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## A Review of Project Management Practices in EU-funded Horizon2020 Projects

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### Abstract

The current global economy is extremely competitive and it requires an efficient funding of public projects, especially when it comes to research and development. Project Management (PM) practices are intended to increase such an efficiency. The objective of this work is to explore the usage of PM methodologies and practices in projects funded by the European Union as part of the “Horizon2020” research framework program from 2014 to 2020. To this end, this research uses of a survey-based data retrieval to investigate the level of perceived PM maturity in Horizon 2020 projects. The results show that Project Managers involved in Horizon 2020 projects hold a high level of PM maturity, especially in the areas of cost management, communication and stakeholders management thus confirming that PM standards, which are imposed by the EU commission as a binding process, are effectively enforced. In conclusion, this work extends the results to provide useful feedback, suggestions, and opportunities for improvement to be implemented in future programs.

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## 1. Introduction

Over the last decades, the popularity of Project Management (PM) methodologies has been increasing as shown by relevant number of organizations exploiting them as tools to improve productivity and strategic alignment. Starting from the '60s, PM practices have been progressively formalized and multiple standards emerged and bolstered in diverse frameworks [1]. Today, major standards and norms are available and widespread (PMBOK, 2013; PRINCE2, 2009; IPMA ICB4, 2015; ISO 21500, 2012). The European Commission itself developed a PM methodology, named PM<sup>2</sup>. Its purpose is to enable Project Managers to deliver solutions and benefits to their organizations by effectively managing the entire lifecycle of their projects. PM<sup>2</sup> has been created with the need of European Union Institutions and projects in mind” (European Commission, 2021, 1). It is the European Commission's official PM methodology, drawing on PMBOK, PRINCE2, IPMA-ICB, CMMI, TEMPO, and operational experience from EU institutions to included features from a variety of generally recognized best practices in project management (Kourounakis and Maraslis, 2015).

The PM<sup>2</sup> methodology found extensive application in the Horizon 2020 European-funded research and development framework programme, named H2020 in the following. This is the financial instrument for establishing the Innovation Union, a flagship project of the European Union aimed at ensuring Europe's worldwide competitiveness (*What Is Horizon 2020?* | *Horizon 2020*, n.d.). It is the EU's largest ever research and innovation initiative, with about €80 billion in funding available from 2014 and spread over 7 years.

The funding's primary goal is to recruit academics to suggest ideas and contribute technologies to enhance lives, safeguard the environment, and make European industry more sustainable and competitive. (*What Is Horizon 2020?* | *Horizon 2020*, n.d.). In such a program, EU requires to adopt PM practices for achieving more efficient projects' outcomes.

The PM discipline can be defined as the application of practices and processes aimed at specific project objectives and it is recognized to be one of the key success factors of mature organizations [2]. On the contrary, immature companies do not enforce well-established management practices and thus fail in properly coordinate the different areas of expertise [3].

Thus, the level of PM maturity proves itself to be a critical factor to deliver successful projects. That is especially valid in the context of H2020 projects wherein complexity and a variety of different stakeholders with different perspectives and objectives needs to be coordinated. However, little studies have been carried out to understand how PM methodologies and practices are used in EU-funded projects.

Therefore, to bridge this research gap, the present study aims to understand the use of PM methodologies in H2020 projects as perceived by Project Managers. To this end, a questionnaire survey is administrated to PM professionals involved in the execution of H2020 EU-funded projects to capture their perspectives about the adoption of PM practices.

The paper is structured as follows. First, an overview of the relevant literature on the maturity of usage of PM methodologies and practices is conducted. Then, the methodology adopted in the study is presented together with the presentation of the questionnaire. The results of the questionnaire follow. Finally, conclusions are given.

## 2. Literature Review

PM is a valuable framework for coordinating organizations towards the achievement of project success using formalized practices and tools [4]. However, organizations and individuals may have different level of maturity in the deployment of PM practices. Maturity represents the capability of an organization to dealing with projects in a consistent manner [5].

