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Identifying Success Factors, Deciding On Methodology and Implementation of Project Portfolio Systems: A Hybrid, Two-Layer Solution in TurkStat

Proje Portföy Sistemlerinin Uygulanmasında Başarı Faktörlerinin Belirlenmesi ve Metodolojiye Karar Verilmesi: TÜİK'te Hibrit, İki Katmanlı Bir Çözüm

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Abstract

Purpose: In order to manage projects to achieve strategic goals and targets with limited resources, portfolio-project management (PPM) systems become increasingly popular tools for large organizations. Nevertheless, due to various reasons such as lack of financial resources, awareness of the significance of portfolio management many organizations do not have a software system that can keep up with the projects. The purpose of this paper is to share The experience gained within three years during the establishment of an effective and inexpensive PPM system to manage organisational projects.

Design/methodology/approach: In this study, several project management tools are compared to understand what features of these tools meet the needs of Project Management Institute (PMI) knowledge areas. Afterwards, a hybrid, two-layer portfolio management tool developed in the Turkish Statistical Institute (TurkStat) is introduced. The first layer is built on Redmine, an open-source tool, and its purchasable plugins. The second layer is an in-house developed software application which uses the application programming interfaces (APIs) of Redmine. Findings: This needs-oriented, less costly hybrid system has yielded remarkably successful results in planning, leading, monitoring and controlling processes of projects under the knowledge areas of PMI. Limitations: Besides the advantages of the system, some knowledge area activities still cannot be managed by the hybrid system like quality management and procurement management. Originality: The two-layer approach can be an example of the best practice solution for other organisations with limited resources as well.

Öz

Amaç: Büyük kuruluşlarda kısıtlı kaynaklarla stratejik amaç ve hedeflere ulaşırken portföy-proje yönetimi (PPY) gibi sistemler giderek daha popüler hâle gelmektedir. Birçok kuruluş, finansal kaynak yetersizliği, portföy yönetiminin öneminin farkında olunmaması gibi çeşitli nedenlerden dolayı projeleri yönetebilecek bir yazılım sistemine sahip değildir. Bu makalenin amacı, organizasyon çapındaki projeleri yönetmek için etkili ve uygun maliyette bir PPY sisteminin kurulması esnasında üç yılda edinilen deneyimlerin paylaşılmasıdır.

**The research and publication process of this article was carried out in accordance with "Research and Publication Ethics".*

Yöntem/Tasarım: Bu çalışmada, çeşitli proje yönetimi araçlarının hangi özelliklerinin Proje Yönetim Enstitüsü (PYE) bilgi alanlarının ihtiyaçlarını karşıladığını anlamak için karşılaştırma yapılmıştır. Ardından Türkiye İstatistik Kurumu (TÜİK) bünyesinde geliştirilen hibrit, iki katmanlı bir portföy yönetim aracı tanıtılmıştır. İlk katman, açık kaynaklı bir araç olan Redmine ve satın alınabilir eklentileri üzerine inşa edilmiştir. İkinci katman ise Redmine'in uygulama programlama arayüzlerini (API) kullanan, kurum içinde geliştirilen bir yazılım uygulamasıdır. Bulgular: İhtiyaç odaklı, daha az maliyetli olarak geliştirilen hibrit sistem, portföy-proje yönetimi bilgi alanları kapsamındaki projelerin planlama, yönlendirme, izleme ve kontrol süreçlerinde oldukça başarılı sonuçlar vermiştir. Kısıtlar: Sistemin avantajlarının yanı sıra, kalite yönetimi ve satın alma yönetimi gibi bazı bilgi alanı faaliyetleri henüz geliştirilen hibrit sistem tarafından yönetilememektedir. Özgünlük: İki katmanlı yaklaşım, sınırlı kaynaklara sahip diğer kuruluşlar için de en iyi uygulama örneği olabilir.

1. Introduction

Organizations with an institutional vision develop strategies that will bring them closer to this vision. Various goals and objectives are determined for the realization of corporate strategies. In this regard, projects are developed to achieve strategic goals and targets with limited resources in a certain period. In order to manage projects, PPM systems become increasingly popular tools particularly for large organizations. Nevertheless, due to various reasons such as lack of financial resources, awareness of the significance of portfolio management software and appropriate organizational culture, many organizations do not have a software system that can keep up with the projects in their portfolio, which in turn makes it harder to keep track of how close they are to their strategic goals and targets.

