

VIRTUAL PROJECT MANAGEMENT IN NIGERIA'S CONSTRUCTION INDUSTRY

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Abstract

As communication technologies improve, virtual teams are now a reality in today's workplace. The Corona Virus (Covid-19) pandemic has future pushed the need for virtual project management. The new trend has allowed teams from different parts of the world to participate in project tasks and collaborate through internet-connected computers. They can be considered as remote team members or virtual team workers. Due to this fact, these members must work effectively and add value to the project using technology. This research examined the Information Communication Technology (ICT) application in the Nigerian Construction Industry, processes used by online project teams, and their management. A comprehensive questionnaire was designed and administered to the respondents (construction industry professionals) for data collection and analysis. The research findings show that although there are more indigenously owned construction companies in Nigeria than foreign-owned companies, the later tend to use ICT more; the factors contributing to this imbalance and possible remedies are discussed.

Keywords: Virtual Project Management, Virtual Teams, Remote teams, Nigeria Construction Industry, Information Communication Technology (ICT)

1. Introduction

[1] cited that Krill, Terry & Juell, 1997, recommended a similar definition: "A virtual project is a collaborative effort towards a specific goal or accomplishment which is based on 'collective yet remote' performance." In the old days (as late as the 1980s), whenever a development project was initiated, it was necessary to form a project team at a centralized geographical location in order to expedite communications between project members. Currently, available ICT technology permits greater flexibility in allowing workers to work just about anywhere; at home, some could be off-site operating consultants, some overseas. Thanks to such things as collaborative software, the Internet, cell phones, etc. Even though electronic communication is useful for exchanging design documents/files and instant messaging, interpersonal relationships are often sacrificed, and this is a vital part of any project [2]. A company in an undesirable location may desperately be in need to recruit employees who have the right skills but do not want to move. Most times, companies use virtual (blended, mix, online, remote) project teams to unify employees who were added through mergers and acquisitions [3]. Most companies are off-shoring projects in order to reduce overhead-cost and save money; when a company begins growing, it is impractical to relocate numerous employees who become part of the company. As a result, instead, certain departments simply became remote teams [4], [5]. In order to capitalize on the talent within an organization, it is good to use technology and e-business practices. [6] Cited that, ICT is a vital tool in assisting the construction industry in coping with the increasing complexity of its product and services as well as the increasing demands of clients and regulators, and in enhancing construction productivity [7], as illustrated in fig. 1.



Fig. 1: Virtual project management process

This research is based on the application level of Information Communication Technology and the communication problems in managing virtual project teams in construction companies. The objective of this study is as follows: To determine the cost reason of a virtual project team in the construction industry, to ascertain techniques used in managing a blended project team, to establish regular communication issues faced by the virtual project team, discover issues and challenges in managing projects when virtual teams are used and how technology tools and software can help manage the challenges.

The research is of significant importance to construction industry's employees who collaborate physically or virtually with their team members, also for employees who need to work without worry of travel time and its expenses and employees safety as a precautionary measure to avoid the spread of Covid-19.

The research covers a review of the level of communication (Information Communication Technology (ICT)) adoptions, applications, and management of remote teams in the Nigerian Construction Industry.

1.1 information communication technology application in the global construction industry

Subtitle of introduction

The role of Information Communication Technology is changing the way and the speed of acquiring information, knowledge, the impact on education and learning across societies and sectors globally. According to [8], the visible impact of Information Communication Technology is undeniable, as some countries particularly in East Asia, China, have used electronics as a basis of significant wealth creation. Some examples of ICT supported technology in construction are;

Global ICT networks, document management, project and process models, data warehouses, national construction information systems for information processing and management.

E-mail, video, conferences, virtual reality, graphical user-interfaces, indirect contact using computers, robotics for interaction facilities.

Database lookup, internet search, subscriptions to customized content, for time-saving. However, this study will consider the supported ICT technologies for the construction industry [9].

