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Effective Information Flow In Project Management: Lessons From An Information Technology Project

Azeez Olatubosun Shodeinde
University Of Law Business School,
Manchester, United Kingdom

Abstract
Network analysis of scheduled activities is a widely-applied project management tool which promotes timely and efficient project delivery. However, lack of coherent network of information flow during the project implementation can render the project objectives and targets unrealisable. In this study, the researcher analysed lessons on information management from a plant installation process in an information technology (IT) company within the Manchester neighbourhood. The lessons were relatable because the researcher was a member of the team who managed the plant installation. In particular, an electronic information model (under the auspices of Excel software) was designed and implemented in collaboration with the project team. This immediately kept the team well informed of the project progress, corrected slowdowns in activity execution and facilitated timely completion of the plant assembly. The multiple-machine plant was successfully prepared for production operation within the specified timeline. This study therefore argues that project managers may take lessons from this experience in creating a network of information flow such that the project team implements their assigned activities with full information knowledge of what comes before and after each activity.
Keywords: *information network, information model, case study, plant installation, narrative analysis*

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I. Introduction

A critical element of project management is information flow (Modupe-Samuel, 2022; Ciechomski and Strojny, 2022). For effective management of project execution, all stakeholders involved in the project need be served with the right information at the right time (Ciechomski and Strojny, 2022). This strengthens decision-making process (Modupe-Samuel, 2022), consolidates problem-solving skills (Malenko, 2023) and solidifies all stakeholder behaviours towards meeting the project targets (Ciechomski and Strojny, 2022). However, seamless flow of information among the project stakeholders is often considered a natural occurrence in the project life cycle (Malenko, 2023). While this is a wrong approximation by project managers, it predisposes the project to misguided interpretations from stakeholders, slacks in project activities and overall inefficiency in project delivery (Malenko, 2023). Another common assumption is that project information management is important only for mega projects and can therefore be discounted for mini or medium projects. In the evidence found in Bashir et al. (2020), this assumption may be beneficial to the top-management stakeholders who accord little relevance to the experience and perspectives of factory workers in charge of the production base. However, further evidence by Kaina et al. (2020) indicated that mismanagement of information flows even at the lowest end of the project is a recipe for inefficiency on the project. Both Bashir et al. (2020) and Kaina et al. (2020) maintained that all project stakeholders are interdependent regardless of the cadre or project units they manage.

In projects involving preparation of production plants, focused attention is on preventing project overruns to delay the commissioning of materials on the projects. Nonetheless, allowance for information gaps results in preventable delays from the project stakeholders (Bashir et al., 2020). The author of this article experienced a version of this delay while working as a project team member in a plant assembly of a UK-based information technology (IT) company. The project involved readying and moving a number of machines to the plant site, loading infrastructure elements on the machines individually (before the assembly) and jointly (after the assembly), and preparing the plant for production operation. However, the project experienced slacks in about two weeks into its execution. This called for a revisit to the project lifecycle and the corresponding adjustment of schedules and activities. While this adjustment is noteworthy, the current researcher considered the redesign of information management on the project as the primary driver of success recorded on the project. Thus, the motivation of this article is to piece together change elements in information management in the project and offer lessons for future project managers.

It is worth mentioning that the findings and discussion generated on this article are offshoots of the bespoke case study it contains. That is, no other evidence forms the basis of arguments in this article. This suggests

that managers of projects with similar background as that described in this article may particularly find the discussion relevant. The reminder of the article is organised into four sections. Section II presents a short literature review describing the central role of information flows in project management. Section III explains the case study approach adopted as methodology in this study. Section IV analyses the case study and discusses emerging relevant issues. Finally, Section V offers conclusive summary of the main arguments of the article.

