation task dynamics for the improvement of IT Project management services.

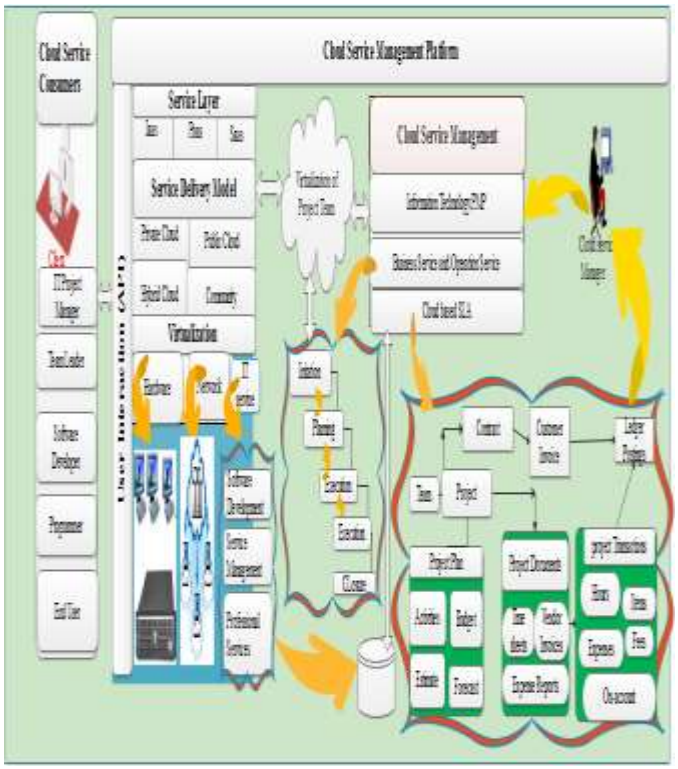


Fig. 7. The Proposed cloud-enabled Outsourcing IT Project Management Framework- DPS-MA-AA.

## VII. Components of the Framework

### A. Cloud Service Consumer Layer for Cloud Service Community

This is the Client Community Layer. In this layer, important players can be anyone from the Service Community in general but as a case study of Ethiopian industry, the service community consumers' are- IT Project Manager, Team Leader, Software Developer, Programmer, and the End Users. The service community consumers can access the cloud services provided by the cloud services providers (CSPs) in the selected business cases. Also, the IT organizations can get the services to advance or upgrade their IT capacity, internal work cultures by hiring external professionals from outside to perform the tasks that are out of the local capacity in terms of high-end IT skills. This implies that human resources can be outsourced (hired) using a pay-per-use model overcloud. In this manner, IT companies can fill the gap of "haves and have nots" in terms of IT human resource capacity. Here the product quality can also be improved or maintained.

### B. Cloud Service Management Platform Layer

This is the main Processing Layer of the Framework. In the IT project management, the resources, and the skills the gap with scope creep creates a typical challenge as investigated in a rigorous review of related works. These challenges or problems are the roots causes of the project failure, and/or impairments, and the same is verified by review of different research literature. To resolve such challenges or problems; this framework provides a new baseline solution and the direction about how to achieve the project goals even if such human resource challenges co-exists and the organization is lagging

behind in the capacity. The framework clearly shows the different pathways that how an IT project manager can resolve such issues and challenges in terms of scarcity of resources, the capacity of skills and the quality assurance of the project by applying the cloud-enabled technology-based tools and techniques to facilitate/ hire the human resource from outside without physical hiring or migration using the pay-per-use model. Thus the monitoring and control of the project cost, and time, through tracing and management systems over the cloud can support project success.

*1) Cloud service layer*: This layer is designed for the services in which the client requests are forwarded for the computing / communication/collaboration services required by cloud service providers (CSPs). These cloud-enabled services are readymade services. These services can be used/requested by any type of user to support and serve their professional activities, functions, and operations. The service models in this Layer may be anything like SaaS, IaaS, or PaaS and users can use it in terms of required software, infrastructure, and platform. These services are provided overcloud via the network with negotiable prices or a cost-sharing basis or free of the charge. To make such services easy and user friendly, the online training to the target users and employees are also facilitated via live media platforms and chat boxes. This Service Layer can help in connecting the users to SaaS (software as a service), PaaS (platform as a Service), and IaaS (Infrastructure as a services).