Construction software packages provide support for a broad range of computer-aided design and drafting, building visualization, design appraisal, project management, information storage and retrieval, cost estimation, structural analysis, on-site management, facilities management, etc. One example of an evolving technology that can adapt and promote the globalization of construction project management is that of Building Information Modeling systems (BIM) that allow architects, engineers, managers all over the world to concurrently view and change plans/designs in "real-time in."

1.2 Application of information communication technology in the Nigerian construction industry

The construction industry is made up of an organized formal sector and an unorganized informal sector. The formal sector comprises foreign and indigenous companies, which are classified into small, medium, and large scale according to their level of capitalization and annual turnover. [10] said that the few large firms (mostly foreign), which constitutes just about 5% of the total number of contractors in the formal sector, control about 76% to 95% of the construction market, giving the small firms just about 5% to 24% share of the market [10]. Studies to investigate the IT situation in the Nigerian construction industry showed that the factors influencing the use of Information Communication Technology were grouped into internal and external factors. The internal factors were organization characteristics (type of business, size, ownership, and age of the firm) and management characteristics (academic qualifications, years of professional experience and computer literacy, form of computer training, level of computer literacy, and the attitudes of CEO/senior managers to Information Communication Technology). The external factors were classified into general political, economic, and social factors (including infrastructures such as power supply and the availability/affordability of Information Communication Technology software and hardware), and specific factors such as customer/client and supplier demands as well as the influence of competition and technological demands. According to [10], [11] the 2002 global Information Communication Technology rankings by the international telecommunications union (ITU) ranked Nigeria 27 among 51 Africa countries and 153 among 178 countries in the world. Following these rankings, [10] has reported that the construction industry in Nigeria has during the past few years increased its use of Information Communication Technology. However, very little is known about the impact of the technology on the industry and the prospects for its widespread penetration of the industry. This is because very few reports exist of research in Information Communication Technology in developing countries, including Nigeria.

In addition, the Corona Virus (Covid-19) pandemic has made national, state, and local governments introduced new construction laws/guidelines to control the spread of the virus on construction sites. This move has increased the use of ICT tools to conduct project activities [12].

1.3 Effective management of virtual teams

A traditional team is defined as a social group of collocated and interdependent individuals in their tasks. They undertake and coordinate their activities to achieve common goals and share responsibility for outcomes. Remote teams have the same goals and objectives as traditional teams. Still, they operate across time, geographical locations, and organizational boundaries linked by communication technologies [13], [14].

Virtual Teams are faced with challenges inherent to their dispersed and often impersonal nature. Ineffective communication especially related to the nonverbal component of messages, poor management of multiple time zones, and biases of language, culture, and tribe, could lead to discrimination amongst team members. Other challenges are security concerns in the online environment, lack of opportunity to settle and discuss conflicts and problems instantly face to face, difficulties in monitoring and performance management, requisition of skilled professionals only. Remote teams are mostly faced with poor face-to-face interactions, and the introduction of video calls is advised. Since virtual teams must maintain frequent communication, there is a need to choose affordable, convenient, innovative ICT software [15]. Communication is the key to keeping team members, managers, and stakeholders informed and on track to pursue the project objectives, as well as to identifying issues, risks, misunderstandings, and all other challenges to project completion [16]. [17] cited that effective communication is a critical element of team effectiveness, both in traditional and virtual teams. Successful communication helps generate respect, trust, and motivation in team members.

2. Research Methodology

The research approach for this project entailed a survey for the purpose of generating data that was analyzed quantitatively, the level of Information Communication Technology application and from two perspectives working in, and managing online teams using a framework that integrates virtual team dynamics and project management practices. The researchers used questionnaires and a web-based survey that were administered online. The web-based survey was chosen for the following reasons:

Faster; because the information is being gathered automatically, as it does not require waiting for answered hard copy questionnaires to be returned physically. Cheaper; using online questionnaires reduces research costs. It does not require allocating time and resources to enter the information into a database.

The margin of error is greatly reduced with online surveys because participants enter their responses directly into the system. More selective; with an online survey, you can pre-screen participants and allow only those who match your target profile to complete the survey [18], [19].

