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Impact of Schedule Management Plan on Project Management Effectiveness

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Abstract: ***Project management is a strategy implemented in service and manufacturing sector organisations to manage the effective completion of a project. The successful running of an organization, i.e. the organizational performance and timely achievement of goals depends on the effective project management. Schedule management is a process of controlling, scheduling, and monitoring the entire working process of an organization. Thus, it is relevant to have efficient schedule management plan implemented in the organization to have effective project management. This study aimed to check the impact of schedule management planning on project management effectiveness. A close ended questionnaire is used as a tool to collect the data on the perception of 208 employees about relevance of schedule management planning in their project management strategy. The analysis shows that factors affecting schedule management plan does have a significant and positive impact on project management effectiveness. The findings of this study can be used by organisations, particularly in the manufacturing sector, to correctly identify the project management parameters that require more attention and utilize schedule management planning to enhance the effectiveness of their operational processes.***

Keywords: ***Schedule management planning, project management, project management effectiveness, organizational performance, project performance.***

I. INTRODUCTION

a) An introduction to complexities in project management

The purpose of project management is to plan, coordinate and control the fulfillment of project objectives in the most efficient manner as per the needs of the stakeholders [10] (Harris & McCaffer, 2013). Amongst the different features of projects, complexity is one which has received rising interest. [13](Hyvari, 2016) was of the opinion that, in general, the two main reasons for this phenomenon include increasing demand and an increase in restrictions in projects regarding deadlines and swift delivery of products. On the other hand, [9](Ham & Lee, 2019) showed that project complexity is associated with delays, overruns in cost, restrictions with respect to functionalities of the system and decline of user satisfaction. Therefore, projects today are complex in all industries due to the increasing difficulty in attaining the performance objectives, high interdependence amongst the organizations involved in the project, implementation of innovative technology and large number of different activities to be performed [7]

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(Fitsili, 2009; Maximiano, Leroy, Morias, & Yugue, 2010; Remington, Zolin, & Turner, 2009). One of the ways to effectively manage a project and increase its effectiveness is schedule management planning.

b) An introduction to schedule management planning and its usefulness today

Schedule management planning is done during the planning phase of the project and is regarded as a part of the project management plan [11](Heales, Susilo, & Rohde, 2011). Preparing a project schedule is useful as it helps project managers to summarize the start and finish times for every separate duty which forms a part of a project, thereby giving a graphical illustration of how protracted the project is probable to last for [26](Solis-Carcano, Corona-Suarez, & GarciaIbarra, 2015). It is complex to develop a project management schedule as it involves identification of activities, sequencing those activities, deciding milestones for the activities and afterward executing the project schedule management plan. An effective schedule management plan consists of outlining the work breakdown structure, identification of interdependencies amongst activities, sequencing them, estimating task duration, identification of risks involved and finally development of project schedule management plan. One of the most important tools which are used in schedule management planning is the Gantt chart which is a type of bar chart illustrating a project schedule and for complex project, separate Gantt charts can be prepared for each of the key stages [3](Beleiu, Crisan, & Nistor, 2016).

The aim of this paper is to examine the impact of schedule management plan on project management effectiveness.

II. LITERATURE REVIEW

c) Project management effectiveness

Project management effectiveness is defined as a measure of degree with which the objectives have been attained [12](Hyvari, 2016). It is the extent to which the goals of a project are attained or the degree to which a system can be expected to achieve a set of specific requirements. There are various factors that need to be met to assure achievement of meeting objectives. A project is said to be effective if the objectives of the project have been achieved to the full satisfaction of the users, all activities have been completed and all designated interest including the projects sponsor and initiator officially accepts the project results and closes the project. It is important to measure project management effectiveness as it helps the project managers in verifying the efficiency with which the output of the process meets the constraints of the input and how well the efficiency from the providers is dealt with by the constraints of the process [29](Wysocki, 2011).

d) Factors affecting project management effectiveness

The factors affecting project management effectiveness are perceived as main variables that have an impact on the success of projects and levers that can be used by project managers for the purpose of enhancing chances of getting the preferred results [28](Westerveld, 2013). A combination of different factors determine the success or failure of a project and understanding these factors at the correct time increases the chances of making the project successful [25](Shah & Patel, 2018). These are as follows.

