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Role of project management methodology in challenges faced in implementation of Information Systems projects in the new normal after pandemic

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***Abstract*---**Information technology and information systems have gained importance than ever before after the onset of COVID-19. Information systems in the new normal needs to be developed considering the huge demand for online services and the wide population consuming these services. Development of such information systems requires robust project management methods for smooth implementation and efficient delivery of services to the users. The prime objective of adoption of a project management methodology by Information system providers is to address the challenges in management of the projects in the organization. Different project management methodologies are available for different types of projects. There is a need to understand if the project management methodology adopted has any significance in the current challenges faced in the implementation of the project. A questionnaire survey was conducted among practitioners in the IT industry to understand if their current project management methodology has any association with the challenges they face in the current projects during the COVID pandemic time. The survey was conducted among a group of practicing professionals in the state of Kerala, India in the field of IT in

Government and private sector. The results indicated that project management methodology has a significant association with the challenges faced in project management. Hence the selection of the methodology by IT organizations should be such that the challenges are taken into consideration and the resulting methodology should help to address these issues in project implementation in these challenging times. This will help to develop the most efficient systems addressing the increasing IT needs of the new normal.

***Keywords*---**Project management methodology, Project management challenges, PMI, Prince2, Agile, Waterfall, COVID-19.

Introduction

Technology has played a significant role in normalizing the work and life routines in the rather abnormal situation created by the COVID-19 pandemic (Herath & Herath, 2020). Strong environment and digitized health information systems were vital in controlling the epidemic (Elsa Negro-Calduch, 2021). Digital transformation in the basic education sector, the variety of digital divides emerging and getting reinforced, and the possible roadblocks were outcomes of the pandemic (Iivari, Sharma, & Ventä-Olkkonen, 2020). As pandemic restrictions are getting lifted, we need to think how we can develop a new normal rather than going back to pre–COVID-19 routines (Kantrowitz-Gordon, 2021). There has been a massive shift in the nature of work and the role that technology has in the workplace. Organizations have been forced to adopt a rapid 'big bang' approach of technology and 'tech-driven' practices in an unprecedented and time bound manner (Caroll & Conboy, 2020). The success of an Information Systems project, the roll-out of the solution and the operation of the information systems depends on efficiency of the equipment and software developed. Software and IT projects have their challenges due to the rapid technological advances, pressure to provide better services and facilities to customers. Hence standard project management methodologies only may not be suitable for managing projects in this IT sector. Studies have shown that various factors like leadership commitment, budget controls, organisation structure, employee reward system, training of project teams, etc. play a vital role in managing projects successfully. Project management is complex and requires technical skillsets along with people management skills for managing expectations of stakeholders. A project is often influenced by internal and external factors and requires multiple channels of communication and techniques for reducing the gaps and in delivering projects efficiently. Different project management methodologies are suitable for executing projects in different domains. Tailoring of project management methodologies would be more suitable according to the project scenarios to provide efficient project management and control. The challenges in implementing IT systems could be such as managing multiple time zones, differences in culture, virtual communication environments, associated costs, etc. There is a need for setting the right expectations, managing stakeholders, managing the cross cultural differences and proper documentation (Singh & Lano, 2014). Some of the additional benefits of project management along with the routine ones are better

return on investments, customer satisfaction, process improvements, learning and growth within the organisation (Patah & Carvalho, 2009).

Literature review

During the COVID-19 pandemic, dependence of many facets of society on technology and online systems has grown exponentially. This has impacted all sectors alike including the health-care, education, retail, travel, food, and government agencies. In order to facilitate telecommuting, organizations will have to adopt different types of technologies and emphasize on the most appropriate practices and policies (Herath & Herath, 2020). There is a need to promote digital solutions beyond the COVID-19 pandemic. Proper financing into out-of-the-box data management systems and people-centred, completely digitized health records and systems in social services are key elements for better policy-making (Elsa Negro-Calduch, 2021). The picture of digital divide was found to be strong in the current COVID-19 new normalcy. Organisational procedures and project management processes that were focused on already established methods and practices have now been subjected to dramatic changes leading to more emphasis on agile methods as part of a strategic COVID-19 world, where new routines and processes become the new normal (Sonjit, Dacre, & Baxter, 2021).

