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Assessment of Factors Affecting Road Construction Projects Implementation: The Case of Kellem Wollega Zone Road Authority

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Abstract
The main aim of this research was to assess the major factors influencing the implementation of road construction projects and their relative importance in Kellem Wollega zone. Descriptive research design was employed in the study. The survey results indicate that the major factors in each category were as follows: Equipment availability and failure, Designer's experience, and appropriate design, Clear specifications, and availability of materials in markets, Complete drawings, Documentation and detailed written procedures, Material delivery to site, Supply of construction materials, Strikes, political unrest. (Time), Cost of building materials, Cost estimate, Labour related matters such as the availability, skills, productivity, and Degree of government regulations control, Stability of cost of labor, and Site management and supervision, Fraudulent practices and corruption, Design stability, and Adequate project preparation, planning and implementation, and Experience of the project type, Cash flow and financial ability of contractor, Speed in decision making, and Ability in project management (cost), and Availability of equipment, operator's skill, management system and its maintenance, Effective incoming inspection and in-process supervision, Availability of good quality construction materials, Accuracy and detailing of the bill of engineering measurement, Final inspection, and Supervision staff understanding of construction process (quality). From qualitative data, Unit rate rigidity and Natural disaster such as flood and land slide (cost), and mismatch of URRAP standard with difference in actual construction site conditions as (quality) factors found. It was recommended that the federal government and region of Oromia review existing or formulate policies and regulations that require clients to change their procurement strategies and as a result force the construction companies to adopt more innovative approaches in the construction delivery process. The region's road authority should review existing road construction regulations/ directives, the zone road authority improve the technical capacity of its human resource, and road contractors to anticipate some of the expected challenges to plan in advance for successful implementation of road construction projects.
Key words: Road construction projects, implementation, time factors, cost factors, quality factors

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1. Introduction

The demand for construction all over the world is promptly increasing, as the numbers of inhabitants grow. Construction expansion will be greater in the next 30 years, than in the last 2000. As projects become increasingly more complex due to increased size, number, and supply chain participants, project managers are faced difficulty in delivering services on time, on budget, with great customer satisfaction (Alfredo et al. 2017). The construction industry also effects the rate of GDP and employment of several countries, as a result of this, the construction industry is considered to be vital for the economic progress of a country (Olawale, 2010). Business nowadays is operating under high level of uncertainty, projects implementation are open to all sorts of external influence, sudden events, endlessly growing requirements, dynamic constraints and fluctuating resource flows. This undoubtedly illustrates that if projects are being functioned and steps are not taken in order to manage them effectively and efficiently, the chance of failure is high. There are various things that result in project success and many that lead to failure. Out of which effective project implementation is the crucial one, Project implementation is the Process whereby "project inputs are converted to project outputs". May be looked at as executing the activities of the project, putting into practice what was proposed in the project document (i.e. transforming the project proposal into the actual project.) or Management of the project or executing the project intentions (Sommerville, and Campbell, 2001).

(Helen, 2016) in her study undertaken in Akure revealed that the top ten most important factors influencing the performance of construction projects are: delay in progress payment to Contractors, Client's interference during construction, Client's inability to brief the project objectives and escalation of materials prices. Other factors were Client's experience whether it is sophisticated or specialized; complexity of project; motivating skill of the project team leader; project team leader experience; Contactors commitment to ensure construction work is carry out according to arrangement as well as Client's inability to make project decision. Additionally, (Ludwig R., and Hilario B., 2020) found that lack of an skilled construction manager, poor planning/scheduling, influence on people's land alongside road construction project, poor interaction among construction parties, everyday changes in design, equipment shortage, force majeure, contract reform, delays in accomplishment of progress billing, construction materials limit, payment delay to contractors, and poor labor productivity are ten most frequent causes of delay in Road Construction Projects across 25 Developing Countries.

additionally, Ethiopian researchers (Robel, 2015) and (Werku, 2016) have identified that delay is caused by clients, consultants, designers, contractors, suppliers and the like. According to their findings the following are the critical factors such as site handover and right of way, finance arrangement and inadequate fund provision; materials price ceiling , delay and shortage of the materials; poor planning and scheduling; change and variation in order throughout construction, managerial problem or local contractor's limited capacity and ability that cause construction delays in the country in addition to this study undertaken by (Nigussie, 2018) also identified that the most three factors causing project delays in Ethiopian construction projects from the collective group perspective of importance were: (1) Right of Way problems, (2) poor design, and (3) Delay of material delivery besides the most three factors causing cost overrun such as right of way problems, design changes, and poor project preparation, planning and implementation.