PM Maturity Models (PM3s) can be defined as tools for assessing how project leaders manage projects [6]. International organizations such as the Project Management Institute (PMI), consider these models to evaluate the effectiveness and the dissemination of PM methodologies among companies and in turn they are used to measuring the related maturity [7]. A maturity model provides a framework for the improvement of an organization's performance and enables comparison with similar organizations by assessing the application level of PM practices [8]; [9]. Typically, higher levels of maturity drive the achievement of deadlines, quality standards and cost [10].

A lot of models are available in the literature. Many researchers developed maturity models to rate PM performance to assess expertise in PM [11]. There are those ones focusing on PM processes, those ones oriented to technical processes for developing project outcomes and other ones considering organizational related factors [12]. Most of the models refer to the maturity of an organization in a step-like structure with different levels. The lowest one is associated with informal PM methodologies. On the contrary, highest levels are related to standardized PM processes across the organization, accomplished by performance indicators [13]. Moreover, PM3s have high proximity to international bodies of knowledge, best practices and standards [14]. In the last years the increasing projectification of firms is requiring managing portfolio of multiple projects [15]. In this context, maturity processes adoption might play a crucial role in PM processes, as well as in project portfolio and risk management processes [16].

Similarly, the maturity of PM practices applies to European funded projects. In particular, [18] underlines how multi-lingual project teams and not standardized PM approach might bring to communication misleading and in turn they might jeopardize projects' success. Thus, the adoption of maturity models based on appropriate practices and tools might become a lever to increase the European project performance.

### 3. Research Methodology

This research has been conducted as follows. First, the questionnaire survey is designed and the respondents' sample identified. Finally, the empirical model is carried out and results analyzed.

The survey approach has been selected as an empirical method as it is broadly used in exploratory research. In fact, surveys, are an excellent instrument for measuring a wide range of unobservable data such as companies' and individuals' preferences and behaviors. In addition, surveys are economical and they allow to remotely collect data about a population that is too large to observe directly. For the purpose of this research all data are gathered from the original source of information, since that primary data, is more reliable, authentic, objective and has more confidence-level for the results and conclusions to be made [18]. This data comes from the answers obtained from the questionnaires. The intended respondent of each questionnaire is the project manager of the project, so as to gather information as accurate as possible and within the limits established by one's own subjectivity.

The following information was retrieved from official project websites: a list of all projects participating in the program, additional information such as the related pillar, thematic priority, project number id, project name, organizations participating, funds provided, and many more. A further deepening on the specific project objective was available through specific project website.

The second sampling is a simple random sampling. Using such a method, each individual in the population has a fair chance of being chosen, then it is the best option for results that are representative of the entire population. 980 potential respondents have been initially contacted. 100 out of the total accepted to take part to the study, with a response rate equal to 10.2%, that can be considered suitable for carrying out further study [19].

Considering the questionnaire, the most accurate reliability analysis is Cronbach's Alpha ( $\alpha$ ), as [20] also suggest as a reliability check for the scales' internal consistency. Cronbach's Alpha is a test used to estimate internal consistency of a composite score. It is generally used for calculating reliability coefficients for survey instruments that use Likert-type response sets. "The resulting  $\alpha$  coefficient of reliability ranges from 0 to 1 in providing this overall assessment of a measure's reliability. The Cronbach's Alpha value for the whole questionnaire regarding PM's perceived level of usage is 0.963, indicating that the set of questions developed are measuring the same overall construct. The full questionnaire is available as attachment in the present paper. The results might be available upon request by contacting via mail the Authors.

### 4. Results

The H2020 framework program focuses on three main key areas or "pillars", namely: excellent science, industrial leadership, and societal challenges. Each section of the program has different subsections that gather activities and projects with similar objectives.

Activities in the "Excellent Science" pillar aim to strengthen, build up, and broaden the EU's science basis and technology, and to consolidate the European research area with the purpose of making the Union's research and innovation system more globally competitive to bolster its position as a world leader in science.

The “Industrial Leadership” pillar intends to accelerate the development of strategic technologies and ideas that will support upcoming business, organizations, and enterprises, as well as to assist innovative European SMEs in becoming global leaders and more innovative, efficient, and competitive. The “Societal Changes” pillar reflects the priority of the European Union to address major concerns that affect all citizens in Europe and world-wide. This investment in research and innovation can have a real impact benefitting the citizen by bringing together all types of resources, knowledge from different areas, technologies, and disciplines.

