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Impact of communication management on megaproject

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Abstract:

Background-Mis communication between stakeholder in Mega project has side effects not only on the project cost and time, but also on the government economic. Mega projects are decreasing the unemployment by providing thousands of works. However, coordination between extensive mount of worker is a pandemic for both developing and developed countries.
Purpose- Enterprise communication platform to share knowledge between different construction departments. The purpose of this study is to support site Engineer by all the information to make decision or to execute specific task in ideal time and without extra cost.
Methods- Based on recent literature review, a proposal is derived to compromise between stakeholder self-interested and company interested by gathering the usage of existing communication tools, old experience and youth power in servicing the company goals. Qualitative data were collected to investigate the communication methods between construction departments and to judge the constrains of sharing an information between the stakeholder whether it is personal behavior or accidental mistake. The model was tested by mathematic method by experts' judgment on communication criterial and methods in Riyadh Metro Project.
Findings-The morality of cooperation between different stakeholders is increased as each worker effort is recognizable. Reducing time and saving cost in communication are noticeable. The availability for project information whether the stakeholder present or absent.
Conclusion_ This study definitely answers the question regarding correlation between saving time and cost to communication methods. Further studies are needed to establish causal relationship between organizations and countries in a sharing method for ideal use for the resources.

Key words: Mega project, Stakeholder, Communication

I. INTRODUCTION

1.1 Problem Background

Mega projects have a big scope, which has ample time to effect negatively on the project, such as change in management and lack in resources, and also, they have the reputation of being behind the schedule and cost overrun, which are sequence of lack of information. Ambiguity around project information during feasibility study has drawbacks on country economy, which rely on project revenue whether financial or social. Developing country suffered from completing mega project within budget, Suez Canal project in Egypt, and Panama Canal in Panama had cost 19 and 2 times respectively the estimating budget. Likewise, in developed country mega project like Troy and Greenfield Railroad Project in the USA and Montreal Summer Canada Olympics in Canada experienced nine and thirteen times over cost respectively. (1)

Mega project failure is still a chronic even in the recent time, such as 2020 Olympics project in Japan, which cost three times over the estimated budget. Also, Japanese had planned to achieve profits through establishing new projects as an investment to attract Olympic fans. In contrast, the Olympiad did not occur at the schedule time and the Japanese lost their investment due to COVID 19 pandemic which hit China at the end of 2019 and spread all over the world. (9)

1.2 Problem Statement

Generally, organization categorizes project information which complies with the company regulation whether to be shared or not. Sharing an information between internal and external interested parties needs communication plan and documented information as an evidence to support the organization's obligation, milestone, achievement, and sustainable resourcing. Early communication method to coordinate between different stakeholder is a key factor in timely notifying the concerned stakeholder. Communication method should comply with a set of requirements which are what, when, with whom, and how an information will be shared. The information should reflect project updated status to reinforce decision making based on facts and their evaluations.

Until recently, there has been little interest in coordinating between construction industry fragments. Any fragment and other fragments in a project differ not only in the assigned stakeholders, but also in the way which they share the project information between each other, so employee is facing constrains to get an information. (15) Critics have argued that not only are stakeholders keeping their knowledge as secrets but also if they are forced to share an information, they will provide the data as a package. A mount of information without integrating with other relevant information has no benefit to work orientation and to timely make a decision. (19) One major drawback of influential stakeholder is that misusing their power for personal interests. Using an authority as a tool to achieve personal benefits and prevent the cooperation between different stakeholder to share knowledge is surrounded by ambiguity, which needs to be controlled. This study aimed to determine whether ant's communication method is applicable to be simulated for humans to full their need to make a decision based on tracing each other.

