JIMMA UNIVERSITY

JIMMA INSTITUTE OF TECHNOLOGY

FACULTY OF COMPUTING AND INFORMATICS

INFORMATION SCIENCE PROGRAM

MASTERS PROGRAM IN INFORMATION SCIENCE (IKM)

DEVELOPING A FRAMEWORK TO MITIGATE THE SKILL GAP BETWEEN INFORMATION TECHNOLOGY DEPARTMENT CURRICULUM IMPLEMENTATION AND INDUSTRIAL INFORMATION TECHNOLOGY SKILL REQUIREMENT: THE CASE OF SELECTED ETHIOPIAN PUBLIC UNIVERSITIES

BY: MUSE TAMRAT

JANUARY, 2023

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR DEGREE OF MASTERS OF SCIENCE (MSc) IN INFORMATION SCIENCE (IKM)

BY: MUSE TAMRAT

PRINCIPAL ADVISOR: Dr. WORKU JIMMA (PhD)

CO-ADVISOR: HAMBISA MITIKU (ASSISTANT PROFESSOR)

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As members of the examining board of the MSc. research defense examination of the above title, we members of the examining board (listed below), read and evaluated the thesis and examination.

Name	Title	Signature	Date
——————————	Chairperson	—————	—————
——————————	Principal advisor	—————	—————
——————————	Co advisor	—————	—————
——————————	Internal examiner	—————	—————
——————————	External examiner	—————	—————

Declaration

I declare that this thesis is my original work and it has not been presented in any other Universities. Every material sources used in this work are scientifically acknowledged.

_____

Muse Tamrat, 2023

This thesis has been submitted to the department of Information Science for examination with our approval as University Advisors:

Principal Advisor: Dr. Worku Jimma (PhD)   Sign ——————Date——————

Co-Advisor: Hambisa Mitiku (Assistant Professor) Sign ——————Date——————

DEDICATION

The dedication of this work is to my loving HERO MOTHER (Workinesh Tilahun) and other moms who look like her throughout the world. My beloved mother, like yours, deserves better. I have smart and responsible mother. She is not only just my mother, but also my father. She gave up all in this world to raise me and see me succeed. My mother is the only reason for all of the good things that have transpired in my life. Show your love to your mom and do your best before it's too late.

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Acknowledgement

First and foremost, I would like to give special gratitude to **God** for his support in everything to accomplish my courses and this thesis. I would have not been able to complete my study without the help of God. My grateful thanks go to my principal advisor Dr. Worku Jimma (PhD) and My co-advisor Mr. Hambisa Mitiku (Assistant Professor) for their continuous support, friendly approach, invaluable comments and their constructive guidance starting from the moments of giving the courses which helped me to being ready and capable to completion of this thesis work. I would like to express my thanks and appreciation to the information technology department chairs and other teaching staff at Jimma University, Wachemo University, and Wolita Sodo University for their courteous collaboration. Lastly, I would like to thank the entire Jimma University Information Science Department team for their moral support in my effort.

Acronyms and Abbreviations

ACM: Computing Machinery Association

CS: Computer science

HEI: Higher educational institutions

ICT: Information communication technology

IT: Information technology

OECD: Organization for Economic Cooperation

Abstract

Higher educational institutions are the factory for producing skilled human resources in all knowledge areas and disciplines over the globe. Ethiopian Higher Education Institutions, particularly public universities in Ethiopia are in charge of creating skilled human power to all disciplines across the country with the standard baseline for minimum skills required in the market for all kind of disciplines. Graduating proficiency are serious and need to be achieved effectively to sustain the development of the country especially Information Technology department graduated human resources with their expected skill in the market and industry. Major aim of this research is thus to design a curriculum framework that helps curriculum implementation to analyze the skills required to bridge the gap between the skills needed by the industries and market of Information Technology graduated students and the actual students' academic program (Curriculum) at higher educational institutions to cope with the Information Technology graduates to qualify the countries information technology careers. To come across those phenomena, the proposed research uses survey- based research design to explore the gap by investigating the banking and telecom industries' skills requirements, knowledge needs and the existing curriculum of Information Technology at three selected Ethiopian Ethiopian Higher Education Institutions specifically Jimma University, Wolayta Soda and Wochamo Universities and design a framework that mitigates the skill gaps. The study finding(72.7% of respondents) showed that various challenges, factors that regulated and related to learning-system, learner factors, lecturer factors and technological factors, for Information Technology department graduates skills and industries' Information Technology skill requirement play a role in Information Technology department graduate skill. Information Technology department graduates' skill and the hiring companies' skill requirements have a direct relationship in a working environment. Further studies should be conducted on other computing faculty departments for both graduated and undergraduate and other hiring companies' skill requirement.

Keywords: Curriculum, Industry skills, skills gap, computing faculty careers, computation, Framework

Chapter one

Introduction

1.1. Background of the Study

Global societies are changing rapidly in relation to the changing nature of the world environment. Education systems require rapid economic, environmental and social change, an important skills, to solve uncreated jobs, uninvent technologies, and undiscovered social problems. At this day, quality curriculum development is a global issue. This is because the curriculum needs to reflect the educational needs of the country business market. Thereby, there is no doubt that the curriculum needs to be updated promptly to meet the requirement of the country economy and society. Unless, they would be unable solve the global economic problems of a competent, professionally qualified and technically educated workforce (Shewakena Tessema, 2017).

Glossary of Education Reform noted in standard work's report (Steiner, 2017), defines curriculum as the knowledge and skills students are expected to learn, which includes the learning standards or learning objectives they expected to meet; the units and lessons that teachers teach; the assignments and projects given to students; the books, materials, videos, presentations, and readings used in a course; and the tests, assessments, and other methods used to evaluate student learning. Besides, Wang, X., Chen, Y., & Zhu, W. (2021) defined curriculum as a means of learning plan. It can be used as a set of rules or guidelines in which learners are required to know what should be delivered through the education system. In those definitions, we can simply undermine curriculum allows students to get the required knowledge in their area of study. Hence, if the curriculum does not fully specify the courses students can learn in their discipline area, it is clear that they do not fit the job.

The curriculum of any academic program have crucial role in order to develop the skill and knowledge of graduates. Globally, the term "information technology" generally refers to integrating all aspects of data processing and all aspects of today's social and digital platform economies. Every organizations rely on information technology and computer systems which are sub-domain of the Information Technology departments to function properly, efficiently,

securely, and scale to meet their business goals and customer needs. IT department, professionals choose computer products and services, integrate them to enhance the supported environment, and develop, customize, and manage computer technology to achieve organizational and business goals (Sabin et al., 2017).

The field of science develops with the subject of research. Information technology programs have emerged to meet employer demands has had a major impact on the development of the discipline. Nowadays, IT department innovations and discoveries break through traditional silos in the computing domain (Sabin et al., 2017).

The use of information technologies in a variety of fields is turning into breakthroughs, activities, goods, insights, and best practices that propel advancement and growth. According to learning point of view, the development of a country is highly dependent on the capabilities of its human resources, organizational and technological skills. Most of the industries require their employees to have different skill sets. These set of skill are categorized into two major categories called hard skills and soft skills (Zeidan, 2020).

There is a principal-agent relationship between the laboratory and industry. It is claimed that there is a rationale for a powerful institutional and industrial interface. Therefore, the industry needs to contribute to the academic institution, and the educational institution needs to expect the contribution of the industry. If the other role is not recognized, the interaction among institutions will be diminished. Moreover, in the side of industry; there may be a potential mismatch between supply, demand and the number of workers can lead to labor market turmoil (Donald Menezes et al., 2016).

Productive interface between academia and industry in today's knowledge economy is an important requirement. Regularly changing leadership paradigms to respond to the increasing complexity of today's business environment brought the two closer. Dedicated industry-academic community interface is all about the exchange of knowledge and experience/skills (Donald Menezes et al., 2016).

The industries have their skill requirement for the IT department graduates who will be an employee of their organization. Those skill sets are significant and basics for the industries in order to achieve their goals and the students are also expected to have these essential skills

required by the industries to get their carrier opportunities. To achieve these, the universities' curriculum implementing bodies needs to collaborate with those industries to identify the required skills which are expected from the students (Zeidan, 2020).

Curriculum is the critical issue that requires due focus both in global and national context to come across all barriers in learning system. Problem domain of curriculum in Ethiopia goes in different disciplines ranking differently; however, focus is given here in this study towards IT department undergraduates skills required to fit the country's industry for sustainable and everlasting development. Education is the motor generator for economic advancement, mitigating the gap in knowledge requirements is mandatory. As stated by (Sharma, 2015) Information and Communication Technology (ICT), helps to facilitate the transaction between producers and users by keeping the students updated and enhancing teachers' capacity and ability to facilitate contact between the teacher and the student through ICT infrastructures (Sharma, 2015). Another report by the standard works group reviewed that, research showed the significance of curriculum in academic success and knowledge matters (Steiner, 2017).

Various studies have been conducted in Ethiopian context specifically the skill requirement of Finance and marketing graduates' in relation to the industries skill requirement. The purpose of this study is identifying the skill requirements of the IT department-related careers in banking and telecom industries in the market contexts of Ethiopia, with new technologies curriculum. Hence, the study is initiated with the main aim to discover the skill gap between IT department curriculum implementation of selected Ethiopian public universities and IT graduates' skills required by banking and telecom industries and develop a framework to mitigate these skill gaps.

1.2. Statement of the problem

Based on empirical evidence employer requirements and applicant skills labor training must be more directed skills and abilities required for employment. The gap between industry and science is large. Educational institutions are forced to investigate details orientation of face-to-face education tailored to the needs of the workforce with this reference and curriculum combined with classroom theory and practical applications that can be the right answer from higher education not just needed by tomorrow's workforce knowledgeable, but requires application experience knowledge (Shewakena Tessema, 2017).

Essential skills required by industry may not be available in the following cases when students graduate and go to work. Researcher's note a lack of collaboration and partnerships between academia and industry too effectively to prepare students for industrial needs. To mitigate the existing skill gap on the graduates of information technology department, some industries require graduates to undergo onboard training before they are ready for employment. It is a rather expensive and unsustainable practice, given the sheer cost and time involved in further training (Zeidan, 2020).

According to (Manivannan & Suseendran, 2017) the needs of industries are changing from time to time quickly in science and technology advancements this pushes the industries for looking graduates with qualified skills. However, these industries are not satisfied with the universities' curricula in order to get better and more qualified graduates. Most of the industries expects the universities to train their future workers on the basis of advanced technologies. Inefficient collaboration in the curriculum implementation process between the IT department and industries can cause a skill gap in graduated students of the IT department. These leads the graduated students not to be enough competent for industries work environment (Zeidan, 2020).

The gap created between universities IT department graduates skills and industries toward the skill requirement of the industries from IT department graduated skills need to be mitigated by the collaboration of these two parties called the industry and the IT department's curriculum. Working environment and the technologies for the industry are becoming vast and complex. The implementation of effective curriculum according to the industries' skill requirements by the universities can play a great role in mitigating the gap between the rapidly changing technology and industry skill needs (Manivannan & Suseendran, 2017).

In various studies conducted by different scholars, there is no attempt to develop a curriculum implementation framework in Ethiopia which allows to mitigate the skill gaps between IT department curricula and industries. These all points are the gap that exists in this area of study (Moon, S. M., 2021).

The major problem in this domain is the skill gaps of the IT department graduates due to its popularity for many industries concerning to skill requirements of various industries, especially in the banking and telecom industries. Skill gap is a limitation of performance and appropriate mismatches between the skills which is expected by the industries and what the students have.

The skill gaps can be explained in terms of subtracting the required ability from the existing performance of the students. It is also referred to as being less capable in specialization (Zeidan, 2020).

The country's education policy and strategies is change through time still, its capability to foster the deliverance of all disciplines and select the best content for the curriculum in with respect to industries requirement is not researched in the IT department. Availability and utilization of ICT infrastructure in the education sector are not satisfactory in Ethiopia (Ferede et al., 2021). Careers of IT departments are opening through time requires qualified IT department graduates with minimum expected work experience to be eligible for registration for career opportunities. In general, the skills of IT department graduates from various Ethiopian universities are incapable according to the skills and a qualification which is expected by industries as a result of not collaborating with concerned industries in the curriculum implementation process. These created the skill gap between IT department graduates and industries IT department skill requirement (Shewakena Tessema, 2017).

As a result of having this skill gap in IT department graduate students industries are highly engaged in to giving different skill development trainings for their new coming employees. These can entirely affect those, industries financial resources and they will spend much of their time training their employees.

In today's digital world, every organization seeks to gain a competitive advantage in its business operations through the effective and efficient utilization of resources, which includes personnel, who are an entity's most valuable asset and a critical component in achieving organizational advancement through their dedication and performance (Tingo & Mseti, 2022). The workers having set of skills required by the industries are critical for the effectiveness of the industry as like other resources. The skill gaps between employee and the requirement of the industry can affects the performance of the industries (Dabo & Ndan, 2018).

To achieve the need of industries, there must be a strong relationship between industries' and the higher institutions to implement the curriculum according to the demands of industries. Unless these skill gaps affect all parties existing in this domain problem. Graduated students will not fit the industry skill requirements because of less collaboration between industries, and the IT department curriculum toward the required skill sets and this skill gap can be responsible for

increasing unemployment rate of IT department field that are graduated in the country. For the industry side, they will invest their budget and their time to train these new employees of the industry. For higher institutions side there will be a probability in being less productive (Büth et al., 2017).

There is an enormous number of research works conducted locally and globally in different discipline by different authors to investigate the gap between the industry skill requirement and the basic skills that the student has obtained from the higher institutions. The studies conducted in our country (local) do not have given attention for Information Technology-related department curriculum rather than other business and linguistic-related disciplines. No studies were conducted to analyze the gap exist between IT department curriculum and industrial Information Technology skill requirement in Ethiopia.

1.3.   Research questions

To the knowledge of the researcher, no research has been done in Ethiopia to date, and thus, this study is intended to answer the following research questions:

RQ1. What are the academic program assessment and course delivery modes of IT department?

RQ2. What IT department graduates' skills are expected by the banking and telecom industries?

RQ3. What are the major factors considered as responsible the existence of skill gap between IT department curriculum implementation and industrial information technology skill requirement?

RQ4. How do the existing practices of the IT department teaching-learning process in Ethiopian universities creates the skill gap between the IT department graduates and industries?

1.4. Objectives of the study

1.4.1. General Objective

The general objective of the study is to investigate the skills gap between the IT department curriculum implementation of Ethiopian public universities and IT department graduate students skills required by industries and to develop a framework that helps to mitigate the gaps.

1.4.2. Specific objectives

The specific objectives of this study are:

1. To find out the academic program assessment and course delivery mode of the IT department from the study area.
2. To identify knowledge, skills, attitudes and values of IT department students' need to have from the study area.
3. To identify responsible factors for the existing skill gaps between IT department curriculum implementation and industrial information technology skill needs.
4. To discover the existence of skills gap between the IT department graduates and industries IT skills requirement.

1.5. Scope and Limitation of the study

This study focuses on the IT department curriculum implementation, it is all about exploring the gap between IT department curriculum implementation and the industry skills requirement primarily focus only on Ethiopian public universities undergraduate IT department to create curriculum implementation framework that assists curriculum designers in addressing the changing nature and new technologies into curriculum to fit the industry expectations of knowledge and skills requirements. The study finds factors affecting curriculum implementation in one perspective to come up with the challenges of dynamic nature of technology and to get solutions (the framework), mitigate the current skill gap by revising the existing IT department curriculum. In general, this study aims to design a curriculum implementation framework that can mitigate the gap between the skills of IT department graduates and the skills expected by commercial bank of Ethiopia and Ethiopian telecommunication corporation industries headquarters to provide highly qualified graduates of IT department in the context of Ethiopia for sustainable development of the country in its IT department human resource.

Finally, this study does not cross the boundary of academic program IT department undergraduate students in public universities of Ethiopia. What matters on other disciplines curriculum and career opportunities on the market, the study is delimited to and only focuses on IT department undergraduate curriculum and skills gap of IT department graduate students' due to the factors like time, budget and skill required.

1.6. Significance and beneficiaries of the study

The result of this study which is a curriculum implementation framework helps to mitigate the skill gaps between IT department graduates and industry skill requirement, has a crucial effect on the contribution of skills required by the global market in a particular area. It also validates current academic IT departments in public universities in Ethiopia and it minimizes available skill gaps in this area to provide talented people who fit the country's IT department market in all respects. All of the stake holders are beneficiaries from the designed curriculum implementation frame work. The stake holders include Ethiopian public universities IT department, IT department graduated students and Ethiopian banking and telecom industries are the beneficiaries of this study.