Projects are an integral part of business life in many organizations. Projects can be defined as systematic efforts to achieve specific goals within an identified scope and time by using skills, knowledge, tools, and resources (Rosacker & Rosacker, 2010). Project management (PM) is a process that depends on critical success factors and their combined effects for projects (Belassi & Tukel, 1996). Project portfolio is defined as "a group of projects that are carried out under the sponsorship and/or management of a particular organization" (Archer and Ghasemzadeh, 1999; cited in (Martinsuo, Gemünden, & Huemann, 2012). Project portfolio management (PPM) is fundamentally different from project management due to PPM's strategic dimension. The significant focus in project management is "doing things right"; on the other hand PPM deals with "doing right things" by aligning multiple projects according to the strategic direction of organizations (Cooper, Edgett, & Kleinschmidt, 1997). Project Management Institute (2008) has introduced the global standards for PPM. PPM relates to (a) primary screening, selection and prioritization of project proposals, (b) continuous re-prioritization of projects in the portfolios, and (c) continuous re-allocations of resources to projects due to priority (Martinsuo et al., 2012). The linkages between PM, PPM and strategy are well established in the literature. Meanwhile, the application of strategic management to PM and PPM is relatively new, therefore lessons learned from different applications are particularly illustrative (Killen, Jugdev, Drouin, & Petit, 2012).

A well-equipped PPM tool is necessary for an effective portfolio management particularly in large organizations where multiple projects compete concurrently for the same scarce resources. In fact, PPM tools may not always ideally meet the organizations' needs in terms of features and cost. In workplaces where monetary resources are limited, especially in public institutions, having a good PPM tool to implement portfolio management approach in the best way is crucial. Deciding which PPM tool is the best regarding to low cost and properties associated to expectations is a significant issue to be addressed. When the PPM tools are examined, it is seen that many free and commercial software are used by organizations such as Asana, Trello, Microsoft Project, Basecamp, Jira, Redmine. When the commercial PPM tools are examined, besides having many additional equipment and features, they can be costly for many organizations. Alternatively, while free PPM tools meet some specific needs, many knowledge areas on portfolio management methodologies such as cost management, communication management, quality management and procurement management, could not be carried out through these tools. These drawbacks of PPM tools have led us to set up a line of new researches.

According to (Erduran, Bulu, & Orhan, 2018), public institutions are following behind the private sector in project portfolio management in Türkiye. In fact, the lack of a PPM system in which critical public projects are classified according to their sectors, institutions, significance, budget and

monitored instantly by a central government, is quite a shortcoming in Türkiye. Establishment of such a PPM system could be a critical macro success factor itself.

TurkStat, a governmental organization, carries out many projects with many partners by using internal resources instead of outsourcing has led to an increase in the project management experience. It is decided to include TurkStat, which is such a working environment where projects are carried out with many partners, as an example in our article. At the TurkStatit is needed to have a proper, effective and inexpensive PPM tool to manage organizational projects. In this regard, first of all success factors of PPM have been identified through the literature review. The success factors of PPM should be actively applied both at the initial stage and during the execution of the projects (Martinsuo et al., 2012).

Afterwards, several popular PPM methodologies and commercial and free PPM tools are compared. Once deciding on applying PMI methodology and using Redmine as an open-source PPM tool, we step up to the implementation section. Nevertheless, some of the expectations of PMI knowledge areas were still not met by Redmine platform such as risk management, cost management, shareholder management and human resource management. For that reason, some of the mentioned short comes of Redmine have been overcome through both purchasing plug-ins of Easy Redmine and also developing an in-house software interface.

The software interface, TurkStat Portfolio Management and Monitoring System (TurkStat PM&MS), is developed by TurkStat. TurkStat PM&MS uses the APIs of Redmine. Hence it easily gets and sets data from Easy Redmine data sources such as project names, project members, stakeholders, start and end dates of projects. Through using Easy Redmine data sources, TurkStat PM&MS with its user-friendly interface generates automatic progress reports, displays delay rates and completion rates of project tasks, enables reaching project documents with one click. This needs-oriented, less costly hybrid system has yielded remarkably successful results in the phases of leading, monitoring and controlling processes of projects under the knowledge areas of PMI such as management of scope, time, cost, human resource and risks. In the coming section, the success factors of PPM are identified through literature review. It is evidently argued that PPM is a critical tool to gain control of all projects to improve project execution.

