

Assessment and Effectiveness Analysis of the Women Workers in Construction Projects in Debre Berhan and Addis Ababa, Ethiopia

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Abstract: For a construction project to be completed successfully there must be an effective and efficient utilization of resources. One of these resources is human resource which includes women worker. This research focus on the effectiveness analysis of women worker in construction projects at Debre Berhan and Addis Ababa, Ethiopia and analyzing its impact towards personal safety and construction accidents, quality of construction, project completion or lead time, and effectiveness in project management as a whole. Descriptive survey research method were utilized and questionnaire was administered to 200 randomly selected respondents which comprised of women workers, foreman, project managers and contractor firm owner. The results of the overall analysis shows that most of the workers in construction are women in Debre Berhan, whereas the construction industry in Addis Ababa is dominated by males and most of the job positions in Debre Berhan are equally distributed among male and female employees except the foreman position but all job classifications in Addis Ababa are dominated by male workers especially the key positions like Project Manager and Project Supervisors. There is no wide disparity in the salary of construction employees in Debre Berhan except for the Foreman Position. Males are compensated higher than the females while in Addis Ababa there are obvious variations in the average salary of the male and female employees. Male takes higher overtime than females. Women workers committed low frequencies of quality defects. The study also shows that there is a low rate of safety violations, major & minor injuries incurred by women in the workplace yet they have low safety awareness. There is a low absenteeism rate to women workers & they have medium productivity rate. Finally, based on the results recommendations were forwarded that trainings should be given for women workers on safety and awareness should be created on construction firms on the effectiveness of women workers.

Keywords: Safety, Quality, Cost and Effectiveness, Project Management

1. Background of the Study

The construction sector is an important vehicle for employment generation and economic development through building environment assets such as houses, roads, utility networks, schools and clinic [1]. Ethiopian economy is one of the fastest growing economies in African region. Construction projects such as, private and government buildings roads railways manufacturing plants and power stations are prevalent all over the country. It is evident that

most of these construction projects employ women most of them in the labor-intensive position which is predominantly a men's job in most countries in the world. However, in Ethiopian construction industry in particular, women are most common scenario that can be seen in construction projects.

Women are deprived remunerated participation in the labor force relative to their male counterparts and they tend to be

self-employed in the informal sector on primary productive sectors like construction sector areas, generating the highest incidence of women impoverishing Africa, women work for low pay, in unskilled and informal jobs, under unhealthy and substandard condition [2]. According to the Construction Industry Training Board [3], women only account for 9% of the construction work force. The construction industry is typically a male dominated industry and presents a major challenge for equal opportunities for women.

However, there has been a scant empirical study on the role of women in construction projects in Ethiopia in particular. In addition, the literature search failed to locate any refereed journal articles relating to assessment on the effectiveness of women in the Ethiopian construction sector.

Therefore, this study was conducted to assess the effectiveness of the role of women in construction projects at Debre Berhan and Addis Ababa City by analyzing its impact towards personal safety and construction accidents, quality of construction, gender sensitivity and equality, project completion or lead time, and effectiveness in project management as a whole.

General Objectives

The overall objective of the study aims to assess the uniqueness role of women in construction in Debre Berhan and Addis Ababa.

Specific Objectives

1. To assess the quality of work of women in heavy or laborious job in construction.
2. To determine the gender sensitivity issues in construction projects.
3. To analyze the effectiveness of project management by employing women instead of men.

2. Related Literature

2.1. Women in Construction

Until today the construction industry with its extreme gender stratification is still conservative in its recruitment of women. The prevalent social conditions underpins the occupational segregation of the labor market into masculine and feminine jobs is as imperforate today as it was at the beginning of the century, with construction as the prime example. The majority of women working in the construction industry undertake administrative, technical and professional work while the intake at the operative level is very low and the data are scarce to non-existence, but in most countries these represent less than 1% of the workforce [4].

There are many studies discussing the reasons why female workers shy away from the construction industry as a whole and the craft sector in particular [5] [6] [7] [8] [9]. Among the common barriers are social acceptance of employment, sexually-inappropriate occupation, sexual discrimination, sexual harassment, physical incapability, unqualified for blue-collar jobs and labor conditions such as extreme weather, unsociable work-hours and exposure to hazards.