On other side, it benefits the universities by delivering essential information on the skills which is required by the industries needs to convince the appropriate implementation of curriculum to make it cop up with the working environment and technology of the industries. It also benefits the industry in a number of aspects such as there will be a stable and constant supply of qualified graduates and doctoral candidates in the fields required for employment, they will save the money that will be spent to train the new coming employees, there the industries will get many of scientists and researchers who will plays role in project developments on innovation and discoveries. Lastly, the graduate students of IT department earn a lot of benefit regarding to have the appropriate skills which is required by the industries and this provides the students in higher career chances.

1.7. Ethical consideration

Before starting the data collection from selected universities and industries, the researcher distributed an official letter. This study was aimed to make the problems clear and understandable for all respondents. Any of communication with the involved bodies will be finished with their voluntarily consent without harming and threatening personal and institutional well-being. In addition, all information gathered from individual respondents was kept confidential.

1.8. Operational definition of terms

Curriculum: is the organized module for the department in learning process

Skill: is the practical application of acquired and developed IT department's graduate knowledge throughout learning system

Gap: is the variation between IT department department's graduate skills and Industry skill demand for workforce

Framework: is the baseline which supports running regular activities in effectively way.

1.9. Organization of the thesis

The content of this thesis is organized into five chapters based on the flow of ideas in each chapter included in the thesis. Accordingly, the details were presented as follows.

Chapter One provide the introduction part of the thesis that highly focus on the background of the study, statement of the study, the objective of the study, scope, significance and operational definition of terms.

Chapter two focuses on the literature review of the study that paves the way for clarification and development of ideas from different perspectives in order to support the main objective of the study in line with the gaps found through systematic research review of previously conducted research works.

Chapter three presents the research methodology employed to achieve the main objective of the study.

Chapter four focuses on the analysis of the collected data from the target population through data collection tools. Chapter five presents the finding conclusion and recommendations for the future research works and finally reference and appendices are the general contents of the study organized in sequential manner.

Chapter two

Literature review

2.1. Introduction

This section of the study content focuses on the study's existing literature. Incidentally, different conceptual backgrounds obtained from various information sources and resources such as journal articles, books, and websites and different previously conducted related research works that support the organization of this study were rigorously analyzed in order to grasp and assess the current gap in the problem area.

In our country, Ethiopia, educational policy evolves overtime by considering numerous benefits to students' progress and participation in their work environment, however, there are also drawbacks to these changes in curriculum adoption. Since, most of the time curriculum at Ethiopian HIEs is adopted from other countries' with different economic, cultural, religious, and philosophical backgrounds. Therefore, research is critical in supplying the dimension and how it may be used and implemented in order to effectively implement the designed curriculum (Mengistie, S. M., 2019).

2.2. Information Technology

The concept of information technology is wide in different perspectives. In academic discipline information technology is the study of technical methods to choice, maintain, implement, combine and manage protected computing technologies to allow the stake holders to attain their private and institutional goals. It contains all kinds of computing technologies in order to interact as intermediaries between the societies and technologically shaped environments. Any of the organization who operates on the age of information has a greater probability of dependency on information technology (Sabin et al., 2017).

2.2.1. Course delivery mode of information technology academic program

There are a number of effective methods for delivering the courses for the students in information technology department academic program that allows the graduates to acquire the required knowledge from their stay on their studies in higher institutions. Mode of delivery is

expected to be whether mixed, parallel semester or block but from those modes of delivery parallel is the appropriate mode for information technology department. Course delivery mode includes lecture, demonstration, student presentation, project work, home study (assignment), discussion, and question and answering, class work (group work) (Program & Universities, 2013).

2.2.2. Modes of assessment and evaluation for Information technology academic program

The students is assessed and evaluated in different modes of assessment and evaluation mechanisms were. First cognitive ability the cognitive ability of the students will be evaluated through both in written and continuous assessment, essays, classroom tests and computer programming problems. Second practical abilities practical ability of the students are mostly evaluated by continuous assessment. Group project module is among from the major modes to assess the student's practical ability (Program & Universities, 2013).

As stated in (Program & Universities, 2013) The last mechanisms for assessing the students in information technology department academic program are through transferable skills. There are a number of skills which can be assessed like know how about software tools and the ability of the students to communicate orally and in written form. These skills can be directly assessed by assignments or different individual or group projects.

There are also other skills which are difficult to measure it in direct ways but such like assessment and evaluation mechanisms can play a great role if they are applicable in appropriate manner to enable the student's entire capability. Generally the evaluation will be done on base of midterm exam, evaluation will be done on the basis of midterm exam, assignments, laboratory sessions demonstrations, Project work, final exam and different continues assessments (Program & Universities, 2013).

2.2.3. Skills of information technology academic program graduates

There are different skills of Information Technology Academic Program graduates. These skills are completing projects using relevant information technologies, developing/maintaining/testing business support and IT systems, Effectively collecting, analyzing and integrating multiple forms of information, communication skills (written & oral) for project documentation and presentations, project management skills for completion of projects with varying

complexities/durations, structured thinking and sound/logical judgments to achieve results, identify priorities, manage multiple projects and meet deadlines and effectively collaborating in multi-disciplinary teams for different projects (Sabin et al., 2017) .

2.2.4. Knowledge, attitudes and values of IT department students

In terms of attitudes, IT department students need to have professionalism which allows them to act and do as a professional on their every activities on the job relating with their mentality. IT department students are highly expected to develop good and attractive attitudes in to the importance of information resources directly related with their profession this can be expressed in terms of love, dedication and commitment. Having a pleasant personal characteristics and believing on their performance in order to accomplish works and professional jobs expected from them. To being ethical in working environment with coworkers and customers, having ability to work in co-operation with coworkers, honesty and loyalties are primary attitudes and values which is expected from IT department students (Program & Universities, 2013).

2.3. Curriculum

The curriculum designed for a given department does have a consequence on student achievement and addresses the issue of copying the curriculum of another country without defining and analyzing the academic, economic, social, behavioral and political views of one country. Although the study played an important role in discussing the impact of curriculum on student achievement and the direction of positive curriculum change, it does not address positions where students may apply for a job after successfully completing of the course. Additionally, the research does not provide information on whether students will have greater success in the computing market in applying their knowledge in their subject area (Steiner, 2017).

Developing a quality curriculum goes through a number of subsequent stages that require effective and efficient monitoring and control of each process. Therefore, curriculum development is not a simple process that can be carried out without the cooperation of various stakeholders. It is therefore a complex and iterative process with many activities involving many stakeholders. The five stages of curriculum development (i.e., analysis, design, development,

implementation, evaluation) should be followed so that more effective and efficient delivery content based on the diverse and critical roles of industry needs (Matkovic et al., 2014).

2.3.1. Curriculum design

Curriculum design is a term used to describe the purposeful, deliberate, and systematic organization of curriculum (instructional blocks) within a class or course. In other words, it is a way for teachers to plan instruction. When teachers design curriculum, they identify what will be done, who will do it, and what schedule to follow (Karen Schweitzer, 2021).

It is largely concerned with issues such as what to include in the curriculum and how to present it in such a way that the curriculum can be implemented with understanding and success (Barlow et al., 1984). Therefore, curriculum design refers to how the components of the curriculum have been arranged in order to facilitate learning (Pieters, J.,et al.,2019).

It is also concerned with issues of choosing what the organizational basis or structural framework of the curriculum should be incorporated. Choppin, J.et al., (2018) says that curriculum design is a way of organizing contents to be delivered for students that permits curriculum ideas to function. The authors also added that curriculum design refers to the structure or pattern of the organization of the curriculum contents. Its process results in a curriculum content development that contains the following concepts such as a statement of purpose(s), an instructional guide that displays behavioral objectives and content organization in harmony with school organization, a set of guidelines s(or rules) governing the use of the curriculum, and an evaluation plan(O'Neill, G. ,2015).

2.3.2. Types of curriculum design

There are different types of school/college curriculum design. These include subject-centered, learner-centered and integrated or broad fields (which combines two or more related subjects into one field of study; e.g., language arts combine the separate but related subjects of reading, writing, speaking, listening, comprehension, and spelling into a core curriculum)(Grant, J.,2018).

2.3.2.1. Subject-Centered Curriculum Design

This type of curriculum design refers to the organization of content in terms of separate subjects, e.g. geography, math, and history, etc. It has been the oldest school curriculum design and the

most common in the worldwide. It was even practiced by ancient Greek educators. The subject-centered design was adapted by many European and African countries and states and districts in the United States. An examination of the subject-centered curriculum design shows that it is used mainly in upper elementary and secondary schools and colleges (Hooper, B.et al., 2020).

2.3.2.2. Learner-Centered/Personalized Curriculum Design

Students who have varying needs, interests, and abilities may benefit from a personalized curriculum design. Learner-centered curriculum design may take various forms such as individualized or personalized learning. In this design, the curriculum is organized around the needs, interests, abilities, and aspirations of students. Advocates of the design emphasize that attention is paid to what is known about human growth, development, and learning. Planning this type of curriculum is done along with the students after identifying their varied concerns, interests, and priorities and then developing appropriate topics as per the issues raised. This type of design requires a lot of resources and workforce to meet a various needs. Hence, the design is more commonly used in the U.S. and other western countries, while in the developing world, the use is more limited (Friis, E., & O'Hair, 2020).

2.3.2.3. Broad Fields/Integrated Curriculum

In the broad fields/integrated curriculum design, two, three, or more subjects were unified into one comprehensive course of study. This organization is a system of combining and regrouping subjects related to the curriculum. This approach attempts to develop some kind of synthesis or unity for the entire branch or more branches of knowledge into new fields. Examples of Broad Fields of Language Arts incorporate reading, writing, grammar, literature, speech, drama, and international languages. General Science includes natural and physical sciences, physics, chemistry, geology, astronomy, physical geography, zoology, botany, biology, and physiology other, Including environmental education and family-life education (Akib, E. et al., 2020).

2.3.3. Curriculum development

Once the Curriculum framework and the syllabus guidelines are in place, subject specialists work to develop the core of the curriculum; the specific details of what will be taught, how it will be taught, what competencies will be developed and how, and what learning outcomes will result at

each stage/year/grade of schooling. These are the detailed syllabus for each subject, and provide the real substance to the curriculum, setting out content for each subject and stage or year. It is common for these can be done by subject panels, and groups of specialists (Moon, S. M., 2021).

The syllabus for each subject and each stage or year can be expected to give sufficient details for teachers to deliver the curriculum, for textbook writers/publishers to produce appropriate learning materials and for examination and assessment bodies to be able to test what has been learned. Typically the syllabus will set out the timed sequence and content of topics, state what is expected to be achieved the learning outcome, provide guidance on teaching and in the learning materials, provide suggestions on how topics may be taught ,state what be assessed and how (Smith, A.,2015).

Curriculum development also entails relating the units of the subject matter to learning resources, choosing the appropriate strategies for the curricular transaction, suggesting suitable media exploring relevant learning experiences, advanced testing of the achievement of objectives through these experiences, the role of the subject in the overall development, general and specific objectives (competences) and content table include unit number, unit objective, enabling objectives, unitized content relevant resources, transitional strategies, learning experiences, using the media, progressive self -testing items, time proposed from each unit knowledge, skill and attitude proportion for materials, methods and media testing, references linking with the other subjects in the curriculum(Nicholls, A., & Nicholls, S. H.,2018).

2.3.4. Curriculum Implementation

Curriculum implementation entails putting into practice the officially prescribed courses of study, syllabuses and subjects. The process involves helping the learner acquire knowledge or experience. Curriculum implementation cannot take place without the learner.

The learner is, therefore the central figure in the curriculum implementation process. Implementation takes place as the learner acquires, the planned or intended experiences, knowledge, skills, ideas and attitudes that were aimed at enabling the same learner to function effectively (Nevenglosky, E. A., 2018).

Viewed from implementation perspective, curriculum an implementation also refers to the stage when the curriculum itself, as an educational program, is put into effect. Putting the curriculum into operation requires an implementing agent. Johnson, O.et al., (2021) identifies the teacher as the agent in the curriculum implementation process. The author argued that implementation is how the teacher selects and mixes the various aspects of knowledge contained in a curriculum document or syllabus. Implementation takes place when the teacher-constructed syllabus is the teacher.

2.4. Curriculum modes

2.4.1. Curriculum modes

In Ethiopian higher institutions there is a concept of harmonized modular curriculum development which makes those institutions common in manner of using uniform curriculum. According to the analysis of this study there is a slight difference on those institutions toward the implementation of harmonized modular curriculum on those selected three universities IT departments. This is due to the staff profile, technological infrastructure and the seniority of the institution.

According to the focus of this study, the curriculum of IT department graduates' in Ethiopian higher educational institutions were currently revised. Those revised curriculum of higher education institutions IT department undergraduate student's curriculum were mentioned as follows. From those curriculums these paper focused on the old version as a result of unavailability of graduated students on the revised versions of the curriculum and for getting appropriate information about the graduate's skill and the skills required by the industries from IT department graduates.

2.4.1.2 The old version IT department curriculum model

These models of curriculum were developed in February 2013 under the participation of 16 universities in number (Program & Universities, 2013).

Module Number	Module Name	Course Code	Courses	ECTS	Year I		Year II		Year III		Year IV	
					I	II	I	II	I	II	I	II
ITec-M1011	Information Technology Basics	ITec1011	Introduction to Information Technology	5	5							
		ITec1012	Computer System Application	3	3							
ITec-M2021	Computer Systems	ITec2021	Computer Organization and Architecture	5			5					
		ITec2022	Operating Systems	7				7				
ITec-M3031	Computer Maintenance	ITec3031	Computer Maintenance and Technical Support	7					7			
ITec-M1041	Basic Programming	ITec1041	Fundamentals of Programming I	5		5						
		ITec2042	Fundamentals of Programming II	5			5					
ITec-M2051	Advanced Programming	ITec2051	Data structure and Algorithms	7				7				
		ITec2052	Object Oriented Programming	5				5				
		ITec3053	Event-Driven Programming	7					7			
		ITec3054	Advanced Programming	5					5			
ITec-M1061	System Development and Project Management	ITec1061	Structured System Analysis and Design	5		5						
		ITec2062	Object Oriented System Analysis and Design	5			5					
		ITec2063	Information Technology Project Management	5			5					
ITec-M2071	Database Systems	ITec2071	Fundamentals of Database Systems	5			5					
		ITec2072	Advanced Database Systems	7				7				
ITec-M3081	Information Management	ITec3081	Information Storage and Retrieval	5						5		
ITec-M2091	Web Systems and Technologies	ITec2091	Fundamentals of Internet Programming	5				5				
		ITec3092	Advanced Internet Programming	5					5			
		ITec3093	E-Commerce	3					3			
ITec-M3101	Computer Networks	ITec3101	Data Communication and Computer Networks	7					7			
		ITec3102	Introduction to Distributed Systems	5						5		
		ITec3103	Telecom Technologies	3						3		
		ITec3104	Wireless Networking and Mobile Computing	5						5		
ITec-M4111	Network Design and Administration	ITec4111	Network Design	5							5	
		ITec4112	System and Network Administration	5								5

		ITec4113	Network Device and Configuration	5								5
ITec-M4131	Integrative Programming and Technologies	ITec4131	Integrative Programming and Technologies	5								5	
ITec-M3121	Multimedia and HCI	ITec3121	Multimedia Systems	5							5		
		ITec4122	Human Computer Interaction	3								3	
		ITec4143	Information Assurance and Security	5									5
		ITec4142	Social and Professional Ethics in Information Technology	3								3	
ITec-M3141	Information Technology and Society	ITec3141	Seminar on Current Trends in Information Technology	3							3		
		ITec4151	Artificial Intelligence	5								5	
		ITec4152	GIS and Remote Sensing	5								5	
ITec-M4152	Elective I	ITec4153	Computer Graphics	5								5	
		ITec4161	Security Implementation and Management	5									5
		ITec4162	System Integration	5									5
ITec-M4162	Elective II	ITec4163	System Simulation and Modeling	5									5
		ITec4171	Basic Research Method in IT	3								3	
		ITec4172	Industrial Project I	5								5	
ITec-M4171	IT Research and Project	ITec4173	Industrial Project II	5									5
CESt-M1023	Civics & Ethical Education	CESt1021	Civics and Ethical Education	5	5								
		EnLa1011	Communicative English Skills	5	5								
EnLa-M1013	Basic English Skills	EnLa1012	Basic Writing Skills	5		5							
	Reasoning Skill		Logic and Reasoning Skill	5	5								
	Electricity and Electronics		Fundamentals Electricity and Electronics Device	7		7							
	Statistics		Introduction to Statistics	5			5						
			Applied Mathematics	7	7								
	Mathematics for IT		Discrete Mathematics and Combinatory	5		5							
	Entrepreneurship		Entrepreneurship and Small Business Management	5									5
	Management		Introduction to Management	5		5							
			Semester Total	30	32	30	31	31	29	29	30		
			Grand Total	242									

Figure 1 IT old version curriculum (Program & Universities, 2013).

