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The Strategic JOURNAL of Business & Change MANAGEMENT
ISSN: 2312-9492 www.strategicjournals.com
Vol. 6, Iss. 3, pp 176 - 188 July 23, 2019. www.strategicjournals.com, ©Strategic Journals

EFFECT OF TECHNOLOGY USE AND LEADERSHIP ON PERFORMANCE OF BOREHOLE DRILLING PROJECTS IN MACHAKOS COUNTY

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Accepted: July 4, 2019

ABSTRACT

This study focused on the effects of technology use and leadership on borehole drilling projects in Kenya with specific reference to Machakos County. Borehole drilling had been established to be successful if competent committee overseeing the operations was in place. The study would be of importance to the management of Machakos county government, other counties and researchers. The researcher faced the challenge of confidentiality. The study used descriptive research design because it dealt with the aggregate of all responses using descriptive statistics such as mode, percentages, mean and frequency distribution through self administered questionnaires and stratified random sampling procedure to select the sample that represented the entire population. The stratified random sampling was used because the population was heterogeneous. The researcher targeted 198 respondents from the three levels of management of the Machakos County and a sample size of 99 respondents. Questionnaire administration was the main method of data collection. The results were analyzed by use of both qualitative and quantitative techniques. Results were analyzed qualitatively by data being corrected, coded and narrative explanations given. Quantitative data was analyzed quantitatively by use of tables and charts for easy interpretation. The study concluded that technology use and leadership affected committee competency in performance of borehole drilling projects. It was concluded that the overall borehole drilling operation and decision making strategies depended on various tools of information technology to improve drilling process. Committee in drilling projects was mandated to oversee all the operation of the project to ensure maximum utilization of time and resources. The study recommended that for drilling performance the committee should carry along with the modern technology in all the drilling process and ensure that, it adopts the best leadership style to make better decisions and strategies towards borehole drilling projects.

Key Words: *Technology, Leadership, Borehole Drilling Projects*

CITATION: Makau, E. K. (2019). Effect of technology use and leadership on performance of borehole drilling projects in Machakos County. *The Strategic Journal of Business & Change Management,* 6 (3), 176 – 188.

INTRODUCTION

Flammbot (2004) established that, for effectiveness in a committee competency it must develop a strategy for maximizing their potential. Doing so will allow a company to deliver value to its customers based on a sustainable competitive advantage. These enhanced proficiencies should represent an organization's collective learning and the ways in which it aligns diverse talent sets and technologies in order to establish competitive differentiation in borehole drilling. A committee can develop core a working environment by coordinating various stakeholders groups in order to deliver an end product or service to the marketplace (County). In doing so, county government should isolate key abilities and organizational strengths; ensure they're developing unique capabilities that customers value; invest in line with those priorities; create a road map that establishes goals for building additional competences; and consider outsourcing or other vendor-managed arrangements to access core competencies that might not be available within the organization.

A research done in Russia established that, the effect of the drilling committee on the borehole drilling projects was positive on the performance. In 2005, the selected committee implemented a workflow that ensured drilling performance limiters were identified, redesigned, and extended continuously. The use of mechanical specific energy surveillance to address bit limiters and dysfunction was resolved. They also established additional practices that were developed to extend the non-bit performance limiters, particularly those related to borehole quality.

They identified over 40 non-bit performance limiters and redesigned globally. While these are diverse, those with the greatest global impact were found to be tied directly to borehole quality. Consequently, in 2008 the performance management workflow was modified to increase awareness of borehole quality as a performance limiter. The result was that acceptable borehole quality became defined as that which would not limit footage per day. Quality is now redesigned to the "economic limit of performance" in the given interval. The economic limit of performance is a significantly higher standard than the common industry objective for borehole quality, which is to achieve low trouble time and run casing successfully as outlined by Wellis (2009).

Dupriest (2006) indicated that, performance management (PM) tools in all drilling projects organizers (committee) tend to share a core process on the project sustainability, which is the basic plan-do-analyze cycle. This is seen in important early works like the process used by the industry to optimize hydraulics to the "technical limit" workflow each reflects the intuitive process through which progress is made in any endeavour, which is to identify an issue, make changes to address it, and then repeat the process based on the results. While the fundamental cycle is the same, the detailed workflows differ, and probably should. To be effective, a performance management process designed by the committee must be consistent with a variety of factors, such as the organization's risk management culture, its technical resource base, the availability of internal training resources, and the complexity and diversity of its operations. Use of Fast Drill Process (FDP) is geared to ensure performance of the drilling. Other details may be uniquely tailored to the operator's own strengths, well mix, or operating environment.

Machakos county government was under the leadership of the visionary, youthful and energetic Governor, Dr. Alfred Mutua who had set pace in county governance and was the first to constitute his cabinet. It was also the first county to hold investors conferences that saw investors from different parts of the world participate in the multi sector event and identify areas of investment. By day two of the conference, Ksh.56.3 billion had already pledged.