Site team depends on receiving dynamic data from several sectors to prepare his lookahead and weekly plan. In other words, the more relevant information avails, the more efficiency and effectiveness site team gains. Integrating data from disparate systems is an obstacle for site team, who usually has no access to all systems. The organization process to integrate the important parts called as Enterprise Wide Resource. Although EWR has addressed a one to one connection, it has not dealt with site- based process. Therefore, construction teams are manually cascading their information through phone, fax, meeting, or email, regardless the cost and time for the communication. (20) Conflict is a site team mutual interaction with different respective of project objectives. The conflict reasons can be listed as follows: project teams interdependent, construction complexity, specialized labor, and technology, whereas its sequences are confrontational relationship between teams, disputes on the task arrangement, and conflicting the objectives. The evidence shows that project losses from conflict in the range of three to five percent of the total project investment. Therefore, using creative communication method is the ideal way to minimize unnecessary expenditure due to teams' conflict. (21)

II. LITERATURE REVIEW

The literature review is aiming to emphasis communication role in project performance and to identify the gap in the previous work to integrate construction team at site level through enhancing human relationship, simplifying workflow procedure, and unifying communication platform.

2.1 Enhancing Human relationship

Razmerita (2016) questioned influential factors which motivate employees whether sharing information or not. He found that the employees are motivated to help others to feel happiness, to gain money reward, or to get management support, while the barriers to share the knowledge are lack of trust, and time. Apparently, some workers tend to not share information because they believe that information is their power and they don't need to lose their power especially in anonymous way. Maintaining the knowledge avails to all employees through videos, pictures, blogs, wikis, answering questions, on-going online conversation, face to face conversations, or emails provide value for not only the co-workers, but also the organization. The researcher considered the key aspect of sharing the knowledge at work can be a result for integrating team, individual, organizational and technological factors. (9)

Ho (2016) questioned the solution for insufficient workers number and unskilled labors in industry field. The researcher who chose Hong Kong as a case study referred the manpower shortage in a developed country to decline in fertility rate, to increase in education seekers, to early retire. The writer qualitatively and quantitatively collected data to establish a ground theory approach to solve labor supply issues. He found out the quick strategies to attract skilled labors are salary increment, import foreigner labors, and employees training. The author has limited his research strategies to be applicable for his country and overseas but may be other strategies applicable for other country. He also has proposed using dynamic interrelationships among various variables to provide fruitful area for further study. (7)

Moisander (2016) sparked the dynamic and interplay of meaning, and emotion role in communication to convince an audience to adopt particular situation. Firstly, the author analyzed the emotion aspect of powerful organization which provided active support and passive acceptance for economic and political changes. The writer extracted three strategic emotion works: eclipsing, divertive and vocative's which were applied to arouse, regulate, and organize emotions to judge the negative of legitimacy and the resistance of company rule. He found out that participants had limited responsibilities and influenced by others. Secondly, the author proposed if the workers dismiss misbehavior in communication and follow a new arrangement of ethical emotions, they will exceed their power in the field, will create a strength communication with their colleagues, and will add value to the organization. (4)

Franz (2017) challenged the traditional method such as stakeholder's isolation, which has negative effect on project delivery strategy, that defined as a categorization system represents common combination for owner's decision. proposed structural model to evaluate the effect of different delivery methods on project cost, time and quality. He collected 204 completed projects as a case study to compare metric quality, cost, and time performance under different delivery methods, and he compared integration and cohesive delivery method against other delivery methods. The researcher revealed that the integrated and cohesive method interacted with all project participate levels and achieved the work with more cost transparency, communication timeliness, and higher quality than other delivery methods. The researcher concluded that applying early project delivery method can affect the integration of project team who plays a key role in project success. (6)

Dong (2017) addressed the leader challenge to motivate his team to be creative. The researcher developed a model to measure the impact of transformational which focused on individual and team leadership separately. He collected data from different resources and levels such as workers, leaders, and direct supervisors. He revealed that the transformational affected on an individual by increasing his creativity and skill development. On other hand, he found that well informed individuals became more creative team when they had shared the knowledge between each other. The Author concluded that the team creativity is more important and productive than individual creativity. The writer suggested to apply transformational focus leadership (TFL) to an organization to measure the productivity for further study. (13)