2.1. Quantitative research and sampling

The data collected are analyzed and interpreted using methods of analysis that reflect the complexity, detail, and context of the data regarding the uniqueness of the study. This study applied both quantitative and qualitative components. It is believed that the use of quantitative and qualitative research provides a better understanding and enhances the overall strength, validity, and reliability of the study [19], [20] & [21].

The mixed-method was used in this study to address these objectives [22], [23] & [24].

- To identify the cost reason of a virtual project team in the construction industry.
- To identify the techniques used in managing a virtual project team.
- To identify regular communication issues faced by the virtual project team.

Discovering issues and challenges in managing projects when virtual teams are used and how tools and software help to cope with them.

2.2. Area of study

This research studied the application level of Information Communication Technology and the communication problems in managing virtual project teams in construction companies in Nigeria. The effort was made for the study to cover construction companies that are domiciled in each of the six geo-political zones.

2.3. Sources of data

The following two types of data were employed to realize the objectives of this study;

Primary Data: These data were derived from the questionnaire, distributed to engineers and managers of various construction companies. It helped to gather valid and reliable information through the response of the respondents. Secondary Data: were collected mainly from a review of published and unpublished materials, including relevant textbooks, journals, and magazines.

2.4. Method of data collection

The data for this study were collected by means of a computerized questionnaire designed by the researcher. The questionnaires were relevant to the primary objectives of the study and were completed by the participants independently. The researcher also explored the topic using a house survey questionnaire. These encouraged respondents to identify what issues were important in their understanding of the research topic and how they expressed their input. A computerized questionnaire gave the participants the feeling of obscurity and encouraged honest responses. It also gave the respondents time to answer the questions asked accurately without pressure.

2.5. Validity and reliability footer

The researcher ensured that the study objectives were achieved by consulting the supervisor of the project and experts in the field (Engineers and managers), during which adjustment and regrouping of the questionnaires formulated by the researcher on the literature based on the objectives were made. The reliability of the questionnaire was established again by presenting it to the experts in the field to ensure that the information gathered from the questionnaire was consistent with the research study.

2.6. Survey design and administration

A well-structured and comprehensive questionnaire and an online survey were designed by the researcher using survey monkey software and were administered to the respondents for data collection and analysis. For authenticity and data integrity, the questionnaire was administered directly to the engineers and managers of the various construction companies.

3. Results and Discussion

The presentation of results from respondents, interpretation of the analyzed data, and summary are discussed here. A questionnaire survey was carried out from February 2017 and January 2018 in Nigeria. Convenience non-random sampling was adopted by choosing participants (construction Engineers and Project Managers) of sample size 150 who are convenient for the study. Only 56 responses were received, with a total response rate of 38.7%. This response rate is considered adequate as, according to [25], [26], a response rate of 30% is good enough in construction studies as cited by [27]. The link to the survey in the survey monkey software used by the research to carry out the data collection and analysis was <https://www.surveymonkey.com/results/SM-5PGNWG838/>

3.1 Results and analysis

The results of the respondents on the utilization of ICT and mixed team management are presented below:

3.1.1 Distribution of respondents by ownership status of the firm in percentage

Results and interpretation: The distribution of respondents by the ownership status of their employer in which 12 respondents (21%) were foreign construction employees while the 44 respondents (79%) were indigenous construction workers. The chart reveals that construction industries in Nigeria are dominated by indigenous industries and which is very promising. When a country promotes indigenous industry, it helps the nation build a strong, stable, and diversified economy in the global market.

3.1.2 Educational qualification of respondents

Results and interpretation: The distribution of respondents by educational qualification in which 4 respondents (7%) were Ph.D. degree holders, 19 (34%) were Master degree holders, 19 (34%) were Bachelor's degree holders, 6 (11%) were HND degree holders, 7 (13%) did not disclose, while 1 (2%) was a Postgraduate diploma holder. This implies that the researcher ensured that only qualified experts (Ph.D., Masters, Bachelor's degree, and HND) in the field of study took the survey to ensure a high quality of data. For details, refer to table 1 to show the pool of professionals who took the survey.