With all these developments being undertaken within a very short period of the county government’s existence, it had truly won the hearts and minds of many and it was regarded as the trend

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setter in county governance. Bore hole drilling had been embraced as the new paradigm of solving the water problem once and for all in the county, since drought affected the entire county. The county government was determined to ensure each of the 300,000 households in Machakos County had access to water through bore hole drilling projects.

Statement of the Problem

The effect of committee competency on projects is of great importance on performance of projects. Competent committee skills on borehole drilling projects implementation had helped improve the success of service delivery to citizens. Most projects had had a long history of failure due to the impact of expertise of the project committee. For over a long period, there had been major challenges to the project committees in ensuring full implementation of all drilling processes.

In recent years of the devolved governance, there had been several committees formed in Machakos County to oversee the implementation of several projects. The competency of the committee had paused a great challenge as most of the members were accused of unethical practices through unclear procedures of implementing projects and procurement problems resulting to lack of trust by the public due to lack of transparency. This created a major problem which needs to be addressed to ensure committee members were competent enough and effective to carry out their designated mandate of delivering to the public interest.

Modern Technology had not been embraced by the committee to help in improving the drilling work and other activities like keeping project data. Poor committee leadership had marred many projects as they became more centred on financial self-gain. This resulted to disagreements and decreasing projects performance and viability.

There had been several studies conducted on factors determining performance of borehole drilling. However, there was no known extensive study that had been done on effects of technology use and leadership on performance of borehole drilling hence a knowledge gap. This study sought to bridge this gap by determining effects of technology use and leadership on performance of borehole drilling projects in Kenya by doing a case study of Machakos County.

Objectives of the study

The objective of this study was to examine the effect of technology use and leadership on performance of borehole drilling in Machakos County.

LITERATURE REVIEW

Review of Theoretical Literature

Committee Leadership Theory

Sox, (2001) established a theory on the committee effectiveness on their role in the oversight of projects. Sox states, that good corporate governance in committee is the ability to improve boards and their committees to manage effectively and in the best interest of shareholders, whose trust and confidence is gained. Evidence from studies suggests that, a committee which is sizable in number meet more frequently is effective in their monitoring role. In the same way, committee's competency with more members is obligated to have a higher oversight function. The issues of both committee corporate governance and competency have been receiving a tremendous concern from government and private entities. The integrity of committee should be questioned in case of failure to oversee its mandate. DeFond and Francis (2005) claim that, in most cases shareholders depend on the ability of committee to monitor the independence of the management. Therefore, the responsibility lays on the effectiveness and competency of board and its committee.

Shared Leadership Theory

Shared leadership theory suggests that leadership in committees develops throughout a team's lifespan as the team dynamic evolves based on inputs, processes and outcomes. As the culture of a committee team is formed, reciprocal patterns of interaction emerge and reinforce relationships

between members. The objective of this style is to utilize individuals' talents, skills and knowledge in group effort to achieve organizational goals. Shared leadership results in emergence of team assets and enhanced knowledge, which is further utilized for the development of any project the entity is undertaking.

Empirical Review

Information Technology

Bruce, (2008) defined Information technology as making usage and knowledge of tools, machines, techniques, crafts system or methods of organization in order to solve a problem or perform a specific function. Information technology has affected the society and its surroundings in a number of ways. In many organizations technology has helped develop more advanced economies including today's global economy.

Performance of borehole drilling projects has been made easy if effective committee team is able to administer the modern technology in drilling. Weil and Holden (2000), established that, if technology is used in drilling, employees will be well empowered to spend the employers time wisely for the overall benefit of the organization. Where there is use of information systems the roles are clearly defined. The system administrator will manage all the services of the project where the monitoring systems are well connected and the employees will be motivated and have a sense of belonging to the organization through job satisfaction.

Committees which have sourced and implemented recent technology in drilling have increased efficiency and service delivery to their clients. Such borehole stability technology includes chemical as well as mechanical methods to maintain a stable borehole, both during and after drilling. Most borehole stability and drilling fluids-related problems can be handled with present technology in relatively easy, well-defined environments, provided stringent quality control measures are maintained. Nevertheless, severe, complex drilling situations and formations still present serious challenges to economically viable drilling. Drilling fluids range from water to oil to complex chemical systems with properties designed for specific site conditions to aid the drilling process. Detournay, (2007) outlined drilling fluids to include the following functions which can be achieved through use of modern technology: carrying cuttings out of the hole, cleaning the bit, cooling and lubricating the bit, providing buoyancy to the drill string, controlling formation fluid pressures, preventing formation damage, and providing borehole support and chemical stabilization.