II. A Short Review Of Information Flow In Project Management

For projects involving engagement of many stakeholders for a long period of time, information flow is a catalyst for smooth project coordination, resource management and effective project delivery (Rizvanolli, 2016). This assertion was a sprout from Rizvanolli (2016)'s findings, having analysed a case study of real estate investment firm in Albania. It was revealed that the firm leveraged the use of online platform as information and communication tool. The success of this innovative approach was evident in the coordination of stakeholders' interests and timely delivery of a stream of projects. Rizvanolli (2016) therefore recommended that project managers should clarify workable approach of information management which the organization would adopt before the commencement of the project. Relatedly, Tan et al. (2018) analysed the impact of information flow in three case studies of construction projects in Australia. It was found that information gaps among stakeholders slowed down the project pace and built inefficiencies in the project delivery. Thus, Tan et al. stated that project managers should consider information flow in project life cycle as a building block of project management. This would not only distinguish the firm as conscious of information management, it also scales its demand by clients, contributing to its going concern (Tan et al., 2018).

Dawood and Vukovic (2015) associated information flow to reduction in inefficiencies in project management. The authors applied the whole life cycle (WLC) approach to demonstrate that projects involve amalgamation of four disparate pillars of technology, process, policy and people. In the absence of effective information flow among these pillars, the project is bound to experience deficiencies. It is rather important that all the project phases are interlinked with information flow known to all project stakeholders. Dawood and Vukovic (2015) presented the case of information management at a Building Information Modelling (BIM) consultancy services company while executing projects in its United Kingdom and Qatar offices. While secondary sources provided data from the UK office, interviews were held among the Qatari stakeholders. Data analysis showed that WLC information strategy is proactively infused by the company at every phase of its IT projects. However, a more recent review of BIM's WLC strategy by Shaqour (2022) indicated that bureaucracy is a necessary condition to manage the project stakeholders. The rationale for this is related to the likelihood of information leaks or abuses by unscrupulous elements within the organisation. On this basis, allowing project information to democratically flow within the organisation may generate sub-optimal outcomes for the project. Rather, project managers should skillfully design and protect what information is necessary (and the liable stakeholders) at every phase of the project (Shaqour, 2022). In other words, the mix of democratic and bureaucratic styles in implementing WLC information strategy remains the major driver for the implementation of BIM in information management.

In another context, Ziemba and Oblak (2015) analysed why the infusion of information management in organisational priorities may be resisted by some elements within the organisation. This realisation is important for project managers so that they are equipped with a toolbox of change management skills before integrating information management strategy in the culture of their companies. According to Ziemba and Oblak (2015), a change element is successful if it characteristically shifts existing perspectives of the stakeholders affected by the change. In this case, project managers should carefully introduce the change, having considered the interests of the stakeholders who would implement the change. To do this, the Lewin (1951)'s model for change was prescribed. This classical change model was coined such that the project managers critically analyse the existing practices and code of conduct (unfreeze stage), systematically introduces change to the stakeholders, starting with those who may affect the project outcomes (change stage) and finally replacing the former practices with the changed ones (refreeze stage). Ziemba and Oblak (2015) cautioned the project managers not to expect immediate acceptance of their change proposals from the stakeholders; they should rather focus on understanding and aligning the interests of every stakeholder to see the project through its life cycle. Ziemba and Oblak (2015) provided case studies of this change management approach among public organizations in Poland.

While comparing Project Management Body of Knowledge (PMBOK) with ISO 21500, Tavan and Hosseini (2016) offered that while both provide standards for information flow in project management, PMBOK tends to be more skewed to stakeholder preferences than ISO 21500 which somewhat tilts to scientific management principles. On this basis, project managers may consider application of PMBOK standards in designing information flow among stakeholders at the outset of the project (Tavan and Hosseini, 2016). Nonetheless, the design of information management may be capped with ISO 21500 in order to infuse bureaucratic standards to prevent information leaks and abuses. In other words, project managers complementarily apply professional standards in introducing and managing information flow throughout the

project's life cycle. Consistent with Tavan and Hosseini (2016)'s claim, Gao et al. (2019) stated that the success of BIM as a model of information systems management hinges on the application of evidence-based standards particularly in the area of computer-based management of information flow. This is important because computers can be hacked, leading to information leaks and undesirable outcomes. Therefore, to ensure that information flow does not generate unintended consequences, project managers should take insights from the books of professional standards in project management. After all, an information management strategy is introduced not for its own sake, but for its value addition to the project planning, design and delivery. Therefore, project managers should consider that their performance is related to the success of the information management strategy they adopt, not the strategy for its own merit.