Nathalie (2017) categorized decision making based on three sections: Previous experience, new experience, and social experience. The author observed Ants' behavior in emigration time and how they took their decisions. They are divided into three groups: first group took immigration decision based on repeated visiting to the new place based on reinforced memory. Second group randomly visited the new nest, and their certain was low. Therefore, they waited for a social decision. Third group didn't visit the new nest and their certain was very low, so they decided to follow the team. The writer noticed that the well-informed ants had more influential in the decision making which was the same mechanism of leadership. He also concluded that decision making needs an appropriate balance between existing information through individual experience, and new information through private exploration and social team. (14)

2.2 Workflow procedure

Eduardo (2015) noticed that construction supply chains is insufficient due to lack of managerial process integration between different stakeholders. His case study was rebars supply chain for an elevator as per final design specification, and he limited his study by tracing the information which only flowed along the process chain. The writer studied the process chain and analyzed its problem by using Language Action Perspective which provided an additional approach for analyzing, and emphasizing the commitment to share the information. He revealed that the poor management, lack of information, and improper plan were the main

roots of insufficient supply chain. The Author concluded that LAP can identify the weakness points in the process chain to suggest a corrective action to integrate the process. Also, the author proposed that LAP evaluation is required in further study to identify strength and weakness not only in one chain process but also in the whole construction process chain. (2)

2.3 Unifying Communication Platform

Dave (2016) criticized a long look ahead planning system and partial involvement of site team in decision making due to construction dynamic requirements which need to be updated daily and sometimes hourly. It is a crucial for site teams to get integrated information for their activity. Construction field is an industry field and its information is located in different systems. Therefore, getting an information from separate system could not help to reach the requested efficiency. A communication frame work between system to system, system to human, and human to system communication was the author proposal for totally or partially automating construction project life cycle. The writer leveraged the current communication system such as the VisiLean system and he investigated the relation between the existing framework and using Internet of Things(IOT) which provides sufficiently generic interfaces to exchange any types of information such as an alarm assembly, sensors reading, or any relevant information between any types of systems or smart products. The author applied IOT to various construction scenarios to prove the communication framework has influence on entire building life cycle. He found out that using IOT to full or partial automating the communication can close the loop between site team and head office and it can enhance the construction management system. (5)

Mok (2015) raised a concern on sufficiently managing stakeholder in mega project due to the conflict between different stakeholders' interest. The Author analyzed previous articles and treated them under four headings: stakeholder interests and influences, stakeholder management process, stakeholder analysis process, and stakeholder engagement. The writer concluded that the traditional stakeholder analysis methods are maximizing individual stakeholder attribute and minimizing stakeholder salience, which have been widely used in mega projects. The author proposed a social network to identify stakeholder's influence, and to improve project decision making. Also, he revealed that early planning needs existing designed SN, and he suggested that using comprehensive SN to cover entire project life cycle will enhance communication between stakeholders and their engagement in project stages. (3)

III. RESEARCH METHODOLOGY

Extensive literature review had been done to integrate recent previous studies about human and software communication to fill an interested gap, which is not important for the authors but also for the world. The literature review was focused on information work flow between humans and software programs. Collecting an empirical data was by interviewing experts in construction field. Analyzing was conducted to identify the ideal applicable communication method for the scope of study project. The proposed communication method had passed by three stages:

3.1 Sharing knowledge

This study empathized the workers' cooperation in sharing their project information on the project by a systematic way through a specific discipline for each activity through the project existing tools.

a- Aconex

a cloud-based solution, allows project members worldwide to create and review documents and other project information from any location and any time.