- **Project life cycle:** All projects pass through different phases of life cycle which have a significant impact on the effectiveness of project management. The main phases of all projects include conceptualization, planning, execution and termination. It is important for project managers to understand the life cycle in order to complete the project timely and successfully because it helps in understanding the rational series of events in the range of progress of the project [31](Zou, Kumaraswamy, Chung, & Wong, 2014).
- **Clearly defined roles and responsibilities:** It is important in the management of processes in a project to clearly define roles and responsibilities in order to ensure that they are implemented successfully [2](Anantatmula, 2010). It leads to increase in responsibility of the team members towards their job since their roles have been clearly spelt out and their performance is measured against the same. Responsibility matrix is a popular tool which is used for the purpose of clarifying roles and responsibilities.
- **Time management:** Efficient time management is also regarded as the most important factor which impacts management of project in its execution. It is measured by checking the missed deadlines and unfinished deliverables. Ineffective time management leads to increase in stress as well as frustration in the project manager as well as his team members [26](Solis-Carcano et al., 2015).
- **Economic factors:** Along with the financial benefits of the project, their economic benefits also need to be analyzed to ensure its effective management. These economic factors include generation of employment, regional economic development of the location of the project and savings from foreign exchange in the case of import substitutes and profits from foreign exchange where the projects are export oriented [4](Bjarnason, 2015).
- **Risk:** Risk refers to the possible external actions that can have a negative effect on the project on their occurrence. It includes the different combinations of the possibility that the event shall occur as well as the impact it shall have on the project. The probability as well as its impact on the efficient management of projects needs to be assessed as if it is too high, it shall be detrimental to the successful execution of the projects and proactive plans need to be put in place to mitigate them [27](Uher & Toakley, 2009).

e) Schedule management planning

Schedule management planning can be defined as "the process of determining when project activities will take place depending upon defined durations and precedent activities" [13](Hyvari, 2016). Project scheduling is an important sub-process of project management and it is used to outline the time frames within which the project shall be finished, the costs with respect to resource and labor requirements along with the succession of completion of tasks [21](Mubarak, 2010). Schedule management is a multifaceted and iterative duty which mainly involves assignment of resources to project tasks. It is important for project managers to implement schedule management planning in order to reduce overheads by ensuring that the project is not overstaffed and thus leads to reduction in the cost of completing a project by proper time management [5](Bowen, Cattel, Hall, Edwards, & Pearl, 2012).

f) Factors determining schedule management planning

In the last few years, various studies have emphasized on the existence of different factors which have an impact on schedule management planning. The factors determining it has been the topic of study for many researchers mainly owing to the pressure of implementing successful projects in an energetic global market and dynamic business world [6](Crisan & Borza, 2014). They are as follows.