III. Methods

This study adopted the case study approach to analyse the significance of information flow among stakeholders in the life cycle of a project. Essentially, the motivation for the research emanated from the researcher's experience while working on the installation of a plant at an IT company located in Manchester, UK. To deduce helpful lessons from the installation process, reflexive experience of the researcher was invoked. Furthermore, substance to the experience was derived from detailed (official) documents which included project log book, debrief report and project evaluation handbook. Being a member of the project theme, the researcher experienced negligible hurdle in accessing these documents from the company. More importantly, the researcher led the sub-theme who developed an Excel template to manage information flow at every phase of the project. However, confidentiality was maintained while piecing this article together – no specific name of the project, the company or other project personnel was mentioned.

The data analysis proceeded by identifying and describing the phases involved in the project installation. This is followed by a highlight of specific activities on each phase. Next, the modifications that took place on each activity were discussed. On this note, the emphasis is on value addition on information flow in each activity. Finally, an assessment of the developed information template was carried out. This assessment informed whether the prediction of the model on information flow was attained relative to actual experience on the project. The change management approach among the project team, which controlled for the possibility of innovation rejection by the stakeholders, was also discussed.

IV. Analytical Technique

The project

The company commissioned a subsidiary to procure a manufacturing plant. The plant was delivered within the approved timeline. There was no cost overrun or delivery defects. A plant installation manual accompanied the plant delivery. Given that experienced project managers and officers were on the company's staff profile, the company's management considered its staff capacity as sufficient to manage the installation. This was aimed at reducing costs and bolstering the staff experience on project installation.

The project activities

The installation process was anchored in six stages. First, the number and specific details of machines making up the plant were identified. The position of each machine in the installation process was also determined: what machine comes before and after what machine. In all, seven machines were identified. They were labelled A, B through G. The second stage involved moving each machine to their installation site. This stage was critical because moving the machine before its due time would waste space and constitute inefficient budget. Yet, many machines were moved at the same time by the project team who felt that having all machines at the site once would save the project time. The third stage was about installation of industrial services (electricity, gas, chilled water, compressed air, steam, dust extraction, flue extraction, etc) to each machine. This stage was also critical because an error in service installation would affect not only the machine's performance but other associated machines. The fourth stage was related to plant assembly where all the machines were assembled to form a whole industrial plant. The performance of each machine was measured before its installation was said to be completed. The fifth stage was safety and risk assessment of the project. This led to the development of operational manual of the project. Finally, the project was officially commissioned in preparation for production operation.

The developed model for information management on the project

Given the slacks which were experienced on the project, it was evident that information did not effectively flow to relevant team members at the relevant time on the project. Therefore, a model to manage the information flow was developed. The model had four building blocks which are explained as follows:

Sharing information about the project phases

While there was visible lack of coherent direction among the project team members, the researcher (as a member of the team) observed that there was the need to call a general meeting where every member was debriefed of the project objectives, elements and targets. This was discussed with the project manager who immediately gave their consent. A step-by-step approach was used to share uniform information among the project team. This cleared out ambiguities or misinformation among the team. Questions regarding specific roles of each member were raised and answered by the project manager.

Creating a communication network as the project progressed

To create a constant reminder for the team, an information leaflet was created and distributed to all team members. The leaflet contained the network of information flow from the project manager to all contractors, engineers, factory workers, site managers, and every other stakeholder who are important to see the project through. The cost of piecing together and printing the leaflet was embedded in the project valuation – this was possible because the initial approval of the project manager was granted before the change implementation.