Use of ACONEX for Communication and Documentation Control as project information management System (10)

b- VBC

provided by Computer and communications technology (CCT)Project automated workflow system Visual Byblos Cyberspace (VBC) for initiating, managing and dispositioning all requests for information (RFI), Field Change Documents (FCD) and Non-Conformance Reports (NCR). VBC is used as formal procedure which is

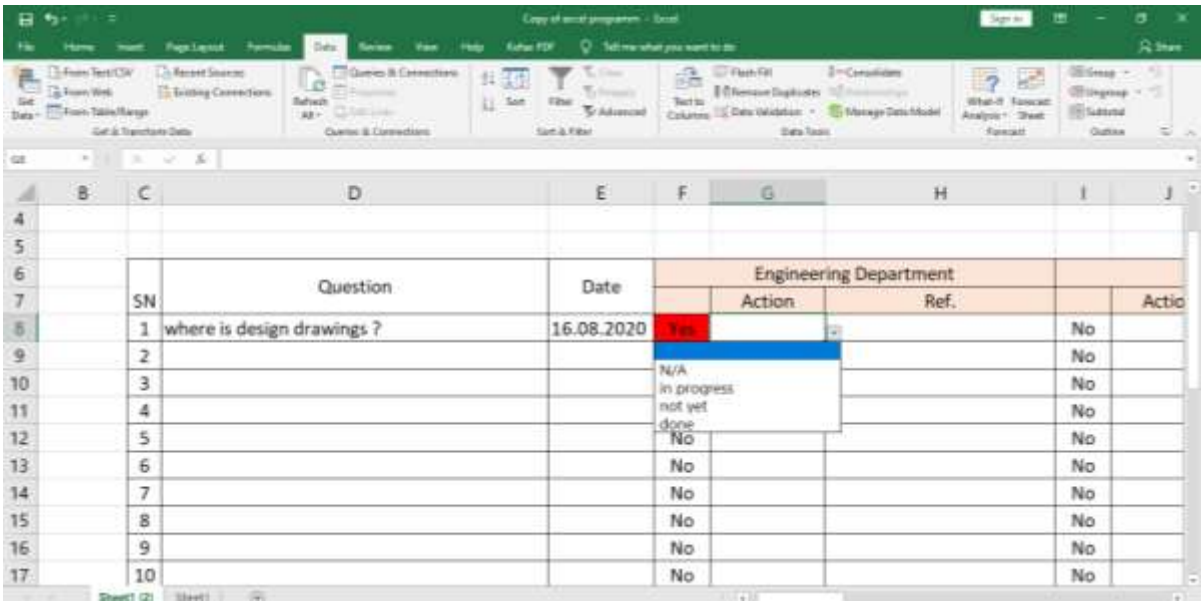
used in a timely manner for everyone's benefit such as all queries, clarification, change requests a nonconformance reports which are clearly recorded with their responses. (11)

3.2 Accessible Information

What the study concerned was not only access to relevant information but also integrate task information in the proposed platform.

Using Microsoft software to Simulate Ant behavior in leaving marks for others and changing their routes when they face a barrier, which were applicable to construction field in the flexibility to change the plan to reach the milestone and to communicate unphysically as a sequence of mega project massive manpower.

a- Refer to figure no, the excel sheet was used as dynamic platform between different construction teams to remotely collect and record data for specific task.



b- The proposal depended on using question and answer model to collect the data by using common key words in Riyadh Metro project

Department	Key words
Survey department	coordinates, as built, setting out, level, survey, and surveyor.
Design department	Engineer, drawing, as built, change, redesign, loads, presentation, design, shop drawing, IFC drawing, finish, structure, architecture, Mechanical, Electrical, information.
Quality department	ITP, MST, inspection, SPECS, revision, conformity, nonconformity, Field Change, Request, information, lessons, observation, Test, check, report, and investigation.
Cost control department	Quantity, Cost, Invoice, withhold, balance.