Haimson and Herrick (2008) indicated of the borehole drilling failures are an increasing concern due to explosion in drilling horizontal wells in unique geological environments (e.g., Hanford site) as well as drilling difficult hydrocarbon reservoirs. Difficult reservoirs include unconsolidated or poorly consolidated sediments, shale's, complex reservoir geometries, naturally fractured reservoirs, and over pressured reservoirs. This had led to greater research emphasis related to the stability of circular rock openings by the international Society for Rock Mechanics, (1987). In areas where there are very hard rocks or water needs to be collected from a greater depth, organizing partners use technologies such as boreholes hydraulic pumps and rock drills to cut through the earth to depths of hundred meters or more. Water is pumped to the surface either by hand or, where there is a high demand, using diesel or electric engines. The water is usually stored in large tanks before being piped to tap stands in surrounding villages.

Leadership

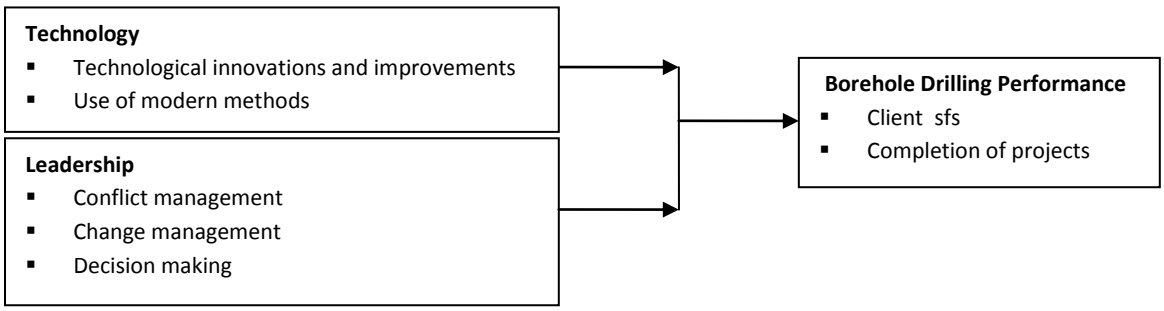
Schulz (2007) described leadership as a process of social influence in which a person can enlist the aid and support of others in the accomplishment of a common task to achieve "goal alignment" in an organization. Leaders should clearly communicate the strategic business objectives across the entire company in terms of human force management. With everyone working together toward the same objectives, a company can execute a strategy faster, with more flexibility and adaptability. Essentially,

goal alignment strengthens leadership and creates organizational agility by allowing managers to influence their followers.

According to Levine, (2007) leaders who implement the best management processes are more prepared than their competitors to compete in the global economy and capitalize quickly on new opportunities. True success is realized when committees do more than adapt to long-term trends; they must be able to anticipate getting new opportunities before the rest of the market. A strategic talent management plan allows them to be become "proactive" versus "reactive" to fill the critical talent management needs and address project and industry changes promptly; Identify essential skills to be developed in all employees; minimize training costs by focusing on key development areas and improve the recruiting process by identifying high-quality candidates using job descriptions based upon the expertise of high performing employees holding uniquely valued industry competencies.

According to Duke, (2000) project managers as leaders are trained to control the three key project parameters of scope, schedule and budget, and to understand the nuances of team dynamics. Some would say that we are fanatic about driving productivity and meeting schedule commitments. Other project managers embody all that, but they have ability to spot red flags, they are zealous communicators, and well respected by peers and business leads. They demonstrate an ability to balance what needs to be done, as driven from the plan, with what should be done to meet the business need, even if it is counter intuitive to the project roadmap. These are the project managers who in still confidence, who are invited to participate in business discussions, and asked to weigh in at the project inception stage.

Conceptual Framework



Independent Variables **Dependent Variables**

Figure 1: Conceptual Framework

Source: Author (2015)

METHODOLOGY

The descriptive research design was used to collect data from the respondents. According to Mugenda and Mugenda (1999), descriptive research is the process of collecting information with the objective of describing a phenomenon. The target population of this study was the management and operations staff of Machakos County, which consisted of 198 members. Sample size is a representative of the target population which was 99 respondents. A sample of 50% respondents was considered to provide a general view on the effect of technology use and leadership on performance of borehole drilling projects. The sample units were the management and operations staff of Machakos county government. Data was collected through use of structured questionnaires technique. The data collected was analyzed mainly by use of descriptive statistics which included: Mean, frequency distributions and chi square test. The results were then presented in form of a well interpreted and easy to understand tables, graphs, charts and percentages.

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FINDINGS

Technology

Technology used is geared to achieving performance

The study sought to rate effect of technology use on performance. The findings were presented in figure 2 below.