On-boarding an Excel template to manage the network

The core aspect of the model was the creation of an Excel template which updated the project activities daily. The template identified all machines in different production departments and locations. Each machine was assigned a code for easy tracking. The infrastructure setup of each machine was then loaded. This setup was of ten categories including permission to setup, network configuration, instance specification, storage configuration, operational system and software, monitoring and management, security and compliance, cost management, advanced configuration and documentation. The categories were loaded sequentially, with account taken of specific requirements of each machine in each location. The project team marked each setup category as open, ongoing or done. This communicated the readiness or otherwise of a category relative to the subsequent category. The Excel template also indicated the commissioning, migration, risk assessment, tagging, production operation and show stopper properties of each machine and the associated infrastructure setup.

Updating the network daily by each project team

A printed copy of the Excel template was displayed at the site entrance. With all team members being aware of the template and its interpretation, they were asked to update it after every activity completed. At the end of the day's activities, on behalf of the project manager, the present researcher updated the template electronically, printed and pasted the updated version at the site entrance. With this in place, every team member approached the template to know what activities were open, ongoing or completed. This closed the tiniest information gap that might exist during the project delivery.

The model's outcome

The offshoots of the implemented model include the following:

Easy-to-read daily information for project team

The immediate impact of the Excel model was easy flow of information within the project team. Every member was duly aware of what activity was open for action, ongoing or has been completed. This also ruled out sending reminders to the team with respect to the status of activity assigned to them. The new culture involved that everyone approached the template when in doubt of the status of a particular activity or setup category.

Significant reduction in slowdowns

With the clear information network, delays became very limited. The network invoked clear direction on the project such that every team member could plan ahead their schedule of activities on the infrastructure setup and machine build-up. Before the model was on-boarded, the slowdowns were around 40% of the project activities. However, the information model decreased the slowdowns to only 5% – this applied to activities with shortage of team members for implementation. Even for this, action was taken by the project manager to recruit new members such that the slowdown was completely eliminated.

No delay in production operation of the plant

The value addition of the information model was mostly noticeable in the preparation of the plant for production. Before the model was designed and implemented, there was clear indication of time overrun of 21 days. That is, given the pace of project build-up, production would not have started until three weeks behind schedule. This was the major concern of the author of this article. Nonetheless, despite the series of slowdowns that have been experienced before on-boarding the model, the production operation commenced a day before the initial schedule, thanks to the information management template that was collaboratively implemented.

Challenges involved while implementing the model

While diffusing the model among the project team, two main challenges ensued. First, the model design was borne of personal motivation of author of this article. Without any prior discussion with other team members, the researcher saw the need to close the information loopholes which were inherent in the machine installation. Although the loopholes were visible to everyone else, the initial bold step of closing them did not benefit from wide embrace. This was connected to the fact that taking the steps to correct them would be at the personal expense of the change proponent. However, the researcher took the steps despite their ongoing role in the project. Retrospectively, this personal challenge is a big deal for every change proponent. In other words, given that the initial burden would be borne personally, it takes self-motivated drive for a team member to correct some deficiencies that may be observed on the project. In fact, the motivation to put this article together was to remind stakeholders of project management that bringing change to project management processes and ethics may involve personal sacrifice of the change proponents, albeit at the initial stage.

The second challenge was getting the other team members to share similar perspectives as the change proponent: in this case information model to effectively manage information flows during the project implementation. This was described in the literature as the generic challenge of every change process (see for example Ziemba and Oblak, 2015). To address this challenge, the researcher began the change process with the project manager who had been incidentally concerned of a workable approach of bridging the information gaps within the project team. This prompted the manager's quick embrace of the change with the instruction that the proposed change should not slack the change proponent's role on the project. Furthermore, conveying a general staff meeting was effective in aligning thoughts and concerns of all team members. It can be said that correcting the information gaps began with spreading the information about the gaps such that every team member understood the problem and the mechanism being proposed to solve it. With every member duly informed of what was ahead of the team, the pathway to on-board and monitor the model for information flow became unlocked.