2.4.1.3 The revised versions of the curriculum model

These curriculums were revised in 2020 at Bahir Dar University by curriculum revision committee which has five members. The aim of revising the curriculum was insisted to achieve the need of the organizations in which the graduates of IT department students goes on after their graduation. The curriculum states that the students will take four year and eight semesters to finish their study time and the total number of CRH/ECTS was is 148/248 (Bahirdar, 2019).

Module Number	Module Name	Course Code	Courses	ECTS	Cr. Hrs	Total
01	Common course	ITec 1012	Introduction to Emerging Technologies	5	3	80
		EnLa 1011	Communicative English Skills I	5	3	
		GeES 1011	Geography of Ethiopia and the Horn	5	3	
		Phys 1011	General Physics	5	3	
		Psyc 1011	General Psychology and Life Skills	5	3	
		LoCT 1011	Critical thinking	5	3	
		SpSc 1011	Physical fitness	(P/F)	-	
		Math 1011	Basic Mathematics for Natural Sciences	5	3	
		EnLa 1012	Communicative English Skills II	5	3	
		Hist. 1012	History of Ethiopia and the Horn	5	3	
		CoSc 1012	Basic Computer Programming	5	3	
		Math 1012	Applied Mathematics	5	3	
		MCiE 1012	Moral and Civic education	4	2	
		Anth1012	Anthropology of Ethiopian Societies and Cultures	4	2	
		Gltr2015	Global Tend and International Relations	4	2	
		Incl2011	Inclusiveness	4	2	
		Eco2013	Economics	5	3	
		Enbd5012	Entrepreneurship and business development	4	2	
02	Computer Systems	ITec2024	Computer Organization and Architecture	5	3	10
		ITec2022	Operating Systems	5	3	
03	Computer Maintenance	ITec3031	Computer Maintenance and Technical Support	5	3	5
04	Basic Programming	ITec2041	Fundamental Programming II	5	3	5
05	Advanced Programming	ITec2052	Data structure and Algorithms	5	3	25
		ITec3051	Object Oriented Programming in Java	5	3	
		ITec3054	Event-Driven Programming	5	3	
		ITec3056	Advanced programming	5	3	
		ITec3058	Mobile Application Development	5	3	
06	System Development and Project Management	ITec3061	System Analysis and Design	5	3	10
		ITec3062	Information Technology Project Management	5	3	
07	Database Systems	ITec2071	Fundamentals of Database Systems	5	3	10
		ITec3071	Advanced Database Systems	5	3	

No	Category	Code	Course	ECTS	Cr.Hrs	Total
08	Information Management	ITec3082	Information Storage and Retrieval	5	3	10
		ITec4081	GIS and Remote Sensing	5	3	
09	Web Systems and Technologies	ITec2091	Internet Programming I	5	3	10
		ITec3093	Internet Programming II	5	3	
10	Computer Networks	ITec2102	Data Communication and Computer Networks	5	3	20
		ITec3102	Introduction to Distributed Systems	5	3	
		ITec4101	Wireless Networking and Telecom Technologies	5	3	
11	Network Design and Administration	ITec4114	Network Design	5	3	15
		ITec4112	System and Network Administration	5	3	
		ITec4111	Network Device and Configuration	5	3	
12	Artificial Intelligence and Multimedia	ITec3121	Multimedia Systems	5	3	10
		ITec4121	Artificial Intelligence	5	3	
13	Information Technology and Society	ITec4133	Information Assurance and Security	3	2	7
		ITec4134	Social and Professional Ethics in Information Technology	3	2	
		ITec4131	Seminar on Current Trends in Information Technology	1	1	
14	Elective	ITec4148	Integrative Programming and Technologies	5	3	5
		ITec4144	Int. to Data mining and Warehousing	5	3	
		ITec4146	E-Commerce	5	3	
		ITec4142	Computer Graphics	5	3	
15	IT Research and Project	ITec4151	Internship	3	2	16
		ITec4155	Basic Research Method in IT	3	2	
		ITec4153	Final year Project I	5	3	
		ITec4154	Final year Project II	5	3	
16	Electricity and Electronics	Eeng2161	Fundamentals of Electricity and Electronics Device	5	3	5
17	Basic Statistics	Stat2171	Introduction to Statistics	5	3	5
18	Discrete Mathematics	Math2182	Discrete Mathematics	5	3	5
	Total ECTS/ Cr. Hrs				148	248

Figure 2 IT revised version curriculum (Bahirdar, 2019).

2.5. University – Industry Cooperation

Today, close collaboration between universities- industry in curriculum development has become important to produce well-prepared graduates who can adapt to the world of work. Therefore, modern curriculum development processes increasingly include public input and consultation with a wide range of stakeholders (Shewakena Tessema, 2017).

The curriculum pays special attention to collaborations between universities and industry. The development process provides many benefits to both parties, as well as to the economy and society as a whole. The most frequently obtained benefits from this process are increased relevance of learning outcomes, an extension of course content and subjects to industry needs, real-life experiences through industry attachments, immediate feedback on the relevance of the developed curriculum, and new course development and adaptation of existing graduates, more prepared graduates, easier selection and recruitment of graduates, etc. (Matkovic et al., 2014).

Academy and industry are separate worlds, in a differently ways and synchronously. However, togetherness a relationship exists between the two worlds in one on the other hand; the academy produces absorbed graduates industry in any way. In addition, research works carried out by the laboratory Universities were used by industry to produce a variety of goods and services and industries. Generally, they provide solutions to their problems and concerns (Zeidan, 2020).

2.6. Skill

Skill is the practical application of acquired and developed knowledge throughout the learning process. It is the mechanism in which graduates implement and apply what has already been accumulated in the form of knowledge within the specific specialization. According to this study focus, skill deals with the practical application of IT department scientific knowledge to implement and solve the industry IT-related affairs problems(Burgess, S., & Sievertsen, H. H.,2020).

2.6.1   Hard skill

Hard skill is related to technical skills. Technical skills can be classified as technology-based or discipline-based knowledge, and the characteristics includes abilities in computer use, programming languages, database management, optimization and the major areas of managerial accounting, finance and operations management. Data handling proficiency and data-based decision-making were also projected to become increasingly important, with employers seeking workforce, savvy in data analysis and presentation. Many core technical activities were envisaged to seek creative and interpersonal skills (Patacsil, F. F., & Tablatin, C. L. S., 2017).

2.6.2   Soft skill

Alshare and Sewailem (2018) distinguished between hard and soft skills by explaining hard skills as context-specific and soft skills as transferable across different job types and not specific to a particular job. In addition, they stated that hard skills are easy to learn through training, whereas soft skills primarily develop through experience in a collaborative professional setting and are tougher to train. They grouped soft skills into two categories as people-related skills, which include interpersonal skills, communication and collaboration/teamwork, and personal skills, which contain adaptability and flexibility, leadership, professionalism, work ethics, voluntarism and social responsibility.

2.6.3   Employability skill

Employability skills mold students' careers by helping them in building and improve their communication skills, presentation skills, teambuilding skills, leadership skills, time management skills, interview skills and interpersonal skills. Thus, training students with soft skills enable them to participate in various selection procedures effectively (Nisha, S. M., & Rajasekaran, V., 2018).

2.6.4. Information Technology skills toward industry needs

The information technology (IT) industry continues to evolve and change, becoming increasingly important in the global economy. IT department professionals apply their skills across various specialties', including businesses, industries, governments, services, organizations, and other structured organizations that rely on computing to automate or efficiently manage products or services (Sabin et al., 2017).

Technology associations focus on industry standards that promote technology development and provide vendor-independent IT graduate certifications worldwide. The different organization serves four important IT department graduate areas. The first development is related to infrastructure that includes network management, project management, help desk and service desk, as well as managing cloud implementations. The Second development is programming and software development for the Internet of Things (IoT), mobility, and cloud devices are the major jobs. The Third one is related to security jobs that focus on ensuring that systems are less susceptible to attacks. The last and fourth one is data-related job roles that focus on database management, as well as analytics of stored data (Sabin et al., 2017).

2.6.5   Banking industry

The banking industry is a vertical market, where the adoption of innovative technology plays a critical role in competition and many times distinguish the leaders from the laggards. However, banks usually employ people with different educational backgrounds and professional experience, so it becomes imperative to enhance their awareness of technology in an easily and efficiently. Important issues that banks face today include having cost-effective, highly accessible and efficient means of knowledge transfer. Furthermore, staff training should be personalized to match the needs of every individual and, at the same time, aligned with the daily operations of the bank, without compromising the quality of the learning material (Gallego-Álvarez, I., & Pucheta-Martínez, M. C., 2020).

Banks have always struggled to keep pace with the digital speed, but the problem has become more pressing in recent years. From a skills perspective, job vacancies for tech roles in different country banking rose to 30%, and the finance industry has called for the creating of a new body to boost recruitment in the sector. To keep up with fierce competition from mobile and online banks and fin techs, established banks are now looking to accelerate digitization projects. This is urgent; because it has forced a decisive shift to digital (Mosteanu, N. R., 2020).

2.6.5.1 Data Analytics

The exponential growth of data volumes and analytical complexity has led to the increasing adoption of in-database analytical tools. Organizations are not only consuming this data to gain consumer insights and build networking but are also driving their major business decisions by

analyzing the data. Data skills allow the professionals to automate processes and provide banks with more marketing muscle. Once professionals have the data analytics expertise, they can benefit the organizations by removing corrupted data, determining data quality, and preparing reports for their employers. Professionals with this skill can work as data analysts and data engineers (Dicuonzo, G.,et al., 2019).

2.6.5.2 Artificial Intelligence (AI) & Machine Learning (ML)

AI and Machine Learning have immense potential in detecting financial fraud and improving the protection gap. The scope of AI has grown leaps & bounds over the last few years, and organizations across the sectors are looking to capitalize on artificial intelligence applications. AI is transforming various businesses' functional, operational, strategic landscapes, and customer experiences. This technology offers a high level of accuracy that helps in determining banks' profitability. Professionals with this skill can work as AI backend engineers, machine learning engineers, and data engineers (Malali, A. B., & Gopalakrishnan, S. (2020).

2.6.5.3 Cloud Computing

Cloud computing has been the most transformative technology and has gained significant momentum since the 2010s. With many organizations migrating to the cloud from their traditional application, jobs in this domain are growing massively. Cloud computing technology improves the overall efficiency and reduces operating costs for the banking sectors. It also ensures smooth banking functions and tunes the computing resources with the customer's needs. Database administrator, network architect, and system administrator are some of the high-demand roles for cloud computing (Vinoth, S.,et al.,2022).

2.6.5.4 Cyber security

With the rise in digitization and adoption of new-age technologies, there is an increased risk of data breaches, leaks, and cybercrimes leading to the dire need for skilled information security professionals with every passing day. Cyber security has become an essential skill to have for the BFSI sector. Once the professionals up skill themselves, organizations will no longer have to hire cyber security teams to mitigate the threat (Ghelani, D.,et al.,2022).

2.6.5.5 Block Chain

Block chain was first introduced as a concept of a technical backbone of the digital currency, and the integration of block chain technology is now witnessing primary demand across various sectors. This technology is used in the banking sector for online identity verification, credits, loans, tracking payments, accounts, and more. Professionals with this skill-set bring in more transparency, reduce transaction costs, and streamline new banking services that create new revenue lines. Post acquiring this expertise, specialists can work with block chain developers, project managers, and quality engineers (Cucari, N., & Torriero, C. (2022).

2.6.5.6 Skill gaps between university curriculum and industry needs

The courses delivered for University students are framed with the prepared and approved curriculum. In the context of Ethiopia, there is not much trend in inviting the industry needs in the curriculum design and development process. The lack of collaboration between universities and industries indicated the gap of skills needed by the graduated individuals to fit with the requirement set by the industry (Garousi, V. et al., 2019).

2.7. Factors affecting effective implementation of curriculum toward the skill

Effective implementation of curriculum in higher education has a number of benefits for the students, the universities and the industries who looks their future carriers from the university. The effective implementation fails due to different factors which is created through the involving parties themselves. Learning system factor, instructors factor, students factor, and technological factors are raised as the major factors which affects the effective implementation of the curriculum in order to attain the objectives which is aimed during the development of the curriculum.

2.7.1. The learning system factor

The overall learning system which is used to produce the qualified graduates in higher institutions has its own effects on the implementation of curriculum for the students. The learning system can be a factor which affects the effective implementation of the curriculum. Under the learning system factor the curriculum itself can be considered as an affecting factor for effectively implementing the curriculum. The curriculum factors mainly includes problems of

curriculum content (size, boundary, and clarity), less compatibility of curriculum, non-relevancy with the value of the students and the society (Karakuş, 2021).

According to (Rudhumbu, 2020) the learning system factor responsible for affecting the effective implementation of curriculum were outstanding management aid, a sense of shared purpose, sufficient resources, and the incorporation of strong team oriented culture in an institution and this all are can be taken as the critical components of successful curriculum implementation (Rudhumbu, 2020).

2.7.2. Students Factor

Students are considered as one of the factor hindering effective implementation of curriculum. Curriculum implementation can be affected through as a result of the student's different behavior and characteristics. According to (Karakuş, 2021) the major characteristics of the student considered as affecting factor for effective implementation of frame work refers to the students diverse various behaviors and unique on previous knowledge, less motivation, encourage and negative attitude.

2.7.3. Lecturers /Instructors Factor

In academic institutions the major role of implementing a given curriculum mainly falls on the lecturers. They are the responsible actor for the effective implementation of curriculum in education system (Rudhumbu, 2020). The educator organizes the learning environment in accordance with how the curriculum is interpreted. What should be conveyed and the best way to use rely on how the teacher interprets the curriculum (Chapman, 2019).

The major factors exist in lecturers factors affecting the effective curriculum implementation were instructor's personal characteristics and the environment. Every individual of instructors has their own understanding about the way in which the students are expected to be learn from previous experiences of the instructors. The second factors were the educational backgrounds of the teachers in which they are learned and this may create a number of limitations curriculum implementation. In third rank the pedagogical competencies of the instructors is the hindering factors. This refers the difference between instructor's challenges in class room applications in implementation (Apsari, 2018). Tending of the instructors to solve the problems with linkage of themselves (Karakuş, 2021).

According to (Rudhumbu, 2020) the instructors factors that affect effective curriculum implementation is referred the behaviors of the instructors those includes level of education, gender, age and years of teaching experiences.

2.7.4. Technological Factor

Practically speaking, there is an obvious need for students to be prepared to use technology to compete in the 21st-century global economy. Technology is an essential life skill in the workforce. Students who are technologically savvy students often have a better chance of getting a job and excelling in their careers (Savage & Brown, 2015). However, the task of integrating technology into classroom instruction in a meaningful and state-of-the-art way remains challenging (Pittman & Gaines, 2015). Although classrooms may have access to technology initiatives, there are several circumstances that affect the proper implementation of technology in classrooms such as poor infrastructure, inadequate technology, lack of sufficient technological tools, effective professional development (external factors), low teacher self-efficacy and teacher perceptions (internal factors). In preparing students to be college and career ready, technology integration is imperative (Susanto, R.et al., 2020).

2.8. Framework

The term frame work is usually used in different disciplines in research preparations and software development process. In common sense the term frame work can be defined as a realistic conceptual arrangements which is desired to be used as facilitate or leads for the development of ideas structure that can extends that arrangements in to other sense full or important features (Adom et al., 2018). A frame work can be considered as guidance for the researcher as research questions are refined, techniques for assessing variables are selected, and findings are prepared" is what the research process is described as providing (Imenda, 2014).

2.8.1. Types of framework

Generally there are two major categories of frame work in research development such as theoretical frame work and conceptual frame works. Those two major categories have their own meanings and ways of usage. The theoretical and conceptual framework clarifies a research's course and strongly establishes theoretical conceptions as its foundation. The two frameworks'

main goals are to increase the representativeness, acceptability, and value of research results in relation to the field's underlying assumptions (Imenda, 2014).

2.8.2. Theoretical framework

It serves as the "blueprint" or direction for a study. It is a framework built on an established theory in an area of research that is relevant to and/or represents the study's hypothesis. It is a blueprint that the researcher frequently "borrows" in order to construct his or her own home or research project. It acts as the cornerstone on which a research is built (Grant & Osanloo, 2014).