The fundamental role of information and communication technologies is facilitating business transactions and communicating relevant information to decision-makers. Success of Information Systems lies in information quality, system quality, service quality, system use/usage intentions, user satisfaction, and net system benefits (Lau, 2020). One of the main challenges in Information Systems development lies in the ability to develop the project concept, in designing and delivering systems to satisfy dynamic requirements of the customer. Project management is implemented to develop products and solutions that meet the client's needs (Tesch, Ireland , & Liu, 2008). Some of the industry wide frameworks are Project Management Body of Knowledge (PMBOK) Guide, by Project Management Institute (PMI), PRINCE2, etc. In case of software projects, Software Development Life Cycle (SDLC), agile methods more relevant to software engineering are in practice. In spite of the existence and acceptance of these project management principles there exists a huge gap in project management in the real world projects and challenges exists in implementation of projects.

Today projects are larger, to be executed in shorter duration with execution to be done in a virtual manner. There is a lot of data to be processed and less of paper. Project management forms the foundation for organisational strategy and life of organisations depend on the execution of their projects. Common project management methodologies do not address the possible challenges, mainly related to the required soft skills which demand the tolerance of the project manager. Organisations devise strategies and put into action innovative business approaches for gaining competitive strengths by using project management tools and techniques. Project management frameworks are formulated around traditional perspectives to innovative project management solutions (Tabassi, Bryde , Kamal, Dowson, & Michaelides, 2019). When choosing the suitable Project Management methodology in an organization, project managers often find organization culture to be more significant than project objectives (Sulej , 2021).

Changes in project scope, conflicts between project based and departmental activities, contention of resources, lack of resource utilisation monitoring systems, resource shortage, absence of a definite project management methodology, absence of a framework for software project management methodology, conflicts in projects prioritization, ad hoc tasks assignment to resources, poor quality of software, unrealistic projects expectations and lack of optimistic planning are some of the challenges faced by IT Project Management Offices (Salamah & Alnaji, 2014). PMOs are partially successful due to several challenges encountered while managing and executing projects.

Project management methodology refers to a set of methods, techniques, best practices, procedures, etc., used for the management of a project. The most commonly used project management methodologies are: PMI, IPMA, APM, YUPMA, PRINCE 2, etc. A major issue with these methodologies is that they are usually implemented without considering the type of project. Agile methodologies are project management methodologies used in development of software and are built on the principles of flexible work systems, continuous recheck of the completed section or task and introduced changes, active role of the clients, a specific manner of project team organisations, regular communication between all stakeholders, regular review meetings of the project team and client meetings. Etc. Use of the right project management methodology involves advantages such as easy and simple project management; easy project planning and control; better project execution, better communication within the project teams and with stakeholders; efficient response to change; efficient project risk mitigation and project quality management, faster achievement of project outcomes, etc. (Jovanovic & Beric, 2018). The selection of project management methodology should be such that:

1. It facilitates in managing risks/opportunities.
2. It facilitates goals setting and project scope by including best practices of all project management group processes, tools, techniques, templates for effective project management
3. It creates a project dashboard to oversee, monitor the project progress
4. It is adaptable and scaled to project sizes
5. It leverages on the best practices to minimize obstacles and failure rate.
6. It should promote organizational learning
7. It depends on upon organizational, government and sector specific standards and regulations (Chin, Yap, & Spowage, 2012)

When it comes to software development, challenges with a Waterfall approach include the methodology's inflexibility towards incorporating change, the amount of rework and unpredictable quality of the software developed due to the testing delay until late in the project. In case of Agile, organization's existing technology may affect attempts in the migration to agile methodologies. Agile requires an investment in tools to support the fast pace and facilitate the iterative mode of Agile development methods such as version management and refactoring (Hillaire, 2018). The main challenges of agile project management in the public sector includes team members' knowledge and experience, behaviour of leaders in the organisation affecting decision making powers to the team. Consistency of efforts is required for focussing on the implementation and integration of methodologies,

lessons learned, best practices and knowledge transfer (Margarita, Evelina, & Stoyanova, 2020). Agile practices have challenges when it comes to acceptance by stakeholders (Raj & Sinha, 2020). Absence of a specific role in managing and controlling scope & changes, absence of a clear procedure for controlling scope & changes, lack of clarity in responsibilities among team members, bureaucracy, absence of procedures to prioritize change, unreasonable and unsystematic change requests, poorly defined objectives, unclear completeness in each sprint, lack of tools to control version history, lack of availability of a modern technologies to handle a change requests, poor participation from members and stakeholders are some of the challenges in Agile methodologies. Most significant challenges are observed in people management & organization, prioritization of user requirements, over-scoping of requirements and coordination and communication (Marnada, Raharjo, Hardian, & Prasetyo, 2021).