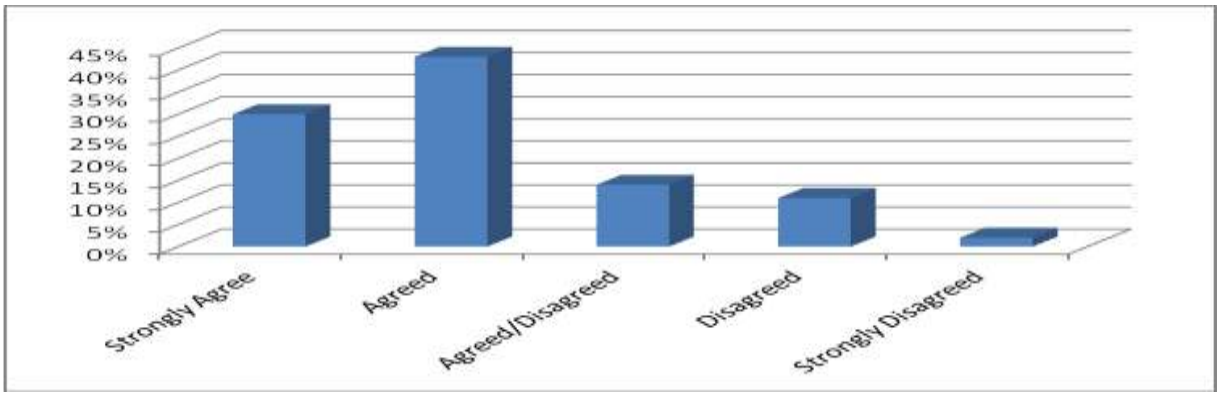

Figure 2: Technology used is geared to achieving performance
Source: Author (2015)

From the analysis in the figure 2 above the showed whether technology used is geared to achieving drilling performance, 30% strongly agreed to this fact, 43% agreed, 14% neither agreed nor disagreed, 11% disagreed that the technology is geared on performance improvement while 2% strongly disagreed. This implies that, technology adoption in drilling borehole purposely improves performance and committee should ensure use modern technology in borehole drilling. Performance of borehole drilling projects has been made easy if effective committee team is able to administer the modern technology in drilling according to Weil and Holden (2000).

Technology is outsourced for performance improvement

Figure 3 indicated if technology was outsourced for performance improvement.

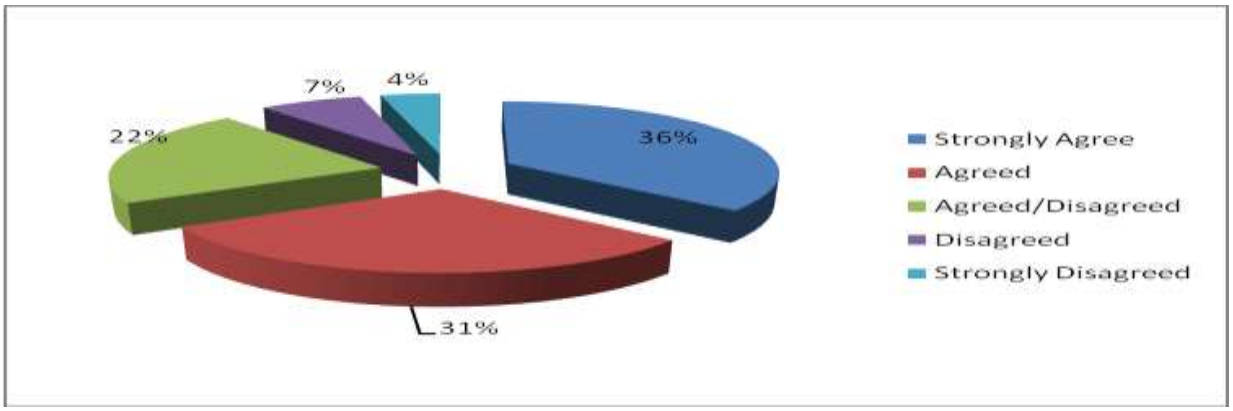

Figure 3: Technology is outsourced for performance improvement
Source: Author (2015)

The figure 3 above showed that, the county committee outsourced technology to improve drilling performance and findings were; 36% strongly agreed that its outsourced for that purpose, 31% agreed, 22% could not agree or disagree, 7% disagreed while 4% strongly disagreed. This clearly implied that, committees should outsource the technology for better drilling operations. Committees which had sourced and implemented recent technology in drilling had increased efficiency and service delivery to their client as stated by Detournay, (2007).

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Employees are aware of modern technology in drilling

The study further sought to determine whether employees were aware of modern technology in drilling. The findings were shown in figure 4.

