



**Addis Ababa University
School of Commerce**

**ASSESSMENT OF PROJECT INTEGRATION MANAGEMENT
PRACTICES FOR PROJECT SUCCESS: CASE OF INTEGRATED
SHALLOW GROUNDWATER DEVELOPMENT PROJECT IN ETHIOPIA**

**A Final Project Submitted to School of Commerce, Addis Ababa University in
Partial Fulfillment of the Requirements for award of Master of Art Degree in
Project Management**

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Advisor: - Dr. Seifu Mamo

June 2022

Addis Ababa, Ethiopia

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Success: Case of Integrated Shallow Groundwater Development Project in
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Post Graduate Program

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Dedication

To my beloved and lovely wife Ferehiwot Ambaye and to my mom, Tikikilua Hadero.

Acknowledgment

I would like to express my heartfelt gratitude to my advisor, Dr. Seifu Mamo, for his unwavering support in completing this Final Research Project, as well as to all Addis Ababa University, School of Commerce, Project Management Courses instructors who provided me with the wonderful opportunity to work on this wonderful project on the topic: **Assessment of Project Integration Management Practices for Project Success: Case of Integrated Shallow Groundwater Development Project in Ethiopia**. They also assisted me in exploring all of the contemporary project management competencies and I gained a lot of fresh stuff, for which I am grateful.

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I am incredibly humbled and appreciative of everyone who has helped me turn these project final ideas—well above the level of simplicity and into something tangible—into reality.

Thanking you,

Belete Bantero

Statement of Declaration

I, Belete Bantero Bassa, have carried out independently a final project research work on the topic: **Assessment of Project Integration Management Practices for Project Success: Case of Integrated Shallow Groundwater Development Project in Ethiopia** in partial fulfillment of the requirement for the award of Master of Arts Degree in Project Management. This final research is entirely my own and has not been submitted for any degree or master's program at this or any other university.

Belete Bantero Bassa

Signature _____

Date _____

Statement of Certification

This is to certify that Belete Bantero Bassa has carried out his Final Project work on the topic entitled — **Assessment of Project Integration Management Practices for Project Success: Case of Integrated Shallow Groundwater Development Project in Ethiopia** under my guidance and supervision. Accordingly, I hereby assure that his work is appropriate and standard enough to be submitted for the award of Master of Arts Degree in Project Management.

Advisor: Seifu Mamo (Ph.D)

June 2022

Addis Ababa, Ethiopia

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Board of Examiners Approval Sheet

This is to certify that the final project entitled: **Assessment of Project Integration Management Practices on Project Success -A Case Study of Integrated Shallow Groundwater Water Development Project** is conducted by Belete Bantero Bassa in partial fulfillment of the requirements for the award of the degree of Master of Arts in Project Management, with the regulation of the university and the accepted standards with respect to originality.

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Abstract

The project integration management practices have utmost impacts on driving execution, managing performance, and ensuring project's meet requirements and objectives holistically; since it fosters proper coordination of the various elements of processes and people, managing resources, stakeholders, and deliverables efficiently and effectively. To address the research questions and incorporate the advantages of both methodologies, a mixed research methodology that integrated parts of quantitative and qualitative research was used in this study. Several secondary data and information were combined with the primary data acquired using Google Forms and quantitatively analyzed using IBM SPSS Statistics Version 28.0.1.1 (15) software. The analysis revealed that while 20% of participants had concerns, 80% of respondents recognized that project integration management practices significantly improved the project performance, assisted in identifying and addressing major challenges, and helped deliver project objectives on time and within budget while also meeting the performance and quality requirements outlined in the project scope. Essentially, the project met predefined goals, as out of the planned 168,189km², the achieved target was 234.8K km² (139.6%) as validated by all descriptive analysis. The consolidated analysis has shown that, project initiation has the highest mean (4.3), followed by planning (4.0) and execution (4.0). The monitoring and control (mean 3.9), closure (3.4) and project success factor (3.5) have indicated higher consistency descriptively and with secondary information support. The standard deviation (SD), 0.56 to 0.77 for all variables, respectively, between one and two SDs (0.68 and 0.95), normally distributed. A positive r value has been observed (linearly, r , 0.876 and polynomial, r , 0.889, whereas the Bivariate Correlations for project closing, 0.754, execution, 0.520, initiation, 0.594, monitoring & evaluation, 0.650 and project planning, 0.581) versus success variables as well as multinomial logistic regression, r greater than 10 Likelihood Ratio Tests result, the likelihood ratio chi-square of initiation, 46.253, planning, 48.260, execution, 77.278, monitoring and evaluation, 64.091 and closing, 81.408 with a p -value < 0.001. The findings can serve as a valuable lesson for several prevailing problems, including subpar work, low productivity, cost overruns, stakeholders' dissatisfaction, and ultimate project failure in Ethiopia caused by fragmented responsibilities, ineffective coordination, poor planning, substandard implementation practices due to weak integration among sectors.

ACRONYMS

| | |
|--------|---|
| ACC | Agricultural Commercialization Cluster |
| ATA | Ethiopian Agricultural Transformation Agency |
| ATI | Ethiopian Agricultural Transformation Institute |
| APTE | Application to Business Techniques |
| BoWR | Regional Bureau of Water Resources |
| BS | British Standard |
| CBO | Community Based Organizations |
| CFA | Confirmatory Factor Analysis |
| CR | Change Requested |
| EFA | Exploratory factor analysis |
| ERP | Enterprise resource planning |
| FAO | Food and Agriculture Organization of the United Nations |
| FGD | Focus Group Discussion |
| GDP | Growth Domestic Product |
| GW | Ground Water |
| HLS | High-Level Structure |
| HVCs | High Value Crops |
| ILUP | Integrated Land Use Planning |
| IMS | Integrated Management System |
| ISGWID | Integrated Shallow Groundwater Irrigation Development |
| ISM | Integrated management systems |
| ISO | International Standard Organization |
| ITTO | Inputs, Tools, Techniques & Outputs |
| IWUA | Irrigation Water User Association |
| M& E | Monitoring and Evaluation |
| M & C | Monitoring and Control |
| MILLs | Ministry of Irrigation and Lowlands |
| MoA | Ministry of Agriculture |

| | |
|-------|--|
| MoWE | Ministry of Water and Energy |
| MoWIE | Ministry of Water, Irrigation and Energy |
| MSs | Management System |
| NGO | Non-governmental Organization |
| OPA | Organizational process assets |
| SDG | Sustainable Development Goals |
| SGW | Shallow Groundwater |
| SHFs | Smallholder Farmers |
| SNNP | South Nations Nationality Peoples Region |
| SPSS | Statistical Package for the Social Sciences |
| SWOT | Strength, Weakness, Opportunity, and Threats |
| PDCA | Plan-Do-Check-Act cycle |
| PMBOK | Project Management Body of Knowledge |
| PMI | Project Management Institute |
| PMIS | Project management information systems |
| PMLC | Project Management Life Cycle |
| PMO | Project management Office |
| PMU | Project Management Unit |
| RBOA | Regional Bureau of Agriculture |
| WBS | Work Breakdown Structure |

CHAPTER ONE

1. Introduction

1.1. Background of the Study

The project integration management practices have utmost impacts on driving execution, managing performance and ensure project's meet requirements and objectives holistically, since it foster proper coordination of the various elements of processes and people, managing resources, stakeholders, and deliverables efficiently and effectively. Proactive management of the integration helps to achieve business outcomes while making trade-offs among competing objectives and alternatives to meet or exceed stakeholder needs and expectations. by identifying, defining, combining, unifying, and coordinating the many processes and activities within the project management process groups, the PMBOK (PMI, 2017). Effective integration within multidisciplinary project teams of methods and practices used to deliver project results, and increased adaptability for the organization in the long term (the PMBOK (PMI, 2021). Since the project integration management integrates the staff, customers, and suppliers of a project management and maintains the quality of work, process, and enterprise results, it is a continuous improvement concept in decision-making that contributes to Total Quality Management (TQM). TQM is defined as: "the integration of all functions and processes within an organization to achieve continuous improvement of the quality of goods and services. Goal is customer satisfaction." Vincent and Joel (2005). According to Goetsch and Davis (2016), a recognition that sustained growth requires the simultaneous achievement of four objectives continually forever- customer satisfaction, cost leadership, effective human resources, and integration with the supplier base. The project integration management is one of the 10 knowledge area: project integration management, project scope management, project time management, project cost management, project quality management, project human resource management, project communications management, project risk management, project procurement management and project stakeholder management.

Water is a crucial entry point for transforming livelihood and other development activities in

many developing countries such as Ethiopia, especially to promote sustainable irrigated agriculture. Irrigation potential assessment for agricultural area is nationally taken as the first and primary investment area to resolve lack of information on water availability, flow and quality, and physical capacity. Given the often-reported large water resources potentials of Ethiopia but frequently recurring droughts, the uneven and erratic distribution of rainfall, resulting in grave impacts on people's livelihood, low agricultural production, and productivity (MoA, 2019). The already identified water potentials of Ethiopia include over 123 BN m³ surface water (12 river basins, 12 lakes, rainfall annual average of 1200-2000mm) and over 60 billion m³ groundwater. Groundwater development and use for smallholder irrigation is only a recent intervention and is in its early stage (currently less than 2% of its potential is utilized) (MoA, 2020). The country can exploit its substantial potential of groundwater resources for the economic development of the country. There is a high need for accelerated smallholder irrigation development for improving food security and economic development. Except for domestic water supply, groundwater use for irrigation was not a widespread practiced. The paradigm shift in the direction of using groundwater for irrigation, in not controlled and monitored, inevitably cause declining in surface water and degradation of the groundwater resources.

In the past ten years, the freshly reorganized Ethiopian Agricultural Transformation Institute (ATI), formerly the Ethiopian Agricultural Transformation Agency (ATA), has made a substantial contribution to the Ethiopian agriculture industry. Over 250 action-oriented strategic studies have been delivered, over 48 innovative and sizable strategic projects have been implemented, about 11000 jobs have been created, about 300,000 people have been lifted out of poverty, the Ethiopian economy has benefited by 1.7 billion US dollars, and investment returns have increased by tenfold (ATA, 2020). Integrated Shallow Ground Water Irrigation Development/ISGWID is one of the 18 projects within ACC program.

Integrated Shallow Groundwater Irrigation Development (ISGWID) Project is one of the projects under implementation with overarching objective to promote sustainable and efficient irrigation development using the unutilized shallow groundwater resources of the country. The project main objective was to know the full existing situation of water and land resources for future new

irrigation plan and detail study as well as to identify and indicate prospective irrigation potential from groundwater and surface water and land resource. Smallholder farmers (SHFs), implementing agencies, public and private sectors, development partners, Nongovernmental Organizations (NGO's), Community Based Organizations (CBOs), and public sector planners (MoA, MoWIE) are beneficiaries of this interventions. The integration of all functions and processes within internal and external project management environment led to achieve continuous improvement of the project performance.

This study revealed the project integrated management practices lead to meet predefined goals of the ISGWID, a project that explored the untapped prospects and eminent challenges of Groundwater Based Irrigation Development in Ethiopia. The project effectively mapped 234,772 km² areas of Ethiopia and found huge amount of reliable, safely exploitable, replenishable and annually rechargeable 27.27 km³ within the depth of less than 30 m; well-distributed and available in many places, can irrigate 3,088,395ha of land and 6,176,898 beneficiary households on 365 woredas in eight regions of Ethiopia: Afar, Amhara, Benishangul Gumuz, Gambela, Harari, Oromia, SNNP and Tigray. The nationally published amount, 2.6 BCM (Birhane, 2002), 2.6 - 6.5 BCM (Awlchew, et al 2007), total (shallow and deep wells) 30 BCM (Berhanu et al, 2014), 40 BCM (shallow and deep wells) (Mengistu, et al, 2019).

The astounding results expected to accelerate the development of new irrigation projects using the untapped shallow ground water potential and thereby increasing domestic food supply, contribute to building resilience, improving food and nutrition security by generating jobs for its growing youth population, supplying raw materials for its emerging agro-industry, substituting imports and by increasing export earnings. The findings of the study also suggested that the proper coordination of the various elements of this complex project processes during initiation, planning, execution, monitoring, controlling, and closing a project needed making trade-offs among competing objectives and alternatives enhanced project management performance within the given time, cost, quality, sustainability, and client satisfaction.

1.2. Statement of the Problem

The exceptional contribution of the agriculture sector (agriculture-water-environment nexus) to national economic growth and its wider multisectoral features necessitates improved efficiency in the sector. Due to poor project integration management practices from project initiation to closing exposed the country, Ethiopia to vicious challenges such as poor-quality, low productivity, cost over-run, stakeholders dissatisfaction (such as donor's fatigue) and ultimate project failure. This has been made worse by uneven institutional restructuring, arrangements, and change, fragmented, frequently shifting ambiguous roles and responsibilities, multiple actors engaged in the same activity within sectors and subsectors, ineffective coordination, competing interests, and other similar weak integration practices that led the sectors to poor planning and subpar project and program implementation. In order to guarantee that processes operate effectively and reach predetermined goals, project integration management necessitates the coordination of all project components, including tasks, resources, stakeholders, and deliverables.

The targeted, ISGWID Project, how far it is integrated from initiation to closing phases in terms of design and its main deliverables, budget, and timeline. Especially:

1. As part of project integration management, while developing project charter, how far the needs, opportunities, and problems to be addressed recognized, evaluated, and responded in terms of quantity and quality, knowledge, skill, and finance requirement?
2. How far the organization developed the Project Management Plan and the strategic planning process in integrated manner? Integration of all major processes, constraints and assumptions, the iteration of the plan before signoff, progressively elaborated and continuous process.
3. How the project management unit directed and managed project execution, monitoring and control and project closing process to the required standard to the extent of stakeholder's satisfaction, what are the key success factors and key learning outcomes?

1.3. Research Questions

To study the problem identified, the following questions have been stated for the study

1.3.1. Main Research Question

To what extent the project integration management clearly been recognized, evaluated, and responded during project life cycle of Integrated Shallow Groundwater Irrigation Development (ISGWID) Project and what are their major effects on project management performance and success?

1.3.2. Sub-research Questions

1. What is the overall framework of project integration management as it relates to the other Project Management knowledge areas and the project life cycle and its purpose and effect on performance against the required standard?
2. How does the integration management in terms of initiation, planning, execution, monitoring, and control and closing affected the overall project management success (the key success factors)?
3. What are the major challenges identified and possible resolutions recommended during planning, directing, and managing project execution, monitoring & controlling, performing integrated change control, and closing of the Integrated Shallow Groundwater Water Development Project?

1.4. Objectives

1.4.1. General Objective

The main objective of the present study is assessing the overall framework of the project integration management practices during the project life cycle of Integrated Shallow Groundwater Irrigation Development (ISGWID) Project in all process starting from initiation, planning, execution, monitoring, and evaluation to closing phases and how this practice led to delivery of project ultimate objectives in terms of time, cost, quality, scope and stakeholders' satisfaction.

1.4.2. Specific Objectives

1. The research has been done to evidently identify and verify all critical factors on the overall project integration management process during initiation, planning, directing, and managing project execution, monitoring & controlling, performing integrated change control, and closing and its effect on project performance against the required standard?
2. Secondly, the research has been done to descriptively analyze the integration management effects on the overall project management success in terms of time, cost, quality, scope, and stakeholders' satisfaction (the key success factors and lessons learnt), major challenges observed and their root-causes?
3. Thirdly, the research has been done to identify possible resolutions recommended during planning, directing, and managing project execution, monitoring & controlling, performing integrated change control, and closing of the Integrated Shallow Groundwater Water Development Project?

1.5. Significance of the Study

The multifaceted challenges and uncertainties facing the agriculture sector (particularly irrigation sub-sector) nowadays are the major concerns of many developing countries in the world because of its paramount springboard impacts to other economic development sectors. The irrigation subsector is the area where the Ethiopia's scarce resources are substantially invested but with curtailed results from development to use. Owing to lack of project integration management, the ever-increasing project management failures in greater extent and severity (from inception to phasing out), socio-economic and environmental stress (right-of way problem to unmatched compensation demand), chronic resource shortages (proliferating inflations to abnormal variation demand), institutional weaknesses (instability to overlapping mandates) and a general inability to deal with the key issues and significant productivity gap to fulfill ends met are altogether needs evidence-based, collaborative and impact driven approach.

Hence, this study has both practical and theoretical significance as it assesses the entire project integration management process within the project in target. Theoretically, how such projects chartered, planned, developed, and executed, monitored, and evaluated, and finally closed in a successful and integrated way. The practical significance, how far the project delivery promoted

and successfully disseminated, various processes worked together, complications avoided or resolved, alignment and harmony created during project execution and what are the major gaps and lessons learnt.

1.6. Scope of the Study

The study was focused to recognize, evaluate, and see the impacts of system interactions of the project integration management experience at the context of the Agricultural Transformation Institute (ATI) exclusively on Integrated Shallow Groundwater Water Development Project. The study has given due emphasis on planning, directing, and managing project execution, monitoring, and controlling, performing integrated change control, and closing of the Integrated Shallow Groundwater Water Development Project. It focused on this project achievements and challenges in the context of Groundwater Based Irrigation Development in Ethiopia and its geographically focused 8 regions of Ethiopia.

1.7. Limitation of the Study

The Agricultural Transformation Institute (ATI) transformational deliverables for the last ten years includes over 48 innovative and large-scale strategic projects implemented, over 250 action-oriented strategic studies delivered. ATI has been implementing 18 Agricultural Commercialization Cluster (ACC) projects that contribute to ACC outcomes and those projects can be categorized as input, production and marketing with targeted outcomes of increased production, productivity, and income, improved access to markets, improved environmentally sustainable farm practices, improved engagement of women and youth, enhanced institutional capacity and enabling environment for agricultural commercialization and enhanced value for money approach. However, this study was limited on the assessment of project integration management practices and its consequences on Integrated Shallow Ground Water Irrigation Development/ISGWID project, which is one of the 18 projects within ACC program.

The project itself is only one of the many similar projects under implementation with overarching objective to promote sustainable and efficient irrigation development using the unutilized shallow groundwater resources of the country. This research has only shown the effect

of project integration management practices on this project key success factors in terms of time, cost, quality, scope and stakeholders' satisfaction and lessons learnt. Henceforth, the researcher advises others to investigate the full impact of project integration management process on the organizational wide survey on all projects, if possible, by including similar other projects executed by different stakeholders in Ethiopia to grasp the major impacts and trends of the integration process.

1.8. Organization of the Research Report

This study has five chapters and is organized as stated below:

Chap-1: -Introduction: - This chapter contain background of the study, statement of the problem, research questions, main research question, sub-research questions, objectives, general objective, specific objectives, significance of the study, scope of the study, limitation of the study, organization of the research report all in the context of project integration management process.

Chap-2: -Literature review: - This chapter deals with the literature review of relevant similar study in the context of project integration process groups. It has detail literature review, theoretical review, empirical review, the conceptual framework of the study and the hypotheses of the study.

Chap-3: Research Design and Methodology: - Under this chapter, descriptions of the type and design of this research to answer the research question; rationale for research approach, population and sample, data sources and types, data collection methods and procedures, reliability and validity measurement, the result interpretations of output reliability test and output validity test, ethical considerations, and data analysis is thoroughly explained.

Chap-4: Data Analysis, Interpretation and Presentation includes descriptions of research findings, demographic analysis, mean and standard deviations, measures of skewness, measures of kurtosis, results, and discussion.

Chap-5: - Summary, Conclusion and Recommendation: -This chapter comprised three sections, which include summary of findings, conclusions, and recommendations. Summary of findings drawn from the results discussed under chapter four including conclusions drawn from the summary of findings. The researcher tried to make the recommendations as realistic and practical as possible. Finally, the annexes are included that contains references, mean score summary of project integration management practices, questionnaires distributed, and ISGWID project profile and milestones.

CHAPTER TWO

2. Literature review

2.1. Introduction to the Literature Review on Project Integration Management

This chapter deals with the literature review of relevant similar studies and documents in the context of project integration process groups and to some extent relating to total quality management in groundwater-based irrigation development project executions context. It has a project management framework, the groundwater development in Ethiopia, theoretical review, empirical review, and the conceptual framework of the study.

2.1.1. Project Management

As the project management knowledge guide (PMBOK® 6th ed, 2017) underlines, effective project management helps individuals, groups, and public and private organizations to meet business objectives, satisfy stakeholder expectations, be more predictable, increase chances of success, deliver the right products at the right time. Besides, efficient, and effective project management resolve problems and issues, respond to risks in a timely manner, optimize the use of organizational resources, identify, recover, or terminate failing projects, manage constraints (e.g., scope, quality, schedule, costs, resources), balance the influence of constraints on the project (e.g., increased scope may increase cost or schedule); and manage change in a better manner. On the other hand, poorly managed projects or the absence of project management may result in missed deadlines, cost overruns, poor quality, rework, uncontrolled expansion of the project, loss of reputation for the organization, unsatisfied stakeholders, and failure in achieving the objectives for which the project was undertaken.

The 6th edition of the PMBOK® Guide described well that, “projects are a keyway to create value and benefits in organizations. In today’s business environment, organizational leaders need to be able to manage with tighter budgets, shorter timelines, scarcity of resources, and rapidly changing technology. The business environment is dynamic with an accelerating rate of change.

To remain competitive in the world economy, companies are embracing project management to consistently deliver business value.”

2.1.2. Project Management Framework

Starting with corporate strategy, that identifies the goals of a company and defines ways of achieving those goals, while project management takes one of the goals and manages costs, schedules, and resources to give the desired result (Tapera, 2014). While corporate strategy and project management both have planning and control characteristics in common, the details of their implementation and execution differ. Strategic management and project management are two activities that are intertwined, in which the latter is a technique for achieving strategic management goals (Collyer, S et al 2009). Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements Project management is performed by implementing and integrating the project management processes that have been identified for the project. Organizations can use project management to execute projects more successfully and efficiently.

A project is a sequence of unique, complex, and connected activities having one goal or purpose, that uses resources and must be completed by a specific time, within budget and according to specifications (Wysocki, 2014). A project is “unique process, consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including constraints of time, cost, quality and resources” (BS 6079-2, 2000). Project management structures can be integrated with an organization’s structure, in such cases, because of the unique nature of projects, project management needs a higher degree of flexibility than a more stable functional organization (BS 6079, 2019). Understanding the organizational structure will benefit us in gaining collaboration and successfully completing our projects, given the cultural influences and communication channels that exist inside the organization.

The project management team needs to be aware of social, economic, and environmental issues because they could have a potentially large effect on the project either now or in the future (Ofori, 2008)). Such major issues include standards and regulations which is related to compliance, internationalization, cultural influences like political, economic, demographic, educational, ethical, ethnic, religious, etc. and sustainability factors like accountability for impacts on people, economy, environment from projects long after they are completed. We must take time in project management to identify, understand, and manage relationships with all project stakeholders who are involved in the project or who are negatively or positively affected by project activities. They may also exert influence over the project and its results. “The project management team must identify the stakeholders, determine their requirements, and then manage and influence those requirements to ensure a successful project” (Bewalya et al, 2012). In project management, we should not just receive the scope or objectives and then strive to complete it, but rather determine all the stakeholders and incorporate all their requirements into the project (Serrador et al, 2015).