The first section of the questionnaire aims to observe the distribution of the respondents among the H2020 pillars and measure the variety of respondents and the representativeness of the investigation. The selected project pool has also been clustered by industrial sector to find interesting patterns. The industrial sectors considered are: Advisory/Networking, Aerospace, Agriculture, Electronics, Energy, Financial Services, Healthcare, IT, Manufacturing, Materials, Robotics and Waste.

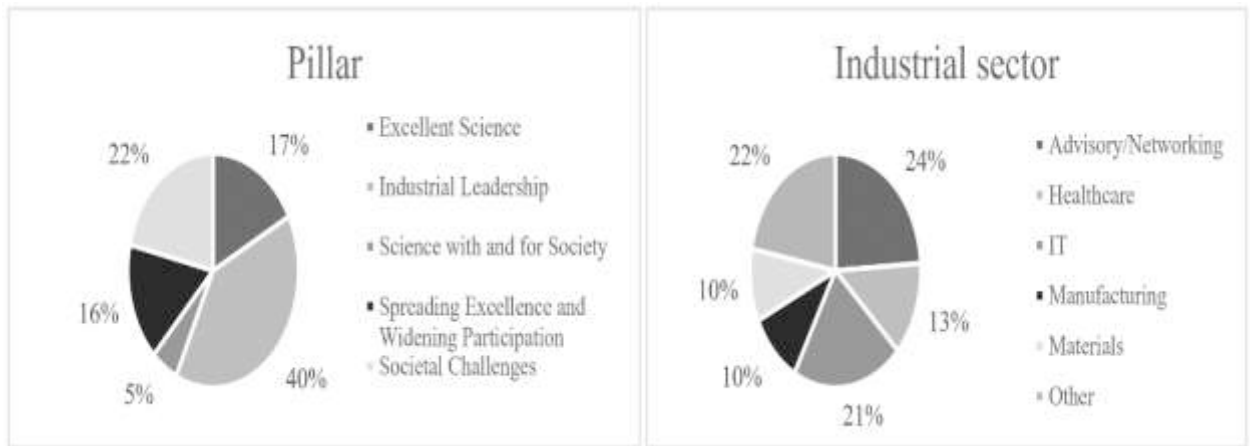


Fig1. Respondents grouped per pillar and industrial Sector

In Figure 1, it can be noted that the pillars “Societal challenges”, “Industrial Leadership” and “Excellent Science” represent 78% of the total responses. By comparing this amount to the percentage of total projects financed and completed in these categories, it is possible to claim that the proportion is maintained in general terms, since this percentage is 85% (data obtained from official data web site for H2020 program). Also, at least one project of every thematic pillar participated and is represented in the analysis. Then, the main conclusions to be obtained during the analysis could be extended to all projects belonging to the programme. A key information for this research, is that 99 out of 100 projects recorded had someone exclusively working in the position of Project Manager. However, only 9% of Project Managers report a PM certification.