Wells [10] discussed the informal labor in construction in

general while Chen [11] discussed the conditions of women participation in the informal sector in the developing countries. According to Chen, women in this sector are over-represented worldwide.

This informal sector is the primary source of employment for women in most developing countries. Existing data suggest that the majority of economically active women in developing countries are engaged in the informal sector [10]. For example 97% of women working in construction in India are considered as informal labor [10]. Hence, the proportion of women workers in the informal sector exceeds that of men in most countries. Women's share of the total informal workforce outside of agriculture is higher than men's share in some countries. The composition of the female informal workforce varies somewhat across regions. In many African countries, almost all women in the informal sector are either self-employed or unpaid workers in family enterprises. In many countries in Latin America and Asia, although the majority of workers are self-employed or contributing family members, at least 20 percent of women in the informal sector are casual waged workers. Compared to the male informal workforce, women in the informal sector are more likely to be own account workers, i.e., self-employed working by themselves, and subcontract workers [10] [11].

On top of proving their technical skills, women workers need to have the ability to fit into the accepted behavior of the workplace which can even be more problematic. In her study on both the physical and psychosocial working environment among the Swedish construction workers, Olofsson [12] stated that most women seem to agree that they can cope with the physical part of the job, while many claimed that they need to be psychologically strong to be on a building site. The women on site feel that they need to be as good as the men. They also need to fit into the accepted behavior of the workplace which can even mean comprising their 'female' identity [13].

2.2. Issues Confronting Women in Construction Industry

Studies indicate that the construction industry's traditional, blue-collared, male-dominated, craft-based culture represents a significant barrier to women recruitment, participation and career progression. The following are issues and barriers opposing the women participation: The assumptions that root the frequent argument are that woman is physically not strong to endure this strenuous task. When entering the gender segregated occupations, these women need to prove their competence despite their qualifications and experiences [13].

On top of proving their technical skills, women workers need to have the ability to fit into the accepted behavior of the workplace which can even be more problematic. In her study on both the physical and psychosocial working environment among the Swedish construction workers, Olofsson [12] stated that most women seem to agree that they can cope with the physical part of the job, while many claimed that they need to be psychologically strong to be on a building site. The women on site feel that they need to be as

good as the men. They also need to fit into the accepted behaviour of the workplace which can even mean comprising their 'female' identity [13].

Women inexplicably run a greater risk than men of work-related musculoskeletal disorder (MSD). Studies have shown that women were twice as likely as men to leave the industry because of complaints of pain and injury. This may also be linked with low job-control and high job-demand which can lead to MSD [14]. Women have been reported to be in this situation with low job-control and high job-demand than men. Many female workers overlook this safe limit and perform task that in the long run can lead to MSD just to avoid being stereotype by the male colleagues [12]. Important variables for health and good work environment such as control over work influence, meaningfulness, support and professionalism seems to be negatively influenced by gender personal offences.

Furthermore the whole workplace culture poses problems to female workers on site. For example, temporary sanitary facilities are usually unisex, often without privacy and generally not well maintained. Unclean facilities can result in disease as well as urinary tract infection. Female workers also complain about the ill-fitting personal protective clothing (PPC) and personal protective equipment (PPE) that are not to size or does not fit which eventually can compromise personal health and safety. A study by OSHA [15] (Occupational Safety and Health Administration) revealed that most tools, equipment and clothing are not designed for a women's physique. The same study by OSHA also state about inadequate information on the extent to which female construction workers are exposed to reproductive hazards in the workplace [12] [15].

According to Dainty et al [16], resentment against women was manifested in overt and covert discriminatory behavior towards them. The type of covert discrimination women workers face are in the form of maintenance of a cultural long working hours and enforced geographical instability. This contributes to the issue of balancing between having a successful career and family-oriented lifestyle [16]. Restricted promotional opportunities within the organizations showed that promotions 'within companies' had tended to occur within divisions preventing lateral staff mobility between operating divisions in order to maintain sub-cultural environment, to restrict opportunities for women and maintain existing hierarchy and work practices [16]. Women were seen as threats to the limited promotional opportunities available within the organizations.