Risk department and Safety department	JHA, atmosphere, Risk, safety, Threat, opportunity, weak, and Strengths.
Subcontractor Administrator	quantity, contract, scope, obligation, contractor, and subcontractor.
Management	Responsibility, authority, scope.
Geotechnical department	geotechnical, report, support, soil, capacity, bear, test, type.
PMV department	load, vehicle, forklift, Pump, maintain, loader, crane, and truck.
Logistic department	paper, pen, pencil, Ink, carrier, office, chair, toilet and desk.
Procurement department	Material, certificate, test, Purchase, delivery, data, inspection.
MEP department	Sleeves, clearance, Pour.
Civil construction department	execute, Report, change, as built, support, interface, excavation, foundation, footing, column, reinforcement, cover, curing, test, spacer, Alignment, Plump, dowel, dimension and form work.
Transportation department	Bus, vehicle, transport.
Accommodation department	accommodate, water, food, breakfast, lunch, dinner, refreshment, and hospitality.

c- Refer to figure no questions were automated by key word to notify the assigned stakeholder.

Specific Question	Concerned department
Matching key word	Yes, and highlighted red
Not matching	No.

d- Refer to figure no , the proposed platform provided the concerned worker by action tools as a clearance form for his duty

Action list	Cell color
N/A	Green
In progress	Yellow
Not yet	Red
Done	Green

3.2.1 Workflow Enhancement

The proposed platform replaced the normal procedure to wait for a specific person by dealing with construction department as a person who has to reply in the due time even the assigned person is absent.

3.3 Evaluation Method

The proposed platform was applied in the Riyadh Metro project (Scope study) . To evaluate the proposed platform Analytical Hierarchy Process (AHP) Saaty 1980 was used to select the applicable method of communication.

a. Expertise brain storming to identify the required communication method criteria for the project concluded to

I. Completeness
II. Saving time
III. Saving cost
IV. Courtesy
V. Ease of use
VI. Correctness

3.3.1 Using pair wise method to get the weight for each criterion:

Experts from Riyadh Metro project has identified seven criteria which control selecting a communication method as the following: Completeness, saving time, saving cost, courtesy, ease of use, and correctness.

a- Conducting a pair wise comparison between the criteria in term of their importance to achieve the goal. As such a rectangular diagonal matrix is created as below

b- Calculate the weights by dividing each element in the matrix by the sum of its column, then add the element in each row and divided by the number of elements.

	Completeness	Saving time	Saving cost	courtesy	Ease of use	correctness	Weights
Completeness	0.09	0.24	0.26	0.20	0.11	0.07	0.16
Saving time	0.02	0.06	0.03	0.23	0.11	0.07	0.09
Saving cost	0.02	0.12	0.07	0.23	0.11	0.07	0.10
courtesy	0.01	0.01	0.01	0.03	0.11	0.07	0.04
Ease of use	0.04	0.03	0.03	0.02	0.06	0.07	0.04
correctness	0.81	0.54	0.59	0.30	0.50	0.64	0.56
Sum	1.0	1.0	1.0	1.0	1.0	1.0	1.0

3.3.2 Using pair wise method to get the weight for the existing communication methods

Also, Pair wise comparison among five alternative communication methods, with respect to each criterion as follows

Completeness	Meeting	Phone	Searching	Emails	Proposed platform	Weight
Meeting	1.0	4.0	5.0	4.0	1/5	0.22
Phone calling	1/4	1.0	1/3	1/3	1/9	.041
Searching	1/5	3.0	1.0	2.0	1/9	0.095
Emails	1/4	3.0	1/2	1.0	1/5	0.085
Proposed platform	5.0	9.0	9.0	5.0	1.0	0.56
Column Sum	6.7	20	15.83	12.33	1.622	

Saving time	Meeting	Phone	Searching	Emails	Proposed platform	Weight
Meeting	1.0	9.0	1/4	1/5	1/9	0.11
Phone calling	1/9	1.0	6.0	4.0	1/9	0.13
Searching	4.0	1/6	1.0	3.0	1/9	0.093
Emails	5.0	1/4	1/3	1.0	1/9	0.073
Proposed platform	9.0	9.0	9.0	9.0	9.0	0.59