For larger projects, a project office is required to establish a consistent organizational approach for systems, processes, and procedures, to perform relevant configuration management functions, to disseminate project instructions and other information, and to collect, retrieve, or chase information required by the project manager on a regular or ad hoc basis (Whyte et al, 2016). Such an office may substantially assist in the seamless integration of all project systems, as well as generate programs, timetables, progress reports, cost analyses, quality reports, and a variety of other essential duties that would normally be performed by the project manager himself (Pyzdek et al, 2014). The first substantive part of the project life cycle is the identification of the requirement, that is a desired end-state whose successful integration into the solution meets one or more needs and delivers specific, measurable, and incremental business value to the organization (Wysocki, 2014).

2.1.3. The Project Management Process Groups

The PMI PMBOK Process Groups are not a project management life cycle (PMLC); they are the building blocks of every project management life cycle (Wysocki, 2014), as originally defined by the Project Management Institute (PMI) in their standards guidelines called A Guide to the Project Management Body of Knowledge (PMBOK Guide). Project management process group – a logical grouping of the project management inputs, tools and techniques, and outputs PMBOK® Guide 6th edition, (PMI, 2017)

The PMBOK Guide has become the de facto standard for the practice of project management worldwide. Project management methodology must answer, whatever project management life cycle model that is used must contain the following five Process Groups which are the building blocks of every PMLC: Scoping Process Group (which PMI calls the Initiating Process Group), Planning Process Group, Launching Process Group (which PMI calls the Executing Process Group), Monitoring and Controlling Process Group and Closing Process Group (Wysocki, 2014). PMBOK® 5 Process Groups are:

- 1) Initiating: “define a project or a new phase by obtaining authorization”
- 2) Planning: “establish the project scope, refine objectives and define actions to attain objectives”
- 3) Executing: “complete the work defined to satisfy project specifications”
- 4) Monitoring and controlling: “track, review, and regulate progress and performance, identify changes required, and initiate changes”
- 5) Closing: “finalize all activities to formally close project of phase”

2.1.4. Defining the Ten Knowledge Areas

PMI defines the project management body of knowledge (PMBOK) as a term that describes the knowledge within the profession of project management. The project management body of knowledge includes proven traditional practices that are widely applied as well as innovative practices that are emerging in the profession. The PMBOK® Guide is a foundation upon which organizations can build methodologies, policies, procedures, rules, tools and techniques, and life cycle phases needed to practice project management and it provides more detail about key

concepts, emerging trends, considerations for tailoring the project management processes, and information on how tools and techniques are applied to projects (see Table 1). PMBOK® Guide 6th edition, (PMI, 2017), Knowledge Areas are:

- 1) **Integration management** - “processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities” PMBOK® Guide 6th edition, (PMI, 2017). It is an overarching function that coordinates the work of all other knowledge areas, and it affects and is affected by all the other knowledge areas.
- 2) **Scope management** - “processes to ensure that the project includes all the work required, and only the work required, to complete the project successfully”, (PMBOK® Guide 6th edition). Scope is “the sum of the products, services, and results to be provided as a project.”
- 3) **Time management** - “processes to manage timely completion of the project” PMBOK® Guide 6th edition, (PMI, 2017). Hence, it is concerned with estimating the duration of the project plan activities, devising a project schedule, and monitoring and controlling deviations from the schedule. Collectively, it deals with completing the project in a timely manner (on time).
- 4) **Cost management** – “processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget” PMBOK® Guide 6th edition, (PMI, 2017).
- 5) **Quality management** - “processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken” PMBOK® Guide 6th edition, (PMI, 2017). Quality is “the degree to which a set of inherent characteristics fulfills requirements” PMBOK® Guide 6th edition, (PMI, 2017).
- 6) **Human Resources management** - “processes that organize, manage, and lead the project team” PMBOK® Guide 6th edition, (PMI, 2017). Project Human Resource Management includes the processes required to make the most effective use of the people involved with the project.

- 7) **Communications management** - “processes to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and ultimate disposition of project information” PMBOK® Guide 6th edition, (PMI, 2017).
- 8) **Risk management** - “processes of conducting risk management planning, identification, analysis, response planning, and control...to increase the likelihood and impact of positive events and decrease the likelihood and impact of negative events in the project” PMBOK® Guide 6th edition, (PMI, 2017).
- 9) **Procurement management** - “processes to purchase or acquire products, services, or results from outside the project team” PMBOK® Guide 6th edition, (PMI, 2017). What to buy, when, how much, make or buy, lease or rent, that is contract type selected, procurement scope of work, contract documents, seller, section criteria, procurement management plan, bidders conference (question and answers); pick sellers, manage the seller and close contract.
- 10) **Stakeholder management** - “processes to identify the people, groups, or organizations, that could impact or be impacted by the project, analyze their expectations and impact, and develop strategies for engaging them and managing conflicting interests” PMBOK® Guide 6th edition, (PMI, 2017). It refers to people/entities that are involved in the project or that can affect or be affected by the project activities in a negative or positive way.

2.1.5. Project integration management

Project integration management is a way of making various processes work together to complete a project on time and within budget as it takes the numerous processes that are being used in a project and makes sure that they're evidently identified, defined, combined, unified and well-coordinated possibly by making trade-offs while managing those interdependencies (Westland, 2018). Project integration management is a holistic process highly related to other Project Management knowledge areas and the project life cycle, that includes the strategic planning process and applied to different project selection methods. Project integration management

process helps to explain the importance of creating a project charter to formally initiate projects, to describe project management plan development, including content, using guidelines and templates for developing plans, and performing a stakeholder analysis to help manage relationships, to explain project execution, its relationship to project planning, the factors related to successful results, and tools and techniques to assist in project execution and to describe the process of monitoring and controlling project work (PMI, 2017). Interface management is critical during project execution. The interfaces are product, infrastructure, resources, people interfaces (cross organization), system interfaces (organization, information). The goals of project integration are coordinating people, product, infrastructure, system (organization, information) together toward accomplishing the project goals. This process group culminates in the publication of the: project charter, stakeholder registry, and stakeholder management strategy.

Table 1 Inputs, Tools, Techniques & Outputs (ITTO) Project integration management adopted from PMBOK® Guide 6th Edition

ITTO -Project Integration Management Process (PMBOK (PMI, 2017))

Develop Project Charter

| Inputs | Tools/Techniques | Output |
|--|--|---|
| Project statement of work, Business Case, Contracts, Enterprise environmental factors (EEF), Organizational process assets (OPA) | Project selection methods and Expert judgment | - Project Charter |
| Develop Project Management Plan | | |
| Inputs Project Charter, Outputs from planning processes, EEF, OPA | Tools/Techniques - Expert judgment | Output - Project Management Plan |
| Direct and Manage Project Execution | | |
| Inputs Project management plan, Approved change requests, Organizational process assets, Enterprise, environmental factors | Tools/Techniques Expert judgment, Project management information system (PMIS) | Output Deliverables; Work performance information; Proj. doc. updates, Proj mgt plan updates, Change requests |
| Monitor and Control Project Work | | |
| Inputs - Project management plan, Performance reports, Enterprise environmental factors, Organizational process assets | Tools/Techniques Expert judgment | Output Change requests, Project management plan updates; Project document updates |
| Perform Integrated Change Control | | |
| Inputs - Project management plan, Work performance information, Change requests, Enterprise environmental factors, Organizational process assets | Tools/Techniques - Expert judgment - Change control meetings | Output - Change request status updates - Project management plan updates, Project document updates |
| Close Project or Phase | | |
| Inputs - Project management plan, Accepted Deliverables, Organizational process assets | Tools/Techniques - Expert judgment | Output -Final product, service, or result transition; OPS updates |

2.1.6. Groundwater Development in Ethiopia

Groundwater is a strategic resource in all climatic regions of Ethiopia, contributing about 80% of the domestic supply of urban and rural populations, however, little research has been available compared with extensive geographical coverage and increasing population growth rates (Mengistu et al, 2021). As per the newly adopted Ethiopian Water Policy (MoWIE, 2021), development of groundwater should be based on sustainable yield to maintain long-term, dynamically stable storage of high-quality groundwater as determined. India boasts one of the largest irrigated agricultural systems in the world, with more than 60 million hectares equipped for irrigation (FAO AQUASTAT). Furthermore, more than 60 % of the irrigated area is fed by groundwater (FAO AQUASTAT). The heavy use of groundwater for irrigation has created extensive concerns about overdraft and depletion and has made India a global hotspot for water resources studies (Kumar et al., 2007; Foster et al., 2008).

Groundwater development and use for smallholder irrigation is only a recent intervention in Ethiopia and is in its early stage, currently less than 2% of its potential is utilized (MoA, 2021). The country can exploit its substantial potential of groundwater resources for the economic development of the country. There is a high need for accelerated smallholder irrigation development for improving food security and economic development. Except for domestic water supply, groundwater use for irrigation was not a widespread practice. The paradigm shift in the direction of using groundwater for irrigation, in not controlled and monitored, inevitably cause declining in surface water and degradation of the groundwater resources.

That is why, the newly enacted policy in Ethiopia recommends the following major strategies on sustainable GW development and management: groundwater use must be carried out in the context of an adequate basin management plan, based on an understanding of the sustainable yield of groundwater resources. Secondly, developing shallow wells for irrigation and water supply with caution and in a controlled manner with due account to uncertainties and unpredictability and variability in geographical conditions to avoid intensive pumping and over-abstraction. Thirdly, foster conjunctive use of surface and groundwater sources as appropriate to

diversify water sourcing and fourthly, the spatio-temporal occurrence and distribution as well as quality of groundwater resources should be mapped to identify their character and support climate-resilient decisions about abstraction, recharge, source protection, and treatment.

The new water resource development policy consists of other critical strategic directions while developing and using the vital GW resources. Such as, mapping, characterization and modeling the geo-hydrological conditions and assessment of the groundwater resources situation should be based on existing well drilling logs and reports, geological and hydrogeological maps, and satellite images. Besides, building the capacity of groundwater users for improved mapping and assessment; supporting community-based monitoring and ground-truthing initiatives to complement formal observations are the vital components. The new policy also directs to ensure that private drillers provide groundwater data to the concerned government institutions and which in turn, the institutions to establish and maintain a database and an information system to keep track of groundwater data. The policy also mandates the institutions to establish robust groundwater monitoring networks across all identified strategic aquifers targeted for immediate development and to establish groundwater protection protocols for strategic aquifers located within difficult hydrogeology environments. Besides, protection and minimum modification of groundwater recharge areas, including their natural ecosystem, should be ensured to enable replenishment of aquifers and to reduce vulnerability to climate change and hydrological variability.

GW sustainable management needs strategies such as introducing and implementing guidelines for suitable recharge measures and structures, and designated aquifer rejuvenation zones, adopting managed aquifer recharge measures when and where appropriate, encouraging the sustainable land management programmes to incorporate specific designs that enhance groundwater recharge. This must include legal frameworks for sustainable management of groundwater should be established to foster conservation, precaution, and protection to support economic development and human health.

2.2. Theoretical Review

Most articles on Integration Management System (IMS) conclude that integration is beneficial regarding cost saving, operational benefits, and improved customer satisfaction (Dahlin et al 2017). Integration is the alignment of the Management System (MSs) through the elimination of mutual overlapping contents by enhancing the use of a uniform language to improve stakeholder satisfaction (Nunhes, 202020). It is considered the best management practice when an organization has multiple management systems in place (Bernardo, 2014).

Through a review of the literature, the integration of management systems, innovation management established between quality and total quality management and innovation analysis by (Bernardo, 2014) allowed classifying the integration of MSs as a form of organizational and incremental innovation, which is initiated internally, and which has an internal impact. The findings substantiate, integration also adheres to three specific perspectives of innovations: institutional, cultural, and rational (Bernardo, 2014). ‘The results enable to propose a model to test empirically the impact of the integration of MSs into innovation management performance. Innovation management performance can be measured in terms of benefits obtained, capabilities development, improvement of efficiency and financial results (Bernardo, 2014).

The findings of some study, that combined the ambidexterity perspective with the Plan-Do-Check-Action (PDCA) principle and expanded the application range of the model from improving the service process to addressing the overall service innovation process and included the gradual construction of the eight steps of scanning, linking, designing, performing, assessing, feedback, improving and adjusting (Wang et al, 2017). A theoretical model is proposed that illustrates service development steps, to assist selected industry (hotels) in improving their targeted service effectiveness such as enhancing the quality of existing services, and its effect in the establishment of new groundbreaking services based on models of (Bernardo & Casadesus, 2009; Karapetrovic, 2002; Karapetrovic & Jonker, 2003; Rocha et al., 2007; Wilkinson & Dale, 2000; Willborn, 1998).

In the service innovation field, the ambidexterity perspective (McDermott and Prajogo, 2012; Tang, 2014) and the Plan-Do-Check-Action (PDCA) cycle (Bernardo, 2014), are two theories used to investigate innovative service development. Continual improvement of existing service flaws leads to high-quality and stable services (Cheng et al., 2016; Martínez-Ros and Orfila-Sintes, 2009), whereas new artistic services bring customers sensory stimulation and are mentally enriching (Ako glan Kozak and Acar Gürel, 2015; Strannegård, 2012). The systemic approach was used, which can link the process and the Plan-Do-Check-Action (PDCA) cycle approaches, and bring them under one roof (Karapetrovic, 2002). Researchers have perceived IMS as a process that receives input from its context and produces organization performance as output.

The input model included a number of variables. Different writers consider various stakeholder expectations when defining these characteristics, but combinations to address all of these needs, as well as other novel features specific to the local context, are sometimes missed in the goal of perfect integration. The IMS process handling management of company is associated with a set of sub-functions. Several studies have identified policy, planning, deployment, acquisition, and evaluation as elements of process of IMS (Beckmerhagen et al., 2003; Zeng et al., 2007) on using a different approach. A functional analysis was performed for this project to develop internal and external relationships and make system implementation easier. The functional analysis is a method for characterizing, categorizing, and evaluating the system's functions and their interconnections. Because the objective is to discover an interpretive technique for the functional analysis of the IMS, the complexity of this approach remains a strength because it must meet the expected theoretical criteria while also dealing with reality (Beckmerhagen et al., 2003; Zeng et al., 2007).

The Application to Business Techniques (APTE) approach is used to offer an initial description of IMS, including information about the system's aims and interactions with the outside world. This system manages the objectives of each process in line with the organization's strategy by utilizing data from standards. As a result, the primary purpose of the Integrated Management System (IMS) is to satisfy all interested stakeholders by first developing and comprehending

their needs before translating them into the fundamental goals of the business (Beckmerhagen et al., 2003; Zeng et al., 2007). The management systems of the various entrants are expected to be tightly connected in our approach. When each system is examined individually, it is discovered that it is tailored to fulfill one or two elements of the intriguing component. The theoretical model is made up of three parts: IMS factors (inputs), IMS functions (process), and product and stakeholder satisfaction (outputs). The IMS factors are founded on the organizational environment and the needs of interested parties (Beckmerhagen et al., 2003; Zeng et al., 2007).

Each business must establish and monitor an internal and external issue that leads to the identification of rising stakeholder requirements and where their interests are viewed as significant and integral to the organization's goal (Amarah, 2015). The IMS process is built on literature studies that emphasize the significance of strategy implementation, performance evaluation, resource deployment and support, and leadership.

2.3. Empirical Review

Since the publication of International System Organization (ISO 14001) 15 years ago, the notion of integrated management system has evolved in organizational management (Benyettou, et al 2018). It was one of the most critical requirements for an organization's long-term viability, cost effectiveness, and, as a consequence, the establishment of a framework for making choices in line with corporate policies and strategy (Dahlin & Isaksson, 2017). It is a network of interconnected systems that communicate information on human, financial, and infrastructural resources in order to achieve predefined goals while keeping the demands of all stakeholders in mind (Willborn, 1998; Karapetrovic & Jonker, 2003). This demonstrates that the organization's strategies and operations are in alignment (Garvin, 1991).

Organizations are increasingly relying on the integration and execution of multiple management systems to reap certain benefits (Domingues, Sampaio, & Arezes, 2017), such as risk reduction and improved internal and external efficiency (Olaru, Maier, Nicoară, & Maier, 2014); cost reduction, duplication of policies and procedures (Rocha, Searcy, & Karapetrovic 2007); creation of synergies, and employee improvement (Khanna, Laroia & Sharma, 2010; Simon, Bernardo, Karapetrovic & Casadesús, 2011), reduction in documentation (Beckmerhagen, Berg,

Karapetrovic & Wilborn 2003; Karapetrovic & Jonker, 2003; Karapetrovic, 2002; Simon, Karapetrovic & Casadesús, 2012; Zeng, Shi & Lou, 2007; Almeida, Domingues & Sampaio, 2014; Mustapha, Manan & Wan Alwi, 2017) and man power for document controller (Mustapha et al., 2017), optimization of resources (Muehlen, 2004; Salomone, 2008). Furthermore, the management system's efficacy and efficiency have increased (Almeida et al., 2014; Bernardo, Gotzamani, Vouzas & Casadesus, 2016). At the same time, there are some barriers to implementing the integrated management system (IMS) that each organization must avoid, such as a lack of resources (Abad, Cabrera, & Medina, 2016; Asif, Fisscher, de Bruijn, & Pagell, 2010; Gianni, Gotzamani, & Vouzas, 2017; Simon et al., 2011), employee motivation (Simon et al., 2012; Gianni & Gotzamani, 2015), top management and staff involvement (Abad et al., 2016), the low organizational commitment, insufficient training, counterproductive attitudes (Simon et al., 2012), the lack of integration guidelines and management commitment, (Gianni & Gotzamani, 2015; Moumen & El Aoufir, 2017), the need for training and cultural change, the scarcity of skilled auditors and consultants, insufficient audit approaches, and a lack of human and other resources (Gianni & Gotzamani, 2015; López-Fresno, 2010; Simon, Karapetrovic, & Casadess, 2014), the lack of support and collaboration between departments (Moumen & El Aoufir, 2017; Rebelo, Santos & Silva, 2014a,b).

Finally, Dahlin has proven that the majority of ISM models suggested in the literature are based on previously existing management systems within a business, a method known as the inside-outside approach (Dahlin & Isaksson, 2017). There are now multiple integration options available, forcing enterprises to select from a variety of implementation methodologies (Ahsen & Funck, 2001; Asif, de Bruijn, Fisscher, Searcy & Steenhuis, 2009; Beckmerhagen et al, 2003; Karapetrovic & Jonker, 2003; Zeng, Lou & Tam, 2006). The first phase in the integration process is standard compatibility, an approach backed by various writers and stated in ISO's principles for management system integration published in a handbook in 2008. ISO altered its methodology and introduced the idea of high-level structure (HLS) in 2015 to improve compatibility with an identical core requirement (Benyettou et al 2018).

The empirically tested theoretical models on the status of integrated management systems implemented in Algerian organizations based on a structure of seven items (organization context,

leadership, planning, support, operational activity implementation, performance evaluation, and improvement) have shown increased the intensity of the process and produce more value (Benyettou et al 2018). These interactions are evaluated using the application to business methods approach in order to describe the system in its basic and sub functions connected to the delivery of the product/service while meeting the expectations of the stakeholders (Benyettou et al 2018). A systematic questionnaire survey was used to experimentally assess the suggested model (Benyettou et al 2018). Exploratory and confirmatory analytic approaches with multiple regression analysis were used to first generate summated scales for assessing the proposed model's components, and then to find the link between these constructs (Benyettou et al 2018). The findings recommended particular activities to aid in the clarification of the integration process inside Algerian enterprises who appear to be having issues using the IMS (Benyettou et al 2018). In general, the correlation and regression analyses supported the seven proposed hypotheses in some way. The findings indicated that Algerian firms are more concerned in external problems than internal concerns, including employee needs, and that the customer is the only party engaged in creating the criteria.

The seven requirements, according to the proposed model, have a direct impact on a company's performance and may assist all companies that have already adopted more than one management system in reducing the amount of documented information and achieving preset objectives while respecting all stakeholders' requirements (Benyettou et al 2018).

2.4. The Conceptual Framework of the Study

Conceptual framework model of the final project is described below, and independent and dependent variables stated as well, based on data gathered by observations and theoretical position to explain the effect of project integration management on timeliness, cost effectiveness, quality delivery, safety, and client's satisfaction (See Fig 1 below).

2.5. The Hypotheses of the study

In order to assess the likelihood of categorical membership of test results and determine whether the likelihood of integration practice had an impact on project success, researchers in the field of

project integration management system process proposed a variety of models, ranging from simple correlation of integration variables to bivariate correlations confidence interval and multinomial logistic regression using the maximum likelihood estimation.

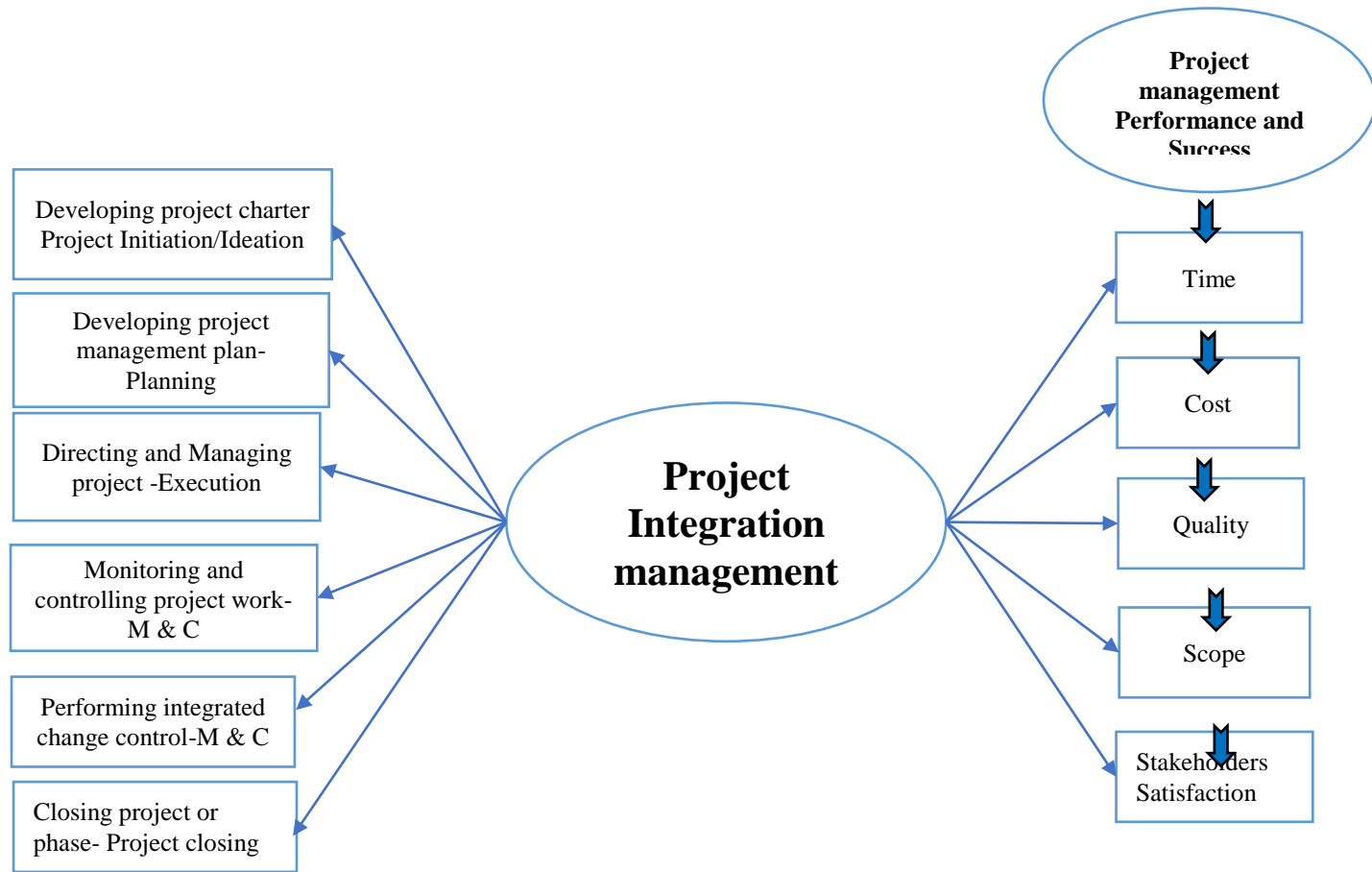


Figure 1 Conceptual framework model

Hypothesis 1 (H1): The project integration practices have significant impact on project overall performance in terms of time, cost, quality, scope, and stakeholders’ satisfaction.