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Likewise, according to (Serkalem et al., 2020) liquidity of organization and escalation of material prices have been a critical factor leading to an overrun of project costs and its cost performance. Out of which too much variation in owners' orders, changes in design, delay in regular payments from owners to contractors and contractors' financial constraints are the factors which affect the time. Whereas lack of availability of quality materials and equipment or machinery affects the quality and were the sequence of work according to schedule, weather conditions, workforce shortages, unskilled machine operators, unavailability of competent staff and machines are the factors which leading to failure in productivity performance of the project.

The Government of Ethiopia planned a five-year programmed to link each kebeles center with the nearest all weather roads through construction of 71,532 km in 2010; which further extended to other five years under GTP II; and includes construction of other 90,000 km roads by 2020. Access to all weather road and vital institutions supporting the livelihood of the poor is greatly improving under URRAP. The responsibility to build and maintain rural roads has been decentralized to Regional Governments since 1993 and implemented lots of the projects. However, in Ethiopia specifically in Kellem Wollega zone, road construction projects have a history of poor implementation. In this particular study, the researcher is going to fill some gaps in previous studies. One of these is that the topic is not explored in the zone, and to replicate if the findings of similar topic studies in the past hold in the zone. Based on a review of past studies in this subject, researchers tend to focus on selective projects such as those financed by specific development partners. In addition to major limitation from past studies in their focus on a single indicator of successful completion of construction projects such as cost or timely completion.

2. Review of Related Literature

2.1 Project, Project Management and Project Implementation

2.1.1. Project

A project, as defined by (Wysocki, 2014) is a series of unique, complex, and connected activities having a goal or purpose that must be executed within specific time, within budget, and predefined specification. This can be differentiated it from a routine set of activities or daily operations which are intended to be continuous process without a planned due date. Projects are also characterized by general attributes such as, purpose, life cycle, uniqueness, interdependencies and conflict (Meredith and Mantel, 2000).

2.1.2 Project Management

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (Project Management Institute, 2013).This application of knowledge needs the effective management of the project management processes. A process is a set of interrelated actions and activities executed to create a pre-defined product, service, or result which are categorized into five Process Groups having their own inputs, the tools and techniques that can be used, and the resulting outputs as discussed in (Project Management Institute, 2013), these process are; **Initiating Process Group**: Those processes performed to define a new project or a new phase of an existing project by obtaining authorization to start the project or phase. **Planning Process Group**: Those processes required to establish the scope of the project, refine the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve.

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Executing Process Group: Those processes performed to complete the work defined in the project management plan to satisfy the project specifications. **Monitoring and controlling Process Group**: Those processes required to track, review, and regulate the progress and performance of the project; identify any areas in which changes to the plan are required; and initiate the corresponding changes and **Closing Process Group**: Those processes performed to finalize all activities across all Process Groups to formally close the project or phase.

2.1.3 Project Implementation

Project implementation is a sophisticated process usually encompassing of multiple variables which influence implementation containing resources management, the operational systems, the organizational culture and the governance of the organization. Projects are designed, planned and implemented in tandem with the order displayed by the project cycle. The Log Frame is the planning tool that is used to design, appraise, manage, monitor and evaluate the passage of a project through the project life cycle from policy framework to final evaluation. It presents the objectives-related activities and corresponding assumptions and pre-conditions of the project design of different hierarchical level matrix format. Increasing globalization of projects and project management adds to this diverse mix, creating intercultural challenges for project managers. Professional associations are become familiar with this diversification of project management. The literature agrees that there are two components of project success-the extent to which technical project performance objectives were attained (e.g., time, cost, and scope) and the value that the project add to the strategic mission of the firm (Kerzner, 2009).