A theoretical framework directs the researcher to ensure that the final academic and scholarly effort is made without departing from the parameters of the approved ideas. The specific theory or theories concerning forms of human activity that can be beneficial to the study of occurrences make up the theoretical framework (Adom et al., 2018).

A theoretical framework is made up of the arguments put out by professionals in the area of study that you intend to investigate. You use this framework as a theoretical coat hanger for your data analysis and generated significant. To put it another way, a theoretical framework is the foundation that condenses ideas and hypotheses that you construct based on evidence that has already been tested and issued and that you then summaries to give you a theoretical background or foundation for your data analysis and interpretation of the meaning in your research data (Kivunja, 2018).

2.8.3. Conceptual framework

A conceptual framework is a hierarchy that the researcher considers clearly illustrates the logical evolution of the phenomenon under investigation. It is connected to the theories, concepts, and empirical studies that the researcher employed to support and organizes the information that she espouses. It is a description of how the research problem would be investigated by the researcher. The conceptual framework offers a comprehensive approach to considering a research subject. The conceptual framework explains the connections between a study's key ideas from a statistical point of view (Adom et al., 2018). It is organized logically to help create a picture or visual representation of how concepts in a subject correlate to one another. It's essential since it demonstrates the sequence of operations the researcher plans to conduct during a research project (Grant & Osanloo, 2014).

A conceptual framework is the full, coherent alignment and correlations of everything that comprises the fundamental assumptions, frameworks, plans, strategies, and methods that will be used to carry out your comprehensive research endeavor. Therefore, your ideas about choosing the research issue, the issue to be looked into, the questions to be posed, the literature to be reviewed, the theories is being implemented, the technique you'll use, the methods, procedures, and tools, the data analysis and interpretation of findings, suggestions, and the conclusions you'll draw make up the conceptual framework (Kivunja, 2018).

2.9. Related Research works

There are a number of studies conducted both locally and globally in the identification of gap between different graduates and industry requirements. The systematic research review in this study majorly focused on the research works which are appropriate and have direct link with this study and reviewed in this proceeding section.

2.9.1. Local Research works

A study conducted by (Shewakena Tessema, 2017) in Ethiopia entitled "university-industry collaboration in curriculum development which focus on analysis of banking and finance graduates' attributes from educators and industries perspective" focused on the collaboration of university and industry in curriculum development on banking and finance graduates. The main aim of the study was the examination of employ ability skills of banking and finance graduates in our country. In order to accomplish the objective of the study, the researcher used the instructors from higher institutions and employees from the industries. The study result revealed that both industry workers and instructors reflected that banking and finance graduates have full of employability skills. Finally, the researcher recommended that industries should develop the competency model for every job that helps to identify the graduates successful performance in a given work environment via their practical competencies.

The study by (Olamo et al., 2019), focused on the challenges hindering the effective implementation of the harmonized modular curriculum in the case of three public universities in Ethiopia. The main objective of the study was to identify the challenges which can affect the effective implementation of harmonized modular curriculum for undergraduate English language

and literature program in Ethiopian public universities. The study resulted that due to a number of challenges modular curriculum has not been effectively implemented.

2.9.2. Global Research works

There are different global research works conducted world widely. (Zeidan, 2020) conducted a study on an effective framework for bridging the gap between Industry and Academia in, Dubai, UAE. The result of the study showed that it was hard to relate theory and practical application during internship. Additionally, the study result also demonstrated that even for the internship readiness, it is important to know of the latest applicable soft wares and techniques applicable in the industry that did not form part of the course curriculum. Lastly, the researcher recommended that the gap in curriculum content can be mitigated either through self-funded external training programs or possibly though further higher education degrees.

(Büth et al., 2017), conducted the study paved the way for bridging the qualification gap between academia and industry in India. The study result proved that professional competencies (theoretical knowledge) generally depend on the industrial sector of the company and the graduates' needs for knowledge about basic production technologies. The author also stated that the methodological competencies, which mainly refer to the transfer of theoretical knowledge into real application-based problems, are generally as more important than the theoretical knowledge itself.

(Sabin et al., 2017), a research report from the Information Technology Curriculum Task Force, provide a clearer understanding of the new information technology curriculum for undergraduate programs for information technology students. The study also provided knowledge that can be gained about each topic identified in the report and how it is presented.

To the Organization for Economic Cooperation (OECD) (2018), explored the future of technology trends in industries around the world. The study presented ways to adapt the changing nature of the technological world to promote sustainable education in the dynamic world.

Andreas Schleicher (2017) cited by OECD (2018), entitled future of education and skills report ,majorly focused on the future requirements of education concerning the changing nature of the

global world. The study considered various knowledge areas to be covered while learning to cope with the future trends of environment.

David Steiner (2017), the major contributions of curriculum as a key factor in academic success. The author noted that, the transformation of academic achievements comes from a well-designed curriculum. The study is important for the proposed research study however it does not give any information on technological change management through that curriculum and also didn't specify the subject matter issues.

(Manivannan & Suseendran, 2017), designing an industry based curriculum for education and research stated that direction towards the personnel to be involved in curriculum design, the need for curriculum change and effect of curriculum on academic achievement. The study is important and provide information to the proposed study, but doesn't discuss the gap existing, factors that cause the gap, the level of the gap existing and also doesn't explain how the changing nature of the world affect the curriculum itself. The following table 2.1 illustrates the summarized form of both locally and globally conducted related research works.

Table 2.1: Summary of both local and global related research works

S/N	Author	Title	Year	Objective	Finding	Remark
1	Shewakena Tessema	University-industry collaboration in curriculum development	2017	To analysis banking and finance graduates' attributes from educators and industries perspective	The study result revealed that both industry workers and instructors reflected that banking and finance graduates have full of employability skills	Not focused on IT department graduates skills and factors affect the graduates skills
2	Olamo et al	The challenges hindering the effective implementation of the harmonized modular curriculum in the case of three public universities in Ethiopia	2019	To identify the challenges which can affect effective implementation of harmonized modular curriculum	The study resulted that due to a number of challenges modular curriculum has not been effectively implemented	Not focused on IT department graduates skills and factors affect graduate skills
3	Zeidan	An effective framework for bridging the gap between Industry and Academia in, Dubai	2020	To identify the difference between theory and practical application during internship	The result of the study showed that it was hard to relate theory and practical application during internship	Not focused on IT department graduates and industry skills requirement
4	Büth et al	Bridging the qualification gap between academia and industry in India	2017	To identify the gap of qualification between academia and industry in terms of skill and knowledge	The study result proved that professional competencies generally depend on the industrial sector of the company	Not focused on IT department skills requirement and specific factors industry skills requirement
5	Organization for Economic Cooperation	The future of technology trends in industries around the world.	2018	To distinguish the trend of technology in industries around the world	The study presented ways to adapt the changing nature of the technological world to promote sustainable education.	Not focused on IT department skills requirement and specific factors industry skills requirement

All the above reviewed both local and global related research works as helped the researcher to conduct this study that would reveal the education sector and industry expectations of IT department graduates in the context of Ethiopian public universities. All the reviewed and relevant related research works are directed towards bridging the IT department skills gap by providing enough information about Ethiopia's education system history and how the curriculum implementation bring impacts students' academic performance and potential IT department skills requirements in different industrial markets.

A careful analysis and systematic review of the related research works revealed a clear distinction between curriculum implementation and industry needs. Therefore, this study is aimed to address these challenges and develop a framework that can support curriculum development.

2.8.3. Research Conceptual Framework

The research conceptual framework process of conducting research is accomplished in order to show both independent and dependent variables. The arrows in the diagram directs to the relationships between those variables.

Indepent Variables

Learning system factor
- Curriculum content
- Incompatability
- Sense of sharing purpose
- Sufficient resources

Student factor
- Students d/t behavior
- Previous knowledge
- Less motivation
- Negative attitud

lecturer factors
- Personal characteristics
- Environment
- Educational background
- Pedagogical competencies

Technolgy factor
- Poor infrastructure
- Inadequate technology
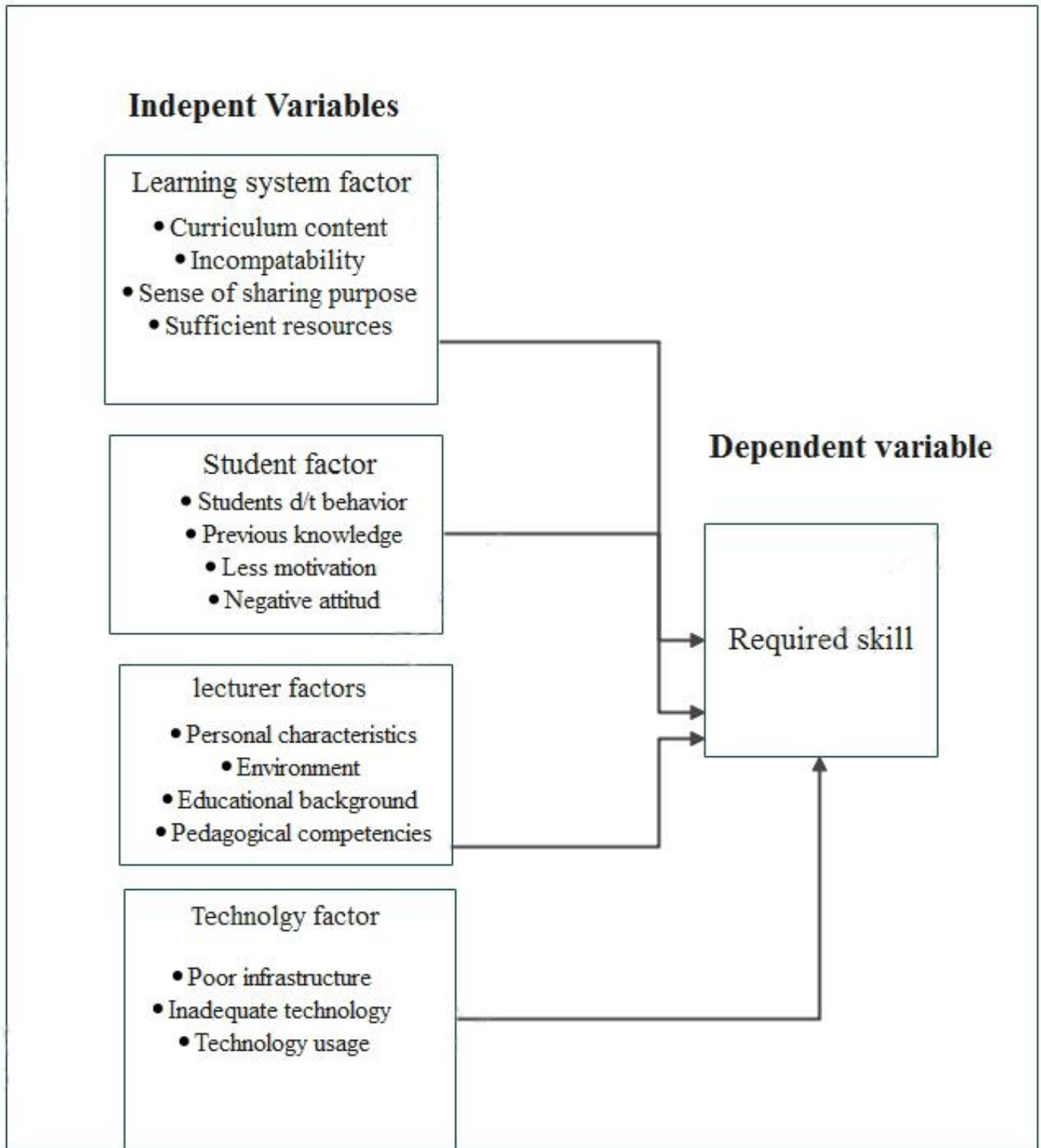- Technology usage

Dependent variable

Required skill

Figure 3.3: The research conceptual framework

Chapter Three

Research Methodology

3.1.   Study design

The choice of study design to achieve the main objective of the study is the major role of the researcher. Accordingly, this study followed a descriptive research method. The descriptive research method describes the characteristics of population enquiries of different kinds. The major purpose of the descriptive research is the description of the state of affairs as it exists at present. The data collection method was both qualitative and quantitative. The qualitative method was used to obtain qualitative data from structured interviews, and the quantitative method was used to collect quantitative data using a self-administered questionnaire. It is an instrument for both approaches because they are inexpensive, flexible, and allow researchers to collect data from a selected sample of people (Sileyew, K. J.2019).

To explore the gap of IT department curriculum implementation and the gaps exist between IT department graduates' employees' skill and industrial IT department skill requirements in context of Ethiopian-selected public universities. Consequently, it aimed at designing a curriculum framework for the existing gap between IT department the skills required in industries and skill of graduates graduated from the three selected higher educations that means by investigating the relationship between IT department skills required in industries as a dependent variable and the skills of graduates employed in the industry as independent variables.

3.2.   Study area

The study was conducted in to three selected Ethiopian public universities IT departments. Information technology department is selected from computing faculty departments because of having greater number of graduates both in selected universities and the industries. Three universities', namely Jimma University, Wolaita Sodo University and Wachemo University are selected from three generations, respectively from one to three jimma university is selected because of it is among the leading universities exist in Ethiopia and it is the institution were the researcher are studying the remaining universities wachemo university and wolaita sodo

university are selected because of their existence relatively close to the researcher working and living places.

In order to accomplish the study main objective among industries which hires IT department graduates' two industries were selected. Accordingly, from the banking industry commercial bank of Ethiopia headquarter and Ethiopian telecommunication corporation headquarter are selected as a result of their higher capacity of IT department carriers, the greater availability of technology related work environments and the number of graduates working on headquarters from those three selected universities. And the data were collected directly from selected universities and industries. Finally, depending on the obtained result a framework was designed in order to mitigate the Skill gaps of IT department graduate skills and industry skill requirements.

3.3. Population of the study

The target populations for this study are the three purposively selected Ethiopian public University IT department graduates who are working in commercial bank of Ethiopia head quarter, Ethiopian telecommunication headquarter and the teaching staffs of IT departments in those universities. The headquarter is selected as a result of having a larger number of information technology infrastructure and technology related works than of other branches. Accordingly, the total population size of the research is the number of the IT department graduate employee in the two industries and IT teaching staffs of the three selected universities. The overall numbers of employees who are graduated from the Universities; including managers of the industries are 1000. However, since studying the total population size of employee of the industries are not manageable, the population that means IT department from the three universities (Jimma University, Wachemo University and Wolayta Sodo University) are 76.

Therefore, the target populations for this study are the managers, employees of both industries and the three selected Universities IT department heads and other teaching staffs. Thus, the population sizes for this study are one thousand (1000) and IT department heads and other teaching staff are 76.

3.4.   Sample size and sampling techniques

For this study, both probability and non-probability sampling techniques have been employed. From the probability study, stratified sampling method was used in order to investigate the number of respondents of the study. The stratified random sampling technique was used due to different groups such as IT department teaching staff, bank employees and Ethio-telecom employees. From the non-probability techniques purposive sampling techniques was used. A Purposive sampling technique was used to select the universities, industries and to get required samples who have a direct relation on the issues such includes IT department heads, Ethio-telecom ICT department manager, commercial bank of Ethiopia ICT department manager, which allows the researcher to identify important informants who are thought to be able to supply the needed information. Consequently, the administrative bodies of each of the sectors supported to get the detail information of the targeted population.

$$n = \frac{Z^2 QPN}{e^2(N-1)+Z^2 PQ}$$ (Kothari, 2004)

Where:-

N= total population

n = required sample size

z = confidence level at 95% (standard value of 1.96)

E = margin of error at 5% (standard value of 0.05)

p =population proportion at which the sample size is maximum (at p=0.5 and q=0.5,   p*q=0.25)

To check the finite population correction (FPC), the researcher divides the determined sample size to the population. If the result is greater than 5% (i.e. n/N>5%N), FPC is used to adjust the final sample size unless the required sample size can be accepted as it is (Kothari, 2004).