Hypothesis 2 (H2): Systems for integrating projects can help with optimizing trad-offs and limitations that are a necessary part of project management.

Hypothesis 3 (H3): The success and effectiveness of a project are positively correlated with the project integration management.

CHAPTER THREE

1. Research Design and Methodology

1.1. Rationale for Research approach

In this research, comprehensive assessments have been done on the project integration management experience of ISGWD project by both qualitative vs. quantitative approach in mixed methods research since it offered powerful tools for investigating complex processes and systems. 'A key feature of mixed methods research is its methodological pluralism or eclecticism, which frequently results in superior research (compared to monomethod research). Mixed methods research considered successful as more investigators study and help advance its concepts and as they regularly practice it' (Johnson 2004). The type of research is both descriptive and explanatory utilizing all accessible data of the project as well as by directly collecting from direct and indirect actors of the project with the non-probabilistic sampling design.

1.2. Population and Sample

The questionnaire designed to reach out the direct actors and all other key stakeholders. The sample size was determined by using a census approach, all responsible for project implementation from organization wide management and team members, that is ATI key staff (PMU) at head office and regional office as well as key stakeholder institutions were invited. The rest of sample was selected

through non-probabilistic sampling technique, those participated from government line offices, partner institution, consultants, and farmers group. The method was chosen, since the population was not created equal, and some participants, selected strategically were more desirable in advancing the research project's objectives in this mixed approach study, that was also based on the qualitative research methods. General information about the project management culture, on the context of the organization and the requirements of the interested parties and project integrated management functions adopted and implemented by with combinations of precision, confidence levels, and variability. The survey was listed, using indicators of the satisfaction of

the interested parties. The measurement items of the questionnaire were based on relevant literature. A five-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree), is used to measure the research variables.

The questionnaire has composed of a total of 60 statements (questions that address wide area of integration management) in 7 categories, the 1st part is general information, the rest are technical questions with respect to project integration management and key success factor. A total of 60 questionnaires (to participants) were distributed online and in hardcopy (to famers participants) to selected ATI head office and regional staff (all ISGWID project federal and regional team members) as well as beneficiary organizations and response got from 33 responded based on their direct experience with the project implementation.

The data were gathered over a period of 3 months. For enhanced consistency, this work was triangulated to the ATI regular annual organizational survey and projects performance evaluation.

Summary of the population and samples are presented in the below table:

Table 2 Sample Description on Demographically and Sampling Technique (Source: own calculation)

| Sample Description | Population Size | Sampling Technique |
|---|------------------------|---------------------------|
| ATI Head Office (Project + Corresponding Staff) | 7 | Census |
| ATI Regional Office | 4 | Census |
| Government line offices (MoA, MoWE, MILLS) | 7 | Non-Probability Sampling |
| Partner institution (FAO, IWMI, etc.) | 6 | “ “ |
| Consultants | 3 | “ “ |
| Farmers | 6 | “ “ |
| Total | 33 | |

1.3. Data Sources and Types

The data collected from both primary and secondary sources using questionnaire survey that was conducted with the collaboration of ATI head office and regional office staff as well as other

directly affected stakeholders to test the anticipated hypotheses. The Research Instrument employed include questionnaires on google survey form, semi-structured interview, face-to-face discussion and focus group discussions (via zoom online meeting options) for the generation of relevant data. Besides, the method of data collection included face-to-face discussions with the project team members and Planning, Monitoring, Evaluation & Reporting department staff, as well as telephone interview with regional staff. Moreover, further reviewed materials include several guidelines, journals, and other references such as maps, atlas, project study documents, research papers, other literatures are collected from different sources (from library and related websites).

For this study, both qualitative (in-depth interview, observation methods and document review) and quantitative data collection methods (mixed approach) employed by random sampling and structured and semi-structured data collection instruments that fitted diverse experiences into predetermined response categories. In a structured interview, the researcher asked a standard set of questions based on the research problems and objectives. In this study, face -to -face interview have been also undertaken that enabled the researcher to establish rapport with potential participants and gain their cooperation. The mixed methods approach as design, combined both qualitative and quantitative research data, techniques, and methods within a single research framework.

1.4. Data collection Methods and Procedures

To answer stated research questions, test hypotheses, and evaluate outcomes, relevant data gathered, and measure based on the project integration management perspective, in an established systematic fashion. The data collection started with determining and defining data types (quantitative, qualitative), the kind of data required followed by the selection of a sample from a given population. The researcher identified appropriate primary and secondary data collection instruments, by adopting and modifying existing structured questionnaires in the current final project context from similar studies (Desalegn, 2018) and others, the researcher has clearly delineated instructions for their correct use to reduce the likelihood of errors occurring.

The qualitative data collected played an important role in creating the sense to the studied aspects by providing information useful to understand the processes behind observed results and assessed changes in people's perceptions on the implemented project. Furthermore, it improved the quality of survey-based quantitative evaluations by helping generate evaluation hypothesis, strengthening the design of survey questionnaires and expanding or clarifying quantitative evaluation findings. As stated above, the researcher administered structured (close-ended) and unstructured survey questionnaires to obtain relevant information's using closed-ended standard set of questions as well as open-ended questions (e.g., face-to face, google form uploaded questionnaires, telephone interviews, zoom based focus group discussion).

1.5. Reliability and Validity Measurement

'Reliability refers to the consistency of a measure whereas validity is the extent to which the scores from a measure represent the variable they are intended to. When a measure has good test-retest reliability and internal consistency, researchers should be more confident that the scores represent what they are supposed to (Petty, et al. 2009 and Cacioppo, et al., 1982).' Reliability is referred to the stability of findings, whereas validity is represented the truthfulness of findings [Altheide & Johnson, 1994]. Psychologists consider three types of consistency: over time (test-retest reliability), across items (internal consistency), and across different researchers (inter-rater reliability). Validity mainly categorized in to three basic kinds: face validity, content validity, and criterion validity (Petty, et al. 2009 and Cacioppo, et al., 1982).' The mixed-method approaches, which is utilized in this study included multifaceted approaches that combine to capitalize on strengths and reduce weaknesses that stem from using a single research design. All this proven approach helped to gather and evaluate data in increased validity and reliability of this research.

1.5.1. The Result Interpretations of Output Reliability Test

The most common measure of internal consistency used by researchers in psychology is a statistic called Cronbach's α (the Greek letter alpha). It is a coefficient of reliability (or consistency). A value of +.80 or greater is generally taken to indicate good internal consistency. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items

are as a group, that is a measure of scale reliability. Exploratory factor analysis is one method of checking dimensionality.

Cronbach 's alpha coefficient for reliability analysis of Project Integration Management calculated by IBM SPSS Statistics Version 28.0.1.1 (15) and found to be 0.937 for this study. Since the value 0.937 is quite greater than the threshold value +.80, the result is generally indicated good internal consistency, and this entails that the reliability of the questionnaire is high.

Table 3 Cronbach's Alpha (Reliability statistics)- (Source: own calculation)

| Reliability Statistics | | |
|-------------------------------|--|------------|
| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
| .937 | .937 | 6 |

Similarly, Cronbach 's alpha coefficient for reliability analysis for all the variables the value is quite greater than the threshold value +.80; Project Initiation, 0.932, Project Planning, 0.916, Project Execution, 0.921, Project Monitoring Control, 0.914, Project Closing, 0.926 and Project Success Factors 0.938. The results are generally indicated good internal consistency and reliability, and this entails that the reliability of the questionnaire is high (see Table 3).

Table 4 Survey Result of Project Integration Management computed by IBM SPSS Statistics Version 28.0.1.1 (15)- (Source: own calculation)

| Item-Total Statistics | |
|------------------------------|------------------|
| | Cronbach's Alpha |
| Project Initiation | 0.932 |
| Project Planning | 0.916 |
| Project Execution | 0.921 |
| Project Monitoring Control | 0.914 |
| Project Closing | 0.926 |
| Project Success Factors | 0.938 |

1.5.2. The Result Interpretations of Output Validity Test

The validity test represents the extent to which the scores from a measure represent the variable. Among, the three basic kinds of face validity, content validity, and criterion validity, using Pearson Correlation, criterion validity is considered as it is the extent to which people's scores on a measure are correlated with other variables that one would expect them to be correlated with people's test anxiety. The correlations between Project Initiation, Planning, Execution, Monitoring and Control, Closing and Project Success Factors, with the construct being measured, and the results described in Table 5 and 6. Based on the output below, Pearson correlation or correlation value between of the item is significant value obtained by the Sig. (2-tailed) for all variables $0.001 < 0.05$, so it can be concluded to all the 6 six items was valid, with 5% significance with $N = 33$.

Table 5 Validity Test Correlation of Project Integration Management: Project Initiation, Planning and Execution-(Source: own calculation)

| Correlations | | | | |
|--------------------------------|---------------------|--------------------|------------------|-------------------|
| | | Project Initiation | Project Planning | Project Execution |
| Project Initiation | Pearson Correlation | 1 | .799** | .648** |
| | Sig. (2-tailed) | | <.001 | <.001 |
| | N | 33 | 33 | 33 |
| Project Planning | Pearson Correlation | .799** | 1 | .904** |
| | Sig. (2-tailed) | <.001 | | <.001 |
| | N | 33 | 33 | 33 |
| Project Execution | Pearson Correlation | .648** | .904** | 1 |
| | Sig. (2-tailed) | <.001 | <.001 | |
| | N | 33 | 33 | 33 |
| Project Monitoring and Control | Pearson Correlation | .700** | .839** | .851** |
| | Sig. (2-tailed) | <.001 | <.001 | <.001 |
| | N | 33 | 33 | 33 |
| Project Closing | Pearson Correlation | .624** | .661 | .688** |
| | Sig. (2-tailed) | <.001 | <.001 | <.001 |
| | N | 33 | 33 | 33 |
| Project Success Factors | Pearson Correlation | .586** | .603** | .542** |
| | Sig. (2-tailed) | <.001 | <.001 | .001 |
| | N | 33 | 33 | 33 |

Table 6 Validity Test Correlation of Project Integration Management-M &E, Project Closing and Success Factor-(Source: own calculation)

| Correlations | | | | |
|--------------------------------|---------------------|--------------------------------|-----------------|-------------------------|
| | | Project Monitoring and Control | Project Closing | Project Success Factors |
| Project Initiation | Pearson Correlation | .700** | .624** | .586** |
| | Sig. (2-tailed) | <.001 | <.001 | <.001 |
| | N | 33 | 33 | 33 |
| Project Planning | Pearson Correlation | .839** | .661** | .603** |
| | Sig. (2-tailed) | <.001 | <.001 | <.001 |
| | N | 33 | 33 | 33 |
| Project Execution | Pearson Correlation | .851** | .688** | .542** |
| | Sig. (2-tailed) | <.001 | <.001 | .001 |
| | N | 33 | 33 | 33 |
| Project Monitoring and Control | Pearson Correlation | 1 | .815** | .653** |
| | Sig. (2-tailed) | | <.001 | <.001 |
| | N | 33 | 33 | 33 |
| Project and closing | Pearson Correlation | .815** | 1 | .762** |
| | Sig. (2-tailed) | <.001 | | <.001 |
| | N | 33 | 33 | 33 |
| Project Success Factors | Pearson Correlation | .653** | .762** | 1 |
| | Sig. (2-tailed) | <.001 | <.001 | |
| | N | 33 | 33 | 33 |

1.6. Ethical Considerations

Ethical considerations in research are a critical set of principles that guide our research designs and practices. In this research, important code of conducts followed when collecting data from people as well as when conducting analysis. The diversity of participants, and their real-life phenomena like the project staff, management, experts, beneficiaries, partner organizations as well as farmers are considered, and their views are well gathered and analyzed. For all important factors, due emphasis and effective treatments considering their behaviors, for positive impact. Key ethical considerations, confidentiality, that is to protect the rights of research participants, enhanced research validity, maintaining scientific integrity, voluntary participated, informed consent, anonymity, confidentiality, potential for harm- physical, social, psychological and all other types of harm are kept to an absolute minimum and results communication.

1.7. Data Analysis

Based on the research questions, problem statement and the objectives, the data collected analyzed and tested for consistency, executed with appropriate method to investigate project integration management practices against the output variable, project overall success factor. The data computed by IBM SPSS Statistics Version 28.0.1.1 (15) software; clearly delineated instructions employed for their correct use to reduce the likelihood of errors occurring. The processes behind observed results and assessed changes in people's perceptions on the implemented project carefully examined and validated with secondary sources. The structured questionnaires results, and semi-structured subjective questionnaires results integrated. The organized, summarized and analyzed results represented graphically as well as numerically. Different tables and graphs produced for intelligent overview of the information collected and support the presentation of the data used in the project.

CHAPTER FOUR

2. Data Analysis, Interpretation and Presentation

As described earlier, both qualitative (in-depth interview, observation methods and document review) and quantitative data employed by random sampling to capture key metrics in the context of project management and the project integration process life cycle. Structured and semi-structured interview response organized in suitable format, particularly the google form data exported to excel sheet, data cleaning, arrangement has been done prior to the analysis. The mixed methods approach as design, combined both qualitative and quantitative research data, techniques, and methods within a single research framework. The google forms own individual analysis and the IBM SPSS Statistics Version 28.0.1.1 (15) software analysis utilized to interpret and present the findings based on project integration management metrics to identify important trends. The data is analyzed to assess the success of a project based on its effect on project integration management process and investigate a project's status, foresee risks, and assess team productivity and quality of work executed.

The analysis is based on 33 respondents from all identified target groups from ATI Head Office-project team and support team members, ATI Regional Office, Government line offices, partner institution (FAO, IWMI, etc.), consultants and farmer groups that was distributed online and in hardcopy (to famers participants). For enhanced consistency, this work was triangulated to the ATI regular project reports and projects performances. Regression analysis, most powerful multivariate statistical techniques for it infers the existence and form of a functional relationship in a population on the selected variables. Different statistical methods are used multiple regression modeling approach. The google forms analysis and the IBM SPSS Statistics Version 28.0.1.1 (15) analysis used for descriptive and inference used to estimate the parameters — the slope and intercept — of the function that links two or more variables.

2.1. Descriptions of Research Findings

The descriptive research, a quantitative research method that attempted to collect quantifiable information for statistical analysis of the population sample, that described the characteristics of

the population and the phenomena studied, focusing on describing the nature of a demographic segment, investigative information patterns, traits, and behaviors of the respondents. It could also be to understand from a respondent, their attitude, or opinion about the phenomenon and measure data trends over time with a descriptive research design's statistical capability.

2.1.1. Demographic analysis

The demographic analysis was part of this study using population-based factors and socioeconomic information expressed statistically, including employment organization (affiliation), educational status, work experience, age, and sex.

On this study in which 34 diverse respondents participated 82% were male and 18% of them were female, 33 included to data analysis. The age is categorized in to 5, among which two age groups are found dominant, age from 36 to 45 and age group from 46 to 55 years old, 44% and 29% respectively. The work experience of the responds categorized in to 4 groups, majority of the respondent, 73% have more than 10 years' experience, those from 3-5 years' work experience are 18%. Likewise, 76% of the respondent's educational background is masters and above, first degree holders 6%. Among, the demographic indicators, the most important indicator that have major effects on the perception of the project integration management is the organizational affiliation, which is grouped into six categories, the inhouse participants from ATI Head office with 20%, and the ATI Regional Office participants about 12%, whereas external stakeholders from government line office 23%, partner institution 18%, consultants 9%, and farmers 18% see Table 7 below. The overall composition of the responds shows the quality of the survey with the explanatory and outcome variables.

Table 7 Respondents Demographic Characteristics-(Source: own calculation)

| | Category | Frequency | Percent (%) |
|------------|----------|-----------|-------------|
| Age | 26-35 | 3 | 9 |
| | 36-45 | 15 | 44 |
| | 46-55 | 10 | 29 |
| | Above 55 | 6 | 18 |
| | Male | 28 | 82 |

| | | | |
|-------------------------------|------------------------------|----|----|
| Sex | Female | 6 | 18 |
| Work Experience | 1-2 Years | 1 | 3 |
| | 3-5 Years | 6 | 18 |
| | 5-10 Years | 2 | 6 |
| | More than 10 Years | 25 | 73 |
| Educational Background | High school and below | 5 | 15 |
| | Diploma | 1 | 3 |
| | First Degree | 2 | 6 |
| | Masters and above | 26 | 76 |
| Affiliation | ATI Head office staff | 7 | 20 |
| | ATI Regional Office staff | 4 | 12 |
| | Government line office staff | 8 | 23 |
| | Partner institution | 6 | 18 |
| | Consultants | 3 | 9 |
| | Farmers | 6 | 18 |

2.1.2. Mean and Standard deviations

Descriptive measures of the selected populations based on the respondents' responses on Likert Scale Response Anchors, were calculated in terms of measures of center and measures of dispersion, the population mean is μ (mu), the population variance, σ^2 (sigma squared) and population standard deviation, σ (sigma) help to identify the center and spread of the data among project integration management process variables. Project initiation has the highest mean (4.3), followed by project planning (mean of 4.0) and project execution (mean of 4.0) from the consolidated analysis, all the participants practically higher levels of agreement (i.e., higher scores) (above average). The Monitoring and control (mean of 3.9) is also reflected higher levels of satisfaction by stakeholders; while project closure (mean of 3.4) and project success factor (mean of 3.5) have relatively lower levels of agreement. The project closure lower levels of agreement could be because of the project is not yet closed totally as it is at the final consolidation and hand overing phases, see Table 8 for all variables.

Table 8 Measures of center and measures of dispersion -Project Integration Management Factors-
(Source: own calculation)

| Statistics | | | | | | | |
|------------------------|---------|-----------------------|---------------------|----------------------|-----------------------------------|--------------------|----------------------------|
| | | Project Initiation | Project Planning | Project Execution | Project Monitoring and Control | Project Closing | Project Success Factors |
| N | Valid | 33 | 33 | 33 | 33 | 33 | |
| | Missing | 0 | 0 | 0 | 0 | 0 | |
| Mean | | 4.3165 | 3.9788 | 3.9758 | 3.8485 | 3.4121 | 3.4758 |
| Std. Deviation | | 0.58539 | .76516 | .72587 | .75834 | .62986 | .61341 |
| Skewness | | -.672 | -.373 | .172 | .140 | .505 | .398 |
| Std. Error of Skewness | | .409 | .409 | .409 | .409 | .409 | .409 |
| Kurtosis | | -.012 | -.165 | -1.332 | -.907 | .904 | .406 |
| Std. Error of Kurtosis | | .798 | .798 | .798 | .798 | .798 | .798 |

The standard deviation, the probability that project integration management variables fell within almost one standard deviation of the mean, that is close to the numbers 0.68 and 0.95. The results of SD, 0.56, 0.77, 0.73, 0.76, 0.63 and 0.61 for project initiation, planning, execution, monitoring, and control, closing, and project success factors, respectively indicated that normal distribution (see fig 5 to 10) curve about 2/3 of the observations would be found within 0.7 of the mean. The results provided an indication of how far the individual responses to a question varied or "deviated" from the mean, how spread out the responses, scattered far & wide or concentrated around the mean.