In a study performed by Hossain and Kusakabe [17], the major barrier identified by women engineers in Thailand and Bangladesh is the recruitment process which favors the male workers. Employers prefer to keep the organization male-dominated even for tasks such as cost estimation, mapping and documentation. Women were excluded while hiring. Employers' prejudice that construction is unsuitable for women is manifest in the recruitment process where employment are often informal and through personal contacts [16]. Apart from organizational practices, country's

traditional religio-cultural assumptions, norms and gender ideologies were hindering women participation. Only recently has this participation in some countries such as Bangladesh increased due to economic necessities allowing women to work to support the family [17].

3. Methodology

3.1. Research Design and Population

Bless and Higson-Smith [18] define the research design as "a specification of the most adequate operations to be performed in order to test a specific hypothesis [research questions] under given conditions." Thus a quantitative approach as earlier explained allowed the researcher to carry out a survey research. Descriptive survey method of research was used in this study. According to Bless and Higson-Smith [18], a descriptive quantitative approach compares different variables and relies on measurement. As aforementioned this quantitative approach is descriptive in nature for the reason that the study intended to describe a phenomenon. Thus a quantitative approach as earlier explained allowed the researcher to carry out a survey research.

The population refers to the entire set of people who are the focus of the study [18]. There were 200 respondents involved in the study, which is comprised of women workers, foreman, project managers, and contractor firm owner selected using random sampling technique. According to Bless & Higson-Smith [18], random sampling is whereby each individual has an equal probability of being selected and this ensures that the sample is representative of the population. Responses were elicited using survey forms and interview questionnaires, which were distributed.

3.2. Method of Data Collection and Analysis

Responses were elicited using survey forms and interview questionnaires, which were distributed. Construction companies provided qualified respondents who were given questionnaires. Interviews were conducted to women, safety officers, foremen, engineer, project managers and owners.

The data collected through questionnaires were coded, entered, and analyzed using the Statistical Package for Social Sciences (SPSS) computer software version 22.0. It then was analyzed using descriptive statistical approach like percentage technique, frequency, arithmetic mean, standard deviation and t-test inferential statistical means.

4. Results and Discussion

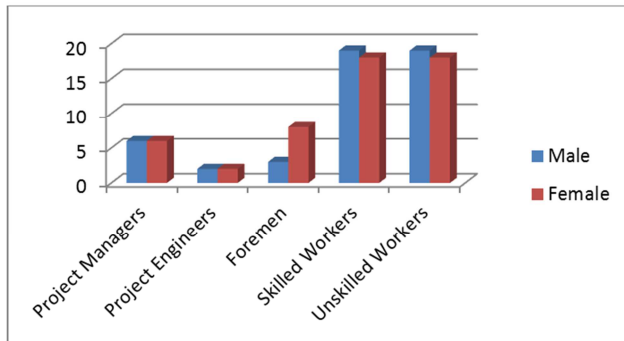
4.1. Demographic Information

Table 1 shows the profiles and demographics of the respondents involved in the study. It presents the descriptive part of the study conducted to various construction firms in Debre Berhan and Addis Ababa City. Respondents involved were 200 respondents comprised of males and females.

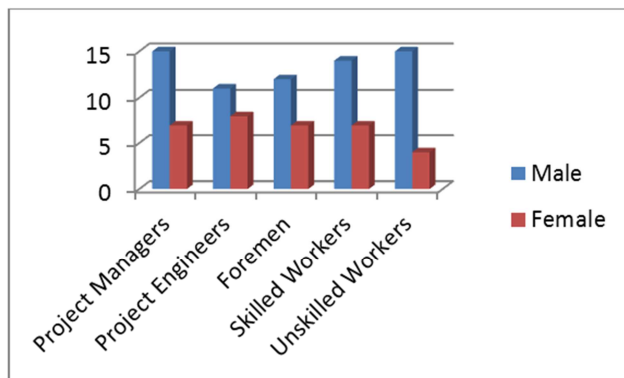
Table 1. Demographic Rate of Respondents.