- **Proper allocation of resources:** Resource allocation or resource loading is the process of allotting the requisite number of those resources which have been recognized in the planning stage to every activity which has been acknowledged in the plan. It has been seen practically that more than a particular type of resource can be attributed to a particular activity which necessitates project managers to do schedule management planning. It is not important for resource allocation to have a fixed allotment as a few activities might need lesser resources at one stage but may require the same resources in a higher number in the later stages of the project [14](Jugdev & Muller, 2015).
- **Incompetency of manager or team:** Successful leadership is significant for developing and integrating new approaches as well timely completion of the project. Schedule management is negatively affected by lack of adequately informed project leadership as well as project team [12](Hyvari, 2012; Muller & Turner, 2007). Improper leadership can lead to increase in costs or delay the completion of project due to lack of planning of resources before the execution of the project.
- **Project priority:** It is important for project managers to prioritize the projects or the different phases of a single project to ensure smooth execution and timely completion [15](Kerzner, 2013). Project schedule management planning is required to meet the objectives of the project, which also needs to be stated in a manner which helps in recognition and assignment of priority within the projects.
- **Inventory of resources:** Scheduling is dependent on the correct ascertainment of the stock of inventories which needs to be kept by the company. It has been seen that as a general rule, most companies hold the supply of one month of each product they require as inventory [16](Lim & Mohamed, 2009). Scheduling needs to be changed by ascertaining whether the resource required is fast moving or slow moving. Therefore, keeping adequate inventory of the resources is important to ensure that the project is moving as per the planned schedule.
- **Delivery dates:** The production schedule also depends on the delivery dates as it is important for the project managers to adhere to the deadlines fixed for the completion of projects. A production schedule needs to be prepared in a manner that guarantees well-timed delivery to the consumers.

It is also important for inventory of resources to be spread out throughout the year in the case of seasonal goods in order to reduce increased pressure for it in demand season of the project schedule [19](Morris, Pinto, & Soderlund, 2011).

- **Availability of raw materials and labor:** Scheduling depends on the availability of raw materials and personnel. It has been observed that appointment of untrained or inexperienced employees leads to the organization to be unable to successfully complete their project. Therefore, the schedule needs to make provisions to incorporate these changes in their plan to ensure smooth execution. Also, availability of regular supply of materials allows the organization to do normal scheduling. On the contrary, if the supply of materials is not standard, then the schedule needs to be prepared accordingly to ensure that there are no delays.

g) Impact of schedule management planning on project management effectiveness

[20](Mouri, 2011) aimed to identify the actual amount of time losses in projects along with identifying the reasons behind it. The study also discovered that the amount of time and monetary lost is considerable which involved a plethora of vital causes acting behind it. These causes include inadequate fund flow, inappropriate allocation of fund, improper schedule management planning and altering scope of the work as well as price changes.

[8](Globerson & Zwikael, 2012) evaluated their use of the 21 processes which had an impact on the planning process out of the 39 processes needed for effective project management. The results obtained from the study showed that schedule management and risk management were the processes which required the lowest planning quality. It found that development of new tools in different areas was needed for improving quality planning processes and enhancing organizational training programs.

[25](Solis-Carcano et al., 2015) in their study included the assessment of fourteen school construction projects executed by a public agency in the Yucatan Peninsula, Mexico. A Use Index was employed for the purpose of assessing the project success while the Schedule Performance Index and the Schedule Variance were computed to assess the schedule management planning. The results showed statistical dependence between both the variables as main projects which attained timely completion as per schedule also made a greater use of the processes related to project management.

[23](Nasseri & Abdullah, 2015) aimed to learn and explain the perspectives of project stakeholders' with respect to a set of recognized criteria consisting aspects which are significant in successful project planning and scheduling. Three different questionnaire surveys were prepared for the purpose of collecting and analyzing data in order to supplement the empirical studies discussed in the thesis.

[1](Al-Hajj & Zraunig, 2018) examined the various methodologies related to project management along with their impact on the elements of project success. The study analyzed the data collected from project practitioners over ten nations. The collected and analyzed data showed that a lot of successful projects use but do not completely utilize contemporary tools used for project management to their full capabilities. Thus, it was concluded that schedule management is an important ingredient for achieving project success.