In case of Hybrid/ Agile project management methodologies variables such as organisational culture along with the change control mechanisms affect adoption of the methodology (Krishnakumar, 2020). Agile and DevOps methodologies have impact on scope, quality management and estimation which has an impact on the project management practices. Agile and DevOps methodologies also have impact on shared responsibilities, feedback mechanisms which organizes team structure and automation. Project management practices must be in pace with the changes in approach of development of software products. The challenges related to team and management approach should be addressed in Agile DevOps methodologies for making the implementation successful. Modern methodologies are found to be about system changes, coordination among project team members and coordinated effort. This requires change in mind-set and changes inside the specific organization harping on the new methodologies. Lack of leadership support and training, and inability to address the cultural differences are the top barriers to effective project risks management (Dandage, Mantha, Rane, & Bhoola, 2017). Design-related activities are a significant source of uncertainty that is transmitted towards later stages of the project (Apaolaza, Lizarralde, & Zubillaga, 2020). Understanding of project complexity and its management is of great importance for project managers due to the variations in decision-making and goal attainment. Complexity influences planning and control; hindering clear identification of goals and objectives, affecting the selection of a suitable project organization form, or project outcomes (Cristobal, Carral, Diaz, Fraguela, & Iglesias, 2018).

By aligning the project management knowledge areas need with the availability of practices, organisations can ensure success of their projects in case of traditional methodologies. Organizations should refine their project management methods, practices and policies to improve efficiency and effectiveness of projects. Improper allocation of human resources in a project affects time, cost and quality of the project (Tesch, Ireland , & Liu, 2008).

Agile methodologies used for financial software development has found to increase the efficiency of the development process, and also satisfaction of stakeholders. However, project managers should know adapting to various Agile methodologies to their organizations (Munteanu & Dragos, 2021).

Both traditional and agile project management approaches have their advantages and disadvantages, depending on the project characteristics. Selection of Project Management approach should consider both; nature of the project and organizational environment. Both project management approaches can be combined for a single project and methodology selected should suit the project. Customised software development projects show that there is a real need to combine both traditional and agile approaches. A lack of clarity exists in specifying the components of Agile Project Management methodology, process, tools, and approaches, especially when compared with the traditional project management (TPM) processes. This is significant when practices and artefacts related to software are used to describe the Agile practices because this method was influenced by agile practices of software-development (Salameh, 2014). Different problems that project managers face can be unstructured decisions, presence of multiple actors and perspectives, conflicts in objectives and important intangibles. Hence project managers should possess hard skills and soft skills with the abilities to view from a management perspective and develop leadership skills (Mateo, Diaz , & Villa, 2017). Agile is popular due to its rapid improvement and willingness to adopt to changes. But uncontrolled changes can delay significantly and make the projects overspend (Marnada, Raharjo, Bob, & Prasetyo, 2021).

In order to design the methodology for a particular project, the challenges lie in defining the project characteristics and also, in defining the right methodology of project management which could be based on different approaches. For custom software development the most suitable project management methodology can be a combination of elements of agile approaches and elements of traditional approaches, as neither a completely agile nor completely traditional project management methodology can be the best fit (Spundak, 2014). Hybrid and agile methods can increase project success compared to traditional methods while achieving the same cost, schedule, scope, and quality results. Hybrid project management approaches were found to be similar in effectiveness compared to agile methods (Gemino, Raich, & Serrd, 2020). When waterfall and agile approaches are used together, it is challenging because it can create conflicts in the organizational levels. There will be conflict in the development process, people, and business understanding in an organization when agile is adapted in traditional organization. The organizations when trying to implement new methodology may find challenges with team members who don't want to change from internally used and developed their previous methodology (Chandrababu & Muddangula, 2019). Some of the challenges in adopting agile are resistance from project teams, lesser flexibility, Scrum ceremonies and underlying challenges in delivering functional increments within the iteration (Modransky, Jakabova, Hanak, & Olah, 2020).