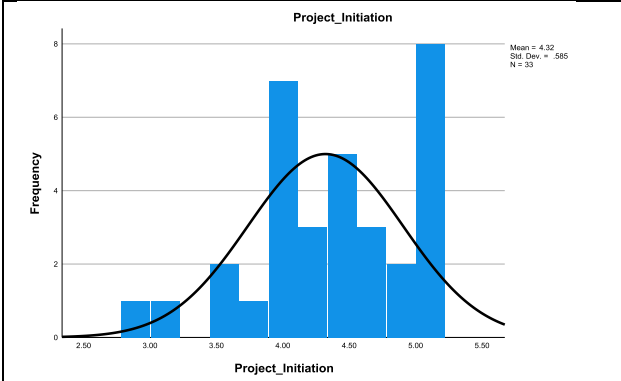


Figure 2 Project Initiation

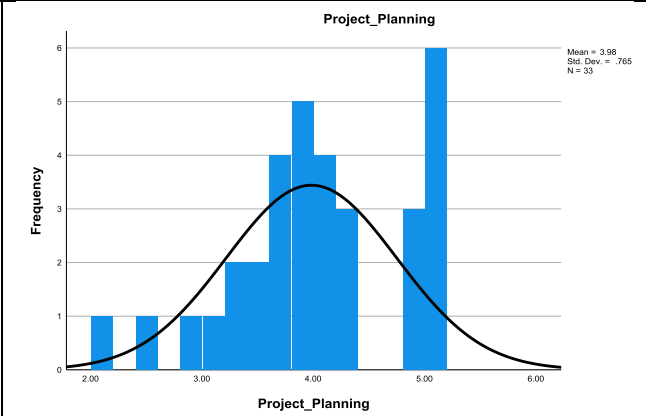


Figure 3 Project Planning

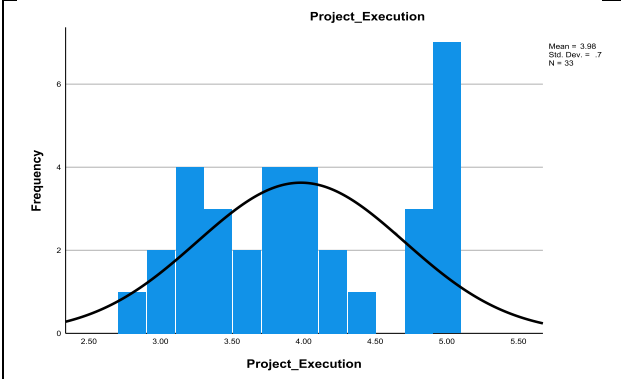


Figure 4 Project Execution

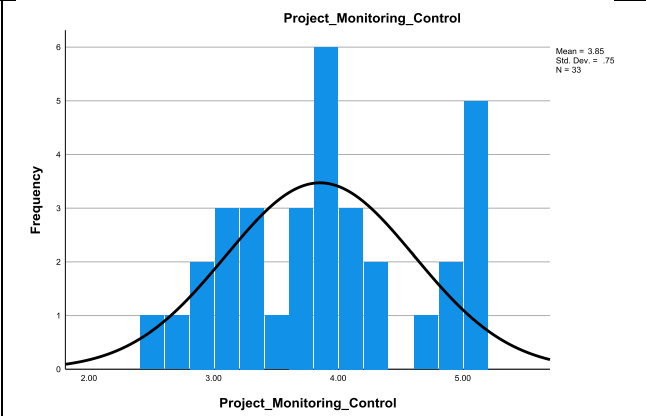


Figure 5 Project Monitoring and Evaluation

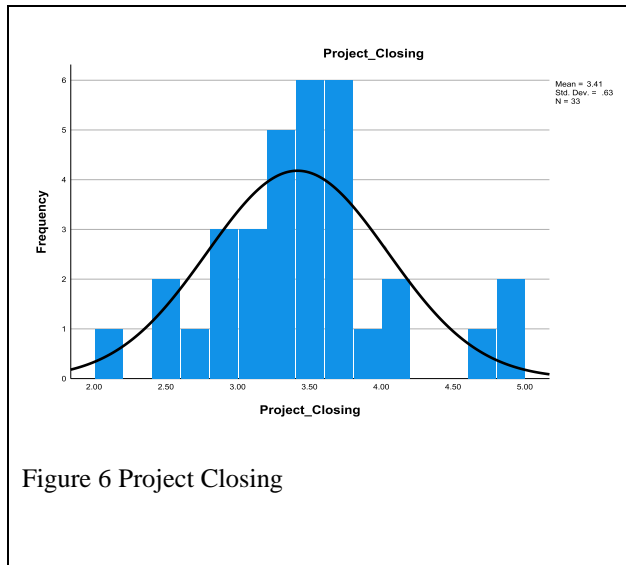


Figure 6 Project Closing

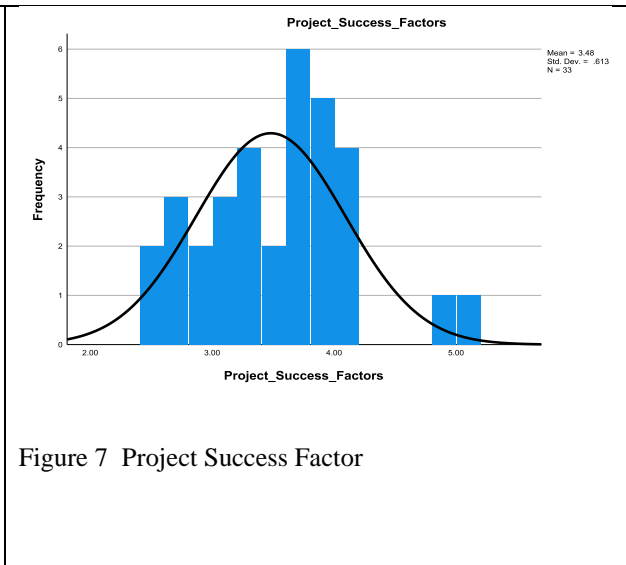


Figure 7 Project Success Factor

2.1.3. Measures of Skewness

Skewness measured of symmetry, or more precisely, the lack of symmetry, hence it described, a distribution, or data set, its symmetricity as it looks the same to the left and right of the center point; it measured a distribution's asymmetry. Whereas kurtosis measured whether the data are heavy-tailed or light-tailed relative to a normal distribution, simply summary statistic communicated information about the tails (the smallest and largest values) of the distribution. From Table 8 above, both curves resulted in an asymmetrical normal curve. Both skew and kurtosis analyzed through descriptive statistics on the IBM SPSS Statistics Version 28.0.1.1 (15). Acceptable values of skewness fall between -3 and $+3$ (Brown, 2006), the results for project initiation -0.672 , project planning -0.373 , project execution 0.172 , project monitoring and control 0.140 , project closing 0.505 , project success factors 0.398 . Likewise, kurtosis is appropriate from a range of -10 to $+10$ when utilizing SEM (Brown, 2006), and the results for Project Initiation -0.012 , Project Planning -0.165 , Project Execution -1.332 , Project Monitoring and Control -0.907 , Project Closing 0.904 , Project Success Factors 0.406 , all are in acceptable range.

2.1.4. Measures of Kurtosis

The ratio of skewness to its standard error employed as a test of normality (that is, you can reject normality if the ratio is less than -2 or greater than +2), but in our case, for all 5 variables found in acceptable range, see Table 8 above. A positive value for skewness has been seen which indicates a long right tail, for all variables, Std. Error of Skewness, 0.409. Likewise, the standard Error of Kurtosis, the ratio of kurtosis to its standard error used as a test of normality (that is, you can reject normality if the ratio is less than -2 or greater than +2), but in our case it is within acceptable range, that is Std. Error of Kurtosis for all variables 0.798.

2.2. Results and Discussion

Data analysis based on questions regarding project integration management process for ATI ISGWD project and the findings are described below.

2.2.1. Project Initiation Phase findings

a) Project Initiation Reliance on Need Assessment and Opportunity

The response of all the respondents on the project ideation and initiation phase, whether the need assessment and opportunities consideration of the Integrated Shallow Ground Water Irrigation Development (ISGWID) project came to reality, shown that the mean is 4.64 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 4.33 and Upper Bound is 4.94. This shows, the project was initiated with highest demands and business value it will deliver. The stakeholders endorsed this project highly (see fig. 11).

b) Project Initiation Reliance on Problem Analysis

The response of all the respondents on the project ideation and initiation phase, whether the problem analysis, understanding actual problems considered during the ISGWID project design phase, shown that the mean is 4.55 with standard error, 0.11, with 95% Confidence Interval for Mean, Lower Bound is 4.33 and Upper Bound is 4.76. This shows, the project was initiated with clear understanding of the real problems in the sector and the stakeholders have endorsed this

project highly considering it solves major problems in Irrigation sector (see fig. 12). The results also confirm, irrigation potential assessment for agricultural area is nationally taken as the first and primary investment area to resolve lack of information on water availability, flow and quality, and physical capacity (see Fig. 12).

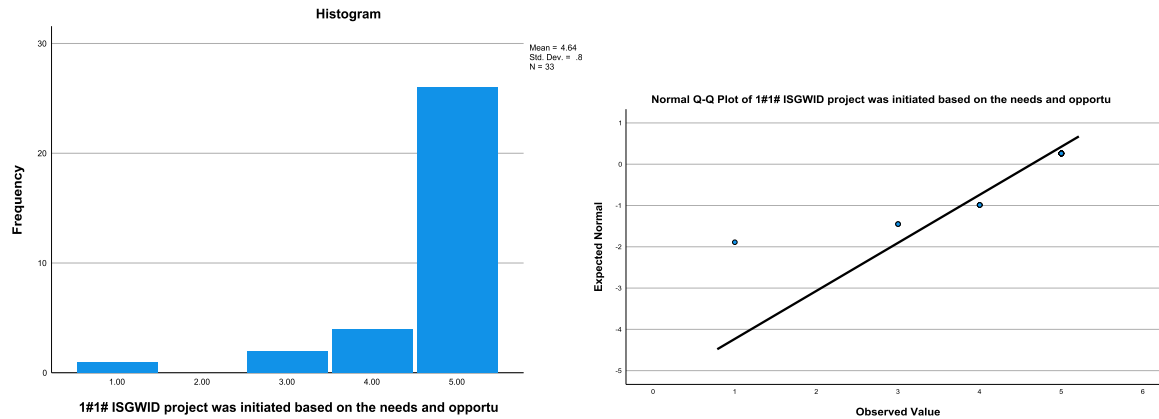


Figure 8 Project Initiation Reliance on Need Assessment and Opportunity (a & b)

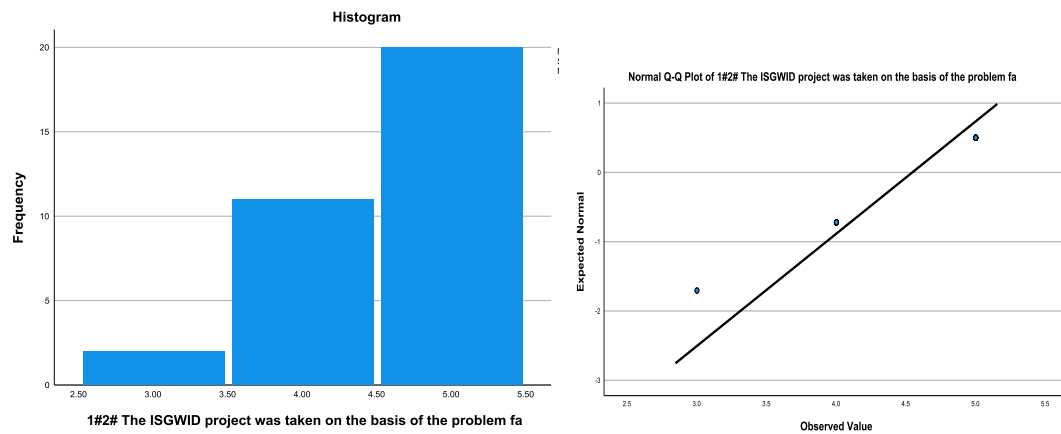


Figure 9 Project Initiation Reliance on Problem Analysis (a & b)

c) Project Initiation reliance on Feasibility Study Existence

The response of all the respondents on the project ideation and initiation phase, whether the feasibility study results contributed for the ISGWID project design phase, shown that the mean is 4.18 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 3.87 and Upper Bound is 4.49. This shows, the project was initiated with the existence of approved feasibility study. As next response also confirmed that the decision to implement the ISGWID

project was based on the final output of feasibility study, as the mean is 4.39 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 4.18 and Upper Bound is 4.61. This confirms that the project has established clear descriptions of the project objectives, considered a viable project, determined the probability of the project succeeding, determined the feasible, reliable, and adoptable technology.

d) Project Initiation reliance on Transformational Agenda Deliverables of the sector

The response of all the respondents on the project ideation and initiation phase, whether the ISGWID project was part of the transformational agenda deliverables, they have strongly agreed that the mean is 4.52 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 4.22 and Upper Bound is 4.81. This shows, the project was initiated as part of the transformational agenda deliverable to transform agricultural production from its dependence on rain fed practices by creating a vibrant irrigation sector, to bring enhanced resilience to climate change and thereby sustain growth, ensure smallholders households food security, and maintain increasing incomes (see Fig. 13).

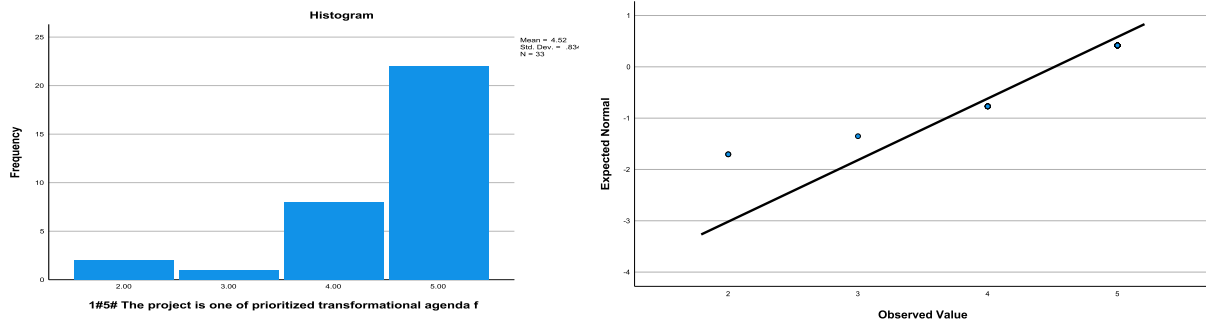


Figure 10 Project Initiation reliance on Transformational Agenda Deliverables

e) Project Initiation reliance on Project Charter

The response of all the respondents on the project ideation and initiation phase, whether the ISGWID project has a project charter, they have agreed that the mean is 3.91 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 3.57 and Upper Bound is 4.25. This shows that the project formally recognized (authorized) and established as the project approved (signed) with clear goals and objectives consisting of project title and description,

deliverables, project manager assigned and authority level, business need, justification, stakeholder requirements (see Fig. 14). This response has also substantiated that, the project has already identified activities and tasks, resource requirements, project costs, project requirements, performance measures, and more, stakeholders, the project sponsor, the project team, and all other were well informed.

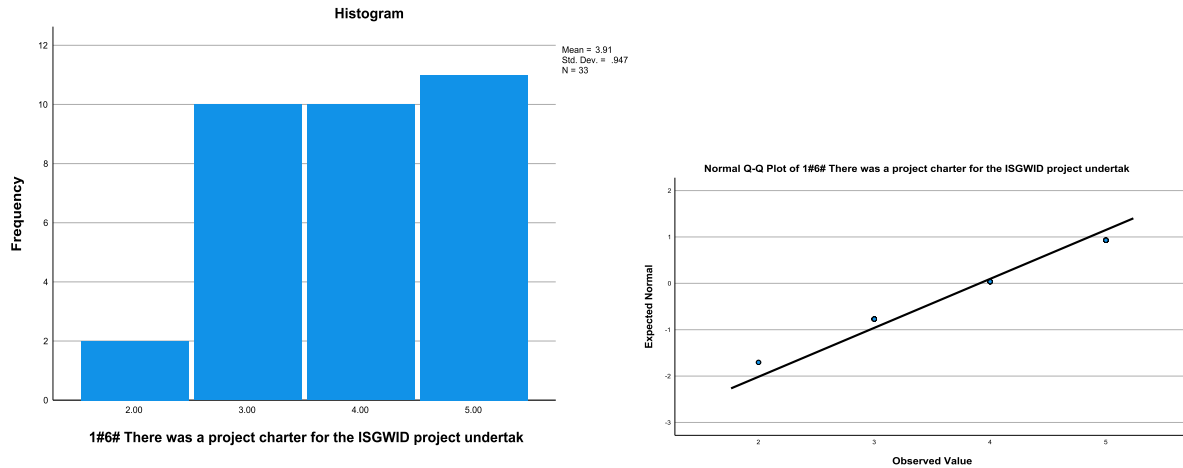


Figure 11 Project Initiation reliance on Project Charter

f) Project Initiation reliance on Project Team Competencies?

The response of all the respondents on the project ideation and initiation phase, whether the ISGWID project team are competent or not, they have strongly agreed the project team were competent, that was why they catalyzed effectiveness and efficiency in leading the projects to a great success. This is depicted on the mean, 4.24 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 3.98 and Upper Bound is 4.51

g) Project Initiation reliance on Coordination

The response of all the respondents on the project ideation and initiation phase, whether the ISGWID project team are well coordinated or not during project initiation stage, they have strongly agreed the project team were well coordinated, organized, and prioritizing well as well as managed expectations. This is depicted on the mean, 4.36 with standard error, 0.14, with 95% Confidence Interval for Mean, Lower Bound is 4.09 and Upper Bound is 4.64.

h) Project Initiation reliance on Phased Review Process

The response of all the respondents on the project ideation and initiation phase, whether the ISGWID project has passed phased review process during project initiation stage, they have agreed indeed, the project passed through phased review process from conception to launch to determine the success of a phase and the ongoing viability of a project. This is depicted on the mean, 4.06 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 3.75 and Upper Bound is 4.37. From discussions with project team, it has been confirmed that owing to the sensitivity of the technology and the unpredictability of the groundwater resources, the project has passed several phase reviews processes, starting with project implementation arrangement (like passing through pilot demonstration phases) up to selection of appropriate technologies (based on the review the changed the previous piloted France based WATEX technology with other Czech Republic based Aqua Test technology).

i) Project Initiation reliance on Project Success

The response of all the respondents on the project ideation and initiation phase, whether the ISGWID project success was very much dependent on the project initiation process, they have agreed indeed, the project due emphasis from conception to launch contributed to the success. This is depicted on the mean, 4.18 with standard error, 0.14, with 95% Confidence Interval for Mean, Lower Bound is 3.90 and Upper Bound is 4.47. From discussions with project team, it has been confirmed that owing to limited knowledge of the resources base (in terms of quantity and quality as well as spatial distribution) –high tech knowledge, skill and finance requirement, poor understanding of the groundwater dynamics and its environments all needed proper starting.

2.2.2. Project Planning Phase findings-Project Management Plan

a. Project Planning reliance on Proper Project Scoping

The response of all the respondents on the project planning phase, whether the ISGWID project has properly defined the project scope and its justification, the major deliverables, and the project objectives, they have strongly agreed, the project defined its scopes well. This is depicted on the

mean, 4.36 with standard error, 0.10, with 95% Confidence Interval for Mean, Lower Bound is 4.15 and Upper Bound is 4.58. From discussions with project team, it has been confirmed that the project team ensured during scoping phase that the project included all the work required to achieve the project deliverables, identified constraints and coping mechanisms as well as the processes (progressively elaborating and documenting the project work) used to create the outputs to complete the project successfully and they have integrated it to the scope management plan.

b. Project Planning reliance on Proper Project Scoping

The response of all the respondents on the project planning phase, whether the ISGWID project has properly defined the project scope and its justification, the major deliverables, and the project objectives, they have strongly agreed, the project defined its scopes well. This is depicted on the mean, 4.36 with standard error, 0.10, with 95% Confidence Interval for Mean, Lower Bound is 4.15 and Upper Bound is 4.58. From discussions with project team, it has been confirmed that the project team ensured during scoping phase that the project included all the work required to achieve the project deliverables, identified constraints and coping mechanisms as well as the processes (progressively elaborating and documenting the project work) used to create the outputs to complete the project successfully and they have integrated it to the scope management plan.

c. Project Planning reliance on Project's deliverables- the Work Breakdown Structure

The response of all the respondents on the project planning phase, whether the ISGWID project has properly defined the Work Breakdown Structure (WBS), whether they have subdivided major project deliverables into smaller, more manageable components until deliverables were defined in sufficient detail for supporting future project activities, they have distinctly agreed, the score of the mean, 4.12 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 3.82 and Upper Bound is 4.43. From discussions with project team, it has been confirmed that the project team determined deliverable-oriented grouping of project elements in Work Package, to the lowest level of the WBS until the point at which the cost and schedule for

the work can be reliably.

d. Project Planning reliance on Project Tasks Dependencies

The response of all the respondents on the project planning phase, whether the ISGWID project has properly identified and handled tasks dependencies, they have distinctly agreed and the score of the mean, 4.06 with standard error, 0.14, with 95% Confidence Interval for Mean, Lower Bound is 3.77 and Upper Bound is 4.35. From discussions with project team, it has been confirmed that the project team identified sequential, task-based types of dependencies considering the complexity of the groundwater unpredictability (satellite based remote sensing data, groundwater based geological data and geophysical data, ground truthing) has given due emphasis for dependencies that might have significant impacts on the project.

e. Project Planning reliance on Defining and Allocating Roles and Responsibilities

The response of all the respondents on the project planning phase, whether the ISGWID project has properly defined and allocated roles and responsibilities, they have distinctly agreed and the score of the mean, 4.03 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 3.72 and Upper Bound is 4.34. Looking to the project human resource planning, the project team was developed with complementary skills and knowledge (from hydrogeologists to irrigation engineers, agronomists, socio-economist to electromechanical engineers along with project senior leadership), have great deal of communication plans(weekly), made joint decisions, accomplished a set of tasks, and motivated each other to accomplish the ultimate project goal. Roles and responsibilities have been well defined and allocated, gaps were filled by recruiting high level expertise as a consultant.

f. Project Planning reliance on Project Schedule Planning

The response of all the respondents on the project planning phase, whether the ISGWID project well-kept Project Schedule Planning, they have basically agreed and the score of the mean, 3.79 with standard error, 0.18, with 95% Confidence Interval for Mean, Lower Bound is 3.41 and Upper Bound is 4.16. As understood from group discussion, the project has indeed, defined, and

sequenced activities, estimated activity resources and durations, they have developed schedule, however, the project was delayed because of several factors. One of the major issues faced by the project was ever increasing additional demands of the project (hence, the scope has been revised several times (from mapping 168,189km² to the now reached 234.8K km²) along with resource mobilization- obtaining sufficient fund (budgetary shortage). At the starting phase, there was a major challenge regarding appropriate technological choices (investigation tools selection for shallow groundwater mapping and long procurement process for items imported from abroad. The other major factor was collecting ground level data hampered due to security situation, inaccessibility of the remote areas and the like. This all reflected on the above results.

g. Project Planning reliance on Enterprise Environmental Factors and Organizational Process Assets

The response of all the respondents on the project planning phase, whether the ISGWID project defined and documented Enterprise Environmental Factors and Organizational Process Assets, they have basically agreed and the score of the mean, 3.82 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.47 and Upper Bound is 4.17. The enterprise environmental factors input refers to the factors outside the project that have major influence the way the project was managed and determined the outcomes of the project. For this ATI has typical organizational culture and structure of employing high-caliber staff, high-performing organizations quality standards (International Standards, product standards, and workmanship standards. The ATI infrastructure, organization's facilities and capital equipment such as information technology, the well-developed Enterprise resource planning (ERP), the human resources, the existing staff's skills and knowledge, personnel administration-hiring, training, and employee performance reviews, organization's decentralized work authorization system, the marketplace conditions, stakeholder risk tolerance, commercial databases- ATI-specific information, risk databases, as well as Project management information systems (PMIS) contributed to this project successful accomplishment based on the secondary data review and beneficiaries feedback.

Likewise, the ATI Organizational process assets (OPA), such as the organization 's policies, guidelines, procedures, plans, approaches, or standards for conducting work, including project work, contributed bigger roles and mobilization of huge resources to map quarter of Ethiopia and identify such great deal of untapped resources. The ATI OPA included a wide range of elements that might affected several aspects of the project, such as project management policies, safety policies, performance measurement criteria, templates, financial controls, communication requirements, issue, and defect management procedures, change control procedures, risk control procedures, the procedures used for authorizing work, etc.

h. Project Planning reliance on Project Cost Management

The response of all the respondents on the project planning phase, whether the ISGWID project properly estimated, budgeted the overall project cost, they have basically agreed and the score of the mean, 3.97 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.62 and Upper Bound is 4.32. Based on the discussions with the project team and the secondary information, the project breakthrough on achieving its target was the proper cost management plan (human, materials, technology, and other requirements) and authorized cost baseline, that was allocated in time of need, helped them to complete the activities identified on the project schedule.

i. Project Planning reliance on Staffing Management Plan

The response of all the respondents on the project planning phase, whether the ISGWID project staffing was appropriately planned, they have basically agreed and the score of the mean, 3.76 with standard error, 0.19, with 95% Confidence Interval for Mean, Lower Bound is 3.36 and Upper Bound is 4.15. Based on the discussions with the project team and the secondary information, the project planned and managed the technology, people, and change to achieve the planned goals, reach targets, and deliver the project on time and within budget. The project coordination unit have solid staff management plan that created an environment conducive to the delivery of the new application in the most cost-effective manner. The practice helped the project team to manage uncertainty, rapid change, ambiguity, surprises, and a less defined environment and to track the performance, appraisals, conflict management and conversation and dialogue during the entire project cycle.

j. Project Planning reliance on Quality Planning

The response of all the respondents on the project planning phase, whether the ISGWID project quality planning was made to ensure how the project quality objectives will be met, they have basically agreed and the score of the mean, 3.91 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.56 and Upper Bound is 4.26. Based on the discussions with the project team and the secondary information, the project has a quality management plan that led to quality deliverables, that required implementing corrective actions to perform quality assurance during quality audits, that brought the work of the project back into alignment with the project plan. This process helped the project team to take preventive actions to reduce the probability of negative consequences, and defect repairs to correct product defects discovered during the quality processes. Adherence to quality standards has been on the entire project implementation process until the project management took decisive actions on technology changes in this studied project.

k. Entire Project Planning Process

The response of all the respondents on the project planning phase, whether the ISGWID project quality planning was successful or not, they have basically agreed and the score of the mean, 3.97 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.63 and Upper Bound is 4.31. Based on the discussions with the project team and the secondary information, the project planning process helped the project team to be organized and prioritize the critical activities, manage expectations, engage effectively with the team and drive development among themselves and tackle challenging situations. The planning habit also helped them gain clarities, under promise but over deliver, prioritize, and stay focused, create contingency plans, and over communicate with all key stakeholders to finalize the project to the required standard.