2. Identifying Key Success Factors of Project Portfolio Management

Most mentioned critical success factors related in PPM are the followings; organizational structure, top management support, continuous prioritization of projects, and selecting appropriate PPM tool. Apart from these four initial success factors, planning, executing and monitoring of the phases of PPM also have several critical success factors as well.

2.1. Organizational Structure

Organizational structure is one of the core elements that influences resource availability and thus the success of project outcomes. Even though each organization has its characteristic structure, traditionally three types of organizational structures stand out: functional, matrix and project-based structures.

Functional structure is basically a classical hierarchy structure that includes centrally and divisionally designed bureaucratic organizations. Functional structured organizations have function-based units such as accounting, software development or marketing units, and each employee has a single unit manager (Ford & Randolph, 1992). Whereas, in the matrix organization, dual or multiple managers have authority and responsibility. Project members keep working in their own departments while having additional tasks from project managers. Therefore, the matrix structure allows organizations to maintain their departmental structure while projects continue through interdisciplinary teams (Stuckenbruck, 1979). Matrix organizations provide several advantages such as (a) enhancing interdepartmental communication and collaboration, (b) allowing employees to develop new skills and (c) enabling project members to continue their duties in their functional units. On the other hand, matrix organizations may have some disadvantages as well. First of all, reporting to more than one manager is not easy. Additionally, having too many responsibilities to multiple managers may lead to overload under the name of job enlargement and job enrichment. Furthermore, managerial roles and

team member roles may be unclear since employees in project teams have a responsibility to two managers, which are project manager and functional unit manager. In this regard, Sinclair (1984) argued that applying a matrix structure to manage projects confuses the relationship dynamics inherent in project teams.

In fact, large-scale and complex projects and portfolios may not be efficiently managed within a single functional unit in an organization. Particularly in portfolios, in which a group of projects that are performed to achieve specific organizational goals, classic matrix structures may not be as efficient as desired. A solution to manage portfolios efficiently within an organization would be to bring all project members together in the same room, and make them only responsible to project managers. This approach is described as a tight matrix. In project-based structures, similar to the tight matrix, project members are temporarily selected from different departments within the organization to work together to complete complex projects and/or portfolios headed by project managers. This would seem very desirable for project managers since communication and sense of identity among project members increase and decision-making process is shortening. Hyvari (2006) argued that having matrix-based or project-based organizational structures is the best-suited for an effective PPM.

Nevertheless, project-based structures may have several disadvantages as well. Selecting key professionals from different departments within an organization and dedicating them to a single project is an expensive solution (Stuckenbruck, 1979). Additionally, there may be disruptions in works of the functional units since the project members temporarily leave their units. When projects carried out in matrix or project-based organizational forms where human resource is restricted and taking the best suitable personnel in the team becomes a problem, the top managers' support is a powerful way to handle this resource availability issue (Belassi & Tukel, 1996).

2.2. Prioritization of Projects, Programs and Portfolios

The prioritization of projects, programs and portfolios according to organizational vision and mission is one of the most significant success factors that could be challenging due to limited organizational sources and changing environmental conditions. Top management support is an essential factor particularly in the prioritization phase for the project success, since it ensures access to organizational resources, including financial and human resources needs (Pinto & Prescott, 1988).

2.3. Top Management Support

Indeed, effective communication is compulsory for the success of any project. Establishing sustainable communication is particularly critical between project managers and the top management. Providing necessary project progress information on time and in required details to top management may increase top management involvement in projects. Top management support ensures mobilizing adequate resources, encourages constructive communication, establishes structural arrangements and gives the project manager sufficient authority (Ahmed & Azmi, 2017). In contrast, lack of top management support is most likely to result in project failure (Zwikael, 2008). In this regard, it is required to ensure timely and appropriate sharing of project information with top management while creating a project communication plan. There are several steps involved in creating a project communication plan such as (a) defining purpose and approach, (b) identifying shareholders, (c) deciding on communication tools such as e-mail automation, presentations, project progress summaries, (d) determining the frequency of communication (Project Management Institute, 2017).

2.4. Determining the Scope and Gathering the Right People On Board

Portfolio scope is a key factor that involves determining a list of tangible and measurable portfolio goals, deliverables and features. The scope also shows how many activities are in single and multiple projects. If the project scope cannot be determined clearly, it may lead to devious outcomes and an inability to fulfil deadlines (Blichfeldt & Eskerod, 2008).