Saving cost	Meeting	Phone	Searching	Emails	Proposed platform	Weight
Meeting	1.0	1/9	1/6	1/4	1/9	0.016
Phone calling	9.0	1.0	1/3	7.0	1/9	0.15
Searching	6.0	3.0	1.0	4.0	1/9	0.14
Emails	4.0	1/7	1/4	1.0	1/9	0.046
Proposed platform	9	9.0	9.0	9.0	9.0	0.64

courtesy	Meeting	Phone	Searching	Emails	Proposed platform	Weight
Meeting	1.0	1/3	1/5	1/2	1/9	0.047
Phone calling	3.0	1.0	1/3	2.0	1/7	0.11
Searching	5.0	3.0	1.0	4.0	1.0	0.32
Emails	2.0	1/2	1/4	1.0	1/5	0.079
Proposed platform	9.0	7.0	1.0	5.0	1.0	0.44

Ease of use	Meeting	Phone	Searching	Emails	Proposed platform	Weight
Meeting	1.0	1/5	1/2	1/3	1/5	0.06
Phone calling	5.0	1.0	4.0	3.0	1/3	0.3
Searching	2.0	1/4	1.0	1/3	1/6	0.79
Emails	3.0	1/3	3.0	1.0	1/5	0.15
Proposed platform	5.0	3.0	6.0	1.0	1.0	0.41

Correctness	Meeting	Phone	Searching	Emails	Proposed platform	Weight
Meeting	1.0	3.0	4.0	5.0	1.0	0.37
Phone calling	1/3	1.0	3.0	2.0	1/2	0.16
Searching	1/4	1/3	1.0	1/2	1/5	0.06
Emails	1/5	1/2	2.0	1.0	1.0	0.13
Proposed platform	1.0	2.0	5.0	1.0	1.0	0.27

3.3.3 Using AHP calculation by collecting multiplying criteria weights with alternative weight to decide which communication method to follow:

Criteria weights	Meeting	Phone	Searching	Emails	Proposed platform
Completeness = 0.16	0.22	0.41	0.095	0.085	0.56
Saving time=0.09	0.11	0.13	0.093	0.73	0.59
Saving cost=0.1	0.016	0.15	0.14	0.046	0.64
Courtesy=0.04	0.047	0.11	0.32	0.079	0.44
Ease of use=0.04	0.06	0.3	0.079	0.15	0.41
Correctness= 0.56	0.37	0.16	0.06	0.13	0.27
Weight Sum	0.258	0.198	0.087	0.166	0.39

IV. DISCUSSION

The findings from this study suggest that human communication method may simulate ant behavior to trace each other for better decision.

A number of barriers and facilitators of communication method were identified that are consistent with past research. Somewhat surprisingly, the dynamic information platform slightly appears more beneficial to stakeholder than one-way process, organizations upload the information as a package in a platform, and two-way process, which depends on conversation between participants. Research concurs with new communication strategy that stated communication to be omnidirectional and diachronic at all project level. (33) Quit surprisingly, individual ant in this investigation reacted with his work by accountability to do the best for himself and for the group. Human simulation to the ant accountability and the availability of a platform to search for task data matches with communication theory, which stated to engage all the participant to view and evaluate the organization strategies to improve stakeholder competence in searching an information to solve a problem. (34)

However, for many construction projects there were several factors that also influenced the successful of communication strategy. Firstly, a dynamic accessible platform, which can be reached by assigned persons, as a social conversation between all the concerned parties is working to collect the relevant data for a specific task. Secondly, collecting the task information by integrating way is reinforcing the decision maker position to choose the best solution. Thirdly, tasks are requested from department as a whole, so the task is smoothly delegated in the same department to save project time and to enhance project progress. Fourthly, the information flow between the stakeholders wasn't disrupted by any individual absent as the data is already existing on the same platform. Fifthly, facilitating the hand over between the employees due to the project information is available in dynamic way on a platform.

One must question the mechanism by which the ant simulation method may affect the construction team behavior. It is possible that it simply serves as a coordination method between stakeholder to release interpersonal conflict and relationship conflict, which affect productivity and performance due to lack of experience. (35)

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