Table 1 Respondent Profile

ANSWER CHOICES	PERCENTAGE	FREQUENCY
Project manager (1)	19%	11
Project engineer (2)	4%	2
Civil engineer (3)	18%	10
Site engineer (4)	11%	6
Construction manager (5)	2%	1
Consulting engineer (6)	7%	4
Mechanical engineer (7)	9%	5
Project supervisor (8)	11%	6
Structural engineer (9)	7%	4
Quantity surveyor (10)	4%	2
Other (please specify) (11) Leadman, Electrical Engineer, Head of works and maintenance, construction manager, process Engineer.	11%	6

TOTAL		57
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This Source: Primary data

3.1.3 Physical contact (how often team members met face to face)

Results and Interpretation: the Survey showed that 3 (6%) never met with team members when working in a blended team, due to distance, location, security reasons and time, 7 (14%) met at project kick off only, 20 (39%) met weekly. While 21 (41%) met at least once in a month. From the result 41% and 39% claimed to have met with team members weekly and at least once in a month. Meanwhile in real life scenario it is not easy meeting with online team members on a weekly basic, and it is not also cost efficient to meet with team members face to face once in a month. A growing number of effectively managed companies are reluctant to cover the cost of any employee moving or traveling to different locations when there are numerous communication tools to be utilized to save cost and time. (Reduces risk of kidnapping).

The Corona Virus (Covid-19) pandemic has introduced new construction laws that encourage team members to maintain social / physical distancing on construction site.

3.1.4 Time dedicated to work in virtual teams

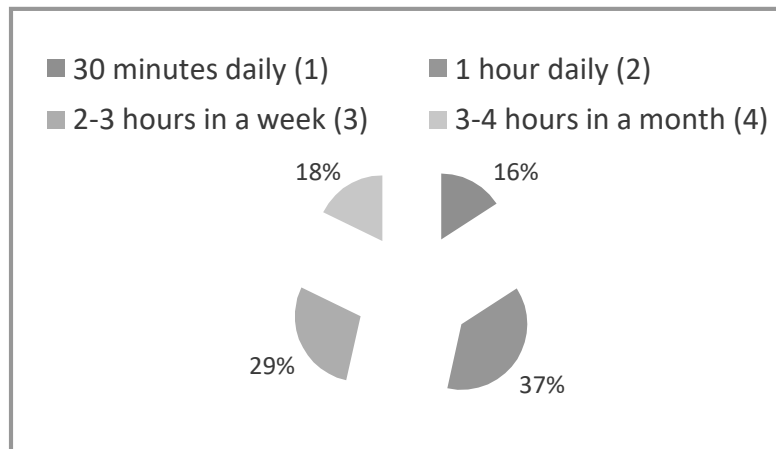


Fig. 2: Time dedicated to working in virtual teams

Interpretation: Fig. 2 above elicited response on how much time was dedicated to work in virtual team. 9 (16%) admitted to have spent 30 minutes daily, 21 (38%) an hour daily, 16 (29%) 2-3 hour in a week, 10 (18%) 3-4 hours in a month. This implies that much time was spent by respondent in communicating with team members. We less content when communicating non-verbally compared to speaking to someone face to face due to poor communication. The inability to communicate effectively can make it impossible to reach an agreement on work progress between team members. But with effective foresight, planning, dedication and hard work, many challenges faced with virtual teams can be mitigated. It is amazing how much can be accomplished in a 30 minute conference call when expectations are set beforehand and every team member is told of what to accomplish in that time frame. Considering that most construction company work for about 8 hours a day, the respondents spent a minimum of 30 minutes a day communicating with virtual teams, over 6% of their time was spent communicating exclusively with virtual teams. A respondent revealed to have spent 3-4 hours daily communicating with team members, which backs up the fact that the findings shows that team members spends much time communicating.