*2) Service delivery model:* This is the deployment layer in the framework. This layer offers its benefits through four types of service delivery/deployment models namely Private, Public, Hybrid or Community Models. A private cloud is built and managed within a single organization for the mission-critical secret services. Private clouds enable an organization to use cloud computing technology as a means of centralizing access to IT resources by different parts, locations, or departments of the organization. When a private cloud exists as a controlled environment, the problems described in the Risks and Challenges section do not tend to apply. A public cloud is a set of computing resources provided by third-party organizations. A hybrid cloud is a mix of computing resources provided by both private and public clouds. A community cloud shares computing resources across several organizations, and can be managed by either organizational IT resources or third-party CSPs. Similar to a public cloud except that its access is limited to a specific community of cloud consumers. The community cloud may be jointly owned by the community members or by a third-party cloud provider that provisions a public cloud with limited access.

*3) Virtualization layer (hardware, software & IT platform services*): This is an interface layer of the framework in which all the resources are virtualized and made available to the users without physical movement. The clients or the users can access the resources like hardware, software, and supporting IT services to minimize the resource problem in IT project management exercises, and scale-up or scale-down based on the capacity of the CSPs.

*4) Virtualization layer of project teams (Interface Layer)*: This layer is the interface/link layer between Service Delivery Model and the Cloud Service Management Layer. This layer facilitates the virtual teams to work remotely by deployment or redeployment and assigning or reassigning the responsibilities by project managers or project leaders. The team can co-operate with each other to perform collaborative tasks from anywhere, anytime over any device in a virtualized environment. This can alleviate and overcome the challenges faced in manual practices of IT project management.

*5) Cloud service management layer:* This layer of the framework consists of three major components.

*a) IT Project Management Practices:* These practices include Management, Control, Collaboration, Communication, Computations, Hiring, Discussion, Meeting, Coding, Testing, and Submitting. All of these activities are proposed to be done over the cloud platforms in an easy and convenient manner with low cost and high performance in anytime, anywhere over any device.

*b) Business Service Operations:* The cloud service operations for business where every system needs three activities i.e. 1) Management, 2) Control, and 3) Monitoring/Metering of the consumed services. Business service and operation component of the framework serves the process of project management in overall activities and practices in IT projects.

*c) Service Level Agreement (SLA)*: Service Level Agreement component of the framework is used for monitoring or metering of the consumed cloud services and helps in preparing the bills.

### *C. Cloud Service Manager*

This Component of the Framework is responsible for the activities like 1) IT Project Management Practices, 2) Business Service Operations, and 3) Service Level Agreement (SLA). Also, this component includes the services related to the Contract, Customer Invoice, and Ledger Postings. It decides about the billing/business operations of consumed cloud services with proper management, control, and monitoring/metering. In this layer, the project contains different financial and managing components like project plan, project document, project transactions, project team, project contract, project customer, vendor invoices, and ledger postings. The project plan can have activities, estimates, budgets, and forecasts. Project documents also have timesheets, vendor invoices, and expense reports of the projects. Project transactions refer to the hours of the activities, items, fees, and on-account. The contract is the agreement between the services user and the service provider. Customer and vendor invoices is an invoice may be created before or after the product or service is received. It's common for an invoice to be included with products being delivered, so the recipient can check off the items to make sure they are all their in-service stack. Ledger postings are the summary of all of the contract agreement of the organization and make the correction in each accounting system. Also, it is the process of business

transactions by recording information about the account. These all the activities are done in this layer. In this framework, the User Information APIs are used for integration and interaction among different components used by the IT project teams and members.

### D. Validation through Functional Demonstration of the Framework over Bitrix24 Platform

According to the framework, the IT project management practices can be implemented, managed, and controlled overcloud. This phase of the research used a cloud-based Bitrix24 platform for designing a functional Prototype with limited features and functionalities. The Bitrix24 was selected to showcase the way how to manage the IT project management practices of the organization in an outsourced environment. It was based on the operations i.e. how to manage, and control the flow of information in the entire organization inside and outside both and share the project data/information within the timeframe. To explore and exercise the IT project management practices over the cloud, the end-user or client can access the tools and techniques through a well-structured registration process with a premium account. For the full professional transformation of the IT Project Management practices over the cloud; the designers can use the premium version with full permissions under SLAs. Thus this functional demo with prototype tried to evaluate the Framework based on the existing challenges in the current state of art IT project management practices in traditional/classical manners.

*Access of Cloud-Based Bitrix24 Network*

*Rules:*

- Register Before Sign into the Platform Network of Bitrix24.
- Login using the login provided by the Bitrix24.
- Create the private/public/hybrid network to make communication and collaboration overcloud.

*1) User/Manager:* As presented in Fig. 8, we can create a Bitrix24 network for private/public/hybrid cloud for communication. Now, select the option "My Bitrix24" above the left corner of the login page.

Then, Click on the link provided by the Bitrix24 platform network.

*2) Task management:* Fig. 9 presents how to control and monitor the project management practices over the cloud in real-time manner.