2.2.3. Project Execution Phase findings- Directing and Managing Project Execution

a) Project Execution reliance on Building Commitment in Project Teams

The response of all the respondents on the project execution phase, whether the ISGWID project staffs were committed to the directions given to them, their level of commitments, whether they

put the project first and made personal sacrifices to ensure the success of each project task, they have basically agreed and the score of the mean, 4.12 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 3.79 and Upper Bound is 4.45. Based on the discussions with the project team and the secondary information, the project staff has exhibited this important competency, their commitments, knowledge, and skills that enabled them to act effectively in this project performance. The team commitment also has driven group dynamics in respect of morale, efficiency, cohesion, levels and types of participation and structure; the project team worked on problems until they were solved.

b) Project Execution reliance on Effective Supervision

The response of all the respondents on the project execution phase, whether the ISGWID project staff responded well to supervision, the culture of constantly measuring progress, evaluating plans and taking corrective actions when required, accomplished its technical performance, maintained its schedules and remained within budgetary costs, they have basically agreed and the score of the mean, 4.03 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.69 and Upper Bound is 4.37. Based on the discussions with the project team and the secondary information, the project is considered highly successful because, there was a supervisory and monitoring system in place, motivating environment that led to achieving business goals. The effective supervisions in place at all levels ensured that specified standards to be maintained, required works to be completed on time and schedule.

c) Project Execution reliance on Project Team Motivation and Increased Performance

The response of all the respondents on the execution phase, whether the people in the ISGWID project were motivated for good performance, they have basically agreed and the score of the mean, 3.73 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.34 and Upper Bound is 4.12. Based on the discussions with the project team and the secondary information, project team members understood their work environment, and exhibited attitudes, ability, motivation, and expectations compatible with the project objectives, that lead to the project's high-level performance.

d) Project Execution reliance on Project Staff Interaction and Effective Coordination

The response of all the respondents on the project execution phase, whether the ISGWID project staff interacted and effectively coordinated well or not, they have basically agreed and the score of the mean, 3.97 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.63 and Upper Bound is 4.31. Based on the discussions with the project team and the secondary information, project staff interaction (care, trust, openness, consensus, and commitment among themselves) was well coordinated that lead to high performance and celebrate success together.

e) Project Execution reliance on Managing Project Team Conflicts

The response of all the respondents on the project execution phase, whether the ISGWID project managed project team conflicts well or not, they have basically agreed and the score of the mean, 3.79 with standard error, 0.19, with 95% Confidence Interval for Mean, Lower Bound is 3.40 and Upper Bound is 4.17. Based on the discussions with the project team and the secondary information, there was conflicts among team members and even with external partners as the project was executed together towards a common goal. The conflicts lead to increasing collaboration, gave rise to new ideas and approaches that driven everyone to perform better.

f) Project Execution reliance on Positive Teamwork Environment

The response of all the respondents on the project execution phase, whether the ISGWID project was executed in a positive teamwork environment or not, they have basically agreed and the score of the mean, 4.09 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 3.78 and Upper Bound is 4.40. Based on the discussions with the project team and the secondary information, the project was indeed executed in a positive teamwork environment.

g) Project Execution reliance on Achieving Synergy

The response of all the respondents on the project execution phase, whether the ISGWID project activities were well coordinated, and synergy created (presented to different stakeholders' platforms to get feedback), they have strongly agreed and the score of the mean, 4.12 with standard error, 0.14, with 95% Confidence Interval for Mean, Lower Bound is 3.83 and Upper

Bound is 4.41. Based on the discussions with the project team and the secondary information, the project activities were well coordinated, and synergy created. The project progress and outcomes were well presented to several government and internationally organized events such as Agricultural Water Management, International Water Week, feedback gathered, and project performance increased.

h) Project Execution reliance on Problem Solving and Decision Making

The response of all the respondents on the project execution phase, whether the ISGWID project when problem raised, the cause of the problem was investigated, and urgently resolved or not, they have basically agreed and the score of the mean, 3.76 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 3.45 and Upper Bound is 4.06. Based on the discussions with the project team and the secondary information, indeed, there is vibrant decision-making and problem-solving practices in such a way, developed underlying evidence to support views, analyzed situations carefully, discussed the issues in an organized way, predicted the consequences of actions, weighed alternatives, generated alternative solutions, and organized ideas, formulated solutions and applied concepts and designed systematic plans of action.

i) Project Execution reliance on Effective and Efficient Performance

The response of all the respondents on the project execution phase, whether the ISGWID project plan was executed by performing the tasks identified in the plan effectively and efficiently, they have strongly agreed and the score of the mean, 4.18 with standard error, 0.12, with 95% Confidence Interval for Mean, Lower Bound is 3.94 and Upper Bound is 4.42. Based on the discussions with the project team and the secondary information, the project accomplished several milestones within the Irrigation and Groundwater field with the least amount of wasted time, money, and competency in performance and produced desired result.

j) Project Execution reliance on Successfully Directing and Managing Project

The response of all the respondents on the project execution phase, whether the ISGWID project was well directed and managed, they have basically agreed and the score of the mean, 3.97 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 3.66 and Upper Bound is 4.28. Based on the discussions with the project team and the secondary information, the

deliverables and requirements agreed met to the required standard and the resources identified and allocated were efficiently utilized and the stakeholders satisfied on the delivery as their corrective actions and additional demands responded well.

2.2.4. Project Monitoring and Control Phase findings

I. Monitor and Control Project Work

a) Project Monitoring and Control- Project Management Information Flow

The response of all the respondents on the project Monitoring and Control phase, whether the ISGWID project collected and disseminated effectively project progress information or not, they have basically agreed and the score of the mean, 3.97 with standard error, 0.14, with 95% Confidence Interval for Mean, Lower Bound is 3.68 and Upper Bound is 4.26. Based on the discussions with the project team and the secondary information, the project team scheduled project activities and resources and collected and distributed project information, captured feedback and changes to the project charter, and published the finalized, approved charter. However, this must be substantiated with financial and viability assessment of this project and must be communicated to the entire key stakeholders for better visibility and major impact.

b) Project Monitoring and Control- Meeting Project Deliverables and Activities

The response of all the respondents on the project Monitoring and Control phase, whether the ISGWID project deliverables and activities were measured to assess quality objectives are being met, they have basically agreed and the score of the mean, 4.03 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 3.72 and Upper Bound is 4.34. Based on the discussions with the project team and the secondary information, Project deliverables, results that were agreed on by the team during the project planning phase and were met and documented.

c) Project Monitoring and Control- Measuring Continuous Improvement on Quality

Delivery

The response of all the respondents on the project Monitoring and Control phase, whether the ISGWID project monitored and recorded result of the quality activities for constant improvement, performed quality assurance throughout the project lifecycle or not, they have

basically agreed and the score of the mean, 3.88 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 3.57 and Upper Bound is 4.18. Based on the discussions with the project team and the secondary information, project team in general, implemented quality assurance method—the plan-do-check-act (PDCA) cycle; measured continuous improvements of project deliverables, monitored and recorded results, assured and controlled the required standard and quality during the entire project management cycle. The monitoring and recording practices enhanced learning and encouraged innovation to achieve better results and contributed to scaling up of project.

d) Monitoring and Recording - Feedbacks Incorporated during Project

Implementation

The response of all the respondents on the project Monitoring and Control phase, whether the ISGWID project feedbacks incorporated during implementation or not, they have basically agreed and the score of the mean, 3.97 with standard error, 0.14, with 95% Confidence Interval for Mean, Lower Bound is 3.68 and Upper Bound is 4.26. Based on the discussions with the project team and the secondary information, the project stakeholders confirmed several feedbacks given to project management incorporated during implementation.

II. Perform Integrated Change Control

e) Monitoring and recording - Recording Change Requests

The response of all the respondents on the project Monitoring and Control phase, whether the ISGWID project request for changes was recorded, created change requests in the initiation and recording stage or not, they have basically agreed and the score of the mean, 3.76 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 3.44 and Upper Bound is 4.08. Based on the discussions with the project team and the secondary information, the request for changes was recorded and managed well. The project coordination office has a good change control system in place (as the project record at the change initiation and recording stage shows, A7 Change Request, Change Requested (CR) by: ISGWID project, Name of the change requested: Dr. Kebede Teshome, RFC Submitted date and Version: 15/01/2020-V1, the description of the change request and the background). The project office collected and recorded

the prerequisite information that was required to create a change request. The change requests were generated due to several reasons by stakeholders and properly recorded with their description, impact, urgency, and the product and service categorization fields.

f) Monitoring and Recording- Implementing Change Request

The response of all the respondents on the project Monitoring and Control phase, whether the ISGWID project changes before implementation were approved or not, they have basically agreed and the score of the mean, 3.85 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 3.52 and Upper Bound is 4.18. Based on the discussions with the project team and the secondary information, several change requests well addressed before implementation. Project management office practiced each time they been requested for changes, they called a meeting with their team and discussed with their stakeholders, every change needed to be evaluated by project team in the presence of Project Management, Evaluation and Reporting Team Member, delegated the project team to evaluate changes and followed the procedures laid out in the change control system, reviewed the change, and documented its possible impact.

g) Monitoring and Recording- Managing Changes to Scope, Time, Quality, and Budget

The response of all the respondents on the project Monitoring and Control phase, whether the ISGWID project the Change Control process was properly implemented to manage changes to scope, time, quality, or budget or not, they have basically agreed and the score of the mean, 3.79 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 3.47 and Upper Bound is 4.10. Based on the discussions with the project team and the secondary information, the Change Control process was properly implemented to manage changes to scope, time, quality, or budget by the project coordination unit.

h) Monitoring and Recording- Controlling and Responding to Effective Schedule

Changes

The response of all the respondents on the project Monitoring and Control phase, whether the ISGWID project controlling and responding to schedule changes were effective or not, they have basically agreed and the score of the mean, 3.73 with standard error, 0.16, with 95% Confidence

Interval for Mean, Lower Bound is 3.40 and Upper Bound is 4.05. Based on the discussions with the project team and the secondary information, the key informants have confirmed, the project team effectively and efficiently controlled and responded to schedule changes. However, there were many cases that affected the original schedules such as prolonged procurement process, cancellations of bids twice due to scantily designed technical specifications and approaches, suppliers financial and technical capability problems as well as longer waiting to get hard currency.

i) Monitoring and Recording- Controlling and Responding to Effective Cost Changes

The response of all the respondents on the project Monitoring and Control phase, whether the ISGWID project controlling and responding to cost changes was effective or not, they have basically agreed and the score of the mean, 3.70 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.36 and Upper Bound is 4.03. Based on the discussions with the project team and the secondary information, the project stakeholders substantiated the project cost change and overall budget management effectively controlled and well responded as the project deliverables found very significant. This revealed, the organization has effective cost control system starting from proper budgeting and handling variances in real time. The effective cost controls along with good communications with funding agency created significant opportunities for project successful implementation.

j) Monitoring and Recording- Project Monitoring and Controlling Success

The response of all the respondents on the project Monitoring and Control phase, whether the ISGWID project monitoring and controlling system, their continuous process of collecting and analyzing information about a project compared to actually planned results, whether, they have systematically and objectively assessed all the elements of the project was successful or not, they have basically agreed and the score of the mean, 3.82 with standard error, 0.14, with 95% Confidence Interval for Mean, Lower Bound is 3.53 and Upper Bound is 4.11. Based on the discussions with the project team and the secondary information, they had a good M & E system that helped them to identify promising interventions, it provided useful information for formulating and justifying additional budget requests. It also allowed judicious allocation of limited resources to the interventions that brought greatest benefit to the organization and the

country. This has been proven, as they have measured and reported on outputs that reflect the critical stated strategic objectives of the organization, it provided them clear indicators against which the organization was working and has been measured verifiably. The system identified the key issues and root of the problems that have been addressed and made the project cost-effective, result oriented, every progress well tracked and effectively support the policy reform process, provided a rationale for how future performance targets are set.

2.2.5. Project Close Project or Phase findings- Closing

a) Project Closing- Meeting Objectives

The response of all the respondents on the project closing phase, whether the ISGWID project objectives were met with the desired outcome or not during project closing, they have essentially agreed and the score of the mean, 3.55 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.26 and Upper Bound is 3.83. Based on the discussions with the project team and the secondary information, the stakeholders confirmed, all the objectives of the project were successfully achieved, federal and regional clients accepted the deliverables (the groundwater atlas published by the organization) to eight regional states. The score is very low compared to other indicators, from the discussions with key stakeholders, though all deliverables are clear, and the documentation was in place, the data are not in usable format to stakeholders (shape files), and the data accessibility is also low. The organization must conduct project deliverables dissemination workshop to get client sign-off on the final report, also should conduct the post-implementation audit for celebrating the success of the project.

b) Project Closing- Getting Client Acceptance of Deliverables and Ensuring that all

Deliverables are Installed

The response of all the respondents on the project closing phase, whether the ISGWID project deliverables were completed satisfactorily or not, they have basically agreed and the score of the mean, 3.39 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 3.08 and Upper Bound is 3.71. Based on the discussions with the project team and the secondary information, the projects deliverables were well accepted and tangible and concrete outputs of

the project are in place and promotion of the success stories and dissemination of the outputs to the public remains.

c) Project Closing- Keeping Projects in Scope

The response of all the respondents on the project closing phase, whether the ISGWID project progress was compared with the scope everyone agreed on at the beginning or not, they have basically agreed and the score of the mean, 3.79 with standard error, 0.12, with 95% Confidence Interval for Mean, Lower Bound is 3.54 and Upper Bound is 4.03. Based on the discussions with the project team and the secondary information, the stakeholders validated the project has followed the agreed-upon process, completed its activities, and met objectives on the schedule, delivered more outcomes as per the scope everyone agreed on at the beginning.

d) Project Closing-Celebrating the Success

The response of all the respondents on the project closing phase, whether the efforts and accomplishment of ISGWID project participants were recognized or not, they have basically agreed and the score of the mean, 3.64 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 3.31 and Upper Bound is 3.97. Based on the discussions with the project team and the secondary information, the organization celebrated the project team accomplishments, and some stakeholders recognized their efforts, however, the public must be aware of the most important project deliverables through aggressive promotion campaign and the project results should be accessible to the public in best and usable formats.

e) Project Close -Outstanding Actions Which Needs Completion

The response of all the respondents on the project closing phase, whether the ISGWID project have outstanding actions which needs completion or not, they have basically agreed and the score of the mean, 3.76 with standard error, 0.12, with 95% Confidence Interval for Mean, Lower Bound is 3.52 and Upper Bound is 3.99. Based on the discussions with the project team and the secondary information, the stakeholders have also agreed the project need to ensure that all important documentation are in place, need getting client sign-off on the final report, should

conduct the post-implementation audit and facilitate a platform to celebrate the success of the project.

f) Project Closing- Project Exit Strategy, Documentation and Organization

The response of all the respondents on the project closing phase, whether the ISGWID project exit strategy is well documented and well organized or not, they have found to be neutral and the score of the mean, 3.03 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 2.68 and Upper Bound is 3.38. Based on the discussions with the project team and the secondary information, the project has well documented exit strategies that clearly described project ownership in the long term, engagement with partners and capacity building plan. However, this is not clearly visible to stakeholders, that is why the score is neutral as they are expressed their worries such great project outputs shelved with no use. Hence, the stakeholders recommend ATI to replan proper delivery of the deliverables to government line ministries such as MoWE, MILLS, MoA, Regional Irrigation Development Authorities/agencies, and regional BoWR as well as all related Universities. The owner of the outputs of all project deliverables including shallow groundwater maps with all development and management tools, and guidelines should be the general public instead of just shelving this vital project deliverable's just with MoWE, MILLS, MoA, RBOA, Regional Irrigation Development Authorities/agencies, and regional BoWR.

g) Project Closing- Effective Communication on Project Completion

The response of all the respondents on the project closing phase, whether the ISGWID project completion report was gathered and disseminated to stakeholders or not, they are found to be neutral and the score of the mean, 3.39 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.05 and Upper Bound is 3.74. Based on the discussions with the project team and the secondary information, project coordination unit has been spearheading project completion and effectively communicating project's strategy, objectives, and budget by delivering all the project outputs to all the 8 regions at different time. However, as stated above on all subsequent sections, the promotion of this project is extremely poor the project successful results were held inhouse, not disseminated to the general public.

h) Project Closing- Project Evaluation

The response of all the respondents on the project closing phase, whether the ISGWID project was evaluated after closing or not, they have mostly rated neutral and the score of the mean, 3.15 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 2.84 and Upper Bound is 3.46. Based on the discussions with the project team and the secondary information, the project coordination unit have already biannual performance evaluation that made the ISGWID project implementation more effective, that helped the project to measure its achievements and success at different time and helped them to document lessons learned for future planning.

But this was not reflected by stakeholders as they preferred to be neutral as the project lacks promotion of its outcome to the general public. They need to implement their planned strategy to resolve this problem by administering structured survey questionnaires to get insight from small holder farmers, focus group discussions and open-ended interviews with different stakeholders such as private suppliers and service providers implementing partners, etc. The project must analyze and compare quantitative data from private suppliers and service providers, regional bureaus project team and other implementers to validate its performance get insights from national oversight committee, comparison on progress made versus millstones set at the start of the project.

i) Project Closing- Celebrating Project Success

The response of all the respondents on the project closing phase, whether the ISGWID Project success was celebrated or not, they have mostly neutral and the score of the mean, 3.09 with standard error, 0.15, with 95% Confidence Interval for Mean, Lower Bound is 2.78 and Upper Bound is 3.40. Based on the discussions with the project team and the secondary information, the organization, and the project coordination unit yet to organize an event for celebrating project success, meanwhile the project has several success stories that will be featured to the public, this should be done immediately to buy-in public support and to make the project results benefitable.

j) Project Closing- Lessons Learned compilation

The response of all the respondents on the project closing phase, whether the ISGWID project lessons learned, kept track of valuable historical information about the project were compiled for future projects or not, they have mostly neutral and the score of the mean, 3.33 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 2.98 and Upper Bound is 3.68. Based on the discussions with the project team and the secondary information, the project team has well documented lesson learnt. But this is not endorsed by all key stakeholders, as they have scored neutral. The organization and the project team should promote their practical experiences and records of project lifecycle (the team's record, project metrics, past schedules, key takeaways, financial data, descriptions of configuration management, and other documentation) that will be of use to others in the organization. They need to document work performance data to show the deliverables that have been completed and recorded as the lessons learned.

2.2.6. Project Success Factors

a) Project Success Factors- Timely Delivery of a Project

The response of all the respondents on project success, whether the ISGWID project targets were completed on schedule with full understanding of their priorities or not, they have basically rated neutral and the score of the mean, 2.88 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 2.54 and Upper Bound is 3.22. Based on the discussions with the project team and the secondary information, they have learned very early on to keep project scope in check, they defined project deliverables in detail and have them signed off and approved that contributed to estimate costs, time, and resources more accurately. The timely delivery of the project outputs and achievements beyond what the project manager anticipates were due to dedication from the enthused, motivated team members that determined the project outcome, regardless of full-time or part-time status.

b) Project Success Factors- Cost Effectiveness of a Project

The response of all the respondents on the project success, whether the ISGWID project was completed within the initially approved budget (ensured cost effectiveness) or not, they have

mostly rated neutral and the score of the mean, 2.97 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 2.64 and Upper Bound is 3.30. Based on the discussions with the project team and the secondary information, the project has ensured cost effectiveness during the entire project lifecycle. However, this must be substantiated with financial and viability assessment of this project and must be communicated to the entire key stakeholders for better visibility and major impact.

c) Project Success Factors- Quality Delivery of Project Objectives

The response of all the respondents on the project success, whether the ISGWID project quality objectives were met or not, they have mostly rated neutral and the score of the mean, 3.30 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 2.99 and Upper Bound is 3.62. Based on the discussions with the project team and the secondary information, the project has ensured quality delivery of project objectives during the entire project lifecycle. Yet, this must be substantiated with total quality assessment of this project outcomes and must be promoted to the entire key stakeholders for better visibility and major impact.

d) Project Success Factors- Achieve the Scope of a Project

The response of all the respondents on the project success, whether the ISGWID project stayed within the documented scope or not, they have mostly rated neutral and the score of the mean, 3.33 with standard error, 0.14, with 95% Confidence Interval for Mean, Lower Bound is 3.04 and Upper Bound is 3.62. Based on the discussions with the project team and the secondary information, the project has overachieved the scope of the original plan. Still, this must be promoted and communicated to the entire key stakeholders for better visibility and major impact.

e) Project Success Factors- Sustainability of the Project Deliverables

The response of all the respondents on the project success, whether the ISGWID project findings and recommendations are sustainable or not, they have basically agreed and the score of the mean, 3.70 with standard error, 0.17, with 95% Confidence Interval for Mean, Lower Bound is 3.47 and Upper Bound is 3.92. Based on the discussions with the project team and the secondary information, the project has sustainability indicators from institutional, financial & commercial, social, environmental & climatic aspects. The project has recommended to ensure the

sustainability of the project deliverables, user community participation and empowerment, establishment of Irrigation Water User Association (IWUA), Cooperatives and capacitating the members, ensuring the study and design of scheme compliance, watershed development to support the rain fed agriculture, on and off farm job creation for youths. The project has also recommended inter-related and mutually supportive principles such as full and effective participation by all stakeholders, technical viability, especially the reliability of water supply. Additionally, a landscape approach to watershed management, ensuring that irrigation command areas and downstream private and public facilities are protected, inclusiveness for all community members associated with the irrigation schemes, and to ensure financial viability, training in agribusiness skills and market access must be readily available to all the participating farmers.

f) Project Success Factors- Project Goals Attained

The response of all the respondents on the project success, whether the ISGWID project achieved its goals or not, they have essentially agreed and the score of the mean, 3.50 with standard error, 0.14, with 95% Confidence Interval for Mean, Lower Bound is 3.20 and Upper Bound is 3.77. Based on the discussions with the project team and the secondary information, the project has overachieved its entire goals. However, this was not promoted to the required standard as well as to the benefits of the direct beneficiaries and to the larger extent to the country at large, hence there is high need to communicate the deliverables the entire key stakeholders for better visibility and major impact.

g) Project Success Factors- Project Requirements Met

The response of all the respondents on the project success, whether the findings of the ISGWID project (irrigation potential) satisfied the requirements or not, they have fairly agreed and the score of the mean, 3.58 with standard error, 0.16, with 95% Confidence Interval for Mean, Lower Bound is 3.26 and Upper Bound is 3.90. Based on the discussions with the project team and the secondary information, the project achieved all the requirements established on the requirement traceability matrix. The requirements traceability matrix linked identified project requirements from their source to the deliverables that satisfy them. This document helped to ensure that each requirement adds business value by linking it to the business and project

objectives. It also provided a means to track requirements through the project life cycle, helped to ensure that requirements were delivered at the end of the project.

h) Project Success Factors- Successful Project Delivery (Outstanding Results)

The response of all the respondents on the project success, whether the ISGWID project represented excellent work or not, they have basically agreed and the score of the mean, 3.82 with standard error, 0.13, with 95% Confidence Interval for Mean, Lower Bound is 3.56 and Upper Bound is 4.08. Based on the discussions with the project team and the secondary information, the project has overachieved its main goals as per the original plan and scope (see section 4.2.6.f remarks). This need to be evaluated with deep dawn analysis and validation workshops.

i) Project Success Factors: Project High Performance

The response of all the respondents on the project success, whether the findings of the ISGWID project were a success (highly performed) or not, they have basically agreed and the score of the mean, 3.97 with standard error, 0.09, with 95% Confidence Interval for Mean, Lower Bound is 3.78 and Upper Bound is 4.16. Based on the discussions with the project team and the secondary information, the project overall performance was considered as one of the highest in its sector, but this should be accompanied with disseminations of results and findings to all stakeholders (see section 4.2.6.f remarks).

j) Project Success Factors- Project Overall Success

The response of all the respondents on the project success, whether the ISGWID project was a success or not, they have basically agreed and the score of the mean, 3.73 with standard error, 0.13, with 95% Confidence Interval for Mean, Lower Bound is 3.46 and Upper Bound is 4.00. Based on the discussions with the project team and the secondary information, project-success criteria, most important attributes, and objectives that met that enabled the project to be termed a success. The project is generally considered successful as it has delivered its objectives on time, within budget, and met the performance and quality requirements set out in the specification. The project digital platforms and accessing its beneficiaries to technologies also contributed to safety

aspects of the project beneficiaries. The project actual findings feasibility and reliability of irrigation sources from ground water resources, is another indicator for the project success factors with respect to sustainability, reliability, long-term performance and meeting the desired business benefit. With the realization that climate change has a significant impact on the environment and our future lives, sustainability in the form of conservation of energy and natural resources and the control of carbon emissions have all become performance criteria.