III. METHODOLOGY

For the purpose of this research, primary quantitative data through the survey method was collected from the universe consists of employees working in service sector organizations. The following process was followed in order to collect primary data for this study.

a) 300 employees were selected using random sampling method from 10 service sector organsiations in various parts of India, out of which 208 participated in the survey. Every organization in this sample consisted of a minimum of 50 employees across different departments such as operations, finance and marketing.

b) Furthermore, all the organizations were engaged in development of technological (hardware and software) solutions as their main product segment.

c) They were first approached via email, wherein the stated objective of this study was explained to them and their participation was requested. Our of the 15 service sector organisations that were approached, 10 agreed to participate in the survey.

d) A close-ended questionnaire was distributed among the respondents consisting of questions related to the importance of schedule management planning in project management effectiveness within their organizations. The questionnaire contained questions pertaining to their demographic profile, general background of the research problem and finally the inferential questions in likert scale format. They were asked to choose the responses from a scale of 1 to 5, where 1 stood for strongly disagree and 5 represented strongly agree.

e) The data was analyzed using SPSS software and the findings are represented below in the form of graphs, tables and description.

f) The demographic profile and general background information pertaining to the implementation of schedule management planning in the organizations was analysed descriptively. In order to test the proposed hypothesis, correlation and regression test has been applied.

IV. ANALYSIS

The study focused on analyzing the impact of schedule management plan on project management effectiveness. Hypothesis used for testing this impact is

H_0: There is no significant impact of schedule management plan on project management effectiveness

H_A: There is significant impact of schedule management plan on project management effectiveness

h) Descriptive analysis

The demographic analysis of 208 respondents (Figure 1) show that about 40% of the population lies in the age group of 30-40 years. Further there is high proportion of male employees in the organization. Most of the respondents were working in the finance/Banking/Insurance services and only 10% of the respondents have worked as the project manager. Mostly the perception of team members is studied to analyze the impact of Schedule management plan on project management effectiveness.

Figure 1: Demographic Profile of Respondents

Background analysis (Figure 2) shows that 89.4% of the population consider project management as essential factor in an organization. Respondents selected for the study depicts that mostly the projects undertaken are for enhancement of existing system and redesign of existing system. Only in 25% respondents new project development was done. Further, most of the respondents relate schedule management plan to time i.e. consider summarizing of start and finish date, sequencing of activities and monitoring and control of working as important benefits of implementing schedule management plan.