2.1.3.1 Theory of Project Implementation

The theory of project implementation was a mastery of Fugate and Knapp in the mid- 1996. (Fugate, Mary, 1998) asserted that over reliance on the theoretical aspects is the single most important factor distinguishing a profession from a craft. Thus an explicit theory is the crucial and single most important issue for the future of the project management profession. (Nutt, 1996) refers to implementation as a series of steps taken by responsible organizational agents to plan change process in order to elicit compliance needed to install changes. Project managers employ project implementation theory to make planned changes in organizations by creating environments in which changes can survive and be rooted. The project manager has to devote more time and energy on human, financial, and technical variables as the key to the realization of project implementation. It is further argued that it is apparent that a number of determinants are capable of affecting project implementation if not handled with care. These include among others: late disbursement of funds, failure to involve stakeholders and citizens, use of incompetent project managers and staff and escalation of project cost due to inflation among others. The study applied this theory because it is encompassing, and adequately incorporates all the relevant stakeholders involved in project implementation.

2.4 Factors Affecting Time (Duration) In Construction Project

Project schedule is a tool that communicates what work needs to be performed, which resources of an organization will perform the work and timeframes in which that work needs to be performed. Project schedule should reflect all of the work associated with delivering the project on time (Gaba, 2013). (Henry et al. 2007) asserted that various factors have been identified by different researchers from the time aspect in different construction industries. Lack of materials, incomplete drawing, incompetent

supervisors, lack of tool and equipment, absenteeism, poor communication, poor site layout, inspection delay and rework were found to be the most significant problems affecting project duration (time). (Olomolaiye et al. 1998) have identified five most significant factors affecting time management in the Nigerian construction industry. They are lack of materials, rework, equipment, supervision delays, absenteeism and interface. Lack of material, weather, and physical site conditions, lack of proper tool and equipment, design, drawing and change orders inspection delay, absenteeism, safety, improper plan of work, repetitive work, changing crew size and labour turnover were found to be the most critical factors in Iran (Henry et al.2007)

2.5 Factors Affecting Cost in Construction Project

Project cost is the total project cost which includes design fees, material costs, and construction costs, permit fees, land, furnishings, financing and all other costs that are incurred in completing a project. The ability to accurately predict the client's financial commitment to a project, which also forms the basis of the contractor's eventual revenue, has many advantageous implications. As a pre-warning indicator, alternative courses of actions can be examined and provision can be made for the preferred option. The client according to (Ibironke, 2003) has the capital and related interests to consider often with no prospect of a financial return until full completion of the project. The factors identified by contractors affecting cost and time in a survey carried out by (Mansfield et al. 1994) include the following: price fluctuation, inaccurate estimates, delay (time overrun), additional work, fraudulent practice and kickbacks, shortening of contract period, construction method, poor contract management, subcontractors and nominated suppliers, mistake during construction and non-adherence to contract condition.

2.6 Factors Affecting Quality in Construction Projects

Quality is the summation of the following characteristics, right first time, value for money, customer satisfaction, and consistent conformance to specification (Ameh et al.2002). Excellence, conformance to standards or specifications, and fitness for purpose has all been criticized as definitions of quality (Dotchin, & Oakland, 1993). Customers typically define quality as value or fitness for use, which involves expectations the customer has for the product (Garvin, 1983) Construction production quality is the degree to which the production meets the requirements and methodology stated in the design and specifications. The requirements refer to the needs or expectations of the client/promoters and the methodology implies execution of construction in conformity with the approved design, drawings and specifications (Chitkara, 2011). The first step in quality as defined by (Bamisile, 2004) is the definition of customer's needs and expectations which must be translated into clearly defined and measurable requirements for building construction projects. He drew attention to the fact that good design embraces such things as getting a proper brief, ensuring the design matches the client requirement, prescribing the best material for the job and making sure that what is inked in the drawing can be built on the site. He also argued that only the contractor has the responsibility and power to achieve specified standard. Experience suggests that the contractor's inspection and control arrangement are rarely sufficient for any contract. Casual inspection methods are not likely to be effective and could leave e large section of defective work until when it becomes unreasonable to remove them. The

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various steps that should be followed in order to achieve specified quality standard at first attempt are often not adhere to by the project team. Such steps are construction methodology, construction programmes, site layout, plant and equipment analysis etc.