Location	Gender	Frequency	Percentage
Addis Ababa	Male	48	48%
	Female	52	52%
		100	100%
Debre Berhan	Male	67	67%
	Female	33	33%
		100	100%

4.2. Respondent's Distribution by Job Classification

**Figure 1.** Jobs Position in Debre Berhan.

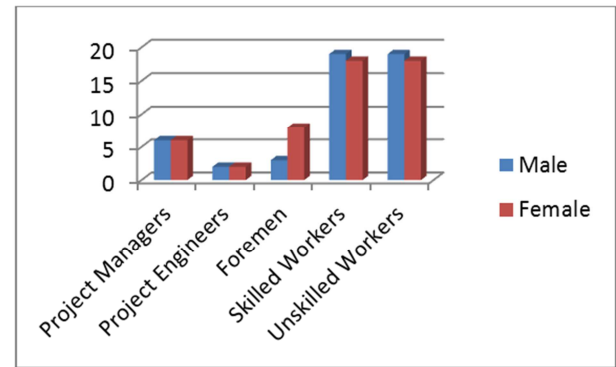
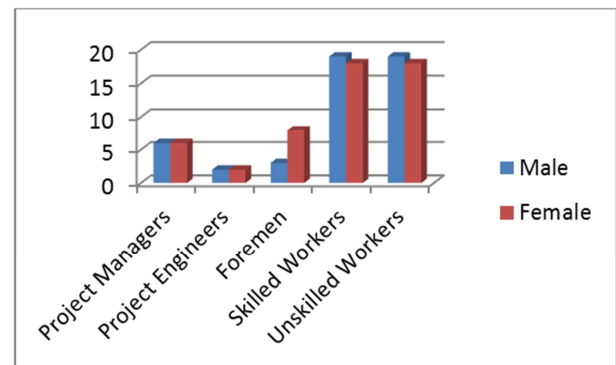
Most of the job positions in Debre Berhan as shown in Figure 1 are equally distributed among male and female employees. Noticeably most of the females ($f=8$) held the foreman position

**Figure 2.** Jobs Position in Addis Ababa.

All job classifications in Addis Ababa as shown in Figure 2 are dominated by male workers especially the key positions like Project Manager ($f=15$) and Project Supervisors ($f=11$). There is a wide gap in the frequency of the Unskilled Workers among men ($f=15$) and women ($f=4$).

4.3. Respondents' Distribution by Salary or Compensation

Figure 3 shows that there is no wide disparity in the salary of construction employees in Debre Berhan except for the Foreman Position. Males ($m=4,000.50$) are compensated higher than the females ($m=1,600.20$).

**Figure 3.** Distribution by Salary in Debre Berhan.**Figure 4.** Distribution by Salary in Addis Ababa.

While Figure 4 shows that in Addis Ababa there are obvious variations in the average salary of the male and female employees. There is noticeable wide disparity in the salary Project managers and unskilled positions respectively. Female project managers ($m=8,637.27$) are paid lower than the male counterparts ($m=10,001.00$). Unskilled women workers receive lower salary ($m=2,000.09$) than the males ($m=4,667$).

4.4. Overtime Rates

Combining the survey results of Debre Berhan and Addis Ababa, it was found out that there is a significant difference in the overtime rates of male and female employees across all job positions as shown in Table 2. Males takes higher overtime ($M=2.24$, $SD=0.955$) than females ($M=2.00$, $SD=0.816$), $t(199)=2.766$, $p=0.005$

Table 2. t-Test: Paired Two Sample for Means – Salary.