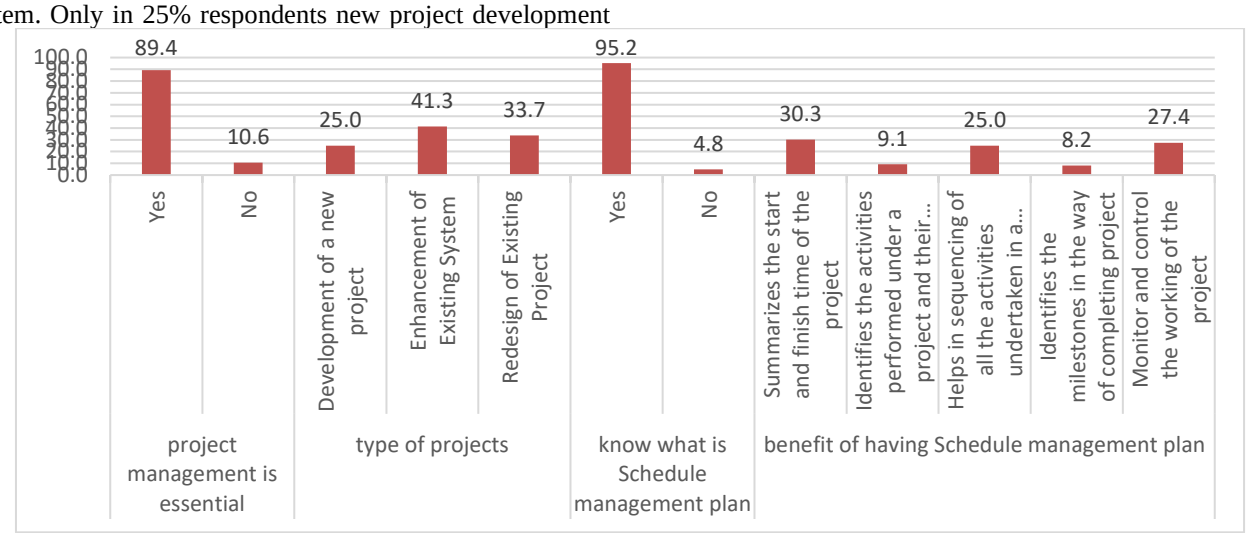

Figure 2: Background Analysis of Respondents

Figure 3 shows that project life cycle, clearly defined roles and responsibilities, time management, and risks are some of the most important factors which influence the effectiveness of project management. However, economic and environment factors too influence the project management effectiveness, but the perception is almost balanced i.e. 43% disagree with contribution of economic factors while 49% accept its relevance, and about 42% disagree with importance of environment factors while 50% accept its relevance in project management effectiveness.

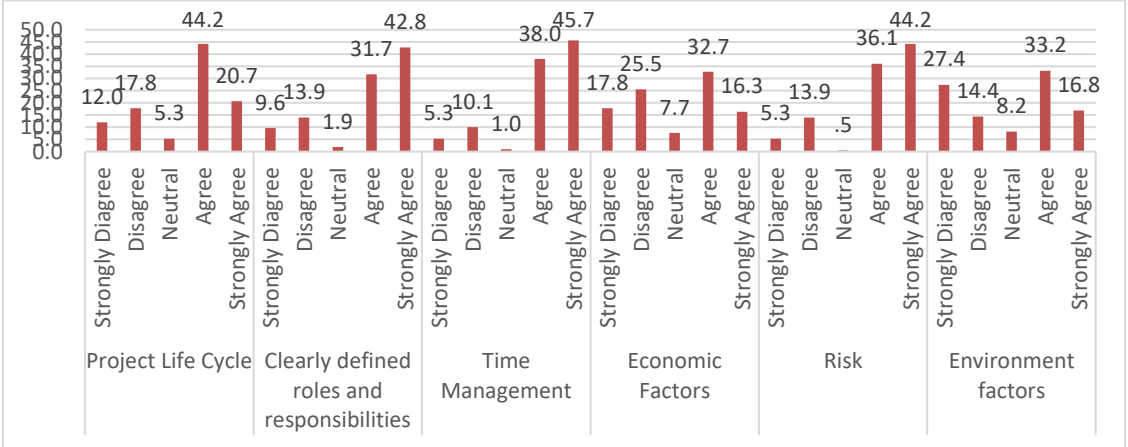

Figure 3: Factors affecting Project Management Effectiveness

Thus, the respondents mostly relate schedule management plan to timing and consider project life cycle, time management, risk, and clearly defined roles and responsibilities as the important factors influencing project management effectiveness.

i) Inferential Analysis

Table 1 shows the correlation matrix for the factors affecting schedule management plan and project effectiveness. As the sig. value for each factor is below the significance level of the study i.e. 0.000 < 0.05. Thus, the factors of schedule management plan and project management effectiveness are significantly correlated. However, the Pearson coefficient value shows difference in strength of correlation. For incompetency of manager or team, and inventory of resources, strong correlation exist with project management effectives as the value of coefficient is 0.651 and 0.640. For project priority, weak positive correlation exist as the value is 0.399 < 0.4. For all other factors moderate positive correlation exist. As weak correlation exist in case of project priority and even delivery dates has coefficient value less than 0.5, thus both factors are not considered for analyzing the impact of schedule management plan.

		Project management effectiveness	Proper allocation of Resources	Incompetency of Manager or Team	Project Priority	Inventory of Resources	Delivery Dates	Availability of Raw materials and labor
Project management effectiveness	Pearson Correlation	1	.541**	.651**	.399**	.640**	.480**	.510**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	208	208	208	208	208	208	208