*3)* How Create the Workgroup and Project Management Groups?

In this activity as presented in Fig. 10 there are different options provided to the user to create the workgroup based on his/her choice to use the network. This is decided based on nature of the project for facilitating the entire communication and protection of sensitive information from outside access or loss of information based on the given workgroups.


Fig. 8. Login Provided form by the Bitrix24.

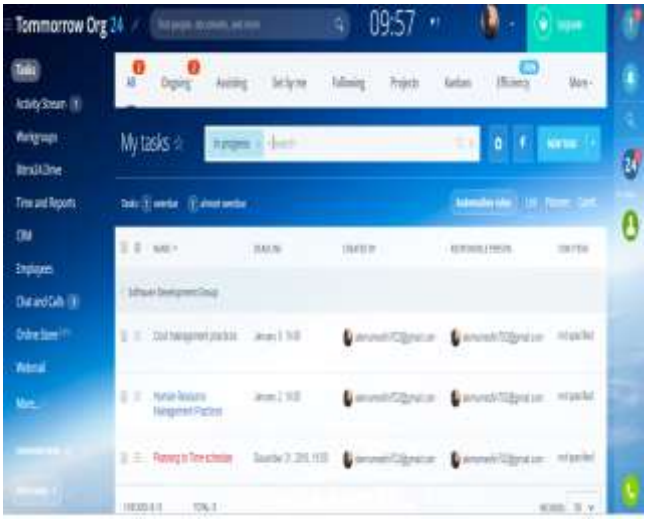


Fig. 9. Task Management Activity.

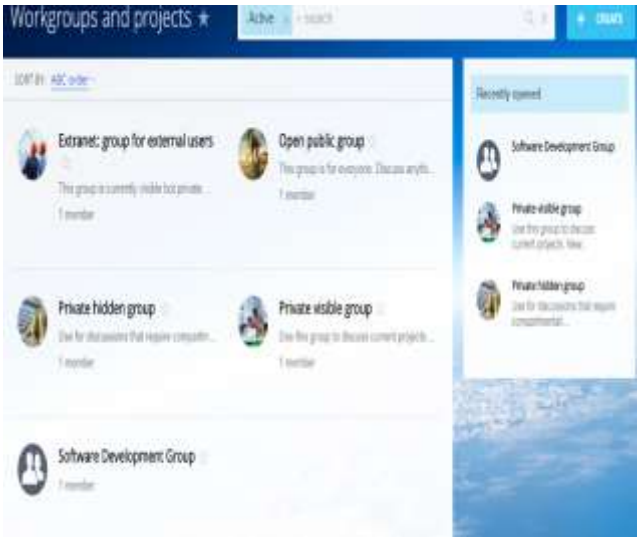


Fig. 10. Workgroups of the Project.

## VIII. The Validation of the DPS-MA-AA Framework

To evaluate or validate the framework's functionalities, this research paper selected only the effectiveness and efficiency of the framework in terms of computing, communication and collaboration in IT project management practices. The cloud-enabled a functional prototype of the IT project management framework clearly demonstrated the effectiveness and the efficiency improvement in the control and management of the activities, and resources used for computing, communication and collaboration purposes. This situation clearly justifies the economic improvement of the organizational activities. The factors evaluated were cost effectiveness, timeliness, resource utilization, accessibility, and availability of IT projects, information sharing along with effective collaboration.

*1) Cost effectiveness*: Based on the measurements of the resources and their cost like the hardware and software were compared with the traditional vs. cloud-based. In the case of traditional, the organization usually purchases all the required resources for their activities to perform the tasks and use them to do the required activities. But these resources consume the high capital of the organization and still limited in size i.e. scalability is limited, all the resources are centralized at a single location, fast obsoleting devices, high cost and underutilized. But in contrary to this traditional framework, the cloud-based resources are highly scalable, on-demand available, distributed over salient locations, no worry about obsoleting devices, rent based low cost and proper utilization with operational expenditure.

*2) Time complexity*: The time is the most important asset in the IT Projects and their Managements. The cloud-based IT project management practices are time efficient because they are managed in a virtualized environment i.e. without any physical movement of any hardware, software, or human resources. The virtual teams can be deployed, redeployed, transferred virtually, managed, controlled from anywhere at any time using any device.

*3) Evaluation of the resource utilization based on the measurement criteria*: The resource utilization overcloud was confirmed as better performing than traditional IT Project Management practices as is presented in Table I.

*4) Accessibility and availability of IT projects:* Since high uptime assurance under the SLA provisions is the basic promise of the CSPs. As presented in Table II, the accessibility and availability of the resources over the cloud also confirmed better than traditional IT Project Management practices.