Indeed, both project managers and team members' performances and external stability are granted as significant factors for success of projects. The project managers' experience has an essential effect on the success of PPM. Unqualified project managers in terms of both experience and technical

background may cause project failure. From that point of view, assigning the appropriate project and portfolio managers is so crucial in the opening phase of portfolios (Belassi & Tukel, 1996). Additionally, it is stated that especially for large projects, hiring someone from outside of the organizations may be required on behalf of being successful in PPM. Having continuous contact between project managers and top management is more critical for the projects team than the classic functional forms in terms of having personnel for the purpose base (Hyvari, 2006). Once clearly determined of the scopes, it is high time to gather the right people on board. In this regard, both portfolio/program/project managers and project members should have technical, interpersonal and organizational skills to fulfil the objectives and deliverables defined in the project scope. Additionally, each individual should also clearly understand their roles and responsibilities.

2.5. Public Sector Factor

All these success factors are generally investigated from the private sector and generalizing these factors to the public sector is not possible before comprehensive work on public sector. The public sector is inherently different from the private sector which makes success factors differ from the private sector. As an example for illustration, law and regulations may be rigid or obstacle more than in the private sector for the public sector, which make some processes slower bringing out some additional measures for success (Rosacker & Rosacker, 2010). In the public sector projects, that pressure to get a successful result and satisfy both top managers and stakeholders leads projects to deliver traceability, transparency, and accountability dimensions to their management processes. The main contributions of the PPM in the public sector are accountability and transparency which result in contributing the issues about control, compliance, risk management in projects. Senior managers are supposed to follow the documentations to be completed and becomes a bridge between team members and top managers by asking questions, showing charts and schedules and making effort activities relevant to traceability, transparency, and accountability (Crawford & Helm, 2009).

2.6. PPM Tool to Monitor and Control of Projects, Programs and Portfolios

In today's digitalized business environment, organizations that outperform in portfolio, program and project management generally use PPM tools rather than gathering project information by constantly asking project managers or project members. PPM software applications are expected to be used in planning, and particularly in monitoring and controlling phases of the projects, contributing to the project dimension of traceability, transparency, and accountability. There is always restricted resource that should be properly allocated based on needs. It can be tackled by PPM tools through scheduling timetables, budgets, risks, sub tasks and responsibilities before and during the implementation of project. Indeed, convincing top managers on which projects require additional resources could be possible by using effective PPM tools which provides instant data to show costs and benefits of projects and how far a project is away from its schedules and other determined objectives and deliverables. Moreover, warning systems generate automatic progress reports showing delays in portfolio completion with all project milestones (Abbasi & Al-Mharmah, 2000).

Several popular free and purchasable PPM tools exists in the market such as Asana, Basecamp, Jira, Microsoft project, Redmine, Trello. While choosing the most suitable PPM tool for an organization, the tool should also be compatible with the project management methodology adopted by the organization. In this regard, the most popular project management methodologies are evaluated by considering PPM's success factors in the coming section.

3. Deciding on the Methodology

There are several project management methodologies to design, implement, and evaluate the projects like Project Management Institute® (PMI)'s PMBOK, PRojects IN Controlled Environments (PRINCE2), the Project Management Methodology (PM2), Waterfall, Scrum, Kanban, Lean and Agile. While some methodologies define principles like Agile, others merely focus on processes like Waterfall, Scrum and Kanban. Apart from these, some methodologies such as PMI, PRINCE2 and PM2 are full-stack methodologies which cover at least two of these three "principles", "process" or "standards".

In TurkStat, which is a governmental organization from Türkiye and has around four thousand civil servants, we decided to choose a comprehensive full stack methodology like PMI, PRINCE2 or PM2, rather than implementing a light methodology that focus merely on principles or processes like Waterfall, Scrum, Kanban, Lean or Agile. While PRINCE2 and PM2 concentrate on principles and processes, PMI focuses on processes and standards.