	Males	Females
Mean	2.235	2.000
Standard Deviation	0.955	0.816
Observations	34.000	34.000
Pearson Correlation	0.855	
Hypothesized Mean Difference	0.000	
df	199.000	
t Stat	2.766	
P(T<=t) one-tail	0.005	
t Critical one-tail	1.692	
P(T<=t) two-tail	0.009	
t Critical two-tail	2.035	

4.5. Company Expenses on Employee Benefits

This section tries to underpin the expenses incurred by the organization for the employees in terms of medical, insurance, maternity, paternity and death benefits. The statistical test in Table 3 shows that there is no significant difference in the company expenses on male ($M=1.640$, $SD=0.776$) and female ($M=1.680$, $SD=0.713$) employees across all job positions. Both are equally given benefits $t(199)=-0.814, p=0.210$.

Table 3. *t*-Test: Paired Two Sample for Means – Benefits.

	Males	Females
Mean	1.640	1.680
Standard Deviation	0.776	0.713
Observations	50.000	50.000
Pearson Correlation	0.894	
Hypothesized Mean Difference	0.000	
df	99.000	
t Stat	-0.814	
P(T<=t) one-tail	0.210	
t Critical one-tail	1.677	
P(T<=t) two-tail	0.420	
t Critical two-tail	2.010	

4.6 Cost of Rework

The statistical test as shown in Table 4 implied that there is no significant difference in the cost of rework incurred by male ($M=1.360$, $SD=0.638$) and female ($M=1.360$, $SD=0.638$) employees across all job positions. Both incurred low cost of rework $t(199)=-0.814, p=0.210$.

Table 4. *t*-Test: Paired Two Sample for Means – Cost of Rework.

	Male	Female
Mean	1.360	1.360
Standard Deviation	0.638	0.638
Observations	25.000	25.000
Pearson Correlation	0.898	
Hypothesized Mean Difference	0.000	
df	99.000	
t Stat	0.000	
P(T<=t) one-tail	0.500	
t Critical one-tail	1.711	
P(T<=t) two-tail	1.000	
t Critical two-tail	2.064	

4.7. Quality Incidents

This pertains to defects in construction projects observed committed by female employees while at work. Using scales: Low <5 incidents per week; Medium: <10 incidents per week; and High: >10 incidents per week the study as shown in Figure 5 that women workers committed low frequencies ($f=109$, 54%) of quality defects.



Figure 5. Frequency Distribution on Quality Incidents.

4.8. Technical Knowledge

This pertains to the training, seminar, or orientation conducted to the women workers as provided by the construction firm. Using the scales Low: No training, seminar or orientation conducted to women workers; Medium: Orientation, Daily Briefs, Safety and quality talks are sometimes conducted; and High: Toolbox meeting is conducted every day. Some training are conducted to the women workers. Safety and Quality are always part of the Daily Tool Box Meeting, the study shows that female workers possess medium ($f=109$, 54.55%) technical knowledge provided by the firms pertaining to their job as shown in in Figure 6.

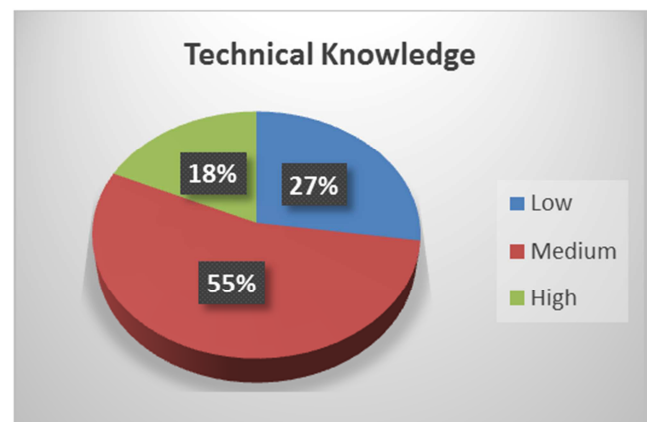


Figure 6. Frequency Distribution on Technical Knowledge.



Figure 7. Frequency Distribution in Quality Control Safety.

4.9. Quality Control Plan

This pertains to the ability of the women workers to follow strictly the control plan set beforehand by the construction firm as manifested by their outputs. Using the scales: Low: >5 incidents per week; Medium: >2 or <5 quality incidents per week; and High: At least 1 quality incident per week as reflected in Figure 7 shows that there is low adherence ($f=80$, 40%) of women workers to the quality control plans laid by the firm.