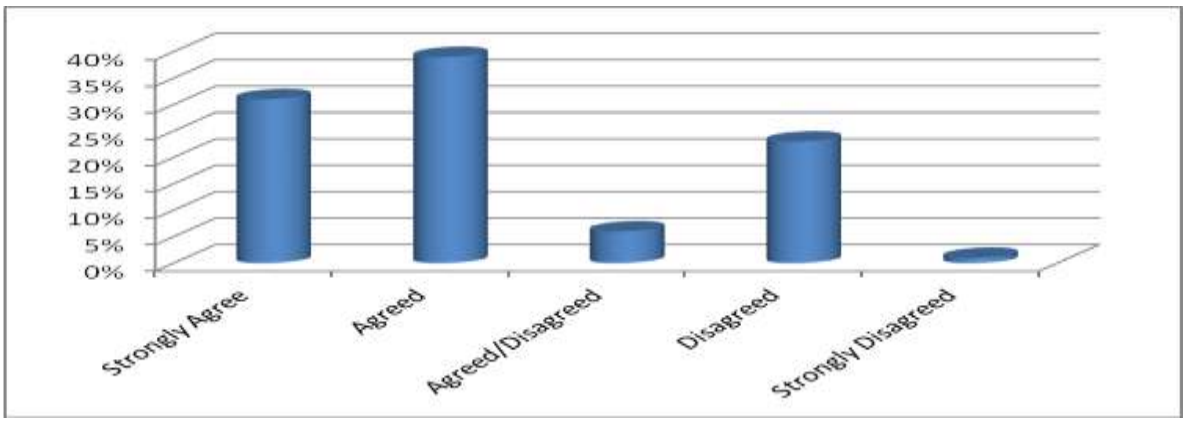

Figure 4: Employees are aware of modern technology in drilling
Source: Author (2015)

Figure 4 above showed whether employees were aware of modern technology in drilling and that, 31% strongly agreed that, employees are aware of modern technology in drilling,39% agreed,6% did not agree or disagree, 23% disagreed while 1% strongly disagreed. The study therefore observed that most of employees were aware of modern technology in drilling and still a few were unaware hence, the need for further exposure to modern drilling technology. Bruce (2005) stated that, the technology used in drilling should be made known to all employees to help in improving the drilling performance.

Employees are acquinted to drilling technology

Figure 5 below summarized the findings on whether employees were acquintedto drilling technology.

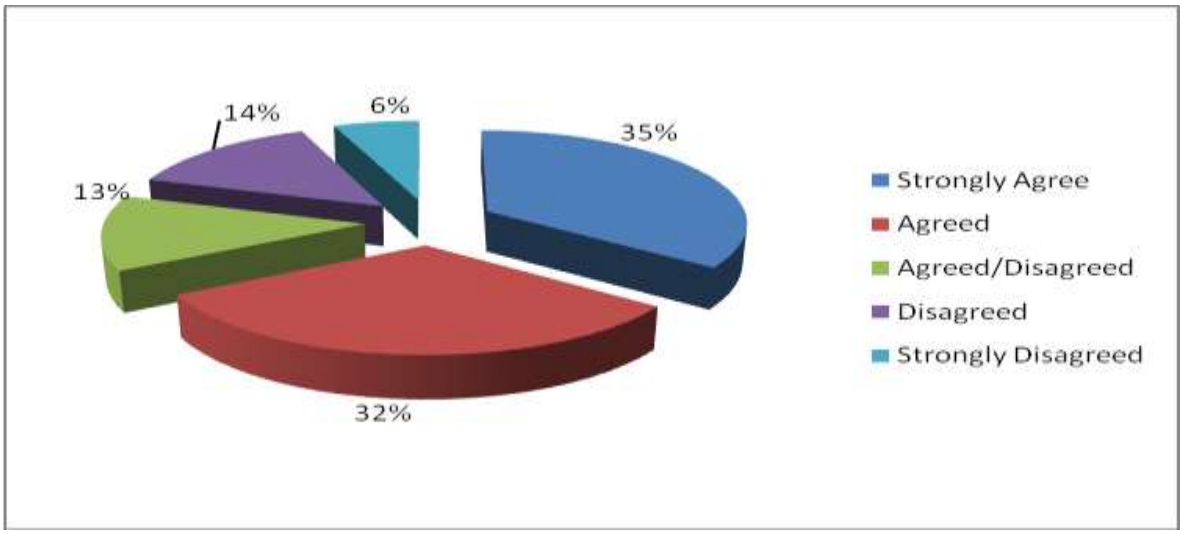

Figure 5: Employees are acquinted to drilling technology
Source: Author(2015)

The data analysis in the figure 5 above showed whether employees were acquitted with drilling technology and the findings were; 35% strongly agreed, 32%agreed, 13% could not agree or disagree on the fact, 14% disagreed while 6% strongly disagreed that, they were acquainted with drilling technology. This implied that, majority of employees were acquainted with drilling technology and this ensured efficiency in

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performance of borehole drilling. Weil and Holden (2000), established that, if technology was used in drilling, employees will be well empowered to spend the employers time wisely for the overall benefit of the organization.