3.1.5 Methods of communication tools utilized by project team members

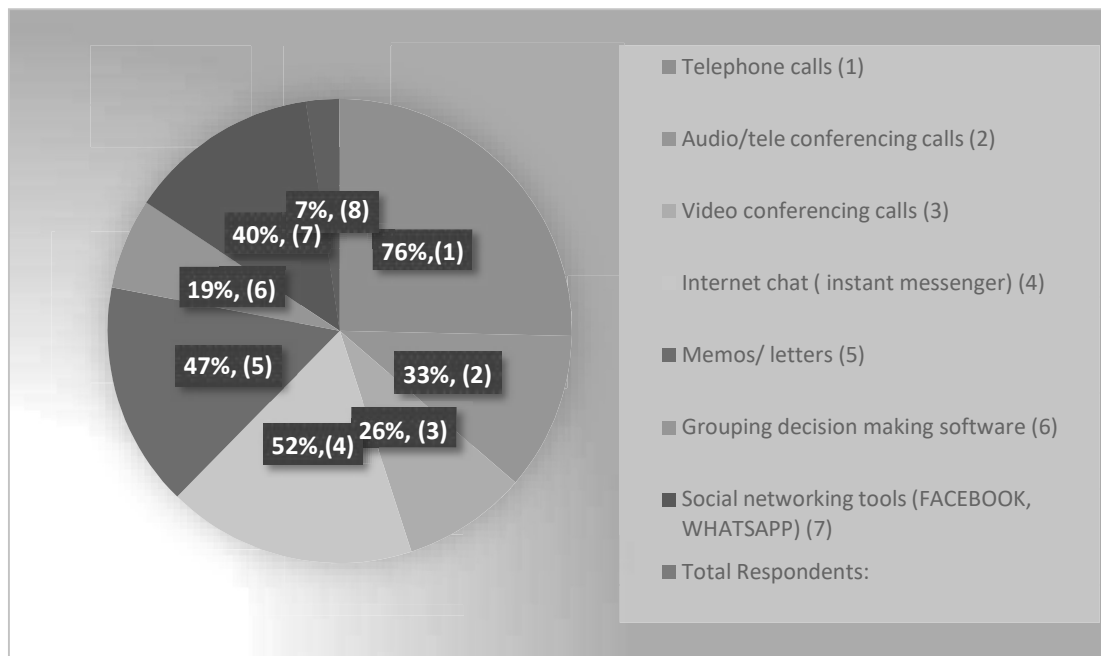


Fig. 3: Methods of communication tools utilized by project team members

Results and Interpretation: Fig. 3 showed that 43 (75%) of respondents used the telephone, 19 (33%) used audio/teleconferencing, 15 (26%) video conferencing calls (Zoom, Go To Meeting, Skype, etc.), 29 (52%) internet chat (instant messenger like Facebook, WhatsApp, Telegram), 26 (46%) memos/letters, 11 (19%) grouping decision making tools, while 4 (7%) indicated using emails and face to face communications. It is not surprising that telephone calls emerged first as the frequently used communicating tool, as it is not complex and does not necessarily require training of the employee, followed by Internet chat, Memos and letters came. Thirdly, this is consistent with international best practices that require important details to be recorded for future purposes, which minimizes possibilities of dispute. The importance of memos (emails) is that it gives the writer enough room to express himself/herself, explain the methods and processes used, and it is a good way of storing and keeping records related to facts.

3.1.6 Members cost of hardware and software as an obstacle to the use of ICT in Nigeria construction industry

Results and Interpretation: The survey showed that 7 (12%) of respondents indicated that the cost of hardware and software is a very weak obstacle to the use of ICT in the Nigeria construction industry, 12 (21%) indicated it as a weak factor, 20 (35%) indicated it as a very strong factor, 10 (18%) indicated it as a strong factor, while 8 (14%) choose Nil. 35% of the respondent indicated that cost of hardware and software has been a great obstacle to the usage of ICT, which is mostly experienced in indigenous industries.