*5) Information sharing and effective collaboration*: The design artifacts and features as presented in Table III of the cloud-based resources themselves justify the better opportunity in Information Sharing and effective collaboration than traditional IT Project Management practices.

*6) Security and privacy assurance under SLA:* The design artifacts and features of the cloud as presented in Table IV such as Security as a Service Models themselves justify the better opportunity of Information Security and Privacy than traditional IT Project Management practices.

TABLE I. Evaluation of the Resource utilization based on the Measurement Criteria

| SNO | Measuring Criteria | Resource utilization | | | | | |
|---|---|---|---|---|---|---|---|
| | | Traditional | | | Cloud based | | |
| | | Low | medium | high | Low | medium | high |
| 1 | Customer satisfaction | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| 2 | Quality improvement | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| 3 | Product Improvement | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |

TABLE II. Evaluation of Accessibility and Availability of IT Project based on the Measuring Criteria

| S. No | Measuring criteria | Anywhere Accessibility | | | |
|---|---|---|---|---|---|
| | | Traditional Project accessibility | | Cloud based Project Accessibility | |
| | | Availability | Accessibility | Availability | Accessibility |
| 1 | Inside | Yes | Yes | Yes | Yes |
| 2 | Outside | No | No | Yes | Yes |
| 3 | Replica | No | No | Yes | Yes |

TABLE III. Evaluation of Information Sharing and Effective Collaboration based on Measuring Criteria

| S. No | Measuring Criteria | Information sharing and effective collaboration | |
|---|---|---|---|
| | | Traditional | Cloud based |
| | | Effectiveness | Effectiveness |
| 1 | Two-way collaboration | Less effective- Low | Highly effective –High |
| 2 | Platform support collaboration | Less effective-Low | Highly effective –High |
| 3 | Effective sharing of data | Less effective-Low | Highly effective –High |

TABLE IV. SECURITY AND PRIVACY ASSURANCE UNDER SLA

| S. No | Measuring Criteria/Requirements | Security and Privacy | | | |
|---|---|---|---|---|---|
| | | Traditional | | Cloud based | |
| | | Security | Privacy | Security | Privacy |
| 1 | Platform form | Relatively good | No | Promised under SLA | High based on the user |
| 2 | Infrastructure | Relatively good | No | Promised Under SLA | High based on the management perspective |
| 3 | Inside and outside user access security and privacy | Relatively good | No | Promised Under SLA | High based on the nature of communication model |
| 4 | Application security | Relatively good | No | Promised Under SLA | High based on the nature of apps. |

## IX. CONCLUSION

The research study concludes that the current status of IT Project management practices in developing countries such as Ethiopia is quite obsolete. Research clearly investigated, observed, and analyzed the critical gaps between the traditional IT project management practices and the modernized outsourcing of IT Project Management practices. The survey, interview, and technical observation clearly revealed that the current state of art IT Project Management practices are still not aligned with the latest IT tools, techniques, and practices. It was also discovered that IT companies are facing an acute shortage of IT human resources with high-end desired skill sets and up-to-date hardware and software resources with legal licenses. It was observed that there is an urgent need for critical review and redesign of the IT Project Management Practices in developing countries like Ethiopia. The judicious intervention or adoption of the modernized tools and techniques like the cloud is the need of the IT industry. The newly proposed framework DPS-MA-AA forwarded the alleviation mechanism of the issues and challenges in traditional IT project management practices. The prototype with selected features evidently demonstrated the improvements in IT Project Management practices. The prototype of the framework and the user acceptance clearly cross-verified and validated that the cloud-based IT Project Management Practices are the better and instrumental option for improving the efficiency and effectiveness of the IT Project Management activities like computing, communication, collaboration, monitoring, control, access, usage of remotely available hardware, software and human resources, etc. in anytime, anywhere over any-device with cost-effectiveness, high reliability, high scalability, and all-time availability. The framework coined a new idea to establish a new paradigm for IT Project managers where they will be on-site away from the site or maybe in an office away from the office. A new community of mobile IT project managers can be created where they can be accessible at anytime, anywhere over any device.

## X. RECOMMENDATIONS

There are many opportunities to perform additional depth and breadth research building on these findings. This study provides a starting point for the development of a more comprehensive conceptual framework of the capabilities that lead to outsourcing effectiveness and efficiency.

This study also provides a baseline for initiating further quantitative, survey-based research to get support for the findings from cloud-based project management software implemented with virtual teams.

Also, the complex cloud computing tools with premium privileges in the IT project management can be a better option to test the performance of the framework in the future. Finally, the research paper recommends adopting the framework in real-world environments to evaluate the performance.

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