Technology used has reduced the workload

The study further sought to find out if technology used had reduced the work load as shown in figure 6.

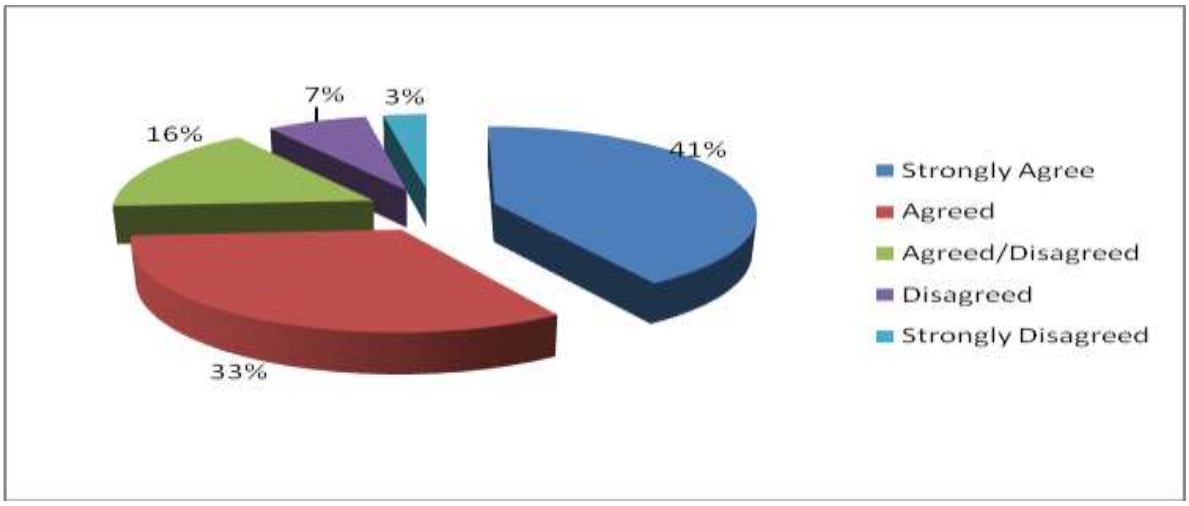

Figure 6: Technology used has reduced work load
Source: Author(2015)

The data analysis in the figure 6 above showed that, technology used reduced workload and that, 41% strongly agreed that technology reduced workload, 33%agreed, 16% could not agree or disagree on the fact, 7% disagreed while 3% strongly disagreed the fact that technology reduces workload. This implied that, technology was of much importance in borehole drilling and thus helped improve operational efficiency. Goodman (2003) established that, use of modern technology to keep the projects continuity information is very crucial than the traditional ways and this reduces work load.

Leadership

Committee has better leadership to plan and improve drilling

Figure 7 below indicated whether committee had better leadership to plan and improve drilling.

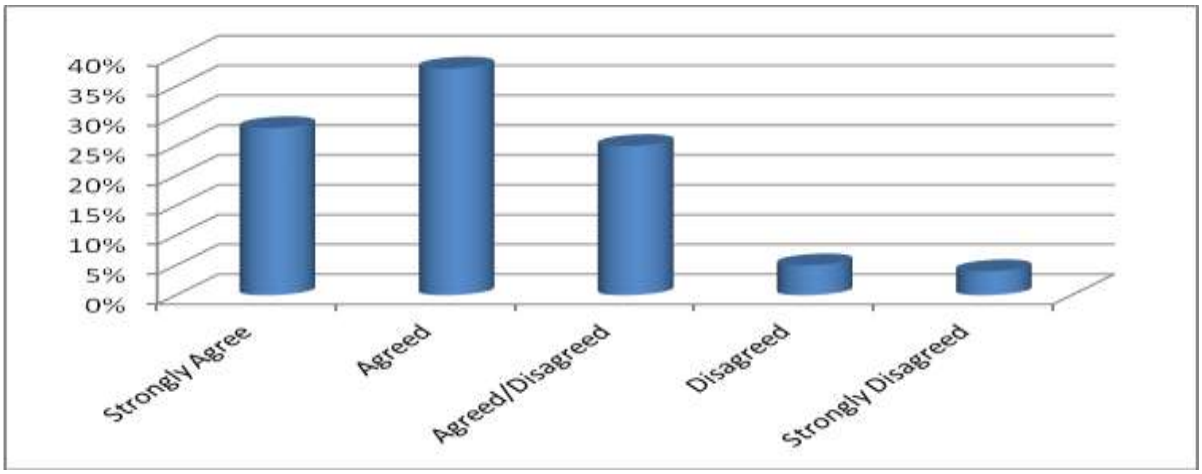

Figure 7: Committee has better leadership to plan and improve drilling
Source: Author(2015)

The figure 7 showed whether the committee had better leadership to improve borehole drilling, 28% strongly agreed that there was better and competent leadership, 38% agreed, 25% did not

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agree or disagree, 5% disagreed while 4% strongly disagreed. This implied that, the committee should be competent enough to provide better leadership and direction toward drilling projects. Dickenson (2007) established that, a competent committee is able to promote project performance to satisfy the need of initiating such a project. Building vision and nurturing collaboration are prerequisites for project success.