3.1.7 Inadequate/erratic power supply as an obstacle to the use of ICT in the Nigerian construction industry

Results and Interpretation: The survey showed that 4 (7%) of respondents indicated that the cost of inadequate/ erratic power supply is a very weak obstacle to the use of ICT in the Nigeria construction industry, 3 (5%) indicated it as a weak factor, 16 (28%) indicated it as a very strong factor, 14 (25%) indicated it as a strong factor, while 20 (35%) choose Nil. Most companies tend to rely on self-generated power to generate electricity, the ability of the government to establish cheap reliable power supply/ electricity has weakened the determination to implement ICT in the construction industry. Some earlier companies that adopted ICT have experienced a breakdown in working process. For example, ministries, extra-ministerial departments and agencies (MDAs), banks, hospitals, Etc. to power their facilities and equipment to conduct business activities, hence force to use expensive energy alternatives.

3.1.8 Fear of virus attacks as an obstacle to the use of ICT in the Nigerian construction industry

Results and Interpretation: The survey showed that 9 (16%) of respondents indicated that fear of virus attacks is a very weak obstacle to the use of ICT in Nigeria construction industry, 8 (14%) indicated it as a weak factor, 23 (40%) indicated it as a very strong factor, 11 (19%) indicated it as a strong factor, while 6 (11%) choose Nil. There is always fear in the security environment that hinders the implementation of ICT in construction industry. Most companies fear losing confidential document to hackers. Examples of companies that have suffered such crisis include technology giants like Yahoo in 2017, Facebook in 2017 and others in public and private organizations.

3.1.9 Low return on investment as an obstacle to the use of ICT in the Nigerian construction industry

Results and Interpretation: The survey showed that 8 (14%) of respondents indicated that return on investment is a very weak obstacle to the use of ICT in Nigeria construction industry, 12 (21%) indicated it as a weak factor, 18 (32%) indicated it as a very strong factor, 16 (28%) indicated it as a strong factor, while 3 (5%) choose Nil. Majority of 32% believed that low return on investment is an obstacle to the use of ICT in the Nigerian construction industries. This mainly limited to the indigenously owned industries, since they mostly do not have the necessary funds to implement ICT properly, there is always fear of low returns from investment in capital intensive project. The earlier such companies start implementing the usage of ICT in Nigeria the greater the chances of economic growth.

3.1.10 Fear of mass job losses in the industry as an obstacle to the use of ICT in the Nigerian construction industry

Results and Interpretation: 8 (14%) of respondents indicated that fear of mass job losses is a very weak obstacle to the use of ICT in Nigeria construction industry, 13 (23%) indicated it as a weak factor, 13 (23%) indicated it as a very strong factor, 12 (21%) indicated it as a strong factor, while 11 (19%) choose Nil. Most people consider ICT are a job destroyer rather than a job creator, The introduction of new innovations/machines do not always leads to loss of jobs rather they simplify work operations and create job opportunities as it requires trained / skilled operators.

3.1.11 Ownership (foreign or indigenous) as an obstacle to the use of ICT in the Nigerian construction industry

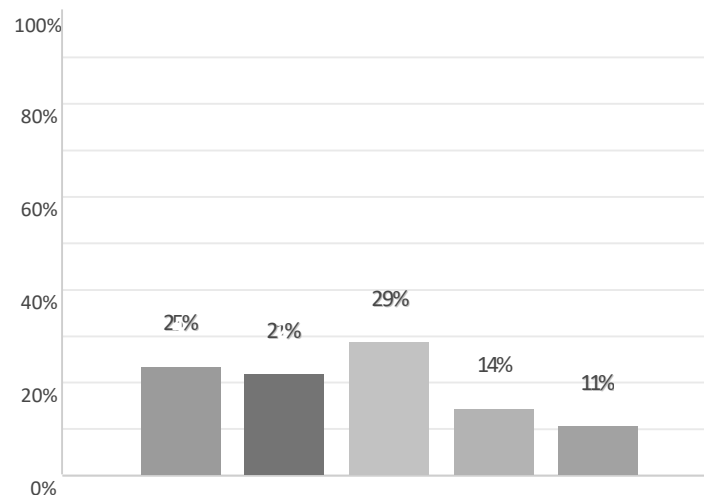


Fig. 4: Ownership (foreign or indigenous) as an obstacle to the use of ICT in the Nigerian construction industry