FPC formula : nf = n/(1+c)Where C = n/N and nf = final sampling size

Sample sizing for Ethio-telecom head office employees and manager

<div align="center">

N=500 (Total numbers)

</div>

$$n = \frac{1.96^2 * 0.5 * 0.5 * 500}{0.05^2 * (500-1) + 1.96^2 * 0.5 * 0.5} = 218$$

$$C = n/N = 218/500 = 0.436$$

$$nf = n/(1+c) = 218/(1+0.436) = 150$$

So, sample size for this study was **150**

Sample sizing for Commercial bank of Ethiopia head office employees and manager

N=500(Total numbers)

$$n = \frac{1.96^2 * 0.5 * 0.5 * 500}{0.05^2 * (500-1) + 1.96^2 * 0.5 * 0.5} = 218$$

$$c = 218/500 = 0.436$$

$$nf = 278/1.278 = \mathbf{150}$$

Sample sizing for Jimma University IT department all staff

N=23(Total numbers)

$$n = \frac{1.96^2 * 0.5 * 0.5 * 23}{0.05^2 * (23-1) + 1.96^2 * 0.5 * 0.5} = 27$$

$$c = 27/23 = 1.71$$

$$nf = 27/1.71 = \mathbf{14}$$

Sample sizing for Wachamo University IT department all staff

N=25 (Total numbers)

$$n = \frac{1.96^2 * 0.5 * 0.5 * 25}{0.05^2 * (25-1) + 1.96^2 * 0.5 * 0.5} = 23$$

$$c = 23/25 = 0.92$$

$$nf = 23/1.92 = \mathbf{12}$$

Sampling Size for Wolayta Sodo University IT department all staff

N= 28 (Total Numbers)

$$n = \frac{1.96^2 * 0.5 * 0.5 * 28}{0.05^2 * (28-1) + 1.96^2 * 0.25} = 17$$

c=17/28=0.61

nf=17/1.61=**16**

Table 3.1: The study sample size

No	Name of study area population	Sample sizing
1	CBE Bank Head office Manager and employees	150
2	Ethio-telecom Head office Manager and employees	150
3	Jimma University IT department head and staff	14
4	Wachamo University IT department head and staff	12
5	Wolayta Sodo University IT department head and staff	16
	Total	**342**

3.5.   Study Variables

The independent and dependent variables are the variables in a research of a cause and affected relationship. The cause is the independent variable. Its value is unaffected by the other factors in the research. When there is a change in independent variables dependent variables are effected.

3.5.1.   Dependent Variable

The dependent variable depends on other factors that were measured. These variables are expected to change due experimental manipulation of the independent variable. So in this study, industries' skill requirement is dependent on many factors that are specified in the independent variable. The research is aimed to examine the affecting factors of industries' skill requirement; hence the industries' skill requirement is explained as dependent variable.

3.5.2. Independent Variable

Independent variables are the variable that is changed by the other factors that are attempted to be quantified. Independent variable is the state of an experiment that has been systematically changed by the researcher. However, specific to this study different factors were identified in order to mitigate the IT graduate skills and industry skill requirements considered as independent variables.

The very core of this research was to investigate the IT department graduate skill and industries skill requirement. Thus, the study used learning system factors, student's factors, lecturer's factors, and technological factors are considered as independent variables.

3.6.   Instruments of Data Collection

The data collection tools used in this study is both questionnaire and interviews. The questionnaires were comprised of close-ended questions which were developed in accordance with the quantitative and qualitative data needed to address the research questions. The close-ended questions are easy to manage, respond and code. The likert scale has been employed to show the level of respondents' respondents toward the provided questionnaires. Hence, they offer an opportunity to present many questions to respondents without exhausting their time. The Interview also employed to gather detailed information about the skill gap of IT department heads and staff, commercial bank of Ethiopia headquarter and the ethio-telecom industries.

3.7.   Method of Data analysis

After the required data was collected, the research was conducted on a three-tiered analysis basis by using the statistical package for Social Science (SPSS) version 28. In the first tier of analysis, descriptive statistics such as proportions were used to summarize categorical variables, mostly the demographic data. Then, in the second tier of analysis, the relationships between each independent variable with the dependent variables were assessed by using the confabulation method. Finally, after all independent variables were identified to a significant associate with skill required by using the above method, their collective impact on the skill required by has analyzed using binary logistic regression. All, exposure variables (independent variables) have been associated with the dependent variables to determine which ones had significant association. Odds Ratio (OR) and 95% Confidence Interval (CI) were used to estimate the

strength of the association between the independent variables and the dependent variable. The threshold for statistical significance was set at p = 0.05. For analyzing the qualitative data on this study thematic analysis method was used because of suitability of the method for finding out people's experiences, views and opinions. Under thematic data analysis method a number of steps has been passed Step 1: Familiarizing yourself with the data analysis method , Step 2: Generating initial codes Step 3: Searching for themes Step 4: Reviewing themes Step 5: Defining and naming themes Step 6: Producing the report/manuscript. First the qualitative data was gathered from both IT department head and other teaching staffs, commercial bank of Ethiopia head office ICT department manager, Ethiopian telecommunication head office ICT department manager and working staffs on both industries. The collected data was organized and coded as a qualitative data and finally it was analyzed for insights.

CHAPTER FOUR
DATA ANALYSIS AND INTERPRETATION

4.1. Result

This study was designed to investigate the gaps of IT department graduate skills and the industries skills requirement by designing a framework in mitigating the gaps. The results obtained from the collected data were presented and analyzed in this chapter. In general, the chapter demonstrated the response rate, the background of respondents and results of the study about the IT department's graduate skills and industries' skill requirement as per the stated objectives.

4.1.1. Response Rate

The field survey result indicated that from the 342questionnaires distributed to investigate the gaps between IT department's graduate skills and hiring industries skill requirements and 325 were filled and returned. The 17 respondents have not filled correctly and omitted. The detailed explanation of the response rate is illustrated both in table 4.1 and figure 4.1: Format as follows.

Table 4.1: Distribution of the response rate

	Name of Participants	Number of questionnaires		Percentage
		Distributed	Collected	
1	Bank Head office Manager and employees	150	140	93.33%
2	Ethio-telecom Head office Manager and employees	150	143	95.33%
3	Jimma University IT department heads and staff	14	14	100.00%
4	Wachamo University IT department heads and staff	12	12	100.00%
5	Wolayta Sodo University IT department heads and staff	16	16	100.00%
	Total	**342**	**325**	**100.00%**
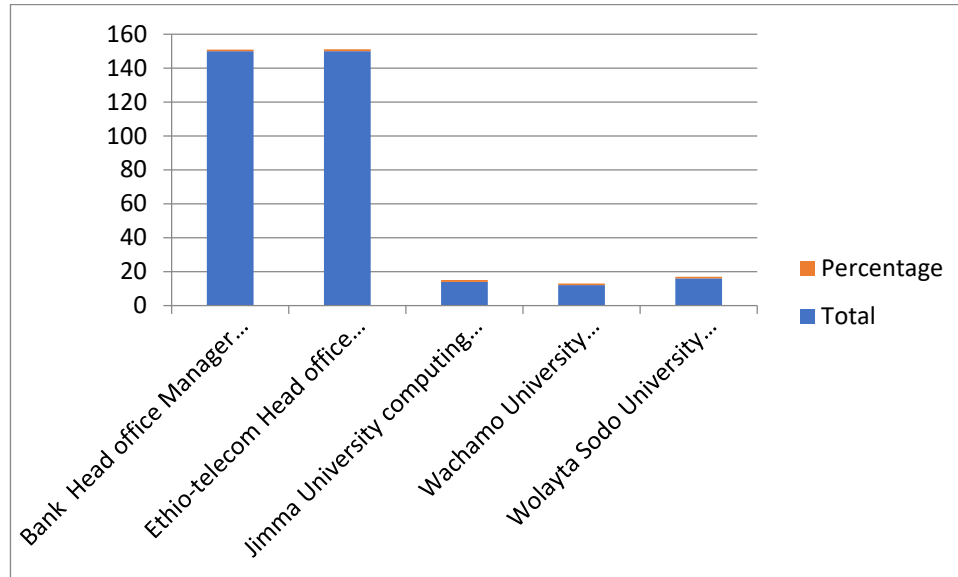
Figure 4. Distribution of the response rate

4.1.2. Demographic Information of Respondents

The demographic information of respondents was expressed in terms of different attributes such age, sex, marital status and etc. The detailed depictions were illustrated in the following part with the help of both tables and figures.

The respondents' of the survey questionnaires have different personal information. Consequently, the demographic profile of respondents who participated in the study is shown in the tables and figures below.

4.1.3. Respondents demographic information by Sex

The following table 4.2 and figure 4.2 illustrate the demographic information of respondents' by their sex.

Table 4.2: Respondents Sex

Sex	Frequency	Percentage
Male	175	53.84%
Female	150	46.16%
Total	**325**	**100.00%**

As indicated in table 4.2 above, among the total 325 respondents, (53.84%) were male, and the remaining (46.16%) were females. This data shows that the participation of female was less than males in overall activities of the organization. We can conclude from the above table, the majority of the respondents are male in the study area. The Sexes of the respondents are also depicted by the following figure 4.2.
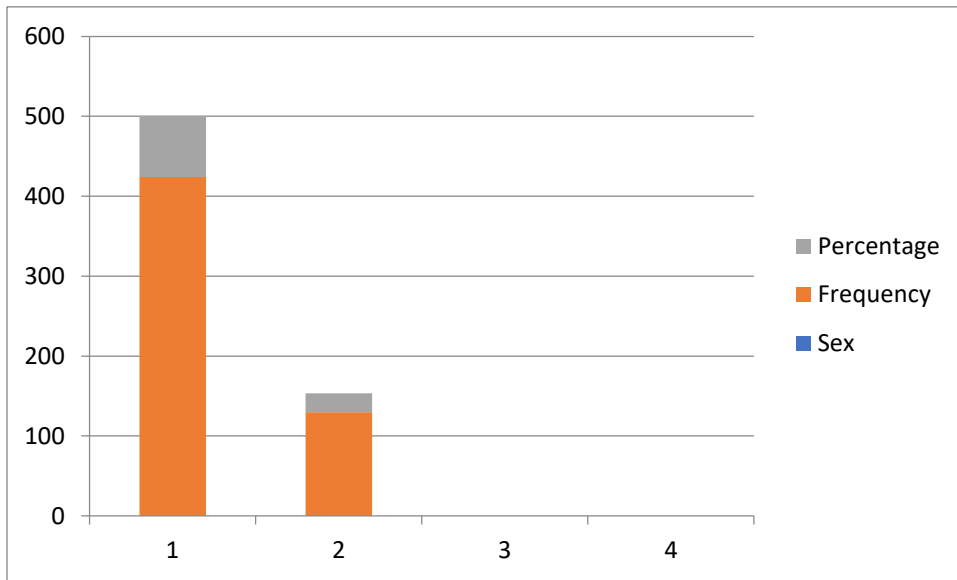
Figure 5: The Sex of respondents

4.1.4. Respondents Demographic Information by Age group

The following table 4.3 and figure 4.3 illustrates the demographic information of respondents by their sex.

Table 4.3: Age group of respondents

No	Age group	Total	Percentage
1	20-25	57	17.54%
2	26-30	88	27.08%
3	31-35	106	32.62%
4	35 and above	74	22.76%
	Total	**325**	**100.00%**

As shown in table 4.3 above, concerning the age distribution of respondents, from this table the majority (32.62%) of the respondents are found in the age group of 31 to 35, followed by 27.08%

of the age group of 26 - 30 and 17.54% in the age groups of 20-25 % and 22.76 % are in the age groups >35 respectively. The result implies that the respondents of the survey study are fairly included from all age groups although the majorities are in the middle of the frequency distribution. Majorities of the respondents are found between the age groups of the ranges of 31-35 years. The age of the respondents are also depicted by the following figure 4.3.
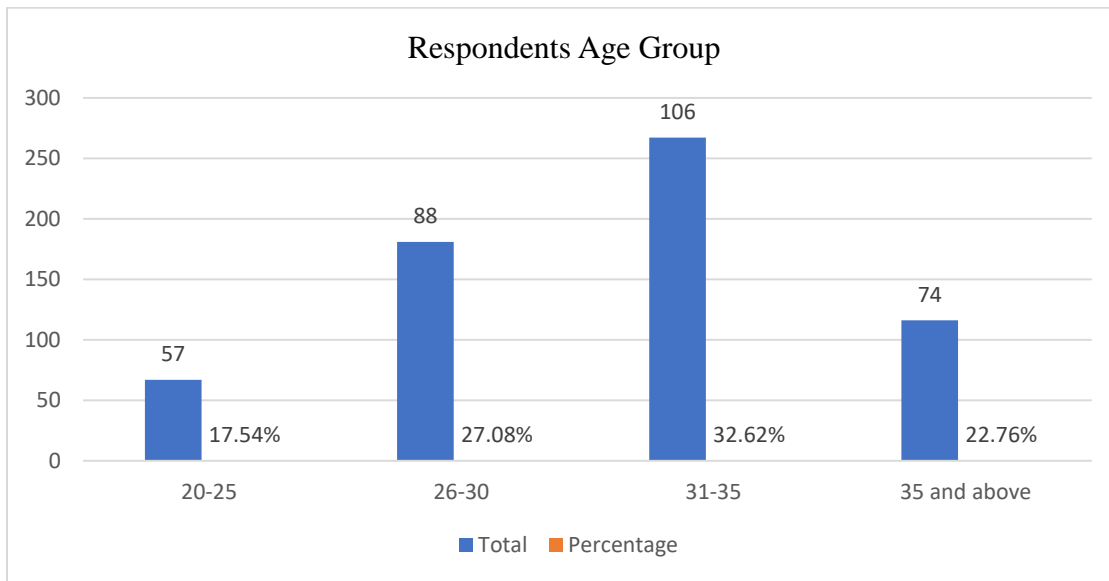
Figure 6: Respondents age group

4.1.5. Respondents Education Level

The following table 4.4 and figure 4.4 illustrates the educational background they attended before joining the working environment. Consequently, the detailed elaboration of the respondents' educational background is depicted as follows.

Table 4.4: Respondents Education level

No	Educational Level	Total	Percentage
1	Diploma	-	-
2	First Degree(BSc)	269	82.77%
3	Master's Degree(MSc)	53	16.31%
4	Doctorate Degree(PhD)	3	0.92%
	Total	**325**	**100.00%**

The above table 4.4 shows that the respondents considered in the study area vary in their education level. The variation in education level reveals that each employee in industries serve the organization based on the education background they have. Additionally, the following figure 4.5 depicts the education level of the respondents' included in the study.
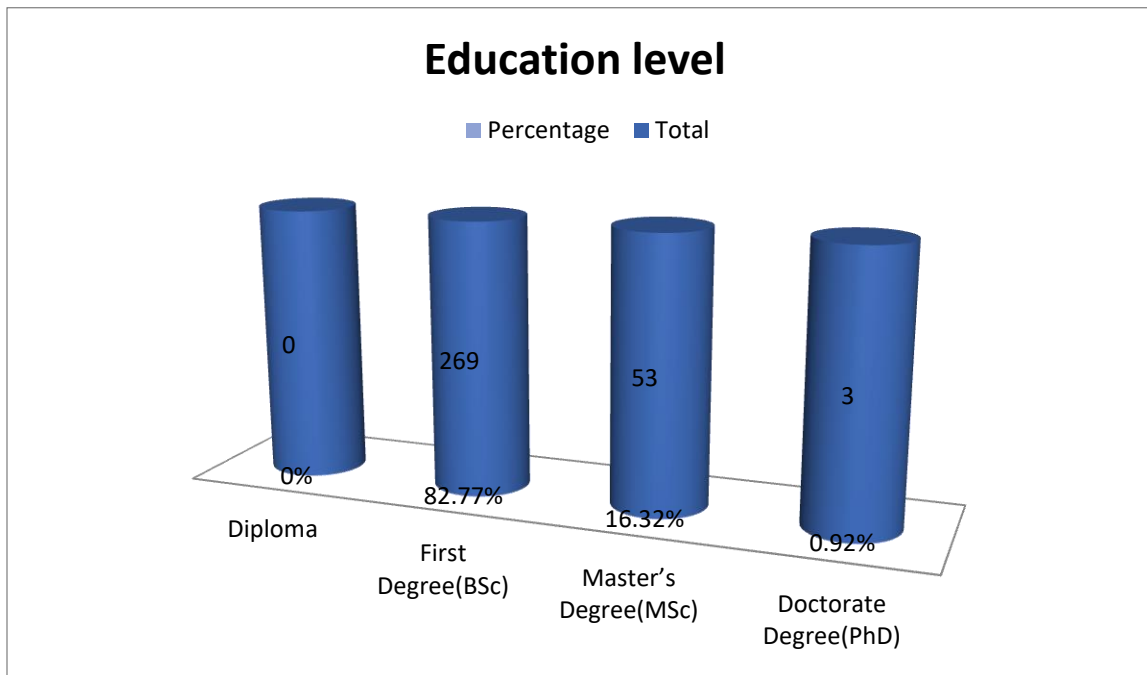
Figure 7: Respondents Education level

The above figure 4.4 shows that employees in the industries have different education levels, which are expressed in terms of both number and percentages. Consequently, among 325 respondents, 269(82.77%), first-degree holders, 53(16.32%) are of them are Master's degree holders, and 3(0.62%) of them are Doctorate holders.