**. Correlation is significant at the 0.01 level (2-tailed).

Table 1: Correlation Matrix

Regression analysis of the selected factors is given in below table 2

Project Management Effectiveness	**Coefficient**	**t-value**	**p-value**	**R^2 value**	**Adjusted R^2 value**
Constant	0.876	4.592	0.000	0.596	0.588
Proper allocation of Resources	0.128	2.946	0.004		
Incompetency of Manager or Team	0.315	6.276	0.000		
Inventory of Resources	0.258	5.265	0.000		
Availability of Raw materials and labor	0.130	3.424	0.001		

Table 2: Regression results

R^2 and Adjusted R^2 value represented in Table 2 is 0.596 and 0.588. This shows that with about 58.8% of variation in project management effectiveness is being determined by the schedule management plan indicators. The p-value of the regression results present in the table is less than the significance level of the study i.e. 0.004, 0.000, 0.000, and 0.001 < 0.05. Thus, the null hypothesis of having no significant impact of schedule management plan on project management effectiveness is rejected. Hence, with increase in proper allocation of resources, incompetency of manager or team, inventory of resources, and availability of raw materials and labor tends to increase the level of project management effectiveness. An article by (Majeed, 2019) has shown that allocation of resources helps in completion of work within the desired budget and hence help in cost - effective working of the organization. Yaghootkar & Gil, (2012) in his study too focused on the relevance of schedule-driven project management and stated that in order to enhance productivity and effective management of projects, schedule management is essential.

V. CONCLUSION

This study was based on analyzing the impact of schedule management plan on the project management effectiveness. Although traditionally project management has been studied and implemented from a broad perspective, of late several methodologies have emerged to further enhance its effectiveness in operations, and schedule management planning is one of them. Schedule management plan helps in time management of each project along with providing the facility of monitoring different tasks in a project. This not only provides the benefit of optimal usage of resources, timely completion of projects, and effective results, but also helps in enhancing the productivity of employees. The analysis showed that mostly the biggest advantage of schedule management plan is related to time management.

Further, clearly defined roles and responsibilities, project life cycle, risks, and time management are the main factors which affect the project management effectiveness. They were also identified as the challenging factors. In order to be successful in running an organization, project management should be effective. This would help in maintaining coordination, planning the entire working process, timely completion of the tasks, and achievement of the goals of the organization. As there is a positive impact of schedule management planning on project management effectiveness, successful implementation of the schedule management plan should be among the key objectives. Moreover, organisations must put in place certain methodologies and strategies that help employees handle the project challenges effectively such that the outcome of the operations is not hampered negatively.