The findings of this project celebrated by stakeholders such as reliable water source (when safely exploited and replenished adequately), domestic water (not trans-boundary nature), well-distributed/available in many places, on-demand water access, less institutional pre-requisites for managing drilling and output, can be developed with simple technologies. There are precautionary recommendations on the project deliverables that need to be understood and care must be taken such as its high variability depending on season and weather conditions, only farmers located close to surface-water sources benefit much and needs drilling and is not accessible if too deep, over exploitation groundwater resources, unsustainable groundwater abstraction and management frameworks for multiple uses may lead to depletion.

Other factors, increasing threats of aquifers threats of groundwater pollution and lack of sustainable recharge and use, lack of groundwater quality monitoring frameworks, lack of integrating groundwater development with watershed management, absence of water centered ILUP and its implementation that can guide water allocation plans. Lack of appropriate and clear policy, proclamation, regulation, strategy, and manuals that guide sustainable exploitation of groundwater for irrigation (shallow and deep) may exacerbate the foreseen risks. With understanding and consideration of the concerns, there will be high opportunity to expand harnessing of shallow groundwater potential delivered by this project to increase the number of small holder farmers with access to water sources for irrigation, to promote sustainable and efficient SGW based irrigation development in the country.

**2.2.7. Project Integration Management Descriptive- Analysis- Mean
(Demographically)**

The demographically segregated analysis of the mean of ISGW Project Integration Management, in general, depicted, farmers have well content with the project overall integration as well as the regional and federal level organization staff. Meanwhile, at initiation phase, all participants except the consultants judged the project was well integrated, when project goes from initiation phase to planning, execution, monitoring, and control to closing phases, the integration is declining as per the result in association to sudden budget cut and some reaming sites to be considered nationally to make this important project all-out success. See Table 8 below.

Table 9 Project Integration Management Descriptive- Analysis- Mean (Demographically)- (Source: own calculation)

| Project Integration Management | ATI Head | ATI Regional | Consulta | Farmer | Government | Partner Inst |
|---------------------------------------|-----------------|---------------------|-----------------|---------------|-------------------|---------------------|
| Project Initiation | 4.26 | 4.43 | 3.73 | 5.00 | 4.30 | 3.92 |
| Project Planning | 4.03 | 4.30 | 3.03 | 4.97 | 3.71 | 3.52 |
| Project Execution | 3.91 | 4.25 | 3.20 | 4.93 | 3.69 | 3.65 |
| Project Monitoring and Evaluation | 3.67 | 4.20 | 3.23 | 4.98 | 3.52 | 3.52 |
| Project Closing | 3.09 | 3.35 | 3.13 | 4.35 | 3.32 | 3.25 |
| Project Success | 3.31 | 3.25 | 3.33 | 4.18 | 3.56 | 3.18 |

The exploratory analysis results have shown that all the processes from initiation phases to closing has significant contributions for project success Fig. 12 to Fig. 16.

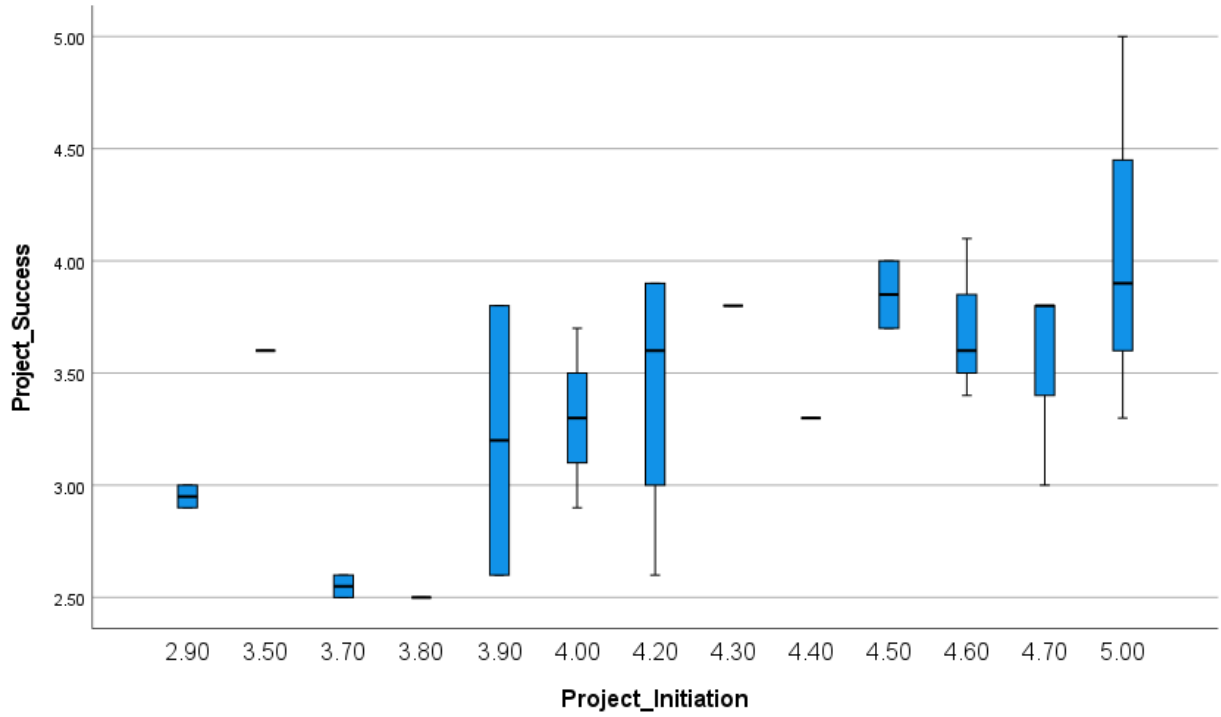


Figure 12 Project Initiation Phase Integration Activities contributions to Project success

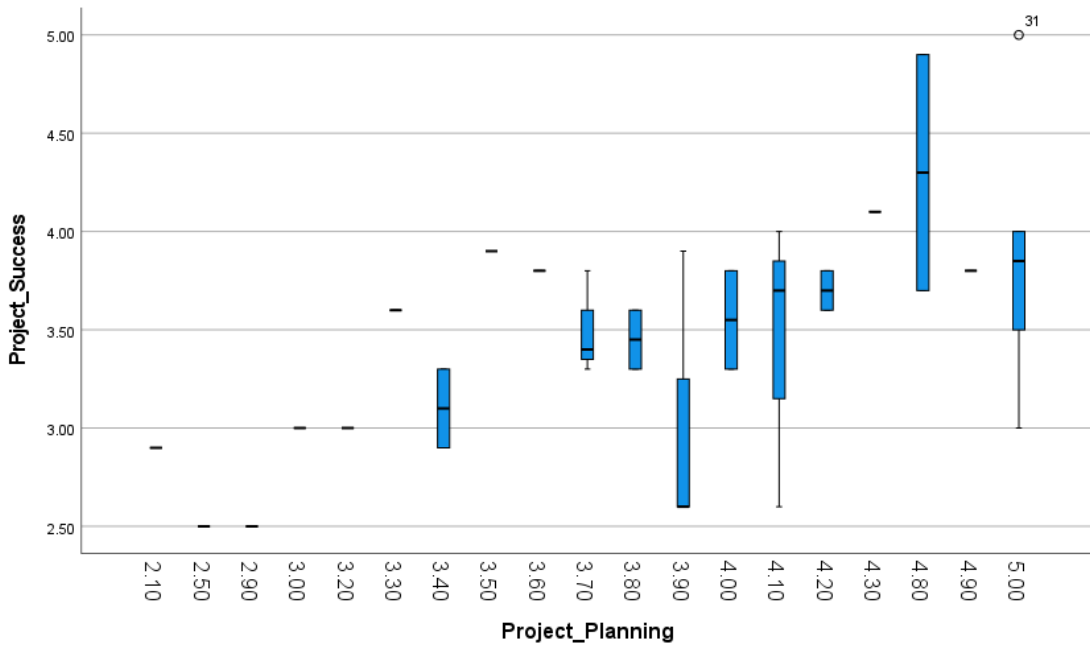


Figure 13 Project Planning Phase Integration Activities contributions to Project success

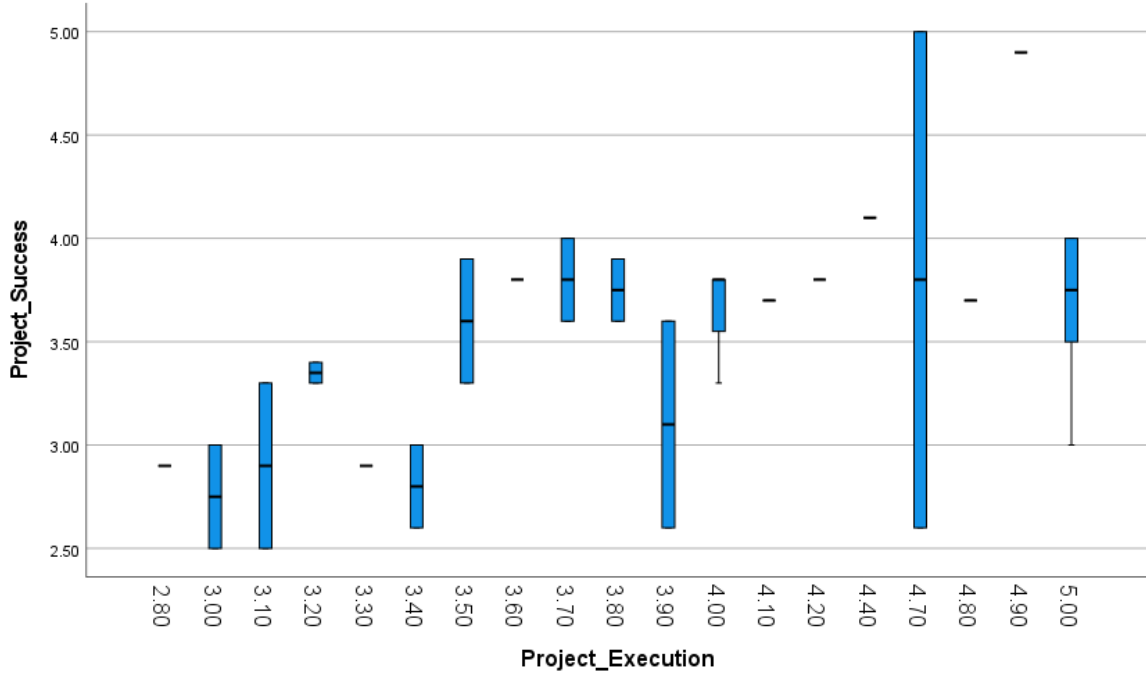


Figure 14 Project Execution Phase Integration Activities contributions to Project success

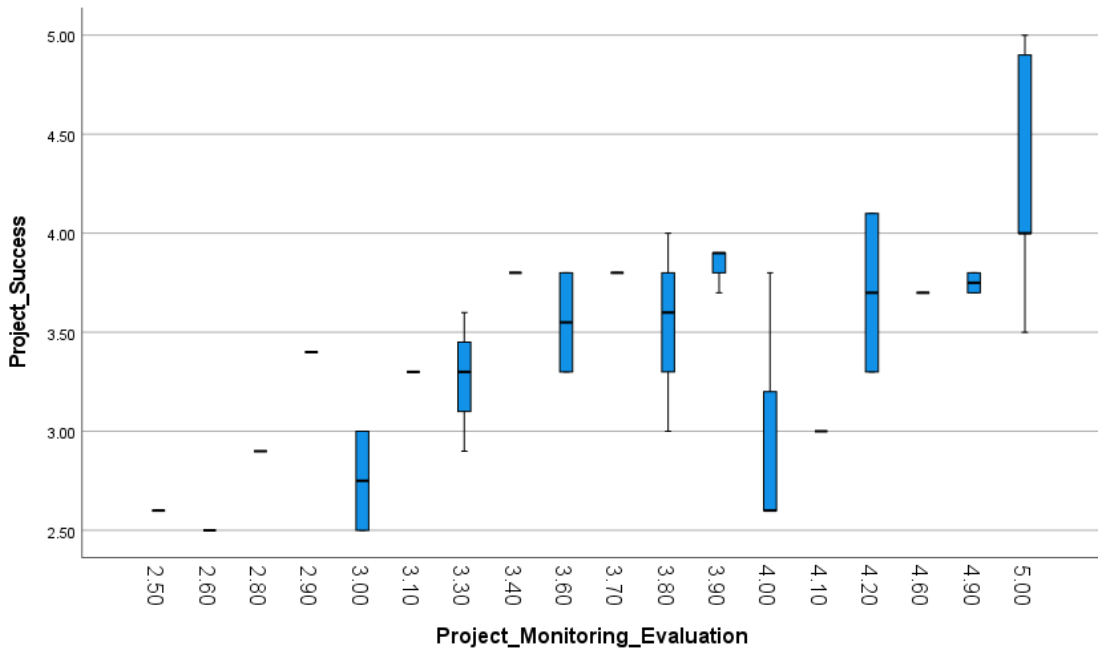


Figure 15 Project Monitoring and Evaluation Phase Integration Activities contributions to Project success

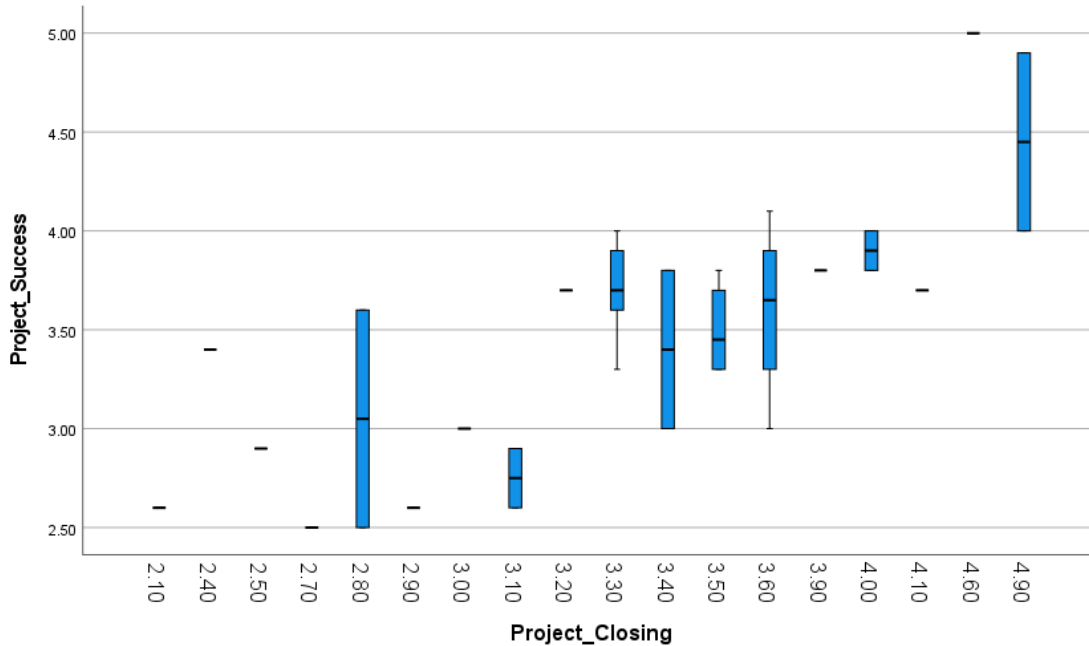


Figure 16 Project Closing Phase Integration Activities contributions to Project success

From descriptive analysis of the mean value, we observed, when project integration management from initiation phases to closing decrease, the project success rate also reduced (see Fig.17 simple correlation and by Bivariate Correlations Confidence Interval) for 35 respondents (2 respondents response added to final analysis). A positive r value expressed a positive relationship between the integrations (Linearly, r , 0.876 and polynomial correlation is 0.889, whereas the Bivariate Correlations Confidence Interval Project Closing, 0.754, Project Execution, 0.520, Project Initiation, 0.594, Project Monitoring & Evaluation, 0.650 and Project Planning, 0.581) versus success variables (the larger integration, the larger the success) (see Table 10 Below). This justified, project integration management system's significance regarding cost saving, operational benefits, and improved customer satisfaction, as it has increased the intensity of the process and produce more value at initial stages. The integration led to high-quality and stable services such as the reduction of risks and improvement of internal and external efficiency, creation of synergies and improvement in employee's motivation, increase in the management

system effectiveness and efficiency. In the opposite, lack of integration lead to the low organizational commitment, counterproductive attitudes.

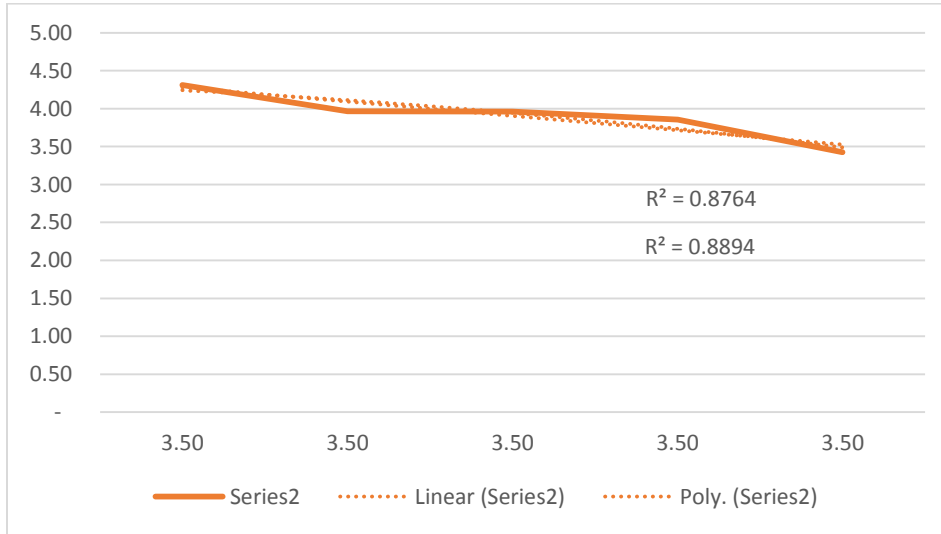


Figure 17 Trends of Project Integration against project success

Table 10 Correlation of Integration Variables against Project Success- (Source: own calculation)

| Bivariate Correlations Confidence Interval | | | | | | |
|---|-----------------|-------------|-------|------------|------------|-------|
| Variable | Variable2 | Statistic | | | | |
| | | Correlation | Count | Lower C.I. | Upper C.I. | Notes |
| Project Closing | Project Success | .754 | 35 | .562 | .869 | |
| Project Execution | Project Success | .520 | 35 | .226 | .727 | |
| Project Initiation | Project Success | .594 | 35 | .324 | .774 | |
| Project Monitoring & Evaluation | Project Success | .650 | 35 | .404 | .808 | |
| Project Planning | Project Success | .581 | 35 | .307 | .766 | |
| Missing value handling: PAIRWISE, EXCLUDE. C.I. Level: 95.0 | | | | | | |

The effect of project integration management on project success has been validated by multinomial logistic regression, that is a simple extension of binary logistic regression that allows for more than two categories of the dependent or outcome variable. Like binary logistic regression, multinomial logistic regression uses maximum likelihood estimation to evaluate the probability of categorical membership. As per Ebell, 2005 Information Mastery AAFP Home Study, greater than 10 Likelihood Ratio Tests result is large and often conclusive increase in the likelihood of integration practice influenced project success. The likelihood ratio chi-square of Project Initiation, 46.253, Project Planning, 48.260, Project Execution, 77.278, Project Monitoring and Evaluation, 64.091 and Project Closing, 81.408 with a p-value < 0.001 have shown that our model as a whole fits significantly better than an empty model (i.e., a model with no predictors) (See Table 11 below).

Table 11 Likelihood Ratio Tests Using Multinomial Logistic Regression (Source: Own calculation)

| Likelihood Ratio Tests | | | | |
|--|------------------------------------|------------------------|----|-------|
| Effect | Model Fitting Criteria | Likelihood Ratio Tests | | |
| | -2 Log Likelihood of Reduced Model | Chi-Square | df | Sig. |
| Intercept | 65.042 ^a | 65.042 | 14 | <.001 |
| Project Initiation | 46.254 ^a | 46.253 | 14 | <.001 |
| Project Planning | 48.260 ^a | 48.260 | 14 | <.001 |
| Project Execution | 77.278 ^a | 77.278 | 14 | <.001 |
| Project Monitoring and Evaluation | 64.091 ^a | 64.091 | 14 | <.001 |
| Project Closing | 81.408 ^a | 81.408 | 14 | <.001 |
| The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0. | | | | |
| a. unexpected singularities in the Hessian matrix are encountered. This indicates that either some predictor variables should be excluded, or some categories should be merged. | | | | |

CHAPTER FIVE

3. Summary, Conclusion and Recommendation

The main objective of the present study was to recognize, evaluate and respond the overall framework of the project integration management practices during the project life cycle of Integrated Shallow Groundwater Irrigation Development (ISGWID) Project and how this practice lead the executing organization to deliver the project ultimate objective and tried to identify the major challenges and their root-cause problems during planning, directing, and managing project execution, monitoring & controlling, performing integrated change control, and closing process and also to devise any proposed solutions for identified problems in the context of project integration management and possible recommendations, accordingly. Hence, here are the summary of study findings, conclusions, and recommendations:

3.1. Summary of Findings

The project integration management practices have utmost impacts on driving execution, managing performance and ensure project's meet requirements and objectives holistically, as it involves proper coordination of the various elements of processes and people, managing resources, stakeholders, and deliverables efficiently and effectively. The findings of the study also suggested that the project integration management essentially enhanced project management performance within the given time, cost, quality, sustainability, and stakeholders' satisfaction as it has revitalized the framework of partnership among multi-stakeholder, facilitated to mobilize and share knowledge, expertise, technology, and finance.