4.1.6. Respondents Work Experience

The following table 4.5 and figure 4.5 illustrate the work experience of the respondents in work environment, specifically in the ethio-telecom and banking sectors.

Table 4.5: Respondents' work experience

No	Work Experience	Total	Percentage
1	Less Six months	-	0.00%
2	Six month-1 year	15	4.62%
3	1year- Three years	78	24%
4	Three years-5 years	19	5.85%
5	Above 5 years	213	65.53%
	Total	**325**	**100.00%**

Based on the above table 4.5, employees in both Ethio-telecom and the commercial bank of Ethiopia have different work experiences in their respective organizations.

Similarly, the following figure 4.5 shows that the work experience of the employees in the two selected hiring industries.

	Less 6 months	6 month-1 year	1year- 3years	3 years-5 years	Above 5 years
Percentage	0.00%	4.62%	24.00%	5.85%	65.53%
Total	0	15	78	19	213

Respondents work experience

Figure 8: Respondents work experience

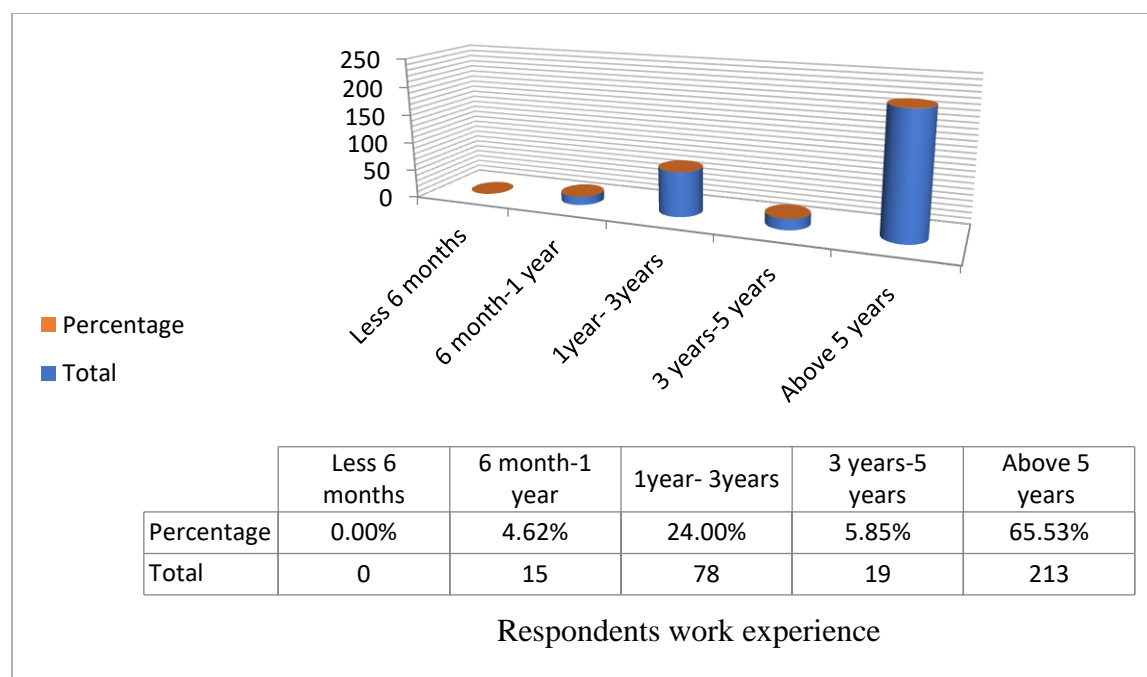The above figure 4.5, elaborates that work experiences do they have in their work environment. Accordingly, among the respondents none of them have do have experience less than six month (0.00%), 15(3.06%) of them have 6 month to 1 year work experience, 78(24%) of them have 1year to 3 years work experience, 19(5.85%) of them have 3 years to 5 years work experience and finally 213(65.53%) of them have above 5 years work experiences in hiring industries.

4.1.7. Respondents Graduation place/Universities

With the same manner, the following respective table 4.6 and figure 4.6 illustrates the place where the study participants graduated from before joining the two hiring selected companies (Ethio-telecom and commercial bank of Ethiopia). As is depicted in the elaboration pictures employees' where graduated from different universities.

Table 4.6: Respondents graduation Universities

No	Graduation places/Universities	Total	Percentage
1	Jimma University	159	48.16%
2	Wachemo University	48	32.61%
3	Wolayta Sodo University	118	19.23%
4	**Total**	**325**	**100.00%**

As it is shown above in table 4.6, employees in both selected ethio-telecom and commercial bank of Ethiopia were graduated from different higher institutions found in Ethiopia. Accordingly, 159(48.16%) of them were graduated from Jimma University, 48(32.61%) of them were graduated from Wachemo University, 118(19.23%) were graduated from Wolayta sodo University

From the table 4.6 above, it is possible to say that employees in an organization were graduated from different universities established at different time intervals and different infrastructural availability. Similarly, the above table 4.6 is shown by figure 4.6 below.
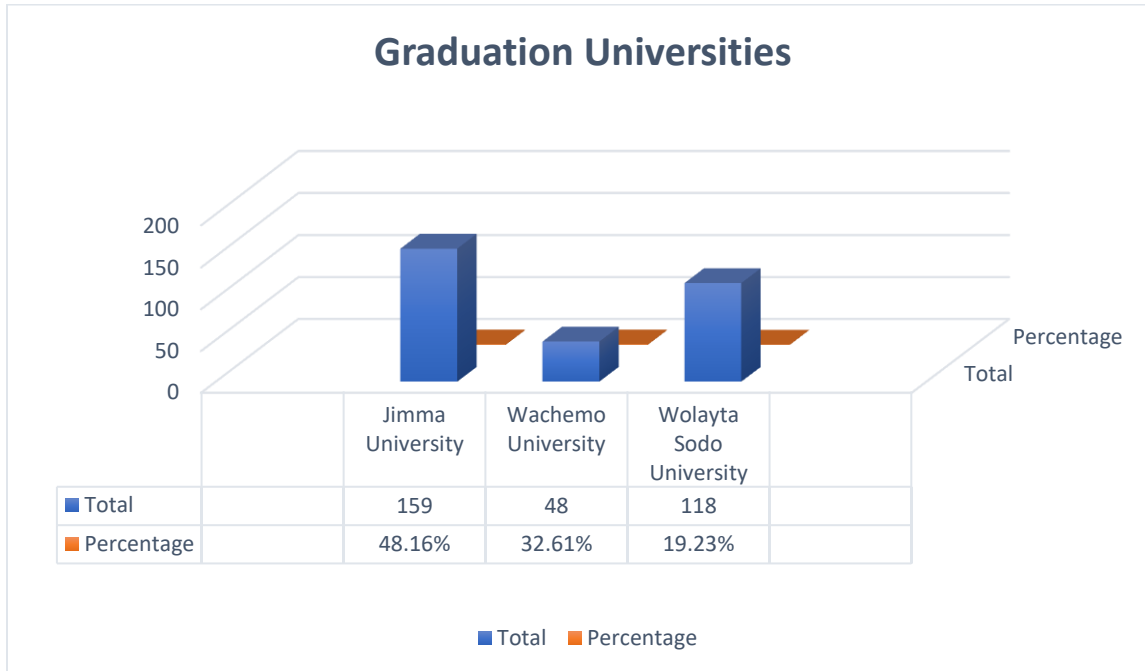
Figure 9: Respondents graduation Universities

With the same manner, the above figure 4.6, illustrates the respondents graduation places. Accordingly, employees were graduated from different Universities with different infrastructural availability. Therefore, it can be said that there is skill variation among employees in an organization based on the trend of education they passed through up to the graduation level.

4.1.8. Current Existing Factors of IT department graduate skill and Industries skill requirement

The following table 4.7 demonstrates the factors related to curriculum implementation process for IT department graduates and industries skill requirement.

Table 4.7: Respondents distribution of curriculum implementation process related factor

curriculum implementation process factor		Frequency	Percentage (%)
	Strongly Disagree	9	2.77%
	Disagree	38	11.69%
	Neutral	96	29.55%
	Agree	168	51.69%
	Strongly Agree	14	4.30%
	Total	**325**	**100.00%**

As shown in the above frequency distribution table 4.7 the overall views of respondents' regarding the current existing challenges, 168(51.69%), is a significant number to judge or comprehend that the employees of the Ethio-telecom and commercial bank of Ethiopia staff have agree on the curriculum implementation process related factor for the skill gap exist with IT department graduates. Whereas about 96(29.55%), from the returned questionnaires, respondents have replied their neutral feelings towards the IT department graduates skill and hiring industries skill requirements. From this result, it may be argued that although the majorities (51.69%) of the employees have had a concern regarding the challenge of curriculum implementation process related factor on applications were agreed. From these results, therefore, it is obvious or it can be safely concluded that majority of the employees have agreed with the existence of challenge of curriculum implementation process related factor for the IT department graduates and industries skill requirements.

The following table 4.8 demonstrates the factor related to curriculum implementation process for IT department graduates and industries skill requirement.

Table 4.8:Distribution of Collaboration between IT department and Industries

Get training	Frequency	Percentage (%)
yes	263	80.92%
No	62	19.08%
Total	**325**	**100.00%**

As shown above in table 4.8, about the 19.08% of the respondents were said "No", regarding the factor related to collaboration between IT department and industries. . About 80.92% of them were said "yes". According to the result of this study, the majority of the respondents' said that, the problem of collaboration between IT department and industries can be factor that create skill gap of graduates and industries skill requirement.

Table 4.9: Respondents distribution of the factors regarding Learning System

Learning System Factor	Frequency	Percentage (%)
Strongly Disagree	11	3.38%
Disagree	36	11.07%
Neutral	82	25.23%
Agree	180	55.38%
Strongly Agree	16	4.94%
Total	**325**	**100.00%**

As shown above table 4.9, 55.38% of the respondents were said 'agree', concerning the learning system factor in teaching-learning process of IT department graduates. About 3.38% of them were said strongly disagree. According to the result of this study, the majority of the respondents said that, the current existing skill gap of IT department graduates is related to learning factor. In essence learning system factors can be the theoretical competency, methodological competency, easiness of the learning system for developing both skill and knowledge of learners.

Table 4.10: Respondents distribution of Learners/Students factor

Learners or students factor	Frequency	Percentage (%)
Strongly Disagree	9	2.75%
Disagree	38	11.67%
Neutral	103	32.67%
Agree	159	48.00%
Strongly Agree	16	4.91%
Total	**325**	**100.00%**

As shown above table 4.10, 48.00% of the respondents were said agree, on factors related to the learners/students in IT department graduates for developing both skill and knowledge required by the industries. Similarly, About 4.91% of them were reflected as strongly disagree. According to the result of this study, the majority of the respondents confirmed that, the current existing the IT department graduates skill gap is related to learners/students themselves. This

ensures that most of the time learners tend to develop more knowledge than skill which is required by industries in real world.

Table 4.11: Respondent distribution related to instructors/lecturers factor

Lecturer/instructor factor	Frequency	Percentage
Strongly Disagree	19	5.85%
Disagree	31	9.55%
Neutral	33	10.15%
Agree	206	63.38%
Strongly Agree	36	11.07%
Total	**325**	**100.00%**

According to the frequency distribution table 4.11 above, the overall views of respondents' regarding the factors which create the IT department graduate skill gap, 206(63.38%) is a significant number to judge or comprehend that the employees of the Ethio-telecom and commercial bank of Ethiopia argue for that lecturers/instructors can be the factor for skill gap of the IT department graduates. About 31(9.55%), from the returned questionnaires, respondents have replied their disagree feelings towards the lecturers/instructors related factors. From this result, it can be argued that although the majorities (63.38%) of the employees have had better understanding towards the role of lecturers/instructors in improving skill gap of the IT department graduates. From these results, therefore, is obvious or it can be safely concluded that lecturers/instructors can be the factor that leads to skill gap of the IT department graduates and industries the skill requirement.

Table 4.12: Respondent distribution of the Technological factor

Technological infrastructure factor	Frequency	Percentage
Strongly Disagree	17	5.23%
Disagree	63	19.38%
Neutral	42	12.92%
Agree	150	46.16%
Strongly Agree	53	16.31%
Total	**325**	**100.00%**

As frequency distribution table 4.12 above the overall views of respondents' regarding the technological infrastructure related factors, 150(46.16%) is a significant number to judge or comprehend that the employees of the both Ethio-telecom and commercial bank of Ethiopia confirmed that technological infrastructures can be a factor for the IT department graduate skill gap and industries skill requirement. About 63(19.38%), from the returned questionnaires, respondents have replied their disagree feelings toward the contribution of technological infrastructures factor for skill gap existence. From this result, it may be argued that although the majorities (46.16%) of the employees have had better understanding towards the technological infrastructure related factors. From these results, therefore, it is obvious or it can be safely concluded that majority of the employees have technological infrastructures shortage for the IT department graduates skill development.

Table 4.13: Respondent distribution of the collaboration between IT department management and industries management factor.

Collaboration between IT department management and industries management factor	Frequency	Percentage (%)
Yes	252	77.54%
No	73	22.46%
Total	**325**	**100.00%**

From the above table 4.13, it is visible that majority 252(77.54%), of the respondents replied that the lack of proper and continuous collaboration between the IT department management and industries management bodies highly be a reason for the skill gap exists on the IT department graduates the skill and industries skill requirement. Therefore, the lack of collaboration among the IT department managing bodies and industries managing bodies leads to skill gap of computing faculty graduates.

Table 4.14: Respondent distribution of lack of framework for both IT department and industries role relationship factor

The Lack of framework for both the IT department and industries role relationship factor	Frequency	Percentage (%)
Yes	200	61.54%
No	125	38.46%
Total	**325**	**100.00%**

By inferring the above table 4.14, lack of the framework for both IT department managing bodies and industries managing bodies created the skill gap of the IT department graduates and industries skill requirement. It is also visible that none of the respondents' replied the questionnaires in a way that as there is problem of the framework which supports the smooth relationship between the IT department managing bodies and industries managing bodies in to mitigate the skill gap.
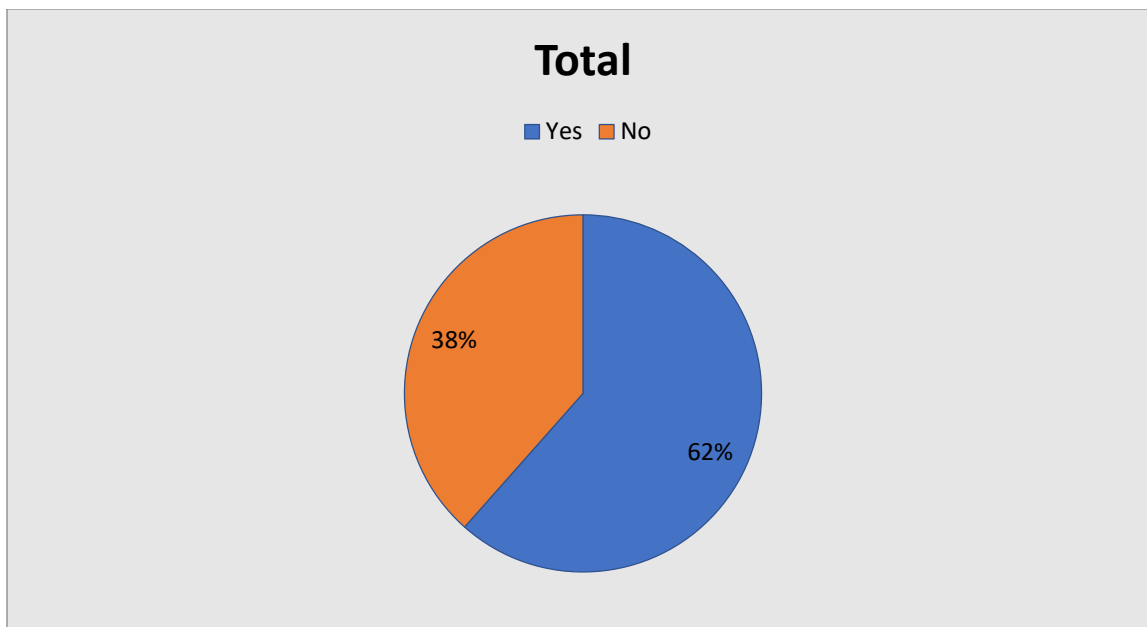
Figure 10: Lack of framework between IT department and industries

The above figure 4.8, illustrates that the lack of framework between the IT department and industries that support smooth relationship for different affairs lead to the skill gap exist between the IT department graduate and industries skill requirement. From the respondents 200 (61.4%) confirmed that there is the problem for a lack of framework between the IT department managing bodies and industries' managing bodies with achieving the objective of the organization.