REFERENCES

1. Al-Hajj, A., & Zraunig, Ma. M. (2018). The Impact of Project Management Implementation on the Successful Completion of Projects in Construction. *International Journal of Innovation, Management and Technology*, *9*(1).
2. Anantatmula, V. S. (2010). Project Manager Leadership Role in Improving Project Performance. *Engineering Management Journal*, *22*(1), 13–22.
3. Beleiu, I., Crisan, E., & Nistor, R. (2016). *MAIN FACTORS INFLUENCING PROJECT SUCCESS*. Babes-Bolyai University, Romania.
4. Bjarnason, E. (2015). *Critical Success Factors for Planning, Scheduling and Control in Design and Construction*. Reykjavik University.
5. Bowen, P. A., Cattel, K. S., Hall, K. A., Edwards, P. J., & Pearl, R. G. (2012). Perceptions of Time, Cost and Quality Management on Building Projects. *Australasian Journal of Construction Economcis and Building*, *2*(2), 48–56.
6. Crisan, C. S., & Borza, A. (2014). *Strategic entrepreneurship, Managerial Challenges of the Contemporary Society* (Ed. Risopr).
7. Fitsili, P. (2009). Measuring the complexity of software projects. *WRI World Congress on Computer Science and Information Engineering, Computer Science and Information Engineering*, 644–648.
8. Globerson, S., & Zwikael, O. (2012). The Impact of the Project Manager on Project Management Planning Processes. *Project Management Journal*, *33*(3), 58–64.
9. Ham, N., & Lee, S. (2019). Project Benefits of Digital Fabrication in Irregular-Shaped Buildings. *Advances in Civil Engineering*, *2019*, 1–14. https://doi.org/10.1155/2019/3721397
10. Harris, F., & McCaffer, R. (2013). *Modern Construction Management* (7th Editio). John Wiley & Sons.
11. Heales, J., Susilo, A., & Rohde, F. H. (2011). Project Management Effectiveness: the choice - formal or informal controls. *Australasian Journal of Information Systems*, *15*(1).
12. Hyvari, I. (2012). *Modern Construction Management*. Helsinki School of Economics.
13. Hyvari, I. (2016). Project management effectiveness in project-oriented business organizations. *International Journal of Project Management*, *24*(3), 216–225.
14. Jugdev, & Muller, R. (2015). A Retrospective Look at Our Evolving Understanding of Project Success. *Project Management Journal*, *36*(4), 19–31.
15. Kerzner, H. (2013). *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*. New York: John Wiley & Sons.
16. Lim, C. S., & Mohamed, M. Z. (2009). Criteria of project success: an exploratory re-examination. *International Journal of Project Management*, *17*(4), 243–248.
17. Majeed, M. (2019). Importance of Resource Allocation and Time Management in Project Management. Retrieved October 3, 2019, from https://project-management.com/importance-of-resource-allocation-and-time-management-in-project-management/
18. Maximiano, A. A., Leroy, D., Morias, C. H. B., & Yugue, R. T. (2010). Avaliação do Uso das Ferramentas de Gerenciamento de Projetos. *7th CONTESI International Conference on Information System and Technology Management*. Sao Paulo.
19. Morris, P. W. G., Pinto, J. K., & Soderlund, J. (2011). *The Oxford Handbook of Project Management*. Oxford University Press.
20. Mouri, H. R. (2011). *An Evaluation of Project Management Processes in Public Sector Organizations Like Public Works Department (PWD)*. BRAC Institute of Governance and Development.
21. Mubarak, S. A. (2010). *Construction Project Scheduling and Control*. New Jersey: John Wiley & Sons.
22. Muller, R., & Turner, R. (2007). The infl uence of project managers on project success criteria and project success by type of project. *European Management Journal*, *25*(4), 298–309.
23. Nasseri, A., & Abdullah, H. (2015). *Understanding Applications of Project Planning and Scheduling in Construction Projects*. Lund University.
24. Remington, K., Zolin, R., & Turner, R. (2009). A model of project complexity: distinguishing dimensions of complexity from severity. In IRNOP (Ed.), *Proceedings of the 9th International Research Network of Project Management Conference*. Berlin.
25. Shah, D. R., & Patel, D. N. (2018). REVIEW: FACTORS AFFECTING SCHEDULING OF MULTIPLE PROJECTS. *International Research Journal of Engineering and Technology*, *5*(3).
26. Solis-Carcano, R., Corona-Suarez, G. A., & GarciaIbarra, A. J. (2015). The Use of Project Time Management Processes and the Schedule Performance of Construction Projects in Mexico. *Journal of Construction Engineering*, *9*.
27. Uher, T. E., & Toakley, A. R. (2009). Risk management in the conceptual phase of a project. *International Journal of Project Management*, *17*(3), 161–169.
28. Westerveld, E. (2013). The Project Excellence Model: linking success criteria and critical success factors. *International Journal of Project Management*, *21*, 411–418.
29. Wysocki, R. K. (2011). *Effective Project Management: Traditional, Agile, Extreme* (6th Editio). Wiley Publishing.
30. Yaghootkar, K., & Gil, N. (2012). The effects of schedule-driven project management in multi-project environments. *International Journal of Project Management*, *30*(1), 127–140. https://doi.org/10.1016/j.ijproman.2011.02.005
31. Zou, W., Kumaraswamy, M., Chung, J., & Wong, J. (2014). Identifying the critical success factors for relationship management in PPP projects. *International Journal of Project Management*, *32*(2), 265–274.

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