4.10. Safety Violations

This section intends to quantify the safety violations committed by women in the workplace such as not wearing hard hats, safety shoes, harness, gloves, reflector vest and the likes. Those were measured using the frequency of the violations categorized as: Low: <1 per week; Medium: <5 incidents per week; High: >10 incidents per week. The study shows as reflected in Figure 8 that there are low rate ($f=120$, 60%) of safety violations committed by women.

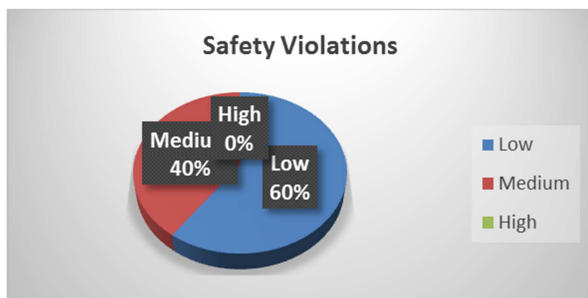


Figure 8. Frequency Distribution Table – Safety Violations.

4.11. Safety Incidents

This section tries to probe the minor injuries, bruises and minor wound incurred by women as they conduct their work. To quantify these, the frequencies of incidents are expressed using the scales: Low: <1 incident per week; Medium: <5 incidents per week; and High: >10 incidents per week. The study shows as reflected in Figure 9 that there is low rate ($f=140$, 70%) of minor injuries incurred by women in their line of work.

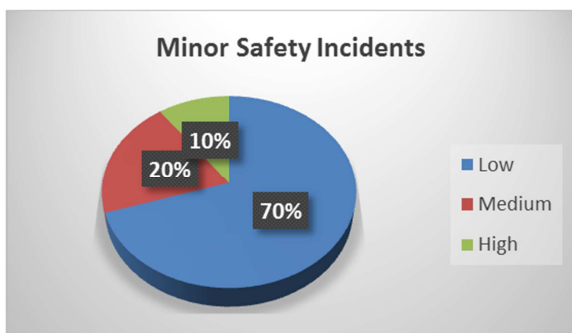


Figure 9. Frequency Distribution of Minor Safety Incidents.

On the other hand, the study also shows as reflected in Figure 10 that there is a low ($f=125$, 62.50%) rate of major injuries incurred by women in the workplace.

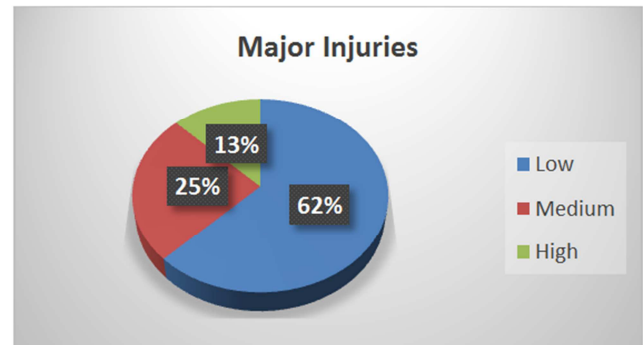


Figure 10. Frequency Distribution of Major Safety Injuries.

4.12. Safety Knowledge or Safety Awareness.

This section would like to determine the level of awareness of women workers regarding safety in the workplace. Using the scales: Low: No knowledge at all; medium: some safety briefs are conducted; and high: Daily toolbox is conducted for safety, the study shows as reflected in Figure 11 that female workers have lower ($f=100$, 50%) level of knowledge or awareness to safety.



Figure 11. Frequency Distribution of Safety.

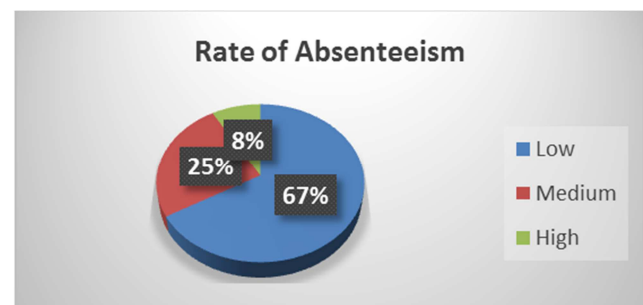


Figure 12. Frequency Distribution in Absenteeism.