4.1.9. Descriptive of Component and Challenges of IT department graduate skill and industries skill requirement

The descriptive part of the analysis highly focuses on the factors that determining the IT department graduate skill and industries (Ethio-telecom and commercial bank of Ethiopia) skill requirement. Determinant factors are described in terms of different descriptive statistics.

Table 4.15: Mean and Standard Deviation of challenges of IT department graduate skill and industries skill requirement

Descriptive Statistics			
	N	Mean	Std. Deviation
Learning System-based factor	325	1.2129	.40975
Learners- based factor	325	1.8184	.38593
Lecturers- based factor	152	1.4180	.49371
Technological infrastructure based factor	151	1.4481	.49779
Valid N (list-wise)	151		

The above table 4.15 shown that, descriptive statistics clearly indicates the corresponding arithmetic mean and standard Deviation of every construct totals (total of every individual categorical construct). Thus, the learning system based factors categorical total has a mean of 1.2129 and a standard deviation of .40975, Learners/students based factor total has a mean of 1.8184 and a standard deviation of .38593, lecturers/instructors based factors categorical total has a mean of 1.4180 and a standard deviation of .49371, technological infrastructure based factor categorical total has a mean of 1.4481 and a standard deviation of .49779 which shows that majority of the respondents have good perception on collaboration role for IT department graduate skill and industries skill requirement compare to other factors.

In this study, the major concern is to investigate and develop a framework that illustrates the strengths of the relationship between (investigating the challenge of IT department graduate skill and standard and Industries skill requirement).

Table 4.16: Distribution of Correlations analysis

		Learning system based factor	Learner based factor	Lecturer based factor	Technological infrastructure based factor
Learning system based factor	Pearson Correlation	1	.245**	.614**	.578**
	Sig. (2-tailed)		.000	.000	.000
	Sum of Squares and Cross-products	85.795	19.799	63.441	60.153
	Covariance	.168	.039	.124	.118
	N	325	325	325	324
Learner-based factor	Pearson Correlation	.245**	1	.399**	.422**
	Sig. (2-tailed)	.000		.000	.000
	Sum of Squares and Cross-products	19.799	76.107	38.871	41.229
	Covariance	.039	.149	.076	.081
	N	325	325	325	324
Lecturer-based factor	Pearson Correlation	.614**	.399**	1	.942**
	Sig. (2-tailed)	.000	.000		.000
	Sum of Squares and Cross-products	63.441	38.871	124.555	118.098
	Covariance	.124	.076	.244	.232
	N	325	325	325	324
Technological infrastructure based factor	Pearson Correlation	.578**	.422**	.942**	1
	Sig. (2-tailed)	.000	.000	.000	
	Sum of Squares and Cross-products	60.153	41.229	118.098	126.376
	Covariance	.118	.081	.232	.248
	N	324	324	324	324

**. Correlation is significant at the 0.01 level (2-tailed).

Correlation results presented in table 4.16, shown that there is significant positive relation between factors such as learning system, learner factor, lecturer factor and technological infrastructure (Sig=.000, r= .118).

❖ There is a significant positive relation between current the IT department graduates and industry skill requirements (sig=.000, r=. 081).

- ❖ There is a significant positive relation between collaboration between IT department graduate skills and industries skill requirements (sig=.000, r= .232).
- ❖ There is a significant positive relation between factors of IT curriculum implementation and IT graduate skills (sig=.000, r=. 248).

From the analysis, it is noted that current challenges existing toward IT department graduate skill and industries skill requirement depends on course delivery mechanism, technology based, lecturers based factors that determine the quality of education in higher institutions.

Regression analysis helps to measure the relative strength of the independent variables on the dependent variables. Hence, the regression between the major components of IT department graduate skill and industries skills requirements is analyzed.

Generally, factors such as learning system, learner factor, lecturer factor and technological infrastructure do have high impact on the IT department student's skill and industries skill requirement.

Table 4.17:Distribution of model summary analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.854[a]	.729	.727	.38818

a. Predictors: (Constant), IT department graduate skill and industries skill requirement determinant factors

The above table 4.17 shows that, the model summary shows the Adjusted R Square, which is the degree of association between the IT department and industries skill requirement determinant factors are 0.727. This result implies 72.7%, of variation in challenges of IT department graduate skill and industries skill requirement is explained by major factors   that determine the quality of education in the higher education system whereas 27.3% of the variance is explained by other factors.

Table 4.18: Distribution of ANOVAa analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	205.350	4	51.337	340.688	.000[b]
	Residual	76.399	321	.151		
	Total	281.748	325			

a. Dependent Variable: challenges of IT department graduate skill.

b. Predictors: (Constant), Current determinant challenges such as learning system, learner

-based factor, lecturers factor, technological infrastructure based factor.

Below table 4.19 shows the extent to which each independent variables influence the dependent variable. The point focused on the relative importance of (independent variables) in contributing to the variance of the (dependent variable) is explained by the standardized beta coefficient.

Table 4.19: Distribution of Coefficient   analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.561	.101		15.522	.000
	Current existing challenges	-.094	.052	-.052	-1.790	.074
	Collaboration between IT department head and industries managers	.268	.049	.303	5.521	.000
		.251	.081	.130	3.099	.002
	Determinant Factors of IT department graduate skill	.331	.038	.488	8.640	.000

a. Dependent variables; Factors of IT department graduate skill

Above table 4.19 shows the extent to which each independent variables influence the dependent variable. The relative importance of (independent variables) in contributing to the variance of the (dependent variable) is explained by the standardized beta coefficient. The beta value is positive that means a higher positive, effect of challenges of IT department graduate skill and industries (Ethiopian telecommunication and Commercial banks of Ethiopia) skill requirements.

Among the independent variables, is explained rating decision is more significant and statistically meaningful. This can be interpreted as a certain improvement on the Explaining rating decision will increase challenges of IT department graduate skill and industries skill requirement is 38%. Thus, Explaining rating decision has a greater rate of change than other variables.

Generally, the study finding reveals that the IT skill requirement and the industries skill requirement do have direct relationship in bringing and promoting the customer satisfaction and service delivery level in an organization.

4.2. Interviews finding

This part highly focuses on first-hand information obtained from the key informants regarding the IT department students Skills gap and industries IT skill requirement. In a mean time the summary of the interview finding is also summarized in a clear manner.

The purpose of these interview questions was to acquire additional information that consolidates the research study and collect questions of responses that are not included in the questionnaires. Accordingly, one of the first major areas given to the interviews was about the major skills which is expected from the graduates to have after their graduation required by the industries. Both of industrial and IT department personnel's was reveled their ideas on the requirements of the skill. Most of the interview especially the information technology department heads and the industry ICT department managers pointed out those major skills expected from the IT graduates needs to have in order to become enough competent in the market.

As answered by those two concerned parties the set of skills which is expected from the graduates for their carrier on industries includes install, customize and maintain applications (network installation, network administration, design Web site, develop multimedia resources, install communication components and oversight of email system); implement and manage automated information system and take care of an organization's technology and infrastructure needs.

The second major areas given to the interviews was about the collaboration of department and industries towards the implementation of curriculum. Many of the respondents reflected that

there is no such collaboration on curriculum implementation process rather participating or collaborating in curriculum development.

Their answer shows that they highly believe on the importance of the collaboration of the industry and departments in curriculum implementation process which allows the sectors to achieve their organizational and institutional goals. The collaboration of industries and departments has a lot of positive advantages for industries as well as the departments and the students. They can understand each other towards their requirement and needs. And this may help the departments to produce qualified professional with required set of skills, the industries will get qualified employee who can invest his best for the success of the organization. The students will become more competitive in the market as a result of having employability skills that allows to work on those industries.

The third major areas given to the interviewees was about the existence of the skill gaps on graduated students after graduation that allows them to being employee in the industries. In this statement almost all of the interviewees agreed up on the existence of the skill gaps between the students and industries skill requirement. And they concerned about the effects of these skill gap on those parties accordingly they have common understanding on the negative impacts which is created as a result of the skill gaps.

"Let's take IT department graduate skills gap exist between IT graduates skill and industries IT skill requirement, the quality of content which are delivered for students should be supported with practical skill that foster competency of learners to fill the gap of industries IT skill."

Depending on the responses of the interviews a number of factors are there accountable for the existence of the skill gaps were the factors related to learners' skill, all responded that there is a great challenge for developing skills rather than knowledge in the domain area. The responses of the IT department heads and other teaching staffs on this factor are mainly "*Learners are highly focuses on scoring good grade in the course than developing set of skills which helps them when they look jobs in the market and this leads the graduate to be incompetent for the industry because of their incapability toward the set of employability skills they are expected to have*."

Among the main factors which hinder IT graduate skill is the allocation of technology infrastructure to achieve the main objective of the department. Accordingly, one of the interview

questions raised during the interview session was, if there were sufficient infrastructures that support the teaching-learning process, specifically in skill development for the IT department. *Accordingly, the responses given by the respondents' show that there is shortage of technology infrastructure that supports the teaching-learning process for IT staff, but there are some observations in need for providing additional infrastructure.*

The Learning system is also one main factor that supports delivering quality education for learners in required manner. According to the response answered by some of the respondents," *the learning system in which education is provided also plays a great role in equipping learners with expected minimum skill requirement from the department.*"

The way of delivering the course content is among the factors that hinders IT skill requirements for industries to address the learners to meet the expected objective. According to," *Instructors play a role in delivering the content through developing both skill and knowledge required form the IT department graduate. Similarly, whenever learners are equipped with both appropriate skill and knowledge they can afford any challenge they face through applying both skill and knowledge they developed in the education environment*"

Generally, the interview finding illustrates that there are the existence of skill gaps between the industrial information technology skill needs and the actual skills of the students they acquired after graduation. This skill gaps needs to be mitigated in order to make both industries and the universities effective in achieving their objectives.

Low level collaboration between IT department and the industries is affecting the effectiveness of IT department, industries as well as the students. Many of the respondents expressed their support on the collaboration between industries and departments. The respondents revealed the major cases for the skill gaps that hinder the IT skill requirement development at student level and industries skill requirements to meet the need of the organization. those causes were curriculum implementation process, less collaboration between IT department and industries', the attitude of the learners' toward the significance of those technical skill, learning system, technology infrastructures and instructors' contributions collectively determine the level of skill expected from IT department graduates.

The respondents raised a lot of points on the measure needs to be taken to mitigate these skill gaps. Primarily collaboration between department and industries, enabling the instructor's performance, changing the attitudes of the students and development of latest technological infrastructures which can help both the instructors and the students to work on those significance employability skills.

4.3. Proposed Framework

The proposed Framework of the investigation the challenges of the IT department graduates' skills gap and industries' skill requirement is described below according to the order of its challenges investigation for the IT skill gap and industries skill requirements are a curriculum-based factor, Learning system factors, learners skill–based factors, organizational factors and technological infrastructure factors respectively.

Curriculum Design and implementation process factors: this play very crucial role developing the skills of graduate throughout teaching learning process. The Curriculum is the baseline for equipping learners with the expected skill and knowledge in their field of study. In the context of Ethiopian higher education Institutions specifically in the IT department, the program curriculum is expected to be practical to ensure both the practical and methodological skills of learners.

Curriculum design and implementation process factors related to the gap of collaboration between graduate producers and graduate hirers within the organization. The process starts from need assessment investigation to curriculum implementation after incorporating necessary and important ideas.

Learning system factors: The major factors affecting the education systems are the resources and money utilized to support those systems in different nations. As it is known, a country's wealth has much to do with the amount of money spent on education.

Learners-based factors: There is a different learning system factor that hinders the skill and knowledge of learners in the education system. Among the major factors related to learners, maturity, age, motivation, previous learning, intelligence, mental health, physical need, diet and

nutrition, attention and interest, goal-setting and level of aspiration are the factors affecting teaching and learning related to learners.

Instructor/Lecturers-based Factors: There are various problems hinder the instructors/lecturers in delivering the course content to meet the expected competency in the teaching-learning process. Among the challenges are lack of time for planning, a lot of paperwork, performance pressure from faculty Administrators, balancing diverse learning needs, handling too many masters, are getting Burn out easily, lack of proper funding and limitations of standardized testing. Therefore, how the instructors deliver the course highly contribute to the development of learners' skills and knowledge for IT department graduates.

Technological-infrastructure factors: The infrastructures in education system play a great role in equipping learners with the expected minimum level so as to compete for enough in industries. The availability of the teaching-learning resources supports development of the skill of learners. Technological infrastructures in teaching-learning process facilitate teaching learning process in effectively and efficiently. Buildings, classrooms, laboratories, and equipment- education infrastructure - are crucial elements of University learning Environments. Strong evidence is that high-quality infrastructure facilitates better instruction, improves student outcomes, and reduces dropout rates, among other benefits.

Lack of frame-work factors: The smooth relationship between the IT department managing bodies and industries managing bodies (Ethio-telecom and Commercial bank of Ethiopia in the context of this study) need proper and continuous joint activities in achieving organizational objectives. The needs of a framework for both parties mold their activities based on the requirement set for achieving the organizational mission and vision. IT department produce graduates who serve the industries through being the employer of the industries. These IT department graduates is graduated from the university with the necessary IT skills and knowledge and on other side the industry want to recruit graduate with necessary and competitive skill and knowledge. Consequently, framework supports both parties in accomplishing their independent mission and vision.

Generally, IT department graduates' skill is affected by many factors in teaching learning process. All the necessary input in education system paves the way the skills development of IT

department graduate and the industries skill requirements. Therefore, all stakeholders in both Education system and industries should be given due attention toward various factors that highly hinder the expected skill of learner in University.
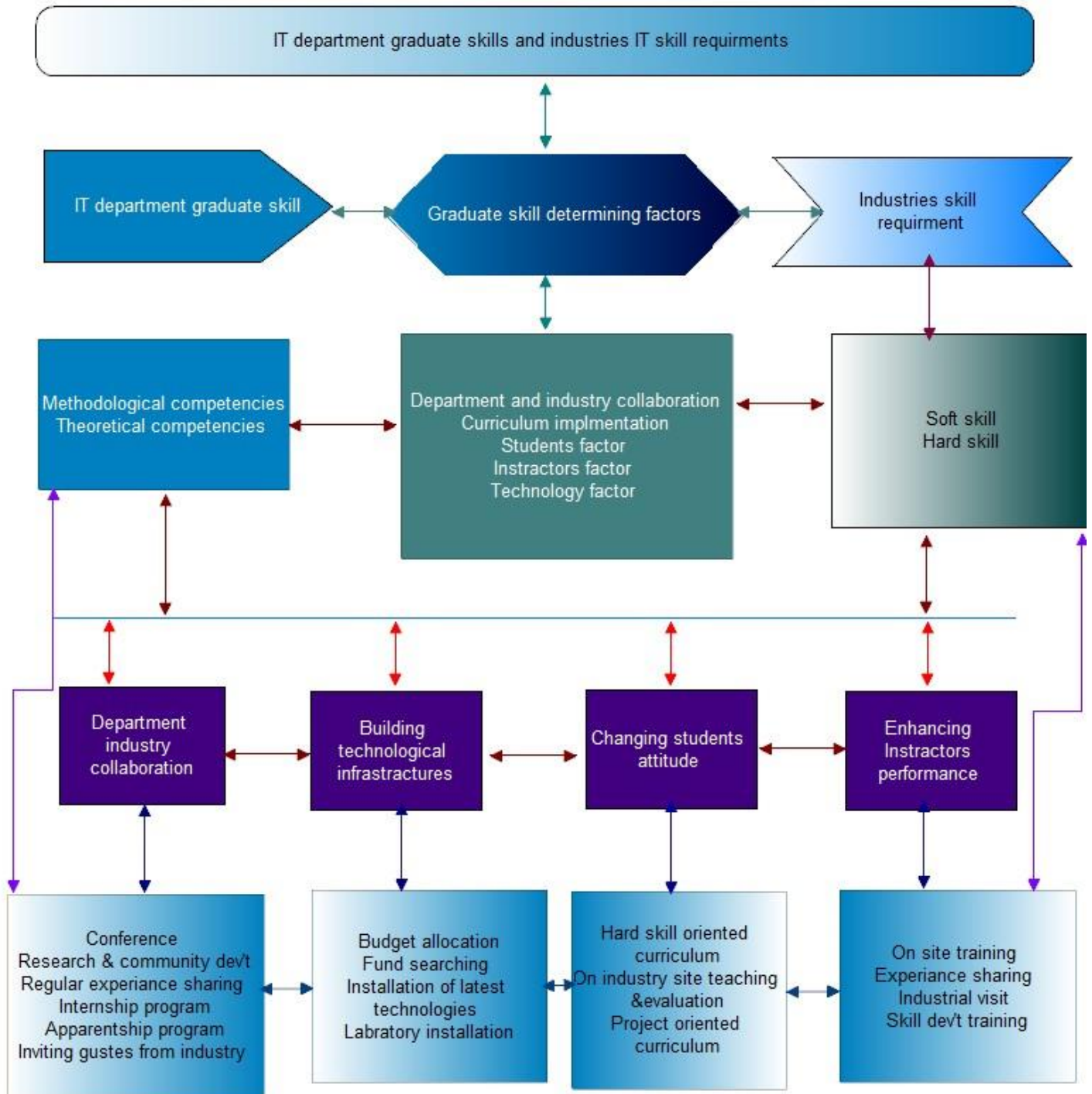

Figure 11: Proposed Framework

Frame work discussion

The developed framework is a theoretical framework and it is derived from the data which is collected from the respondents with both qualitative and quantitative data collection methods basically from structured questionnaires and interviews. And its major purpose it to shows the availability of the skill gaps and the major responsible factors for the existence of the skill gaps between IT department graduates and the industries skill requirements.