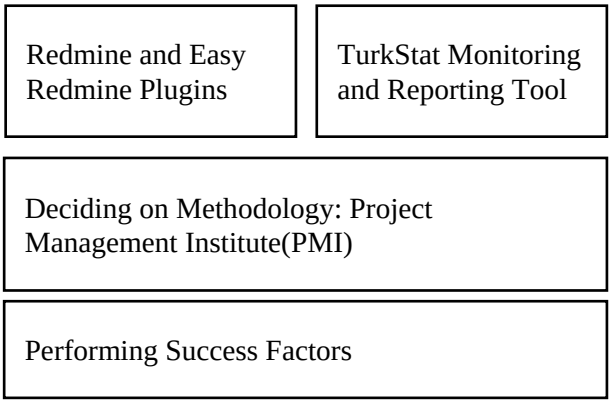
United States-based framework PMI focuses on ten knowledge areas like project integration management, scope management, schedule management, cost management, resource management, communication management, risk management, stakeholder management and procurement management. It has been developed as a process based on project management standard of the American National Standard Institute (ANSI). This standard is based on complementary practices rather than prescriptive practices. PMI approach offers a "standard" model for any types of projects in different industries like IT, construction, transportation or manufacturing.

Secondly, as an alternative to the PMI, the PM2 methodology has been developed and endorsed by the European Commission. PM2 has an open and free version and a practice-oriented methodology with results and works at the centre. It has considered all the terminology and expressions in the international ISO 21500 standard to create a common language for all project managers. It has also considered Agile methodologies because of their usefulness in changing environments (European Commission, 2021). Thirdly, the United Kingdom (the UK) based PRINCE2 is also well-known project management approach and it is preferred mostly in the UK and Europe. The key features of PRINCE2 methodology are that (a) it relies on an organizational structure for the project management team and (b) planning is done towards the end of a stage and (c) much more centred on what is to be done and when. A PRINCE2 project is driven by the project's business case, which explains the organization's commitment, and rationale for outputs. The business case is reviewed regularly during the project to ensure that business objectives, which frequently change throughout the project's lifecycle, are still met (Matosa & Lopesa, 2013).

After comparing the full-stack project management approaches, PMI was chosen by TurkStat to carry out TurkStat Portfolio 2020-2021 for various reasons. The first and may be the most significant reason was PMI had already been applied in some cases and thus the managers in the organisation were familiar with it. Secondly, PMI is focusing on standards rather than principles, and standards and procedures are more significant than principles in bureaucratic organisations like TurkStat. Thirdly, even though PRINCE2 provides more flexibility through its agile principles particularly to small organisations, large public sector organisations like TurkStat operate under immense bureaucratic mechanisms and changing project processes and that can be considerably difficult (Jaques & Weinstein, 2010).

After deciding on the project management methodology as PMI, the identified success factors have been performed to ensure the completion of TurkStat 2020-2021 portfolio. The implementation processes of the success factors are presented in the following section. Overall architecture of project portfolio management system applied in TurkStat can be summarized as in Figure 1.

Figure 1 Project Portfolio Management System in TurkStat



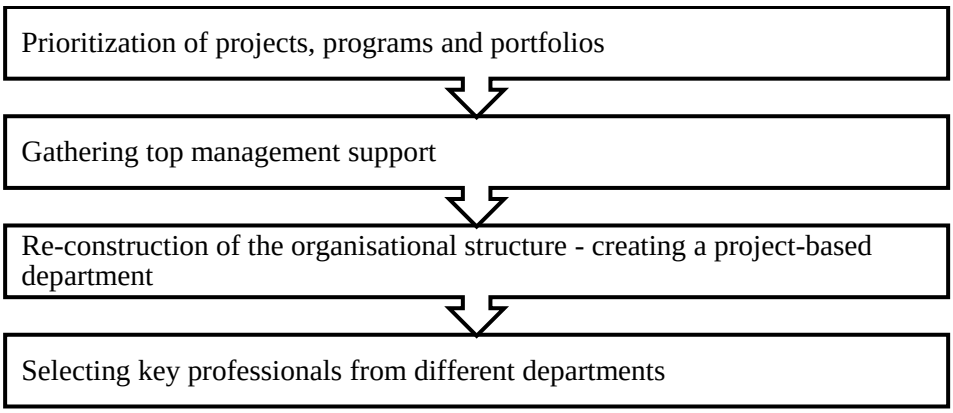
4. Implementation

4.1. Performing the Success Factors

The desire to manage multiple projects in a synchronized and effectively increases expectations on PPM tool capabilities. Though, PPM tools are not magical instruments to sort everything out in project portfolio management. PPM tool is just one dimension of the critical success factors. In this regard, reengineering of organisational structure, prioritization of projects, ensuring top management support and unifying project teams have also been completed by considering the bureaucratic nature of public sector organizations to deploy the PPM concept in TurkStat (Please see Figure 2).