Research Methodology

The objective of this research is in understanding if the existing project management methodology has an association with the challenges faced in project management in implementation of Information systems during the time of Covid pandemic. A questionnaire survey was conducted among 604 professionals comprising of project managers and development team members from

Government IT sector as well as Corporate IT sector. The responses to the challenges faced were collected on a 5 point Likert Scale and Project management methodology on a nominal scale. The data collection was done through a survey questionnaire among 604 employees working in IT sector in Government as well as private sector in Kerala, India. Chi square analysis was conducted to understand if Project Management methodology has an association with the challenges encountered in the implementation of project management in information systems development (Statistics, 2018). The dependent variable in this study is the challenges faced and independent variable is project management methodology. Cochran formula was used for sample size calculation. The dependent variable was further divided into 12 sub variables based on the literature review (Chandrachooodan, Radhika, & Palappan, 2021). The major challenges faced in the implementation of information systems identified in this study are:

1. Technological changes
2. Delay in adoption of new practices
3. Inadequate technical skills within the organization
4. Inadequate Project Management skills in the organisation
5. Inadequate end- to-end project management
6. Absence of Compliance to project requirements
7. Absence of Management Information System(MIS)
8. Inadequate a robust project Governance framework
9. Inadequate support from Top management for Project Management
10. Inadequate reference documents about similar projects
11. Legislative or legal decisions
12. Inadequate support from the project sponsor

Hypothesis

The null hypothesis Ho is states as there is no association between methodology adopted for project management and challenges faced in implementation of the project. The alternate hypothesis H1 is stated as there is association between methodology adopted for project management and challenges faced in implementation of the project. This null hypothesis is further subdivided for each sub variable under the challenges:

1. H01: There is no association between methodology adopted for project management and 'Technological changes' as a challenge in the implementation of project.
2. H02: There is no association between methodology adopted for project management and 'Delay in adoption of new practices' as a challenge in the implementation of project.
3. H03: There is no association between methodology adopted for project management and 'Inadequate technical skills within the organization' as a challenge in the implementation of project.
4. H04: There is no association between methodology adopted for project management and 'Inadequate Project Management skills in the organisation' as a challenge in the implementation of project.

5. H05: There is no association between methodology adopted for project management and 'Inadequate end- to end project management' as a challenge in the implementation of project.
6. H06: There is no association between methodology adopted for project management and 'Absence of Compliance to project requirements' as a challenge in the implementation of project.
7. H07: There is no association between methodology adopted for project management and 'Absence of Management Information System' as a challenge in the implementation of project.
8. H08: There is no association between methodology adopted for project management and 'Inadequate robust project Governance framework' as a challenge in the implementation of project.
9. H09: There is no association between methodology adopted for project management and 'Inadequate support from Top management for Project Management' as a challenge in the implementation of project.
10. H010: There is no association between methodology adopted for project management and 'Inadequate reference documents about similar projects' as a challenge in the implementation of project
11. H011: There is no association between methodology adopted for project management and 'Legislative / legal decisions' as a challenge in the implementation of project.
12. H012: There is no association between methodology adopted for project management and 'Inadequate support from the project sponsor' as a challenge in the implementation of project.

Analysis
Demographic Details

Frequency distribution of the demographic information collected from the participants was done. The demographic details are as given in Table 1.

Table 1
Frequency Distribution

Age	Percentage	Education	Percentage	Roles	Percentage
Less than 25	12	Graduate	62	Other roles	66
25-34	245	Graduate with Technical Qualification	77	Team member	290
35-44	311	Master's degree	207	Project Manager	205
45 and above	36	Masters degree with Technical education	258	Programme Director/ HOD	43
Total	604	Total	604	Total	604

Test for normality

The test for Normality shows that p less than 0.05, hence the null hypothesis is rejected. The data is found to be not normal. Null hypothesis for normality states that data is normally distributed. Since n> 50 Kolmogorov-Smirnov statistic is used. Here p less than 0.05, hence the null hypothesis is rejected. That is data is not found to be normally distributed. The descriptive statistics is given in Table 2.

Table 2
Descriptive statistics

Descriptive Statistics			
	N	Mean	Std. Deviation
PM Methodology	604	3.48	1.374
Technological changes	604	3.65	.834
Delay in adopting new practices	602	3.77	.866
Lack of technical skills within the organization	599	3.58	.894
Lack of Project Management skills in the organisation	598	3.50	.868
Lack of end- to end project management	596	3.66	.871
Lack of Compliance to project requirements	598	3.64	.809
Lack of Management Information System	598	3.52	.844
Lack of a robust project Governance framework	597	3.55	.841
Lack of management support for Project Management	600	3.50	.849
Lack of reference documents about similar projects	599	3.51	.842
Legislative / legal decisions	598	3.35	.796
Lack of support from the project sponsor	598	3.50	.801
Valid N (list wise)	587		

The frequency of the Project Management methodologies adopted is as given below.