Descriptive measures of the selected populations based on the respondents' responses on Likert Scale Response Anchors, were calculated in terms of measures of center, mean μ (mu) and measures of dispersion, standard deviation, σ (sigma) help to identify the center and spread of the data among project integration management process variables. Project initiation has the highest mean (4.3), followed by project planning (mean of 4.0) and project execution (mean of 4.0) from the consolidated analysis, all the participants practically higher levels of agreement, i.e., higher scores). The Monitoring and control (mean of 3.9) is also reflected higher levels of satisfaction

by stakeholders; while project closure (mean of 3.4) and project success factor (mean of 3.5) have relatively lower levels of agreement. The project closure lower levels of agreement could be because of the project is not yet closed totally as it is at the final consolidation and hand overing phases.

The results also revealed the significance of making trade-offs among competing objectives and alternatives to exceed stakeholder needs and expectations while managing projects and their interdependencies. One of the major issues faced by the project was ever increasing additional demands of stakeholders (hence, the scope has been revised several times (from mapping 168,189km² to the now reached 234.8K km²) along with additional resource mobilization-obtaining sufficient fund to respond to the demand. At the initiation phase, there was a major challenge regarding appropriate technological choices (investigation tools selection for shallow groundwater mapping and long procurement process for items imported from abroad. The other major factor was collecting ground level data hampered due to security situation, inaccessibility of the remote areas and the like. The project demanded high level of integration management. As the study corroborated, the integration of all functions and processes within internal and external project management environment led to achieve continuous improvement of the project performance. This study also unveiled the project integrated management practices led to meet predefined goals of the Integrated Shallow Groundwater Water Development Project. The project deliverables included effectively mapped 234,772 km² areas of Ethiopia and found huge amount of reliable, safely exploitable, replenishable and annually rechargeable 27.27 bm³ within the depth of less than 30 m, that can irrigate up to 3,088,395ha of land and about 6,176,898 beneficiary households on 365 woredas in eight regions of Ethiopia. In summary (see figure, 2% strongly agreed (completely agreed), 10% strongly agreed (always agreed), 36% agreed, 33% often agreed, 11% sometimes agreed and 8% neutral, in conclusion 80% supported that there were project integration management practices. This could be reason that the project integration management practice contributed for continuous and simultaneous improvement of quality and productivity –both performance and competitiveness to the Integrated Shallow Groundwater Development Project.

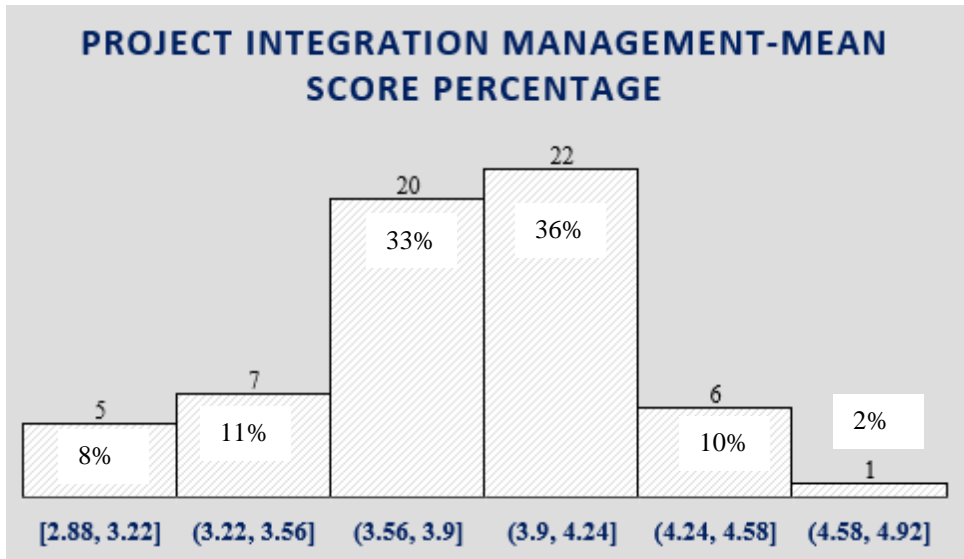


Figure 18 Percentage of Mean Score -Project Integration Management Practice

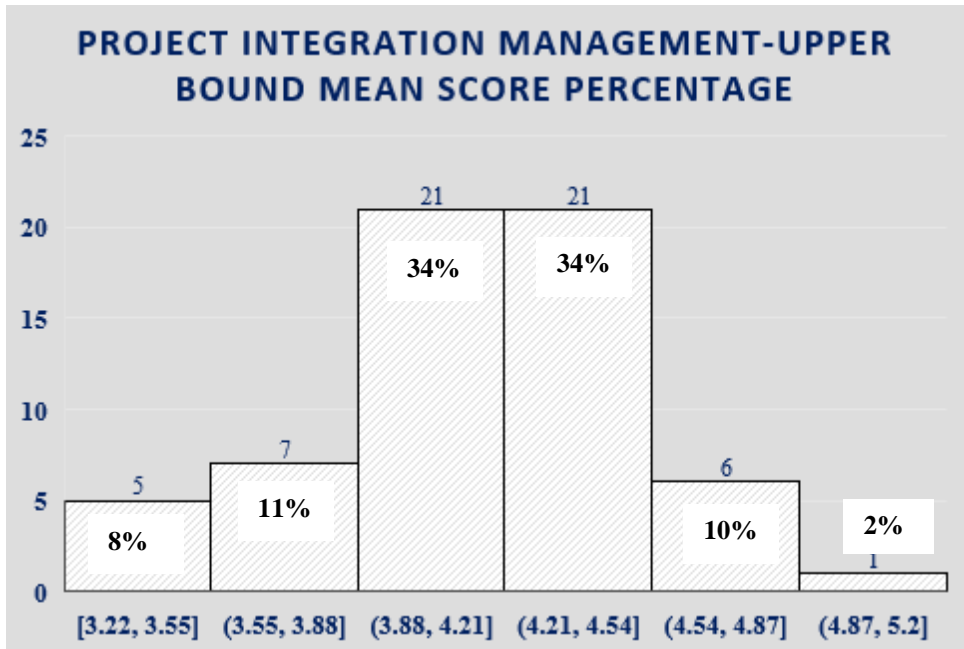


Figure 19 Percentage of Upper bound Mean Score -Project Integration Management Practice

Table 12 Statistics Summary (Mean Score, μ (mu))-Project Integration Management (Source: Own Calculation)

| Statistics (Mean Score, μ (mu)) | | | | | | |
|---|---------------------------|-------------------------|--------------------------|---------------------------------------|------------------------|--------------------------------|
| | Project Initiation | Project Planning | Project Execution | Project Monitoring and Control | Project Closing | Project Success Factors |
| N, population (valid) | 33 | 33 | 33 | 33 | 33 | 33 |
| Mean (grand) | 4.3165 | 3.9788 | 3.9758 | 3.8485 | 3.4121 | 3.4758 |

20% of participants was not endorsed project integration management practice, particularly the project closing, and overall project success feedbacks mean score is neutral as shown in Table 8 and fig. 14 & fig. 15 as the project management unit or the organization (ATI) could be lacked promotion of its outcome to the public or low level of integration. The organization and the project team may need to promote their best experiences and practices, optimistic records, and major achievements to the public. The project coordination unit may also consider substantiating its claim of major success and project impacts with other deep-down study in terms of financial and economic viability and total quality assessment and then can-do aggressive promotion of their success stories to the entire key stakeholders for better visibility and major impact. This may benefit many stakeholders and direct beneficiaries and to the larger extent to the country.

The demographically segregated analysis of the mean of ISGW Project Integration Management experience as described by farmers and the executing organizations' federal and regional staff, the project was well integrated at all levels, yet the staff have concerns like others in partner institutions, project consultants on the project closing and its ultimate success that is related to the exit strategies. Meanwhile, at initiation phase, all participants except the consultants considered, the project was integrated well, when project goes from initiation phase to planning, execution, monitoring, and control to closing phases, the integration is declining as per the result. This is validated with subsequent discussions with participants, as the project closing is derailing due to budget concern and its exit strategy is in question (See Fig. 17 below). Looking into the educational background impact on the assessment, the Project Integration Management Descriptive- Analysis using Mean indicates the high school and below (the farmers) strongly

endorsed the project, while first (1st) degree and the master's and above, when project goes from initiation phase to planning, execution, monitoring, and control to closing phases, the integration is declining as seen on the other rating (Fig. 18). Project Integration Management Descriptive-Analysis using Mean with respect to Work Experience, indicated that those with few years' experience (i.e., 3 to 5 years) strongly endorsed the project integration practice, while 5 to 10 years and 10 years and above, when project goes from initiation phase to planning, execution, monitoring, and control to closing phases, the integration is declining as seen on the other rating (see Fig 19).

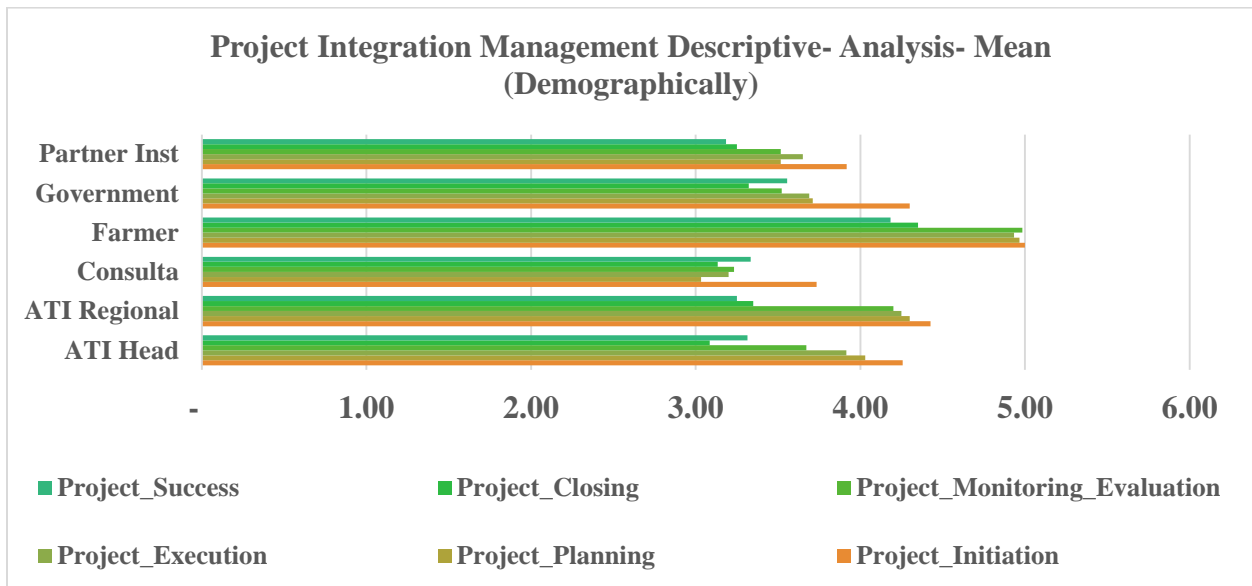


Figure 20. Project Integration Management Descriptive- Analysis- Mean (Demographically)

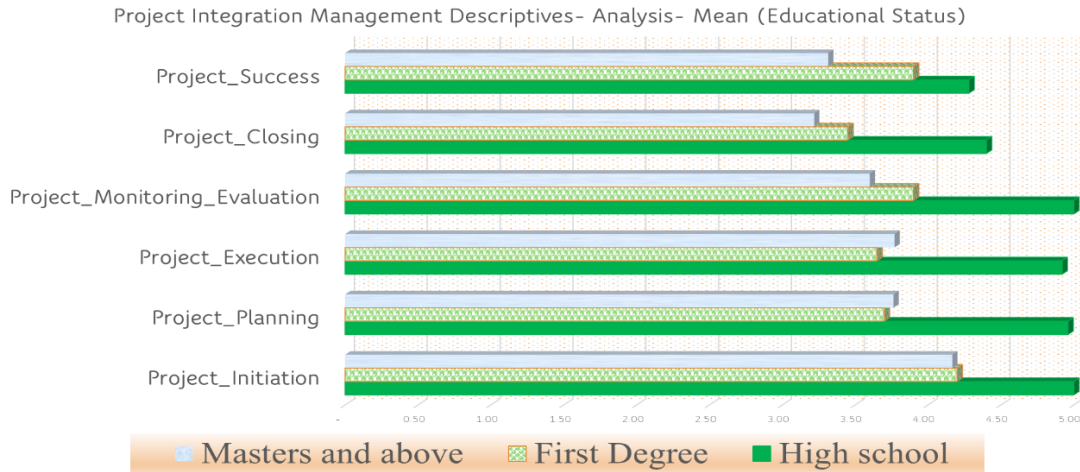


Figure 21 Project Integration Management Descriptive- Analysis- Mean (Educational Status)

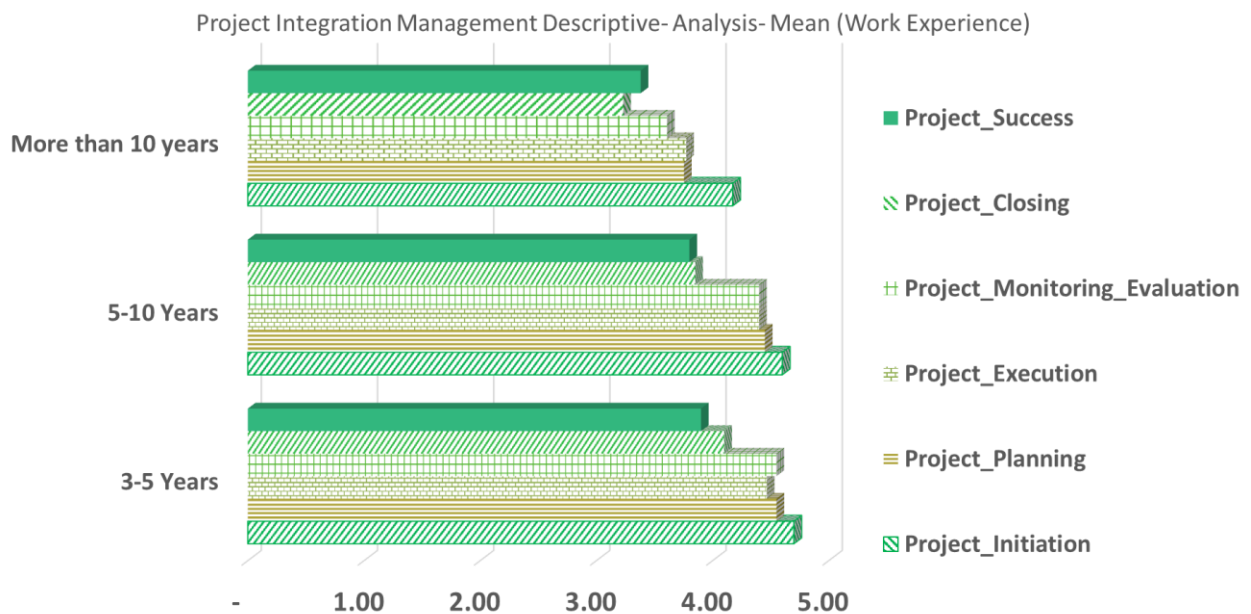


Figure 22 Project Integration Management Descriptive- Analysis- Mean (Work Experience)

A positive r value has been observed on correlation analysis, that has shown a positive relationship between the integrations (linearly, r, 0.876 and polynomial correlation is 0.889, whereas the Bivariate Correlations Confidence Interval Project Closing, 0.754, Project Execution, 0.520, Project Initiation, 0.594, Project Monitoring & Evaluation, 0.650 and Project Planning, 0.581) versus success variables (the larger integration, the larger the success). This justified, project integration management system’s significance on increased the intensity of the

process and produce more value at initial stages, the reduction of risks and improvement of internal and external efficiency, creation of synergies.

The effect of project integration management on project success has been supported by multinomial logistic regression. As per Ebell, 2005 Information Mastery AAFP Home Study, greater than 10 Likelihood Ratio Tests result is large and often conclusive increase in the likelihood of integration practice influenced project success. The likelihood ratio chi-square of Project Initiation, 46.253, Project Planning, 48.260, Project Execution, 77.278, Project Monitoring and Evaluation, 64.091 and Project Closing, 81.408 with a p-value < 0.001 have shown that our model fits significantly better than an empty model (i.e., a model with no predictors).

3.2. Conclusions

A mixed research methodology that combined quantitative and qualitative research with primary and secondary data analysis revealed that, while 20% of participants were concerned, 80% of respondents recognized that project integration management practices significantly improved project performance, aided in identifying and addressing major challenges, and helped deliver project objectives on time and within budget while also measurably improving project outcomes.

The consolidated analysis has shown that, project initiation has the highest mean (4.3), followed by planning (4.0) and execution (4.0). The monitoring and control (mean 3.9), closure (3.4) and project success factor (3.5) have indicated higher consistency descriptively and with secondary information support. A positive r value has been observed linearly, r, 0.876 and polynomial, r, 0.889, the Bivariate Correlations for project closing, 0.754 integration versus success variables as well as multinomial logistic regression, r greater than 10 Likelihood Ratio Tests result, the likelihood ratio chi-square of initiation, 46.253, planning, 48.260, execution, 77.278, monitoring and evaluation, 64.091 and closing, 81.408 with a p-value < 0.001. The effects of integration were observed on the project's successful discovery (performance 139.6 percent) of 27.27 Billion Cubic Meter (BCM), an enormously higher amount compared to the nationally published amount, 2.6 BCM (Birhane, 2002), 2.6 - 6.5 BCM (Awlachev, et al 2007), total (shallow and deep wells)

30 BCM (Berhanu et al, 2014), 40 BCM from all sources. As a result, the findings might serve as a significant lesson for various current challenges in Ethiopia caused by poor sector integration.

3.3. Recommendation

Numerous initiatives in the agriculture sector were often accompanied by inadequate or insufficient quality delivery due to poor project integration management, mediocre execution and management, and weak sector integration. This resulted in project failure, low productivity, cost overruns, and owner unhappiness. According to the study, the integration of all activities and processes inside the internal and external project management environment resulted in continuous improvement of project performance from the beginning to the end of the project.

According to all participants in this research, one of the reasons for the project's overachieving against its aim was that it was properly integrated throughout the start phase. However, as the project progresses from the initiation phase to the planning, execution, monitoring and control, and closing phases, the integration is decreasing due to a sudden budget cut by the development partner institution, despite the fact that there are still some sites to be covered by the project.

Meanwhile, this study and its findings would be best if the analysis also include more projects out of over 48 innovative and large-scale strategic projects implemented, by the organization to really capture the project integration success and failures. There are still 18 Agricultural Commercialization Cluster (ACC) projects in the works that might benefit from the findings of this study. As a consequence, the researcher advises future aspirants to evaluate project integration management approaches by considering numerous project and other aspects in order to get better results. To grasp the major impacts and trends of the integration process, the researcher advises others to investigate the full impact of the project integration management process on the organizational wide survey on all projects, if possible, by including similar other projects executed by different stakeholders in Ethiopia.

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Annex II Mean Score Summary of Project Integration Management Practices

| Project Integration Management | Statistics (Mean Score, μ (μ)) | Standard error | 95% Confidence Interval for Mean | |
|--|--|-------------------|-------------------------------------|-------------|
| | | | Lower Bound | Upper Bound |
| 1.1.1. Project Initiation Phase findings | | | | |
| a) Project Initiation Reliance on Need Assessment and Opportunity | 4.64 | 0.15 | 4.33 | 4.94 |
| b) Project Initiation Reliance on Problem Analysis | 4.55 | 0.11 | 4.33 | 4.76 |
| c) Project Initiation reliance on Feasibility Study Existence | 4.18 | 0.15 | 3.87 | 4.49 |
| d) Project Initiation reliance on Transformational Agenda Deliverables of the sector | 4.39 | 0.15 | 4.18 | 4.61 |
| e) Project Initiation reliance on Project Charter | 4.52 | 0.15 | 4.22 | 4.81 |
| f) Project Initiation reliance on Project Team Competencies' | 3.91 | 0.16 | 3.57 | 4.25 |
| g) Project Initiation reliance on Coordination | 4.24 | 0.16 | 3.98 | 4.51 |
| h) Project Initiation reliance on Phased Review Process | 4.36 | 0.14 | 4.09 | 4.64 |
| i) Project Initiation reliance on Project Success | 4.06 | 0.15 | 3.75 | 4.37 |
| 1.1.2. Project Planning Phase findings-Project Management Plan | | | | |
| a. Project Planning reliance on Proper Project Scoping | 4.18 | 0.14 | 3.9 | 4.47 |
| b. Project Planning reliance on Proper Project Scoping | 4.36 | 0.1 | 4.15 | 4.58 |
| c. Project Planning reliance on Project's deliverables- the Work Breakdown Structure (WBS) | 4.36 | 0.1 | 4.15 | 4.58 |
| d. Project Planning reliance on Project Tasks Dependencies | 4.12 | 0.15 | 3.82 | 4.43 |
| e. Project Planning reliance on Defining and Allocating Roles and Responsibilities | 4.06 | 0.14 | 3.77 | 4.35 |

| | | | | |
|--|------|------|------|------|
| f. Project Planning reliance on Project Schedule Planning | 4.03 | 0.15 | 3.72 | 4.34 |
| g. Project Planning reliance on Enterprise Environmental Factors and Organizational Process Assets | 3.79 | 0.18 | 3.41 | 4.16 |
| h. Project Planning reliance on Project Cost Management | 3.82 | 0.17 | 3.47 | 4.17 |
| i. Project Planning reliance on Staffing Management Plan | 3.97 | 0.17 | 3.62 | 4.32 |
| j. Project Planning reliance on Quality Planning | 3.76 | 0.19 | 3.36 | 4.15 |
| k. Entire Project Planning Process | 3.91 | 0.17 | 3.56 | 4.26 |
| j. Project Success Factors- Project Overall Success | 3.97 | 0.17 | 3.63 | 4.31 |
| 1.1.1. Project Execution Phase findings- Directing and Managing Project Execution | | | | |
| a) Project Execution reliance on Building Commitment in Project Teams | 4.12 | 0.16 | 3.79 | 4.45 |
| b) Project Execution reliance on Effective Supervision | 4.03 | 0.17 | 3.69 | 4.37 |
| c) Project Execution reliance on Project Team Motivation and Increased Performance | 3.73 | 0.17 | 3.34 | 4.12 |
| d) Project Execution reliance on Project Staff Interaction and Effective Coordination | 3.97 | 0.17 | 3.63 | 4.31 |
| e) Project Execution reliance on Managing Project Team Conflicts | 3.79 | 0.19 | 3.4 | 4.17 |
| f) Project Execution reliance on Positive Teamwork Environment | 4.09 | 0.15 | 3.78 | 4.4 |
| g) Project Execution reliance on Achieving Synergy | 4.12 | 0.14 | 3.83 | 4.41 |
| h) Project Execution reliance on Problem Solving and Decision Making | 3.76 | 0.15 | 3.45 | 4.06 |
| i) Project Execution reliance on Effective and Efficient Performance | 4.18 | 0.12 | 3.94 | 4.42 |
| j) Project Execution reliance on Successfully Directing and Managing Project | 3.97 | 0.15 | 3.66 | 4.28 |
| 1.1.2. Project Monitoring and Control Phase | | | | |