2.7 Conceptual Framework

Conceptual framework illustrates the interaction of study variables; mainly the independent and dependent variables. The two sets of variables were in in line with the study objectives. Figure 1 shows the conceptual framework. In this research, the researcher intended to find out how time, cost and quality factors which were independent variables, influence implementation of the zone roads projects which was the dependent variable

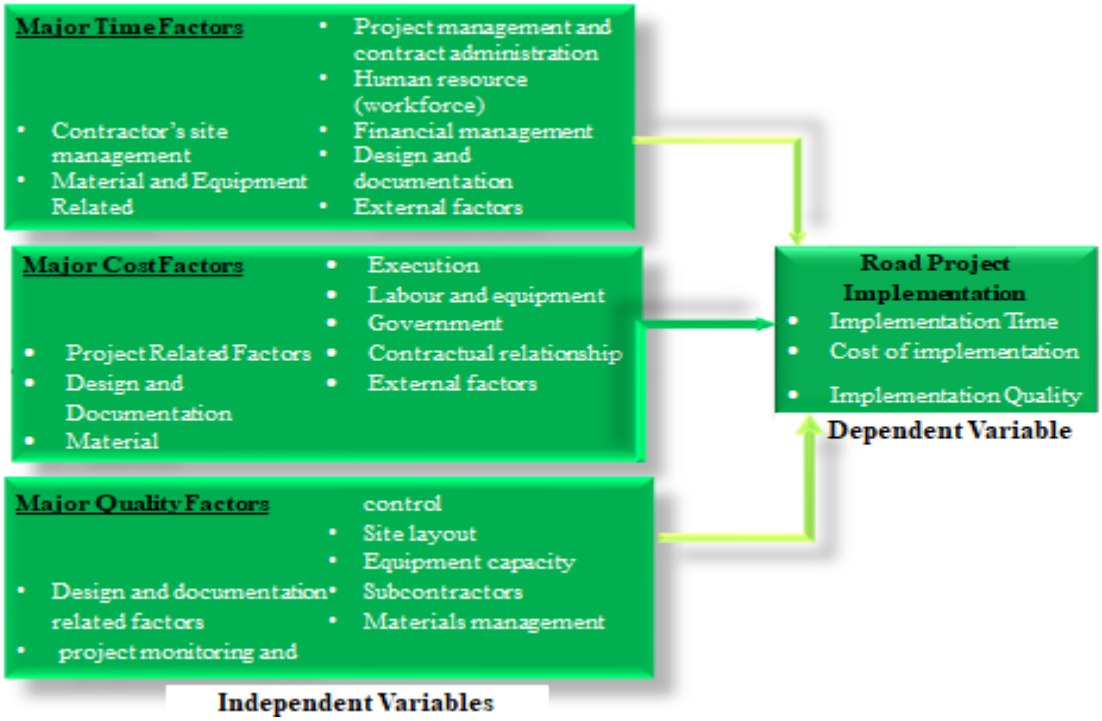

Figure 1: Conceptual Frame Work (Source: (Nigussie, 2018) and (Charles, 2016)

3. Methodology

The study employed a descriptive research since the study was to describe the actual prevailing state of affairs, existing at present or existing position of facts / issues related to the implementation of the projects without manipulation of any of the variables in Kellem Wollega zone, Oromia Region, Ethiopia. The study targeted to 20 total populations to which census sampling techniques was employed. The researchers used structured questionnaires for the collection of the data to elicit the attitude of client and contractors towards the factors affecting the road projects implementation. Totally, 20 questionnaires were distributed as follows; 5 to contractors, 5 to concerned individuals of the client and 10 to the districts technicians and also unpublished documents of the client office were used to substantiate the information with facts and figures are used to augment the data collected through questionnaires toward 45 purposively selected projects as a base for study reference. Data was then coded and analyzed using descriptive statistic assisted by Statistical Package for Social Scientists (SPSS) software 24 by computing frequency, and percentages in addition to figures used to present the findings. Some mathematical computations were performed using excel and pocket

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calculator. RII method was used to rank the factors for the project implementation separately for their importance and frequency of happening.

RIIs for each factor was calculated as shown below:

$$\mathbf{RII= \sum W/A*N}$$

Where:

RII = relative importance index

W = weighting given to each factor by respondents (ranging from 1 to 5)

A = highest weight (i.e. 5 in this case); and

N = total number of respondents.