V. Conclusive Summary

This study has established that information flow in project management process needs to be objectively considered. This is important so that interests of all stakeholders are strategically managed as the project progresses. The arguments put forward in this study were offshoots of lessons learned while assembling and preparing a plant assembly for production operation at the researcher's former place of work. In particular, it was learned that setting the team on track of project activities cannot be effectively achieved if there are information gaps at any end. Rather, the team are required to be fully aware of information network characterising the project under implementation. More importantly, creating a dashboard which clarifies the network of information and communication among the team members can solidify the team's confidence in their scheduled activities. This tells that while network analysis (of project activities) is a widely-applied project management tool which is used to prevent slacks and monitor the project's implementation process, there tends to be little concern for network analysis of information flows. This study has extended the literature of network analysis by providing a case study of the significance of information management during project implementation. It also argued that creating an electronic version of the model for information flow further simplifies the information structure and facilitates quick diffusion of the model among the project stakeholders.

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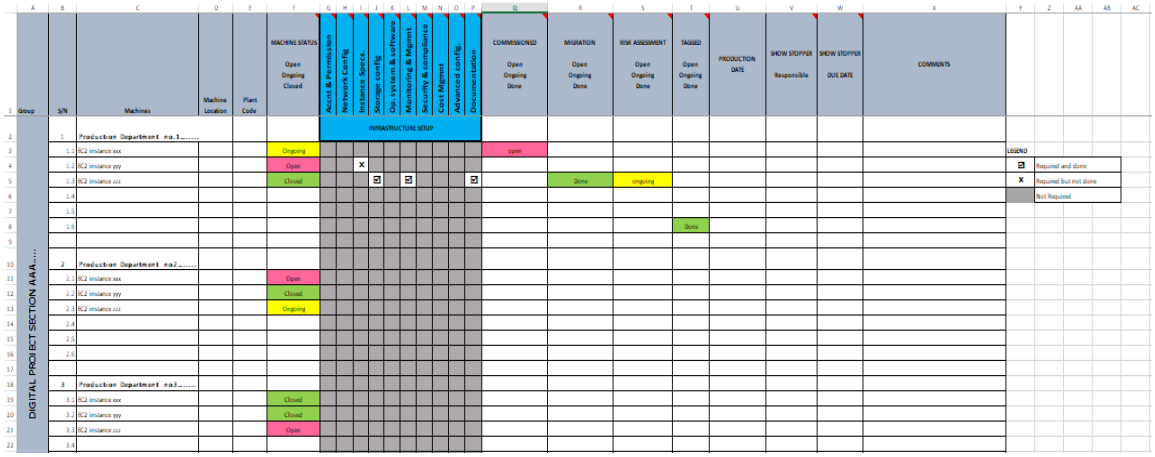
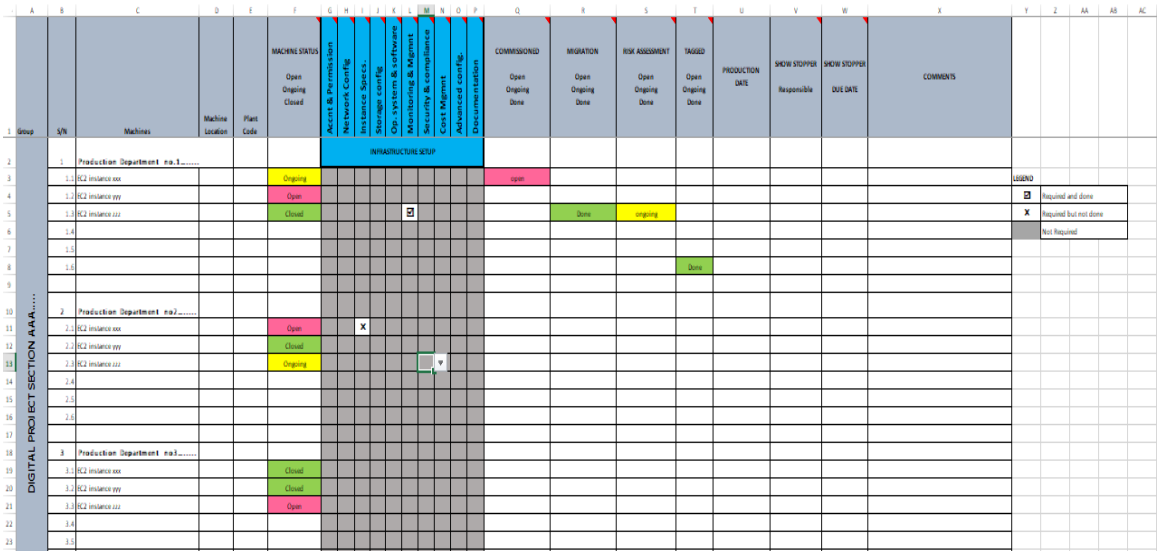
Appendix A: Sample of the information flow template