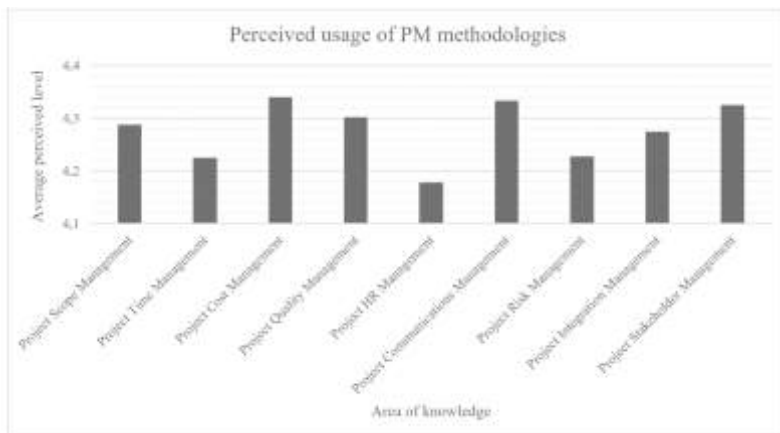


Fig.2 Project Management Methodologies by area of knowledge

The second section of the questionnaire aims to determine the level of usage of PM tools and techniques presented in the PM<sup>2</sup> Guide. This analysis is carried out both by area of knowledge and by process. Figure 2 shows the results by area of knowledge. All the areas present values higher than 4, meaning that there is a shared high consideration about the exploitation of PM techniques in European-funded projects. However, it can be underlined that the management of HR is lower compared to the other areas. This means that even more relevance should be given to the periodic meetings carried out during the pre-design stage of the project, and during the execution one [21]. The highest scores are associated with Cost Management and Communication Management. The attention given to cost demonstrates that this aspect is always critical and Project Managers tend to avoid cost overrun that might impact the performance of the project [22]. Similarly, an appropriate communication is a lever to increase the accuracy of results and, in turn, to enhance clients' satisfaction [23].