4. Findings

4.1 Analysis of Descriptive Statistics Results

From the survey the findings were gained. Using the SPSS frequency, percentage, RII, weighted average and rank were calculated. From the discussion and analysis the major factors were summarized as:

4.1.1 Major Time Factors of Road Construction Implementation

The major time factors that influence the road construction projects implementation were ranked 1st - 7th. These were: first Equipment availability and failure, second Designer's experience, and Appropriate design, fourth Clear specifications, and Availability of materials in markets, sixth Complete drawings, and seventh Documentation and detailed written procedures, Material delivery to site, Supply of construction materials, and Strikes, political unrest, etc.as depicted in below figure 2:

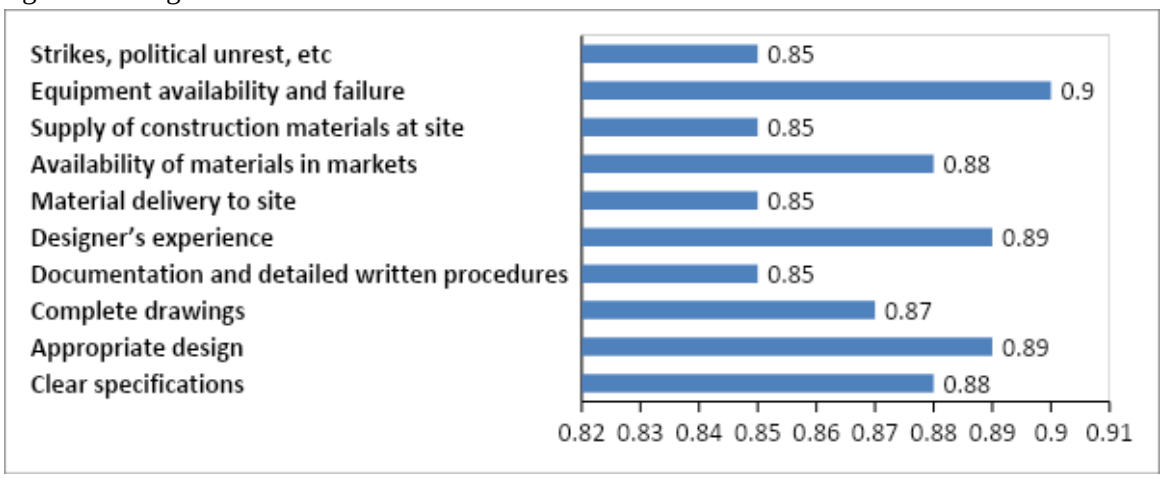

Figure 2: Major Time Factors of Road Construction Implementation (Top Ten Time Factors
Source: Own Survey, 2021)

4.1.2 Major Cost Factors of Road Construction Implementation

Furthermore, the major cost factors that influence the road construction projects implementation were ranked 1st - 10th. These included: first Cost of building materials, second Cost estimate, third Labour related matters such as the availability, skills, productivity,…), and Degree of government regulations and control, fifth Stability of cost of labor, and Site management and supervision seventh Fraudulent practices and kickbacks./corruption/ eighth Design stability, and Adequate project preparation, planning and implementation, and tenth Experience of the project type, Cash flow and financial ability of contractor, Speed in decision making, and Ability in project management. In addition, unit rate rigidity and Natural disaster such as flood and land slide were identified. These factors are also illustrated in below figure 3

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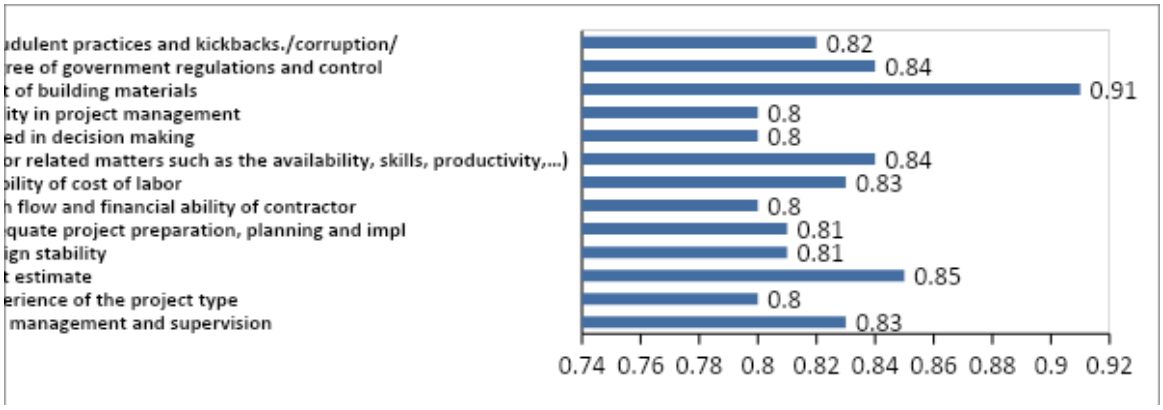