Group	S/N	Machines	Machine Location	Plant Code	MACHINE STATUS Open Ongoing Closed	Accnt & Permission	Network Config	Instance Specs.	Storage config	Os. system & software	Monitoring & Mgmnt	Security & compliance	Cost Mgmnt	Advanced config.	Documentation	COMMISSIONED Open Ongoing Done	MIGRATION Open Ongoing Done	RISK ASSESSMENT Open Ongoing Done	TAGGED Open Ongoing Done	PRODUCTION DATE	SHOW STOPPER Responsible	SHOW STOPPER DUE DATE	COMMENTS
						INFRASTRUCTURE SETUP																	
DIGITAL PROJECT SECTION AAA……	1	Production Department no.1……																					
	1.1	IC2 instance xxx			Ongoing											open							
	1.2	IC2 instance yyy			Open			X															
	1.3	IC2 instance zzz			Closed				☑		☑				☑		Done	ongoing					
	1.4																						
	1.5																						
	1.6																		Done				
	2	Production Department no2……																					
	2.1	IC2 instance xxx			Open																		
	2.2	IC2 instance yyy			Closed																		
	2.3	IC2 instance zzz			Ongoing																		
	2.4																						
	2.5																						
	2.6																						
	3	Production Department no3……																					
	3.1	IC2 instance xxx			Closed																		
	3.2	IC2 instance yyy			Closed																		
	3.3	IC2 instance zzz			Open																		
	3.4																						

LEGEND
☑ Required and done
X Required but not done
Not Required

Appendix B: Sample of the information flow template



Group	S/N	Machines	Machine Location	Plant Code	MACHINE STATUS Open Ongoing Closed	Accnt & Permission	Network Config	Instance Specs.	Storage config	Os. system & software	Monitoring & Mgmnt	Security & compliance	Cost Mgmnt	Advanced config.	Documentation	COMMISSIONED Open Ongoing Done	MIGRATION Open Ongoing Done	RISK ASSESSMENT Open Ongoing Done	TAGGED Open Ongoing Done	PRODUCTION DATE	SHOW STOPPER Responsible	SHOW STOPPER DUE DATE	COMMENTS
						INFRASTRUCTURE SETUP																	
DIGITAL PROJECT SECTION AAA……	1	Production Department no.1……																					
	1.1	IC2 instance xxx			Ongoing											open							
	1.2	IC2 instance yyy			Open																		
	1.3	IC2 instance zzz			Closed						☑						Done	ongoing					
	1.4																						
	1.5																						
	1.6																		Done				
	2	Production Department no2……																					
	2.1	IC2 instance xxx			Open			X															
	2.2	IC2 instance yyy			Closed																		
	2.3	IC2 instance zzz			Ongoing																		
	2.4																						
	2.5																						
	2.6																						
	3	Production Department no3……																					
	3.1	IC2 instance xxx			Closed																		
	3.2	IC2 instance yyy			Closed																		
	3.3	IC2 instance zzz			Open																		
	3.4																						
	3.5																						

LEGEND
☑ Required and done
X Required but not done
Not Required