The framework included also the solution and appropriate measures could be taken to mitigate those identified skill gaps between department and industries includes department industry collaboration, building technological infrastructures, changing students attitude, enhancing the instructors performance.

The collected data and the result of the analysis revealed that the existence of the skill gabs between IT department graduates and industries information technology skill requirement. Depending on those results the framework which can be used as a blue print as a solution for the described problem needs to be designed. The framework included all independent and dependent variables and solution mechanisms stated in the above statements.

In addition to those solution mechanisms the framework describes effective ways in order to apply those mechanisms in every pieces of mechanisms. For department industry collaboration conference and community development program, internship program, apparent ship programs and inviting gusts from the industries are raised as the way to apply the mechanisms. For building technological infrastructures fund searching, budget allocation, installation of latest technologies, laboratory installations are the major mays. For both changing the students attitude and enhancing instructors performance on industry site teaching and evaluation, hard skill oriented curriculum implementation, experience sharing and on site trainings are considered as ways to achieve the solutions.

4.4. Discussion of the findings

This section addressed several challenges, factors that regulate and related to learning-system, learner-based factor, lecturer-based factor, technological infrastructure based factor, curriculum implementation base factor   and lack of framework-based factor for IT department graduates skills and industries' IT skill requirement. These challenges comprise of the different factors that are related to the availability of on work skill development training, leadership support and IT courses   theoretical application problem, technological infrastructure challenges to implement IT department's curriculum, skilled human resource limitation challenges, technical support challenges for IT department curriculum methodological applications. More than 65% of the IT department graduates highly focus on knowledge rather than skill.

Correlation is a measure of association between two variables. According to Kothari (2004), positive values of r indicate a positive correlation between the two variables (i.e., changes in both variables take place in the stated direction), whereas negative values of "r" indicate a negative correlation i.e., changes in the two variables taking place in the opposite directions. A zero value of "r" indicates that there is no association between the two variables.

When r = (+) 1, it indicates perfect positive correlation and when it is (−) 1, it indicates perfect negative correlation. In the same way, Cohen (1998) cited by (Warokka et al. 2012), also interpreted the coefficient of correlation between 0 and 1 in the following manner. The correlation coefficient (r) ranging from 0.10 to 0.29 may be regarded as indicate a low degree of correlation, r ranging from 0.30 to 0.49 be considered as a moderate degree of correlation, and r ranging from 0.50 to 1.00 be regarded as a high degree of correlation.

From the correlation analysis, it is noted that factors of the IT department curriculum implementation are positively correlated with IT department graduates' skill. Moreover, from the correlation analysis there is a significant positive relationship between the IT department graduates skill and industries skill requirements. From the Regression analysis, the degree of association between major factors of the IT department curriculum implementation is 0.727. This implies that 72.7%, of the variation in the IT department curriculum implementation process is explained by the major factors of challenges of the IT department curriculum implementation process whereas 27.3% of the variance is explained by other factors.

As per the interview and document review, key findings are discussed below against the research questions set out at the beginning of the study. The findings of the study and factors for the design of a framework are grouped in learning system-based factors, learner-based factors, and lecturer-based factors, technological infrastructure factors and lack of framework factors.

In these major factors, there are also sub-factors as, infrastructure and financial support, government regulations support, need for IT professionals, and training on these IT department curriculum implementation process and guidelines support.

Collaboration is the ability of two or more systems to exchange effectively use the information and use in the organization. About to this the most notable point that has the failure on lay the foundation of service use and implementation for IT department curriculum implementation process between IT department and industries (Ethio-telecom and commercial banks of Ethiopia). Hence, this issue be addressed through an inclusive the procedures. Philipson (2011) pointed out IT department design and implementation re-new procedure, the IT department operations and service procedure and IT department sourcing procedure as policies to be incorporated in good the IT department graduates' skill development and industries skills requirement. Therefore, this procedures set out by concerned should be prepared in the organization.

Olamo et al., (2019), focused on the challenges hindering the effective implementation of the harmonized modular curriculum in the case of three public universities in Ethiopia. This study identified the challenges which can affect the effective implementation of harmonized modular curriculum for undergraduate English language and literature program in Ethiopian public universities. The study resulted that due to a number of challenges modular curriculum has not been effectively implemented.

(Büth et al., 2017), conducted the study paved the way for bridging the qualification gap between academia and industry in India. According to the result if the study, professional competencies (theoretical knowledge) generally depend on the industrial sector of the company and the graduates' needs for knowledge about basic production technologies. The author also stated that the methodological competencies, which mainly refer to the transfer of theoretical knowledge

into real application-based problems, are generally as more important than the theoretical knowledge itself.

In Ethiopia, higher institutions are categorized into their generation based on their establishment year. Accordingly, the factors that shape the output of education highly depend on the nature of the institution. In the context of this study, three Ethiopian higher institutions among the three generations were considered. Consequently, these three generations have different factors that play a role in teaching-learning process in education system.

Generally, IT department graduates' skill and industries IT skill requirements are the different sides of the same coin. Different factors determine the quality of education in teaching learning process in Ethiopian. Therefore, the developed framework can support as a guideline for all stakeholders in the Universities and hiring industries. The major concern of the stakeholders should be more on the quality of education which is improved through both knowledge and methodological strategy to scale up the skill of the learners that support the industries to hire competent and skilled manpower for achieving its mission and vision.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS
5.1. CONCLUSION

The quality of education in many Universities is affected by a number of factors which are existing in teaching-learning process. The study finding revealed that the gap between IT department graduates' skill and the hiring companies' skill requirements do have a direct relationship in a working environment. Consequently, factors, such as curriculum design and implementation process based factor, learner-based factor, lecturer/instructor based factor and technological infrastructure-based factors are the typical factors which highly affect the delivery mechanism of the course content in the teaching-learning process.

IT department graduate is expected to have various competency skills such as hard skill, soft kill and employability skill in order to be recruited by different organizations including Ethio-telecom and commercial bank of Ethiopia head office. The two hiring industries want to recruit a graduate who is equipped with the required skill to achieve the main objective of their organization's mission and vision.

The developed framework mitigated the way for both IT department and Industries' collaboration by focusing on the distinguishing factors of IT department graduate skills and the industries' skill requirements. The developed framework supports the two parties in sharing responsibility in order to work on the major factors hindering the skill development of IT department graduate and industries' skill requirements.

5.2. RECOMMENDATIONS

Although the study achieved its main objective which is investigating the IT skill gap and the industries skill requirements the following major points demand the focus of the interested a future researchers in the area.

➢ There should be additional study on the role of IT specialized employee and Customer satisfaction level in service delivery in both Ethio-telecom and commercial banks of Ethiopia.

➢ The focus should be given to the curriculum implementation of IT department and the skill requirements of hiring industries for digital age.

➢ Further studies should be conducted on other computing faculty departments undergraduate and other hiring companies' skill requirement.

➢ Interested researchers should conduct future study on the role of both IT skill and knowledge development and satisfying the demand of both governmental and non-governmental organizations in improving their working environment.

➢ The curriculum implementation of IT department should highly focus on the skill development but not only knowledge based course delivery mechanism.

➢ There should be a harmonization in curriculum implementation on all higher institutions in Ethiopia.

➢ The universities should provide necessary technical and financial support to the universities for enabling the graduate with the expected skill and knowledge.

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APPENDICES

JIMMA UNIVERSITY
JIMMA INSTITUTE OF TECHNOLOGY
FACULTY OF COMPUTING AND INFORMATICS
INFORMATION MANAGEMENT CHAIR
MSC IN INFORMATION SCIENCE (IKM)

Data collection tools employed to collect in order to investigate the skills gap between IT department curriculum implementation of Ethiopian public universities and IT department skills required by industries to develop a framework in order to mitigate the gaps. The tools are categorized into different appendices for suitability purpose.

Appendix-A

Part I: Questions-1: Interview Questions for IT department heads

1. What do you think about the gap exist between IT department heads department graduate and industrial IT department graduate skill requirement?

2. What is the role of collaborating with industries who will hire your graduates regarding the implementation of curriculum according to their skill requirement?

3. In what level your departments support the industries so as to provide qualified IT department professionals?

4. Is there any model that shows the current practices of IT department curriculum implementation process?

5. What mechanisms will be used in academic program for assess the students?

6. What are the modes which are applicable in course delivery processes of the department?

7. What are the major IT department graduate skills that are primarily expected from IT department students' need to have?

8. What directions should the department takes or plans to mitigate the skill gaps exist between IT department students and industrial computing faculty departments' skill requirement?

9. Do you have an experience regarding the relationship between your departments and hiring companies? If any, please specify.

Self-Administered questionnaire for IT department heads

Part 1: Respondent Information

1. Indicate your gender:

    O Male [ ]

    O Female [ ]

2. Indicate your age group:

    O Less than or equal 20 years [ ]

    O 21 – 30 years [ ]

    O 31- 40 years [ ]

    O above 40 years []

3. Indicate your Department:

    O Information System[ ]

    O Computer Science [ ]

    O Information Science [ ]

    O Information Technology []

    O Management Information System []

4. Your highest educational level:

    O Diploma [ ]

    O First degree [ ]

    O Master's degree [ ]

    O Doctorate degree (PhD) [ ]

5. Your profession:

    O Department head [ ]

    O instructor [ ]

    O Faculty dean [ ]

6. Please select your work experience:

    O Less than 6 months [ ]

    O 6 months - 1 year [ ]

O 1 - 3 years [ ]

O 3 - 5 years [ ]

O More than 5 years []

Part 2: Questions on IT department curriculum implementation framework

6. Is there any organized curriculum implementation framework in the department?

O Yes [ ]

O No [ ]

7. Do you think that curriculum implementation framework support the industry?

O Yes [ ]

O No [ ]

Part 2 Questions-1: Questions for both IT department Heads and Industries Managers

Please rate and tick (√) one answer only which indicate your extent of agreement Strongly Agree =SA, Agree =A, Neutral= N, Disagree = D, Strongly Disagree= SDA.

NO	Skill gaps	SA	A	N	D	SDA
1	We work with the industries in collaboration on curriculum implementation process					
2	There is a skill gap IT department graduates and industries skill requirement					
3	Collaborating with potential industries can improve the quality of our students skill					
4	Developing a frame work to mitigate the skill gap between IT department graduates skill and industry skill requirement is important for both of us					
5	The students are competitive enough in industries					
6	The industry can use our graduates for their productivity without investing extra cost to train them					
7	The collaboration of IT department and hiring industries paves the way for improving both quality of education and service					

Appendix-C

Part 3 Questions 1: Interview Questions for industries managers (Commercial Bank and Ethio-telecom head office managers)

1. What are the major IT department graduate skills primarily expected from IT department students by your industry?

2. Do you believe that new IT department graduates are competent enough for your working environment with their set of skills?

3. Do you observe the gap exist between IT department graduates with respect to your organization IT department graduate skill requirement?

4. Is there any experience that allows you to participate on curriculum implementation as well as curriculum design process?

5. What do you think about the importance of working with universities especially IT department who will provide IT department professionals for the implementation of curriculum according to your skill requirement?

6. What directions should both the department and the industry takes or plans to mitigate the skill gaps exist between IT department students and industrial IT department skill requirement?

Part 3 Questions 2: Self-administered questionnaire for industry managers

Part 1: Respondent Information

1. Indicate your gender:
    O Male [ ]
    O Female [ ]

2. Indicate your age group:
    O Less than or equal 20 years [ ]
    O 21 – 30 years [ ]
    O 31- 40 years [ ]
    O above 40 years []

3. Your educational level:

O Diploma [ ]
O First degree [ ]
O Master's degree [ ]
O Doctorate degree (PhD) [ ]
4. Your profession:
O CEO [ ]
O General Manager [ ]
O ICT director [ ]
5. Please select your work experience:
O Less than 6 months [ ]
O 6 months - 1 year [ ]
O 1 - 3 years [ ]
O 3 - 5 years [ ]
O More than 5 years []

Part 3: Questions-3 on IT department curriculum implementation framework

6. Is there any experience on participating curriculum implementation and framework development in the university especially on IT department?
O Yes [ ]
O No [ ]

7. Do you think working in collaboration with the department for the development of curriculum implementation framework can support the industry?
O Yes [ ]
O No [ ]

Part 3 Questions No-3   Interview Questions for industries employees (Commercial Bank and Ethio-telecom head office employees rather than managers)

1.   What are the major IT department skills primarily faced due to the lack of IT department skill in working organization?

2.   Do you believe that computing faculty departments' skills support your working environment with respect to the organization need?

3. Do you observe the gap exist between IT department graduate skills with respect to your organization computing faculty departments' skill requirement?

4. Is there any experience that allows you to participate on IT department graduate skill development training program as well as practical attachment you obtained in your education?

5. What do you think about the importance of working with hiring industries especially Banking and Ethio-telecom which provide IT department professionals for the implementation of curriculum according to their skill requirement?

6. What directions should both the department and the industry takes or plans to mitigate the skill gaps exist between IT department students and industrial IT department skill requirement?

Part 1: Self-administered questionnaire for industry managers

Part 1: Respondent Information
1. Indicate your gender: O Male [ ] O Female [ ]
2. Indicate your age group: O Less than or equal 20 years [ ] O 21 – 30 years [ ] O 31- 40 years [ ] O above 40 years []
3. Indicate the University you graduated from: O Jimma University [ ] O Wachamo University[ ] O Wolayta Sodo University[ ]
4. Your Educational level: O Diploma [ ] O First degree [ ] O Master's degree [ ]

O Doctorate degree (PhD) [ ]
5. Your profession Position: O CEO [ ]   O Team Coordinator [ ]   O ICT director [ ]
6. Your work experience: O Less than 6 months [ ]   O 6 months - 1 year [ ]   O 1 - 3 years [ ]   O 3 - 5 years [ ]   O More than 5 years []

Part 4 Questions No -1– Questions for IT department teaching staffs

Questions on factors affecting the skill gaps exist between IT department graduates and industrial IT department graduate skill requirement. Please rate and tick (√) one answer only which indicate your extent of agreement Strongly Agree =SA, Agree =A, Neutral= N, Disagree = D, Strongly Disagree= SDA

3A Learning system factor

NO	Learning system factor	SA	A	N	D	SDA
1	The current curriculum is good enough for learning system					
2	Theoretical knowledge is good enough for industrial companies					
3	Methodological competencies(transfer of theoretical knowledge into real application-based problems) is more important than theoretical knowledge					
4	Irregular learning method is more appropriate than curriculum based learning method for problem solving					
5	The students from current curriculum are enough competitive in industries					

3B lectures factor

NO	Lectures	SA	A	N	D	SDA
1	Most lectures are efficient and effective on knowledge sharing					
2	Most lectures focuses on grading than practical problem solving skill					
3	Most lectures have theoretical competencies than real world application competencies					
4	Most current lectures passed through the current working curriculum					
5	Most lecturers integrate different supporting technologies to reach students in effective and efficient way					

3C Technology factor

NO	Technology	SA	A	N	D	SDA
1	Technology-based education system is better than class room learning system					
2	Current Ethiopian universities have good technology access					
3	Technology has already advanced from current learning					
4	Teaching-learning process of current curriculum highly focus on digital literacy					

3D Students factor

NO	Students	SA	A	N	D	SDA
1	Most students are efficient and active on learning system					
2	Most students focuses on grading than knowledge Acquiring					
3	Most now-day students focuses on business than learning					
4	The attitude of students play a crucial role in improving their skill and knowledge					