Figure 3: ***Major Cost Factors of Road Construction Implementation*** **(Top Ten Cost Factors.**
Source: Own Survey, 2021)

4.1.3 Major Quality Factors of Road Construction Implementation

Finally, 10 factors that influence quality of the road construction project implementation were ranked 1st - 7th which were: first Availability of equipment, second Effective incoming inspection, and Equipment operator's skill, fourth Effective in-process supervision, fifth Availability of good quality construction materials, sixth Equipment maintenance, and seventh Accuracy and detailing of the bill of engineering measurement, Final inspection, Equipment management system, and Supervision staff understanding of construction process. In addition to the alternative factors provided, mismatch of URRAP standard with difference in actual earth characteristics of construction areas was also identified.

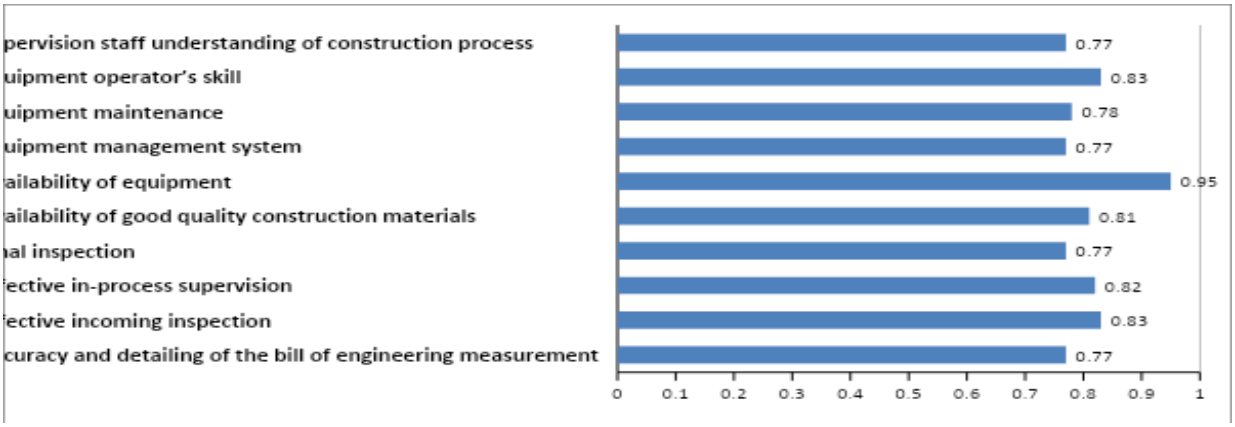

Figure 4: Major quality factors of Road Construction Implementation **(Top Ten Quality Factors**
Source: Own Survey, 2021)

5. Summary

Therefore, from the above findings it was possible to summarize that all the major time factors were categorized under Labor and equipment, Design and Documentation, Material, and External factors related factors. On the other hand, all the cost major factors were categorized under Material and Equipment Related, Contractor's site management related factors, Human resource (workforce) related factors, External factors, Design and documentation related factors, Financial management related factors, Project management and contract administration related factors. Finally, Equipment capacity, Project Monitoring and Control, Construction

process, Design and documentation related, and Materials management related factors were the category where the major quality factors were found.

6. Recommendation

Based on the major findings and discussion of the study the following recommendations were forwarded. Factors influencing road construction projects implementation are considered as instrumental tools that can help projects to be successfully completed. Identification of such factors and executing the project based on the predetermined and an ordered factor minimizes failure and maximizes success opportunities of road construction projects. Therefore;

Federal Government of Ethiopia/ Regional Government of Oromia as a client should formulate policies and regulations that require clients to change their procurement strategies and as a result force the construction companies to adopt more innovative approaches in the construction delivery process. In addition the government should provide leadership in driving a construction research and development agenda.

Also, contractors should, apply implementation and stakeholders theories for successful implementation and effectively manage construction equipment and materials because proper planning; selection, procurement, installation, operation, maintenance and equipment replacement policy plays an important role in equipment management for the successful completion of the project.

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