Results and Interpretation: fig. 4 shows that 14 (25%) of respondents indicated that ownership (foreign or indigenous) status is a very weak obstacle to the use of ICT in the Nigerian construction industry, 12 (21%) indicated it as a weak factor, 16 (29%) indicated it as a very strong factor, 8 (14%) indicated it as a strong

factor, while 6 (11%) choose Nil. It is known that indigenous industries do not have the necessary capital to facilitate the usage of ICT, whereas foreign industries have over the year improve in the usage and utilization of necessary IT equipment and tool as they possess a greater cash pool, while most indigenous industries do not see the need to use IT equipment and tools.

3.1.12 Lack of Sufficient Jobs as an Obstacle to the Use of ICT in the Nigerian Construction Industry

Results and Interpretation: The survey shows that 13 (23%) of respondents indicated that lack of sufficient jobs is a very weak obstacle to the use of ICT in Nigeria construction industry, 6 (11%) indicated it as a weak factor, 14 (25%) indicated it as a very strong factor, 11 (19%) indicated it as a strong factor, while 13 (23%) choose Nil. According to the majority of 14 (25%) respondents, the fear of lack of sufficient jobs is a major factor in the implementation of ICT in the Nigerian construction industry. While 13 (23%) and 13 (23%) said, it has a very weak impact and no impact in the implementation of ICT in the Nigerian construction industry, which is 46% of the respondent having a common agreement. Meaning that the online teams utilizing ICT tools have a vital impact in the construction industry as it helps improve the globalization economy of the construction industry, and it promises the flexibility, responsiveness, lower costs, and improved resource utilization required to meet the ever-changing task requirements in highly dynamic and unstable global business environments.

3.2 Techniques used in managing online teams

According to the respondents, virtual teams provide a wide variety of benefits to the construction industry, the techniques used in managing them were equally pointed out, with issues faced with remote teams.

The following techniques are used in the management of virtual teams: interface management; lean management; leadership technique; developing a work breakdown structure; develop and use team operation agreement, and developed communication.

3.3 Benefits of virtual teams in the construction industry

Financial Benefits: Companies using remote teams experience the following benefits: high return on investment; deduce the cost of physical approach to project planning and execution; lower attrition rate; avoids time wastage and saves resources.

High Return on Investment: Employees face several distractions in an organization like gossip, unnecessary comments, and office politics. When working in a virtual team, these distractions are ruled out. It helps to have an improved turnover due to the high level of customer satisfaction.

Reduce The Cost of Physical Approach to Project Planning and Execution: Traffic, pollution, bad weather conditions, and movement from one location to another are proven causes of stress and low productivity. Traveling in a bus or vehicle in heavy traffic or a bad road network results in a loss of workforce hour, and it is energy draining. But in the virtual team, the efforts, time, and money of commuting to the workplace are saved.

Lower Attrition Rate: A company saves a lot on recruiting and training costs when retaining its workforce for extended periods. This is because employees enjoy working from their place of comfort, as they get freedom in which they have a good work-life balance and at the same time a satisfaction towards their work. A higher level of satisfaction makes employees stay in a company for a very long time.

Avoids Time Wastage: Time is money. Often team members have too many unnecessary meetings, which wastes precious resources and time. Coordination and communication between co-located or traditional teams and heavy pleasantries and discussion of agenda eat away production/construction time. But in virtual team members, the discussion is precise, and work is very fast.

Other reasons for virtual teams: Efficient project monitoring and control reduces the hazards associated with the movement of team members and equipment, workers can multitask on various projects remotely, enhance effective project delivery with stakeholder's agreement, exchange of knowledge, and discourage age and racial discrimination.