4.13. Knowledge/Awareness

Effectiveness

This section underpins women workers' effectiveness by examining their absenteeism rate, lead time and productivity in the workplace.

Absenteeism Rate

This sub-section pertains to the frequency of being absent from the workplace of women workers in the construction projects. Using the scales: Low: <1 time a week; Medium <2

times a week; High: >2 times a week, the study shows as reflected in Figure 12 that there is a low ($f=133$, 66.67%) absenteeism rate to women workers.

Lead Time

This sub-section pertains to the required amount of time for women workers to accomplish their respective job in the construction projects. Using the scales: Low: Always not on –time or delayed; Medium: Sometimes delayed; and High: Always on – time, the study shows as reflected in Figure 13 that women incurred low to medium ($f=73$, 36.36%) lead time in accomplishing tasks.

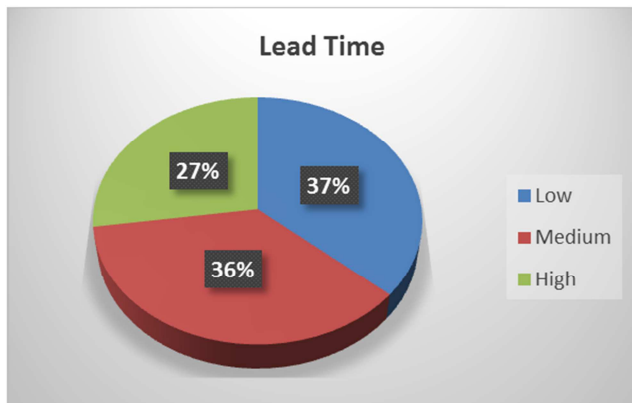


Figure 13. Frequency Distribution in Lead Time.

Productivity

This sub-section discusses about the trend of project item of works by women workers in construction projects. Using the scales: Low: <50%; Medium: 51-80%; and High >80% the study shows as reflected in Figure 14 that women has medium productivity rate ($f=109$, 54.55%) in the construction projects.

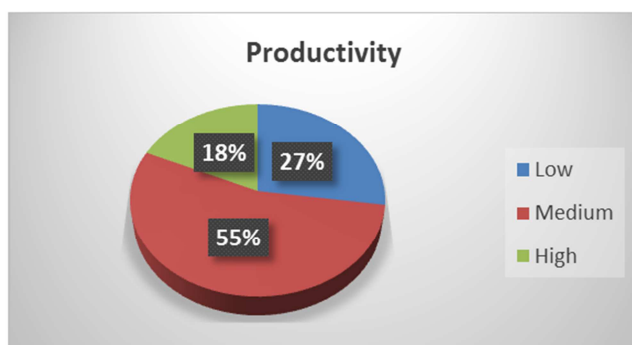


Figure 14. Frequency Distribution in Productivity.

4.14. Key Findings

This section provides the correlation results of *salary*, *absenteeism*, *lead time* and *productivity* and *technical knowledge*. The study revealed that there is no significant relationship that exists between *salary* and *absenteeism*, $r(198) = -0.143$, $p=0.602$. Also, there is no significant relationship that exists between *salary* and *lead time*, $r(198) = -0.112$, $p=0.602$. Lastly, there is no significant relationship that exists between *salary* and *productivity*, $r(198) = -0.281$, $p=0.602$.

Furthermore, it was found out that there is no significant relationship that exists between *technical knowledge* and *absenteeism*, $r(198) = 0.370$, $p=0.602$. However, there is a significant, strong relationship that exists between *technical knowledge* and *lead time* $r(198) = 0.688$, $p=0.602$. Also, there is a significant, strong relationship that exists between *technical knowledge* and *productivity* $r(198) = 0.645$, $p=0.602$.