Committee competency helps in handling change management.

The study also evaluated if committee competency helped in handling change management. The findings were indicated in figure 8.

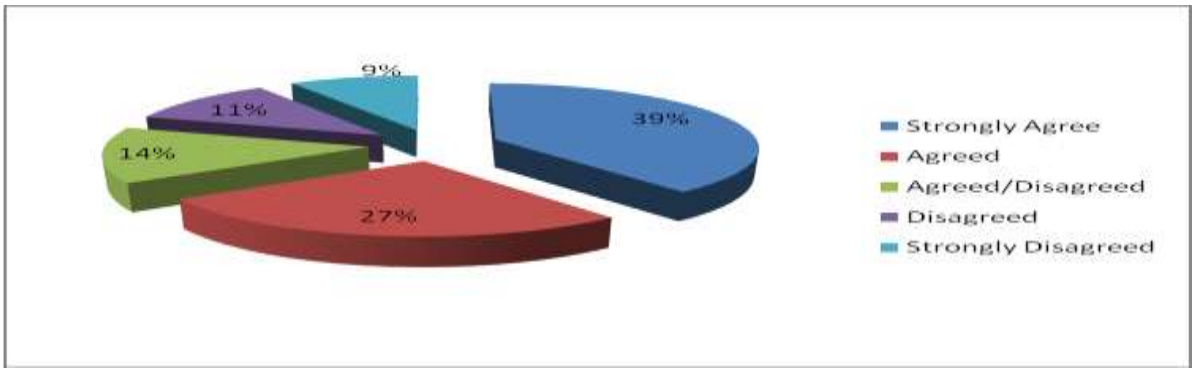

Figure 8: Committee competency helps in handling change management.
Source: Author(2015)

Figure 8 showed how committee competency helped in handling change management in the drilling projects and the findings were; 39% strongly agreed, 27% agreed, 14% did not agree or disagree, 11% disagreed while 9% strongly disagreed. This therefore implied that, committee were well equipped and prepared to handle any change in the course of drilling operations. Graffins (2006) established that, if a committee wishes to change the way it operates, it must turn to its people to make it happen. People (employees) are the agents of projects performance change. Creating business plans and strategies are important, but they are only tools to guide the actions of people because borehole drilling can potentially require significant operational changes throughout an organization.

Committee Leadership deals with conflict resolution

Further, the study sought to determine whether committee dealt with conflict resolution and the findings were shown in figure 9.

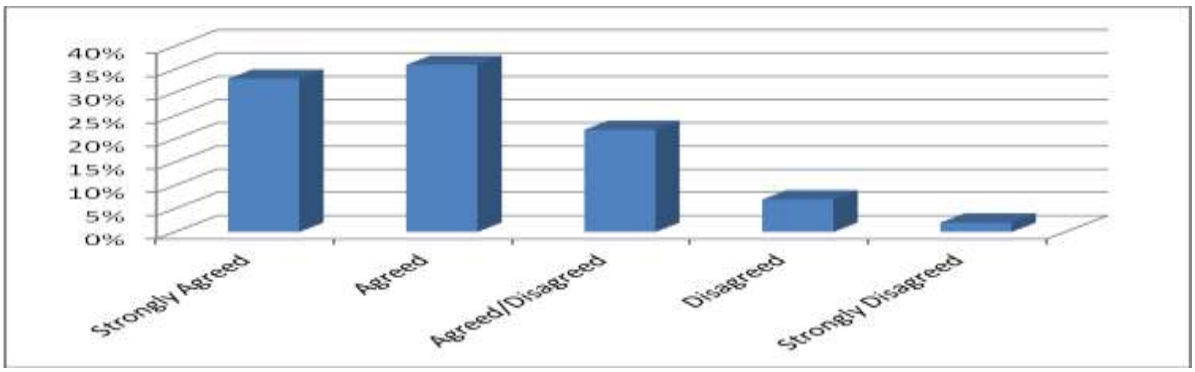

Figure 9: Committee Leadership deals with conflict resolution.
Source: Author(2015)

The data in the figure 9 showed how the committee leaders dealt with different conflict resolution methods and the findings were; 33% strongly agreed that leaders use conflict resolution methods to solve disagreements among employees, 36% agreed, 22% did not agree or disagree, 7%

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disagreed while 2% strongly disagreed. This implied that, conflict management is a role of the leadership and the committee has a duty to ensure no disagreement among employees and if any they are amicably resolved. Michael, (2005) stated that, leadership in action means an ability to take out of crisis situation, extract certainty out of uncertainty, set goals and driving change to ensure that the momentum is not lost, ensure conflict resolution is achieved among employees.