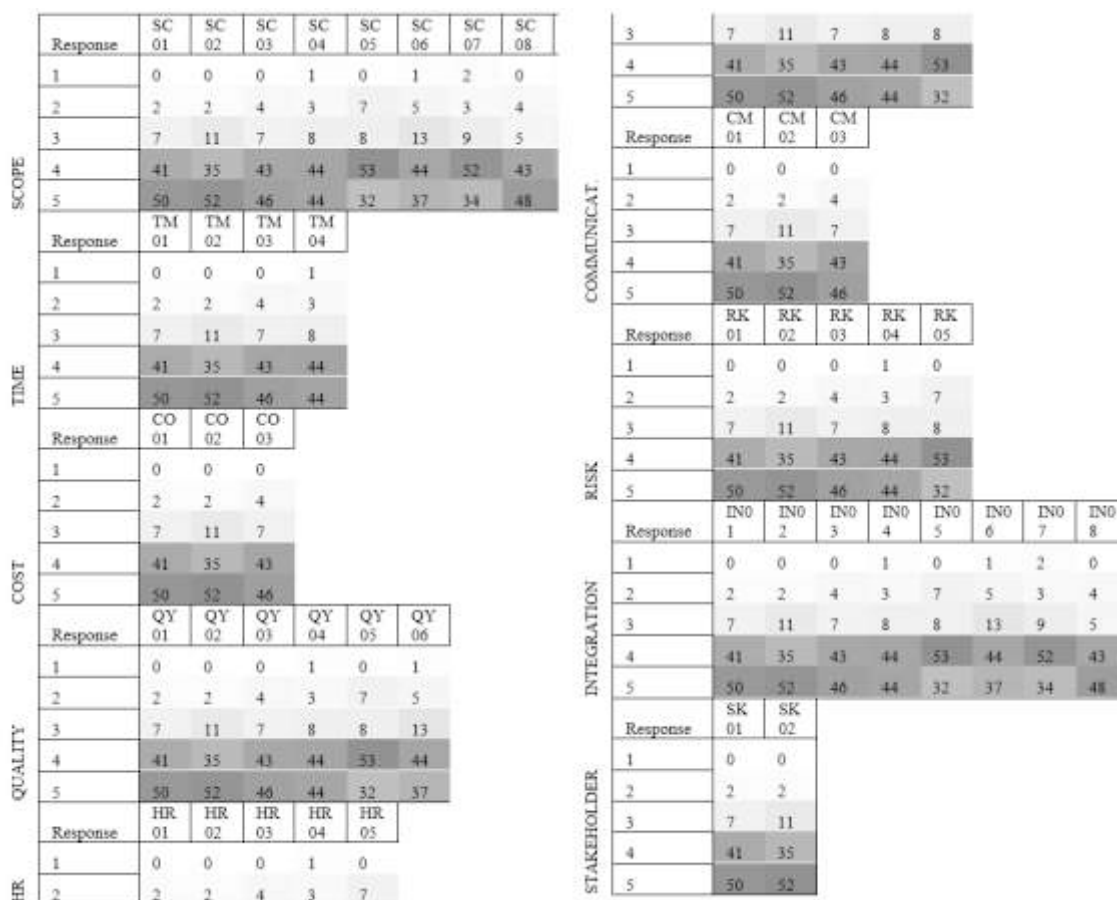


Fig. 3. Analysis of each area of knowledge

Figure 3 shows the perceived level of usage of PM methodologies, tools and techniques is calculated by area of knowledge by averaging the response for each associated question of each knowledge area. A response equal to 1 means that the practice at issue is not used. A response equal to 5 represents a well established used of that practice. The findings highlight most of the respondents claim to have a relevant level of familiarity with PM techniques in dealing with European Projects in the different dimensions at issue. In particular more than 80% used a business case in the proposal phase in order to better justify the project (SC2). This result highlights the convenience of exploiting PM in the *ex-ante* evaluation of project proposals. On the contrary, the exploitation of the delivery acceptance plan

(SC7) is still not completely established. By considering the time management it is worth noticing that the use of appropriate software for determining the project status (TM02) is quite spread, meaning that PM competences are largely adopted and exploited in the time management that is historically crucial in European Projects, since they have very strict time constraints. Similarly, the results show an active involvement of the PM in the monitoring of costs during the project development with a careful computation of the differences between the budget and the actual level of expenses (CO2). The most important aspect related to quality is the definition of the main project specifications at the beginning of the project (QY02). This is crucial, as the early accurate definition of the quality aspects in the initial phase of a project might significantly decrease the probability of future misalignments [24]. However, the development of periodical quality reports by the Project Manager aimed at providing an overview of the quality status of the project (QY05) has to be completely adopted.

As for HR aspects, PM plays a crucial role for most of the respondents (HR02). The less developed aspect is the involvement of people on training courses during the project execution (HR05). The issue of the reporting is confirmed to be broadly diffused also for communication objectives (CM02). Risk management is also well established. In particular, response strategies are defined at the beginning of the project for most of the respondents (RK02). However, the implementation of risk response activities are not completely monitored and controlled yet (RK05). This means that the risk response phase has reached a certain level of maturity and there is a significant level of awareness about this issue [25]. Most of the respondents state that stakeholders are informed about project changes during the action of the project (IN02). On the contrary, final project statistics and performance at the end of a project are not always carried out (IN05). Finally it is important to highlight that at the end of the project, all the project deliverables are received and accepted by the stakeholders (SK02). This aspect plays a crucial role as in European Projects there is often a plethora of stakeholders [26] and their final alignment with the results, is particularly important.

#### 4. Discussion and Conclusions

In this paper the main empirical results are presented. First, PM plays a crucial role in easily achieving the expected project results. Furthermore, careful cost management is considered a fundamental pillar of the PM practice. This might be due to the fact that under a European public funding scheme, rigorous cost control is a strict measure. Similarly, the communication might facilitate the success of a project since bias and errors are reduced via a transparent and effective communication flow. On the contrary, the HR management can be still reinforced, especially considering the active involvement of staff in training courses. This is a quite important aspect in a business operations environment wherein innovation is continuous.

This work might be considered as a contribution to extend the body of knowledge about the assessment of the most adopted PM techniques, highlighting the main trends and the main gaps that might be covered in the next future. In particular, by focusing on the H2020 program, this study might pave the way to develop a framework to more accurately establish how PM can be better integrated in the development of the future European funded projects. This aspect is becoming particularly crucial. In fact, the COVID-19 pandemic plunged Europe in the greatest recession since World War II and huge programs for financial support were developed. In particular, the Next Generation EU funds that are about to be corresponded, or have been started to be given to every European country are a huge amount of money that represent an important engagement from the European institutions. Thus, the appropriate and careful management of these funds become critical. Therefore, future studies will be addressed to the updated evaluation about the exploitation of PM in the current European funded projects that are currently in their design or initiating phase. In addition, future works will be focused on identifying the relationship between the adoption of PM tools and the project success in dealing with European funded projects.