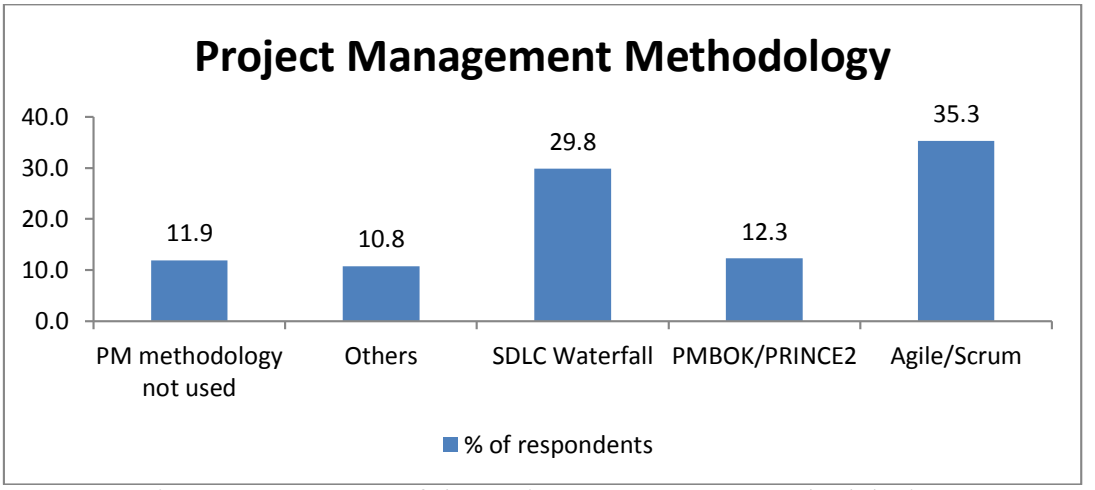

Figure 1 Frequency of the Project Management methodologies

Chi-square analysis is conducted for measuring the association of project management methodology for each of the sub variables. Cramer's V Coefficient (V) is used for measuring the strength of association between two variables. Cramer's V Coefficient (V) can be generalised across contingency tables of different sizes. It is not influenced by sample size and is often interpreted as a measurement of the relative (strength) of an association between two variables. The coefficient ranges from values 0 to 1 (perfect association) (Software, 2015). The analysis is as given Table 3 below.

Table 3
Analysis results of Hypothesis testing

Sl No	Sub variable	Hypothesis	p value	Decision	Creamer's V	Strength of association
1	Technological changes	1. H01: There is no association between methodology adopted for project management and 'Technological changes' as a challenge in the implementation of project.	0.000	Reject null hypothesis	0.174	Weak association
2	Delay in adoption of new practices	2. H02: There is no association between methodology adopted for project management and 'Delay in adoption of new practices' as a challenge in the implementation of project.	0.000	Reject null hypothesis	0.162	Weak association

3	Inadequate technical skills within the organization	3. H03: There is no association between methodology adopted for project management and 'Inadequate technical skills within the organization' as a challenge in the implementation of project.	0.000	Reject null hypothesis	0.185	Weak association
4	Inadequate Project Management skills in the organisation	4. H04: There is no association between methodology adopted for project management and 'Inadequate Project Management skills in the organisation' as a challenge in the implementation of project.	0.000	Reject null hypothesis	0.158	Weak association
5	Inadequate end- to end project management	5. H05: There is no association between methodology adopted for project management and 'Inadequate end-to-end project management' as a challenge in the implementation of project.	0.000	Reject null hypothesis	0.160	Weak association
6	Absence of Compliance to project requirements	6. H06: There is no association between methodology adopted for project management and 'Absence of Compliance to project requirements' as a challenge in the implementation of project.	0.035	Reject null hypothesis	0.108	Weak association
7	Absence of Management Information System	7. H07: There is no association between methodology adopted for project management and 'Absence of Management Information System' as a challenge in the	0.003	Reject null hypothesis	0.123	Weak association

		implementation of project.				
8	Inadequate a robust project Governance framework	8. H08: There is no association between methodology adopted for project management and 'Inadequate robust project Governance framework' as a challenge in the implementation of project.	0.007	Reject null hypothesis	0.118	Weak association
9	Inadequate support from Top management for Project Management	9. H09: There is no association between methodology adopted for project management and 'Inadequate support from Top management for Project Management' as a challenge in the implementation of project.	0.001	Reject null hypothesis	0.131	Weak association
10	Inadequate reference documents about similar projects	10. H010: There is no association between methodology adopted for project management and 'Inadequate reference documents about similar projects' as a challenge in the implementation of project	0.000	Reject null hypothesis	0.133	Weak association
11	Legislative / legal decisions	11. H011: There is no association between methodology adopted for project management and 'Legislative / legal decisions' as a challenge in the implementation of project.	0.000	Reject null hypothesis	0.160	Weak association
12	Inadequate support from the project sponsor	12. H012: There is no association between methodology adopted for project management and 'Inadequate support from the project sponsor' as a	0.009	Reject null hypothesis	0.116	Weak association

		challenge in the implementation of project.				