Leadership helps subordinates solve operational problems

Lastly, the study sought to determine if leadership helps subordinates solve operational problems. The findings are shown in figure 10.

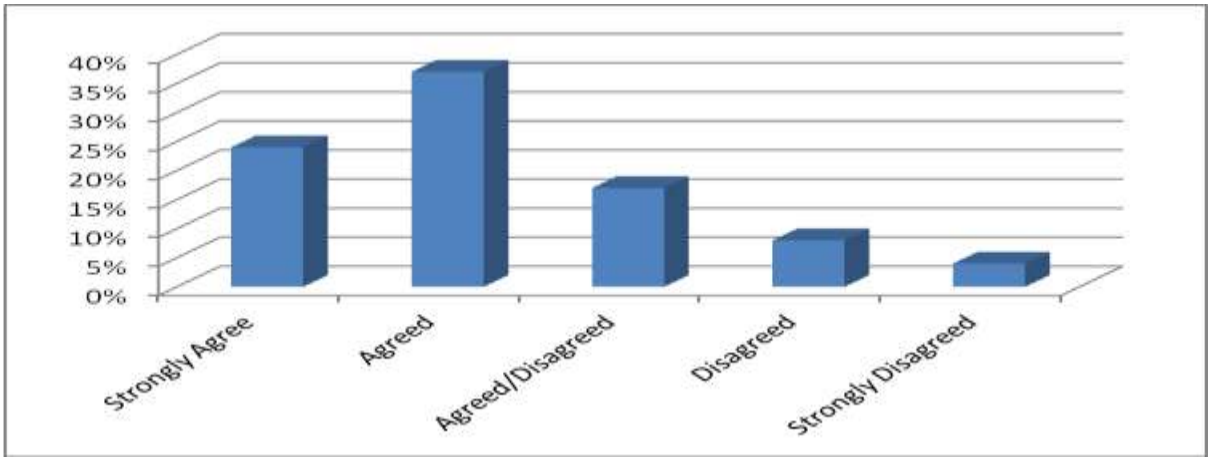

Figure 10: Leadership helps subordinates solve operational problems
Source:Author(2015)

Figure 10 above showed that out of the total respondents who strongly agreed that leadership in competent committee and helped subordinates solve operational problems where 24%, 37% agreed, 17% neither agreed nor disagreed. 18% disagreed that leadership helped the subordinates, while 4% strongly disagreed. This implied that a competent committee in leadership was ready to help subordinates in operational problems which they cannot handle. Committee should provide directional plan to all employees to ensure efficiency is achieved. This is ensured by helping all the employees solve different operational challenges as stated by Wallace, (2004).

CONCLUSIONS

The study concluded that borehole drilling projects cannot overlook the dynamic environment in information technology. The overall borehole drilling operation like determination of the depth and decision making strategies depend on various tools of information technology. The performance of any drilling project is achieved through ICT and involves the active participation of employees with up to date technological knowhow.

The study made conclusion that committee leadership towards drilling project activities is mandated to oversee all the operation of the project to ensure maximum utilization of time and resources. Only drilling projects with better and compatible committee who are prepared for change will survive in the market and deliver to the county governments.

RECOMMENDATIONS

The study recommended that there was need for any committee mandated to oversee any drilling project to carry along with the modern technology in all the drilling process and use of better technology to improve drilling performance. They should emphasize on use of information communication technology which allows efficient operation in the dynamic environment to give best output in the drilling activity.

The study recommended that for competent committee leadership they should ensure that it adopts the best leadership style such that it should give better drilling decisions and strategies towards borehole drilling operation. Through that Machakos County will be able to have the best idea forward.

Suggestions for Further Studies

The research study was not able to cover all aspects of effects of committee competency on performance of borehole drilling projects. Therefore more study should be done on the same. Further research should be done on how to ensure that drilling of borehole projects is done perfectly and efficiently to improve performance and living standards of citizens.

For better performance of borehole drilling, the county should adhere to hiring well qualified employees and provide continuous training programs so as to ensure that, the work force is equipped with technical knowhow on drilling process and also employing modern technology so as to ensure the main goal in borehole drilling is achieved. This will ensure that, drilling projects are carried out within the stipulated time, that they are up to set standards and the allocated resources are efficient for completion of given borehole drilling projects.

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