Overall, the study yielded the following findings:

- There are more female workers in Debre Berhan. In Addis Ababa, males mostly dominate the construction industry.
- There was a disparity in the salaries of workers based on gender. In Debre Berhan, females are paid lesser than the males.
- Combining the results of Debre Berhan and Addis Ababa, it was found out that males take higher overtime than the females.
- The employees, both males and females receive company benefits and are both treated equally.
- Both male and female employees incur lesser cost of reworks.
- Female workers commit lesser frequency of quality incidents.
- Female workers possess medium technical knowledge provided by the firms pertaining to their job.
- There is low adherence of female workers to the quality control plans laid by the firm.
- There is low rate of safety violations committed by female workers.
- There is low rate of minor injuries incurred by female workers in their line of work.
- There is a low rate of major injuries incurred by female workers in the workplace.
- Female workers have lower level of knowledge or awareness to safety.
- That there is a low absenteeism rate to female workers.
- Female workers incurred low to medium lead time in accomplishing tasks.
- Female workers have medium productivity rate in the construction projects.
- There is no significant relationship that exists between salary and absenteeism.
- There is no significant relationship that exists between salary and lead time.
- There is no significant relationship that exists between salary and productivity.
- There is no significant relationship that exists between technical knowledge and absenteeism.
- There is a significant, strong relationship that exists between technical knowledge and lead time.
- There is a significant, strong relationship that exists between technical knowledge and productivity.

5. Recommendations

On the basis of the findings, and conclusion, the following recommendations are given by researchers:

- a) Proper training to women workers especially those who are not professional or unskilled workers so that they have skilled and can compete to men and will eventually have better salaries.
- b) Construction owners that gender equality will be given emphasis for women in terms of overtime so long as they have skilled that is necessary in the project.
- c) To avoid rework in construction projects, construction companies must have to train more workers to their job to avoid rework in the project as much as possible and finished on time per schedule.
- d) Training is recommended to construction owners that women workers specifically those skilled workers such as engineers must be given training and seminars regarding quality control plans so that when they handle project they already had the knowledge on how to undertake quality works in the project.
- e) Construction owners must have safety engineers who will conduct training to all workers in the project regarding safety awareness not only to female workers but all workers in the project.
- f) In terms of productivity, female workers must undergo training in terms of how to accomplish their works on time to have better productivity in the project.
- g) Female workers in construction must be given trainings in terms of technical knowledge of construction project specifically women engineers who will be supervising or handling construction projects.
- h) The construction firm owner must have their women workers undergo training and seminar so that they will be more effective in their workplace must give both productivity and technical knowledge.
- i) Finally, due to the scope and limitations stated in the research it is recommended that further researches should be done on the effectiveness of women workers in construction.
- incurred by female workers in their line of work.
- f) There was a low rate of major injuries incurred by female workers in the workplace and lower level of knowledge or awareness to safety.
- g) We therefore conclude that there was a low absenteeism rate to female workers and incurred low to medium lead time in accomplishing tasks.
- h) Female workers have medium productivity rate in the construction projects and there was no significant relationship that exists between salary and absenteeism.
- i) There was no significant relationship that exists between salary and lead time and there was no significant relationship that exists between salary and productivity.
- j) There was no significant relationship that exists between technical knowledge and absenteeism and there was a significant, strong relationship that exists between technical knowledge and lead time.
- k) There was a significant, strong relationship that exists between technical knowledge and productivity.

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6. Conclusions

On the basis of the findings, the following conclusions are presented by the researchers.

- a) In construction industry more female workers are working here in Debre Berhan than in Addis Abba City, however, in construction work it is dominated by men and salaries of women is lesser than men workers.
- b) In construction works men undertake more overtime than women, however, both males and females receive company benefits and are both treated equally.
- c) Both male and female employees incur lesser cost of reworks and female workers commit lesser frequency of quality incidents.
- d) Female workers possessed medium technical knowledge provided by the firms pertaining to their job and there was low adherence of female workers to the quality control plans laid by the firm.
- e) There was low rate of safety violations committed by female workers and there was low rate of minor injuries

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