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Attachment: Questionnaire

PILLAR: Excellence Science / Industrial Leadership / Widening Participation/ Societal Challenge

INDUSTRIAL SECTOR Advisory - Networking / Healthcare/ IT/ Manufacturing/ Materials/Aerospace/ Electronics/Energy /Financial Services/Robotics/Waste

Please give a rate to the following issue related to the different area of knowledge (1 not at all 5 completely agree)

SCOPE 1 During the proposal phase, the project objectives were clearly defined

SCOPE 2 During the proposal phase, an appropriate Business Case was created providing justification for the project

SCOPE 3 At the beginning of the project, the project scope statement was further developed (detailed list of deliverables)

SCOPE 4 At the beginning of the project, a proper Work Breakdown Structure was developed

SCOPE 5 At the beginning of the project, a Project Change Management Plan was created to define the change process

SCOPE6 At the beginning of the project, a Deliverables Acceptance Plan was created to document the agreed criteria

SCOPE 7 At the beginning of the project, a Planning Kick-off Meeting was run to understand the project scope

SCOPE 8 During the project execution your team used the Deliverable Acceptance Plan to produce deliverables according to it

SCOPE 9 During action of the project, the project's performance was monitored to identify any deviations from the project plans.

TIME 1 At the beginning of the project, a Project Schedule was created to identify dependencies between tasks, and their duration

TIME 2 During the project execution, your consortium used an appropriate software or system for time management

TIME 3 During action of the project, the Project Manager (PM) regularly monitored the schedule

TIME 4 During action of the project, corrective actions were implemented when needed to bring the schedule back on track.

COST 1 At the beginning of the project, the Cost Estimates were developed to outline resources needed

COST 2 During action of the project, the Project Manager (PM) regularly monitored the budget

COST 3 During action of the project, corrective actions were devised and implemented to bring the budget back on track.

QUALITY 1 At the beginning of the project, a Quality Management Plan was created to define and document the project's quality

QUALITY 2 At the beginning of the project, the project quality characteristics were defined and agreed considering project needs, constraints, and a cost/benefit analysis.

QUALITY 3 During the project execution, quality assurance standards were selected and communicated.

QUALITY 4 During the project execution, the Project Manager (PM) produced quality review reports

QUALITY 5 During action of the project, the Project Manager (PM) performed quality assurance and controlled activities

HUMAN RESOURCES 1 At the beginning of the project, the Roles & Responsibilities were identified in every layer,

HUMAN RESOURCES 2 During the project execution, the Project Manager (PM) coordinated people, resources, and meetings, HUMAN RESOURCES 3 During the project execution, the Project Manager (PM) showed technical and behavioural skills

HUMAN RESOURCES 4 During the project execution, the Project Manager (PM) and motivated the project team

HUMAN RESOURCES 5 During the project execution, a Training Plan was defined and carried out to train personnel

COMMUNICATION 1 At the beginning of the project, a Communications Management Plan was created

COMMUNICATION 2 During the project execution, Project Reporting was carried out to document the project's progress

COMMUNICATION 3 During the project execution, relevant information resulting from the execution of the project was provided

RISK 1 At the beginning of the project, a Risk Management Plan was created to define and document how risks will be identified and assessed, the tools and techniques to be used, the evaluation scales and tolerances, the roles and responsibilities, risk monitoring and risk response strategies (avoid, transfer/share, reduce, and accept).

RISK 2 At the beginning of the project, the risk response strategies were developed to plan actions to manage the risks.

RISK 3 During action of the project, the consortium ensured that risk management activities were carried out

RISK 4 During action of the project, risks that could impact the project's objectives were identified

RISK 5 During action of the project, the implementation of risk response activities was monitored and controlled.

INTEGRATION 1 During the project execution, the Project Team executed the activities defined and scheduled in the Work Plan

INTEGRATION 2 During action of the project, project Changes were identified, documented, approved, and communicated

INTEGRATION 3 During action of the project, the Project Manager (PM) ensured that every deliverable was formally accepted

INTEGRATION 4 During action of the project, the consortium managed the transition for the transfer of project deliverables

INTEGRATION 5 At the end of the project, a Project-End review meeting was held

INTEGRATION 6 At the end of the project, the project's overall experience was summarized in a report.

INTEGRATION 7 At the end of the project, the Project Team was officially dissolved, and all resources were released.

STAKEHOLDERS 1 During the proposal phase all project's stakeholders were identified (internal and external members)

STAKEHOLDERS 2 At the end of the project, the consortium ensured that all deliverables were accepted by the relevant stakeholders based on a predefined/documented quality/acceptance criteria and the agreed acceptance process.