Figure 2

Performed Success Factors in TurkStat



4.1.1. Reengineering of Organizational Structure

Digital Transformation and Projects Department was established on a project-based structure in TurkStat in 2019 to overcome difficulties while managing its projects. The department has several temporary project-based units. The fundamental responsibility of the department is to manage complex and multi-shareholder projects and portfolios. The new concept called “temporary project teams” which consist of the members coming from different departments and planned to be returned to their departments after the project will be completed. The new project-based structure empowered project members to focus straightforwardly on their assigned tasks in projects. Moreover, the project members are only responsible to project or portfolio managers who are also the head of project-based units. The mentioned steps are related to the project resource management activities in PMI knowledge areas since it includes plan resource management to identify the roles required by projects. This dimension also can be concerned in the context of developing the team and managing it under the resource management activities.

A further fundamental responsibility of the new department, Digital Transformation and Projects, is to monitor and control TurkStat 2020-2021 Portfolio. The details of this portfolio are given under the forthcoming titles. Apart from organizational structure dimension, several preparations including gaining top management support, project management education, identification of candidate projects of TurkStat portfolio aligned with organizational vision and mission were completed before establishing the TurkStat Portfolio Management and Monitoring System (TurkStat PM&MS).

4.1.2. Strengthening Top Management Support

Several precautions were taken to gain the top management support and hence increase the likelihood of portfolio success in TurkStat. First of all, the purpose of achieving sustainable top management support is defined in the project communication document. Secondly, the key decision makers are identified as the Head of TurkStat, the Vice Chairmen of TurkStat, the Head of Departments and project managers. Thirdly, an automatic e-mail notification feature that generates monthly project

progress reports is added to TurkStat Portfolio Management and Monitoring System (TurkStat PM&MS) (Please see details in
). The purpose of the notification feature is to keep key decision-makers informed and motivate them to support for the organizational projects.
Moreover, entire project documents such as project presentation document, project presentation video, project charter, executive summary could easily be reached by one click by authorized users through TurkStat PM&MS main page (Please see the Figure for details). Additionally, progress reports, project team members, schedules, tasks details could also be reached through TurkStat PM&MS. These activities are also related to the project resource management and project stakeholder management activities in PMI knowledge areas. The main motivation behind all these efforts was to establish a sustainable top management support.

4.1.3. Initiating Process

Preparations for PPMs commenced in 2019, before a year to adopt the project management idea in TurkStat. Heads of departments, heads of group leaders and other personnel were identified from each department and these current and potential project managers were invited to get training on PMI concept. The fundamental target of the training program was to make the managers interested in adopting and using the PMI approaches. In fact, a system that is not adopted by its users cannot survive for a long time.

In this regard, firstly descriptions of PMI project management approaches were explained at the initiating phase of the training program. In the second phase which is the planning and design section, development of a project charter was illustrated. A project charter is typically a brief document that describes the projects through the identified the key success factors and how and by whom these factors are carried out. Project charter is also expected to contain a scope statement, work breakdown structure, time and cost estimations, start-end dates of main subtasks and responsible people of these subtasks (Nessel, 2005).

Thirdly, in the Project Management Execution and Controlling phases, the candidate project managers were informed about how to track; (a) completed and uncompleted deliverables, (b) status reports, (c) forecasting about the closing date and, (d) current cost through TurkStat PM&MS.

4.1.4. Planning Process

After the training program, the project offers including project charters were requested from the departments of TurkStat. Project charters are expected to include information about definition, scope, schedule milestones, budget, human resource and risk of projects. This part of activities is connected with the project integration management in PMI knowledge areas since it includes developing project charter and developing project management plan.

Appropriate candidate projects, which are expected to contain proper projects charters, detailed tasks, a schedule, documents, a project team, were initially evaluated by TurkStat Digital Transformation and Projects Department. Afterwards, the projects considered suitable with strategic goals and targets of TurkStat are presented to TurkStat Top Management. Finally, prioritized and approved projects by the top management are registered on TurkStat PM&MS. The accepted projects are expected to schedule their timelines on Redmine. The project managers are also asked to prepare and upload their project documents like presentations, brief and detailed information notes to Redmine plug-in Document Management System (DMS). These schedules should also contain detailed tasks and determine their start-end dates, assign the tasks to a specific person in the project team.