3.4 Challenges faced by virtual teams

The following are some issues encountered by virtual teams: Some team members may not be psychologically fit to work online; Require developing skills of individual team members to work in a virtual team; Network upheaval and power disruption; Fear of change; Lack of incentives; Lack of appropriate ICT tools; Difference in time zone and language barrier; Lack of trust; Poor interface management; Frequent communication issues; Language and culture barrier; Multiple time zones; Poor network; Poor ways of dissemination of information; Lack of communication etiquette; No technological tool can provide complete support, etc.

Appropriate communication tools should be made available to team members. Effective training and incentives should be given to team members. Also, a virtual water cooler could be created to help cultivate a sense of organizational belonging for employees, serve as a platform for employees to share work-related knowledge. It is essential to bring team members together for training or team building at least once a year to build trust. When there is a language barrier amongst team members, a common language should always be created for team members to operate with. A scheduled time should be set for team members to report both progress and potential pitfalls. Also, team members can communicate information professionally, which mitigates the cognitive stress that communication places on individuals and turns communication from a potential trust destroyer to a trust builder.

3.5 Summary of findings

This research analyzed the results gathered from the survey, principally paying attention to the response gotten on the challenges faced by blended teams and clarify on how proper management and utilization of ICT tool mitigate them and the benefits virtual team poses to an industry economic growth in accordance to the objective of the study. When considering the various industries in the country, it was revealed that the construction sector in Nigeria is mainly indigenously owned. The survey revealed some challenges in implementing ICT. The most rated were; inadequate/erratic power supply, virus attack, low return on investment, ownership status (foreign or indigenous), lack of sufficient jobs. The fear of mass job losses is not an obstacle to the use of ICT in construction industries as it rather a potential job creator. For example, Nigeria, which is an annual Information Technology (IT) summit, focuses on encouraging technology start-ups and young innovators who were designed as a part of a collective measure to create jobs for the teeming youths in the country. ICTs help improves our standard of living and enhances productivity. The research findings show that although there are more indigenously owned companies in Nigeria than foreign-owned companies. However, the latter tend to make use of ICT more.

4. Conclusion

The research aims to assess ICT usage in the Nigerian construction industry, the communication problems in managing virtual project teams in construction companies. The major findings gotten from the response to the questionnaire are;

- The Nigerian construction industry, which comprises mostly of the indigenous industry, is still at the early stage of ICT uptake and utilization. If a developing country like Nigeria fails to upgrade to the 21st century technology, it will gradually lose its place in the global economy.
- Most employees are not quite knowledgeable on the ICT and remote teams, hindering them from performing in a virtual team.
- Remote teams experience the following tenacious communication challenges: multi-language barrier, culture and tribe difference, poor management of multiple time zone, lack or poor implementation of the company vision.
- Lack of project management is the major cause for IT failure in the Nigerian construction industry.
- Regular and effective communication is required to maintain the proper running and management of virtual team members.
- Inadequate/erratic power supply, virus attack, low return on investment, ownership status (foreign or indigenous), lack of sufficient jobs, and fear of mass job losses hinders the application of ICT by the Nigerian construction industry.
- Virtual project management saves cost, travel time, reduces security risk, and aids in the timely delivery of projects..

- Virtual project management aids in real-time project monitoring shared knowledge and encourages zero cost to housing team members.

Communication is the key to keeping team members, project managers, and stakeholders on track to pursue

5. Recommendation

Communication is the key to keeping team members, project managers, and stakeholders on track to pursue the project objectives, identify risks, misunderstandings, and challenges to complete the project. Project managers must ensure that team members in all locations know who the expert is that can be approached when difficulties arise while executing a task. The company should provide training of employees at least once a year, to help the members meet face to face, which aid in building trust. It is expected that these results will guide policymakers in Nigeria to identify the requirements of virtual teams and concentrate on promoting increased use of ICT in the construction industry to save cost and build a strong, diversified, sustainable economy to improve the standard of living for her citizens. It can be achieved by upgrading ICT infrastructure, educating decision-makers on the benefits of ICT, education, and training of team members on virtual project management and IT tools. It is hoped that this study will be repeated in the next few years to measure qualitatively and quantitatively the appreciation level of virtual teams with suitable ICT in the Nigerian construction industry.

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