| | | | | |
|--|------|------|------|------|
| findings | | | | |
| I. Monitor and Control Project Work | | | | |
| a) Project Monitoring and Control- Project Management Information Flow | 3.97 | 0.14 | 3.68 | 4.26 |
| b. Project Monitoring and Control- Meeting Project Deliverables and Activities | 4.03 | 0.15 | 3.72 | 4.34 |
| c. Project Monitoring and Control- Measuring Continuous Improvement on Quality Delivery | 3.88 | 0.16 | 3.57 | 4.18 |
| d. Monitoring and Recording - Feedbacks Incorporated during Project Implementation | 3.97 | 0.14 | 3.68 | 4.26 |
| II. Perform Integrated Change Control | | | | |
| e. Monitoring and recording - Recording Change Requests | 3.76 | 0.16 | 3.44 | 4.08 |
| f. Monitoring and Recording- Implementing Change Request | 3.85 | 0.16 | 3.52 | 4.18 |
| g. Monitoring and Recording- Managing Changes to Scope, Time, Quality, and Budget | 3.79 | 0.16 | 3.47 | 4.1 |
| h. Monitoring and Recording- Controlling and Responding to Effective Schedule Changes | 3.73 | 0.16 | 3.4 | 4.05 |
| i. Monitoring and Recording- Controlling and Responding to Effective Cost Changes | 3.7 | 0.17 | 3.36 | 4.03 |
| j. Monitoring and Recording- Project Monitoring and Controlling Success | 3.82 | 0.14 | 3.53 | 4.11 |
| 1.1.1. Project Close Project or Phase findings-Closing | | | | |
| a) Project Closing- Meeting Objectives | 3.55 | 0.17 | 3.26 | 3.83 |
| b) Project Closing- Getting Client Acceptance of Deliverables and Ensuring that all Deliverables are Installed | 3.39 | 0.16 | 3.08 | 3.71 |
| c) Project Closing- Keeping Projects in Scope | 3.79 | 0.12 | 3.54 | 4.03 |
| d) Project Closing-Celebrating the Success | 3.64 | 0.16 | 3.31 | 3.97 |
| e) Project Close -Outstanding Actions Which Needs Completion | 3.76 | 0.12 | 3.52 | 3.99 |
| f) Project Closing- Project Exit Strategy, Documentation and Organization | 3.03 | 0.17 | 2.68 | 3.38 |

| | | | | |
|---|-------------|-------------|-------------|----------|
| g) Project Closing- Effective Communication on Project Completion | 3.39 | 0.17 | 3.05 | 3.74 |
| h) Project Closing- Project Evaluation | 3.15 | 0.15 | 2.84 | 3.46 |
| i) Project Closing- Celebrating Project Success | 3.09 | 0.15 | 2.78 | 3.4 |
| j) Project Closing- Lessons Learned compilation | 3.33 | 0.17 | 2.98 | 3.68 |
| 1.1.2. Project Success Factors | | | | |
| a) Project Success Factors- Timely Delivery of a Project | 2.88 | 0.17 | 2.54 | 3.22 |
| b) Project Success Factors- Cost Effectiveness of a Project | 2.97 | 0.16 | 2.64 | 3.3 |
| c) Project Success Factors- Quality Delivery of Project Objectives | 3.3 | 0.17 | 2.99 | 3.62 |
| d) Project Success Factors- Achieve the Scope of a Project | 3.33 | 0.14 | 3.04 | 3.62 |
| e) Project Success Factors- Sustainability of the Project Deliverables | 3.7 | 0.17 | 3.47 | 3.92 |
| f) Project Success Factors- Project Goals Attained | 3.5 | 0.14 | 3.2 | 3.77 |
| g) Project Success Factors- Project Requirements Met | 3.58 | 0.16 | 3.26 | 3.9 |
| h) Project Success Factors- Successful Project Delivery (Outstanding Results) | 3.82 | 0.13 | 3.56 | 4.08 |
| i) Project Success Factors: Project High Performance | 3.97 | 0.09 | 3.78 | 4.16 |
| j) Project Success Factors- Project Overall Success | 3.73 | 0.13 | 3.46 | 4 |

Annex III Questionnaires Distributed

(Adopted from Desalegn, 2018)

Section I – Demographic Characteristics

1. What is your age?

20 – 25 26 – 35 36 – 45 46 – 55 Above 55

2. Sex: Male Female

3. Work Experience

Less than 1 Year 1-2 Years 3-5 Years 5-10 Years More than 10 Years

4. Educational Background

High school and below Diploma First Degree Masters and Above

5. Affiliation

ATI Head office ATI Regional Office Government line office (M(B)oA, MILLs, MoWE) Partner institution (FAO, IWMI, etc.) Consultant Farmer

Section II – Project Integration Management Process Groups

Rate the below questions regarding project integration management process for ATI - ISGWID project on basis of the following parameters by ticking on the corresponding number.

| No. | 1. Questions on Project Initiation | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|------|--|-------------------|----------|---------|-------|----------------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1.1. | The Integrated Shallow Ground Water Irrigation Development (ISGWID) project was initiated based on the needs and opportunities | | | | | |
| 1.2. | The ISGWID project was taken based on the problem faced | | | | | |
| 1.3. | The feasibility was considered before initiating the project | | | | | |
| 1.4. | The decision to implement the ISGWID project was based on the final output offeasibility study | | | | | |
| 1.5. | The project is one of prioritized transformational agenda for irrigation subsector in Ethiopia | | | | | |
| 1.6. | There was a project charter for the ISGWID project undertaken | | | | | |

| | | | | | | |
|-------|---|--|--|--|--|--|
| 1.7. | The project team was competent with the requirements of the project | | | | | |
| 1.8. | There was a project office or coordination unit for the ISGWID project implementation | | | | | |
| 1.9. | The project initiation phase was followed by a phase review | | | | | |
| 1.10. | The project success was very much dependent on the project initiation process (the steps above mentioned) | | | | | |

| No. | 2. Questions on Project Planning | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|-------|--|-------------------|----------|---------|-------|----------------|
| | | 1 | 2 | 3 | 4 | 5 |
| 2.1. | The project justification, the major deliverables, and the project objectives were properly defined in the project scope | | | | | |
| 2.2. | The tasks that will be performed to produce the project's deliverables (the lower levels of the WBS) were properly defined | | | | | |
| 2.3. | Dependencies among tasks were properly identified | | | | | |
| 2.4. | Roles and responsibilities were defined and allocated | | | | | |
| 2.5. | The probable duration of individually schedulable tasks and activities were estimated | | | | | |
| 2.6. | Project enterprise environmental factors and organizational process assets referred | | | | | |
| 2.7. | Proper estimates of the overall project cost was made | | | | | |
| 2.8. | The project staffing was appropriately planned | | | | | |
| 2.9. | Quality planning was made to ensure how the project quality objectives will be met | | | | | |
| 2.10. | Overall, the project was well planned | | | | | |

| No. | 3. Questions on Project Execution | Strongly Disagree | Disagree | Neutra | Agree | Strongly Agree |
|-------|---|-------------------|----------|--------|-------|----------------|
| | | 1 | 2 | 3 | 4 | 5 |
| 3.1. | Project staffs were committed to the directions given to them | | | | | |
| 3.2. | Project staffs responded well to supervision | | | | | |
| 3.3. | People in the project were motivated for good performance | | | | | |
| 3.4. | Project staff interaction was well coordinated | | | | | |
| 3.5. | Conflicts within the project team did not emerge | | | | | |
| 3.6. | The project was executed in a positive teamwork environment | | | | | |
| 3.7. | The project activities are well coordinated, and synergy created (presented to platforms to get feedback) | | | | | |
| 3.8. | When problem arises, the cause of the problem was investigated and urgent resolution action was executed when necessary | | | | | |
| 3.9. | The project plan was executed by performing the tasks identified in the plan | | | | | |
| 3.10. | Overall, the project was well directed and managed | | | | | |

| No. | 4. Questions on Monitoring and Control | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|-------|--|-------------------|----------|---------|-------|----------------|
| | | 1 | 2 | 3 | 4 | 5 |
| 4.1. | Collecting and disseminating project progress information was effective | | | | | |
| 4.2. | The request for changes was recorded | | | | | |
| 4.3. | Changes before implementation were approved | | | | | |
| 4.4. | The Change Control process was properly implemented to manage changes to scope, time, quality, or budget | | | | | |
| 4.5. | Project deliverables and activities were measured to assess whether quality objectives are being met | | | | | |
| 4.6. | Monitoring and recording result of the quality activities for constant improvement were performed | | | | | |
| 4.7. | Feedbacks incorporated during implementation | | | | | |
| 4.8. | Controlling and responding to schedule changes were effective | | | | | |
| 4.9. | Controlling and responding to cost changes was effective | | | | | |
| 4.10. | Overall, the project was well monitored and controlled | | | | | |

| No. | 5. Questions on Project Closure | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|-------|---|-------------------|----------|---------|-------|----------------|
| | | 1 | 2 | 3 | 4 | 5 |
| 5.1. | The objectives for the project were met | | | | | |
| 5.2. | The project deliverables were completed satisfactorily | | | | | |
| 5.3. | The project progress was compared with the scope everyone agreed on at the beginning | | | | | |
| 5.4. | The efforts and accomplishment of project participants were recognized | | | | | |
| 5.5. | There are outstanding actions which needs completion | | | | | |
| 5.6. | The project exit strategy is well documented and well organized | | | | | |
| 5.7. | Information to formalize project completion was gathered and disseminated to stakeholders | | | | | |
| 5.8. | The project was evaluated after closing | | | | | |
| 5.9. | Project success was celebrated | | | | | |
| 5.10. | The lessons learned were compiled for future projects | | | | | |

Section III - Questions on Project Success Factors

Rate for the performance of timeliness, cost effectiveness, quality delivery, safety, and client’s satisfaction for The ISGWID project based on the following parameters by ticking to the corresponding the number.

| No. | 6. Questions on Project Success Factors | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|-------|---|-------------------|----------|---------|-------|----------------|
| | | 1 | 2 | 3 | 4 | 5 |
| 6.1. | The project was completed on schedule (timeliness) | | | | | |
| 6.2. | The project was completed within the initially approved budget (cost effectiveness) | | | | | |
| 6.3. | The project quality objectives were met | | | | | |
| 6.4. | The project stayed within the documented scope | | | | | |
| 6.5. | The project findings and recommendations are sustainable | | | | | |
| 6.6. | The project achieved its goals | | | | | |
| 6.7. | The findings of the project (irrigation potential) satisfied the requirements | | | | | |
| 6.8. | The project represented excellent work | | | | | |
| 6.9. | The findings of the project (irrigation potential) were a success | | | | | |
| 6.10. | Overall, the project was a success | | | | | |

Annex IV. ISGWID Project Profile and Milestones



ATI- SGW Mapping & Energy Efficient and Water Saving Technologies Promotion Experience



Ethiopian ATA
Agricultural Transformation Agency
የኢትዮጵያ ግብርና ትራንስፎርሜሽን ኤጀንሲ

March 2022

Introduction

Resource

- Suitable ground water for irrigation
- Reliable and sustainable Energy source (more than 8 hours sunlight)
- Diverse Agro-ecology
- Human capital(youth labor force)

Technology

- Cost effective and sustainable (solar technology) to lift water
- Ground water detection and Well drilling technology
- Monitoring and regulating technology (Ground water pumping)

Focus on renewable energy(MDG 7)

- Climate smart technology
- Support from international community
- Cost of climate change
- Operation cost of fuel and diesel pumps

Synergy

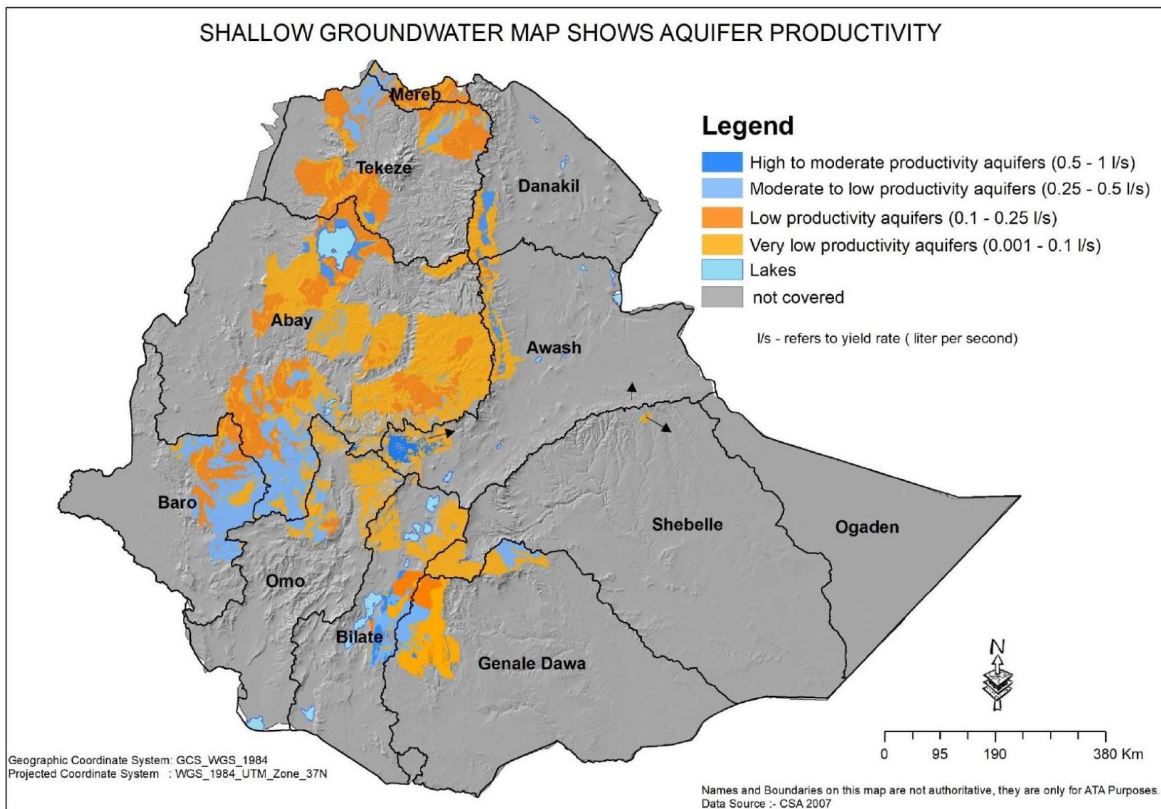
- Integrating the resource and technology
- Multipurpose productive use

ISGWID Project

Project Major components with specific objectives

| 1 Scaling up SGW mapping and regulating SGW use | 2 Promotion of business groups around SGW development | 3 Promotion of high value crop production and marketing | 4 Promotion of energy efficient and water saving technologies | 5 Enhance project management, coordination and evaluation |
|---|---|---|--|---|
| <ul style="list-style-type: none"> Focuses on providing accurate information on the availability of SGW potential and regulate SGW use Targets mapping of SGW potential over 200,000 km² | <ul style="list-style-type: none"> Aims to strengthen the supply chain for irrigation technologies and services, increase adoption of technologies and increase well-drilling service availability | <ul style="list-style-type: none"> Promotes HVCs production and marketing using irrigation by facilitating access to seeds, financial products, market and infrastructure | <ul style="list-style-type: none"> Identify and recommend energy efficient and water saving technologies for farmers, including female farmers | <ul style="list-style-type: none"> Develop capacity of the implementers for effective project management, coordination and evaluation during and after the project timeline |

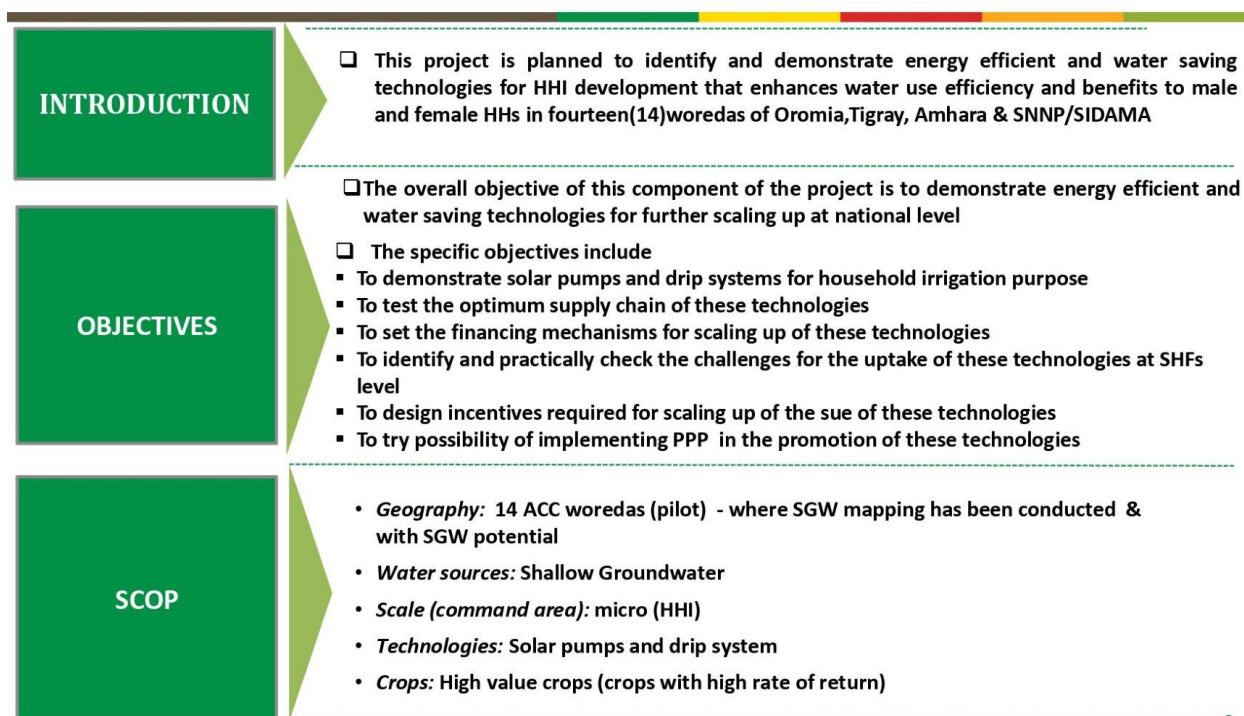
Cross-cutting: Capacity building interventions such as training and resource provisions are incorporated within each of the four components



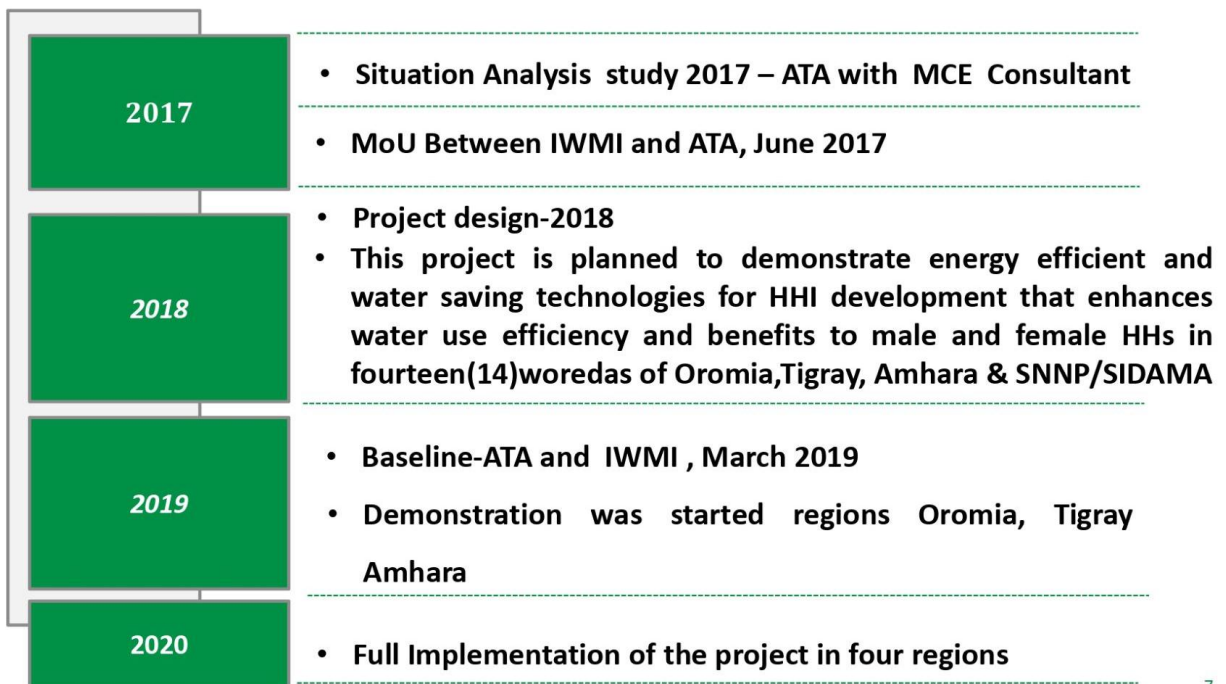
SGW STUDY AREAS and PONTENTIAL GROUND WATER

| S/N | Study Areas | Area Covered KM ² | # Of Woredas Covered | Amount of rechargeable GW(Bm ³) | Irrigation Potential Ha | Estimated Beneficiaries |
|------|----------------------------------|------------------------------|----------------------|---|-------------------------|-------------------------|
| I | Tana -Beles and Tarmaber -Michew | 46,416.26 | 79 | 4.7 | 1,778,400 | 3,337,753 |
| II | Central Ethiopia | 31,870.89 | 23 | 2.97 | 100,000 | 376,422 |
| III | Southern Ethiopia | 20,176.68 | 46 | 0.68 | 21,422 | 85,689 |
| IV | Kofele-Goba | 13,216.95 | 27 | 1.08 | 104,106 | 208,319 |
| V | Chancho - Mehalemeda | 40,431.56 | 71 | 5.2 | 418,353.15 | 836,706 |
| VI | Adigrat-Abergele | 12,613.39 | 26 | 0.58 | 21,979.48 | 43,959 |
| VII | Hareri Region | 331.93 | 4 | 0.01 | 498.9 | 996 |
| IIIX | Axume-Adiremete | 10,531.14 | 12 | 0.48 | 21,636 | 43,046 |
| IX | Fincha-Gimbi, Tepi-Gibe | 59,183.17 | 68 | 11.58 | 622,000 | 1,244,008 |
| | Total | 234,771.96 | 356 | 27.27 | 3,088,359.53 | 6,176,898 |

Energy Efficient and Water Saving Technologies Promotion Project



Project Profile -Energy Efficient and Water Saving Technologies Promotion



7

Current status of the demonstration

CURRENT STATUS OF THE PROJECT

- The four regions Oromia, Tigray , Amhara and SNNP 14 woredas installation completed and site handover conducted
- So far 170 solar & drip system installed in four regions Oromia, Tigray , Amhara and SNNP/Sidama 14 woredas benefiting 160 SHFs, 30% Women and 8 FTCs
- Farmers are producing 2-3 times a year different HVCs selected for the area
- Beneficiary farmers are getting power supply for light , mobile charger, refrigerator and television .

Current status of the demo

CHALLENGES

- Difference of commitment among region and woredas to implement the project
- Budget constraint to conduct impact assessment and develop scaling-up strategy
- Farmers shortage of finance to widely practise the technology.
- Inadequacy of reliable supply of spare parts at near distance and maintenance

Solar pumped drip irrigation system



Solar pumped drip irrigation system



Solar pumped drip irrigation system- Amhara