The analysis indicates that project management methodology adopted has an association with the challenges faced in the implementation of the project. However, the strength of association for each of these variables is found to be low.

Discussion

The chi-square analysis was conducted to measure the association between project management methodology used and challenges faced in implementation of the projects in the context of the new normal. The results indicate that project management methodology has a statistically significant association with the challenges faced during implementation; however the strength of association is weak for each of the variables. It can be hence understood that the stronger the Project management methodology, the lesser would be challenges faced. Project management methodology adopted by the organisation should focus on adapting to the changes in technology over time. Implementations should be in line with current trends in technology with clear directions on how to use up-to-date technology in implementation (Lund & Lundin, 2016). There should be frequent review and adoption of best and innovative practices for optimised solution. Organizational leadership needs to understand that adopting new project management practices will result in a significant organizational change (Burgan & Burgan, 2012). The methodology should be such that there is sufficient technical and project management skills within the project. Providing the inspiration, motivation, and facilitating to produce innovative ideas is also responsibility of a successful project manager, hence project managers should possess both hard skills such as scheduling and soft skill for successful execution of projects (Adams, 2016). PMO office of some organizations establish policies that standardize all their projects, while a few other organizations allow their project teams to select and customize the right project management approach for their individual projects. Sometimes project managers prefer a specific project management methodology and they require compliance from beginning to end of the project irrespective of the project's size or complexity (Burgan & Burgan, 2014). Project management methodology should be built around compliance to legal as well as project requirements. Failure in planning or meeting regulatory requirement can result in failure in meeting the core project requirements. Projects should be in alignment with the regulatory requirements and this will help project managers to develop a favourable bond with regulatory agencies (Schwierking & Anantatmula, 2015). Effective project governance framework well defined in the project management methodology will ensure the smooth execution of the project. Project governance should be customised to an organization's specific needs and its alignment to organisational governance is critical, hence defining (1) the framework for project governance, (2) roles as well as responsibilities and (3) stakeholders' participation and communication should consider the organisation's governance (Alie, 2015). Documentation of the information system forms a component of the communications, control and monitoring of development activities, operation and maintenance of projects (Oprea & Mesnita, 2006). There should be sufficient reference material on previous

projects for the team to refer to best practices and lessons learned. The role of project sponsor should be clear providing more authority and support and this requires strong will from the top management and accepts that project sponsor role is a very important success factor for a project (Islam, 2014).

Conclusion

COVID-19 has created enormous challenges in project management but it also provides unique opportunities for employees to become innovative in their work practices (Sonjit, Dacre, & Baxter, 2021). No project can be delivered smoothly during its lifecycle from concept stage till closure without facing some obstacles and issues (Mossalam, 2019). Project Management (PM) tools and techniques are the systems based on which Project Management processes in the organization are supported. Many methods, techniques and tools have been developed over the years, which cover all phases of managing projects from concept to closure. PM still remains a highly problematical endeavour. Stakeholders are often disappointed by projects' results, with projects failing to live up to their expectations (Gabriela, Ward, & Araújo, 2013). In case of execution of complex projects, excellent level of management is required and use of traditional tools and techniques for usual projects may be inappropriate. Project managers need to cater to the demands of a complex project environment and design right strategies for addressing the challenges; also willingness for a different leadership pattern is also needed. Project managers should able to make decisions in the dynamic and flexible environments which are continuously changing and unpredictable. Integrated approaches for management of projects and innovative methods of planning, scheduling, executing, and controlling of projects should be devised for managing projects in the dynamic environment (Cristóbal, Diaz, Carral, Fraguela, & Iglesias, 2019). Project management methodologies have a significant association in addressing the challenges faced, particularly in the time of COVID-19 pandemic. The project management methodologies should be tailored anticipating the challenges in implementation in the specific sector to ensure the success of the project in addressing the needs of the new normal.

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