These activities are related to the project scope management activities in PMI knowledge areas since it includes work breakdown structures for the project plan and validated scope. Also project schedule management activities like defining and sequencing activities, estimating duration of the activities and developing schedule are performed under this title. In the coming section, experiences gained during the market research period of the PPM tool are shared.

4.2. Just Before Executing Process

4.2.1. Market Research and Comparisons of PPM Tools

There are many PPM software solution applications on the market. Some PPM tools include plugins that save time for the managers through automating several time-consuming tasks including assigning sub-tasks to project members. (Evdokimov, Tsarev, Yamskikh, & Pupkov, 2018). These tools include MS Project, JIRA, Redmine to save time for automating task tracking during the project management. The contribution of the features of these systems to PPM is very valuable.

In Table 1, widely used PPM tools are compared according to their features. PPM software solution applications can be compared in terms of 10 key features. Once the needs are identified, it can be understood that software solution can be chosen (Majstorovic & Majstorovic, 2020). While choosing the PPM tool to be used, the needs of the TurkStat were considered. In Table 1, while the marked areas show that features are available in the PPM tools, the blank ones mean these are not available in the tools.

Table 1

Comparison of PPM software features

Features of Project Management	Asana *	Trello **	Microsoft Project ***	Basecamp ***	Jira ****	Redmine &TurkStat PM&MS	Redmine ***
Resource Management	x		x		x	x	x
Risk Management	x			x	x	x	x
Project Time Tracking	x	x	x	x	x	x	
Progress Tracking	x				x	x	
Project Planning	x		x	x	x	x	
Multiple Projects	x	x	x	x	x	x	x
Collaboration Tools	x	x	x	x	x	x	x
Report and Statistics	x		x	x	x	x	
E-mail Notification	x	x		x	x	x	x
Free of Charge						x	x

* Source: https://asana.com/resources
** Source: https://trello.com/b/zo2N0vE6/trello-features
*** Source: Majstorovic and Majstorovic (2020)
**** Source: https://www.atlassian.com

Some commercial applications such as MS Project do not meet some of the basic needs of the TurkStat like risk management, e-mail notifications and progress tracking. Apart from these, MS Project is costly in terms of license fees. On the other hand, Asana is advantageous while to Trello. For instance, most project management features are available in Asana while Trello and Basecamp do not. Even though Jira met most of the needs in terms of PPM in TurkStat, it is disadvantageous in terms of cost. Apart from those, JIRA Gantt Chart is a reliable platform for creating, sharing and tracking task definitions. This Chart plugin allows import and export to MS Project and also provides one-click export to MS Excel. It is possible to export files in XML format with WBS Gantt. At the same time, the critical path can be determined automatically. Task definitions can be created in the project plan and the existing task definition can be easily monitored by JIRA Gantt Chart as well as Redmine Easy Gantt plugin. In addition to that, the start and end date of the project can be followed on Redmine, and the critical path can be viewed with one click.

4.2.2. Deciding on PPM Tools: Easy Redmine Plug-ins Purchased

Redmine application as well as other applications have been evaluated while doing the PPM tool research in TurkStat. Redmine was meeting the needs of the TurkStat in many respects. For instance, Redmine could easily find solutions to basic needs such as creating and tracking projects

hierarchically, adding unique features to projects, tracking job types and progress. Redmine was also advantageous for the TurkStat since it is free of charge. In this context, we have decided to use Redmine as a PPM tool in TurkStat.

Nonetheless it has been noticed that the free version of Redmine could not meet several organizational needs in areas such as creating workflow, resource management, risk management, cost management, agile software management, quality management, procurement management, and reporting. In order to solve these drawbacks, purchasable plugins of Redmine have been researched and Easy Redmine is appeared as a suitable solution in terms of its charge fee. Easy Redmine is a complete and extensible Redmine upgrade. It is further extensible with plugins for Resources, Agile, Finances, CRM, Help Desk and newly also DevOps. In this context, plug-ins such as easy Gantt, risk management, cost management, and agile have been examined. It has been revealed that these plugins meet several needs until a certain point compared to the free version of Redmine. Nevertheless, although Easy Redmine provides several solutions to apply PMI approach in PPM in TurkStat, an in-house developed software application is needed to manage and monitor the portfolio, programs and projects of the TurkStat.

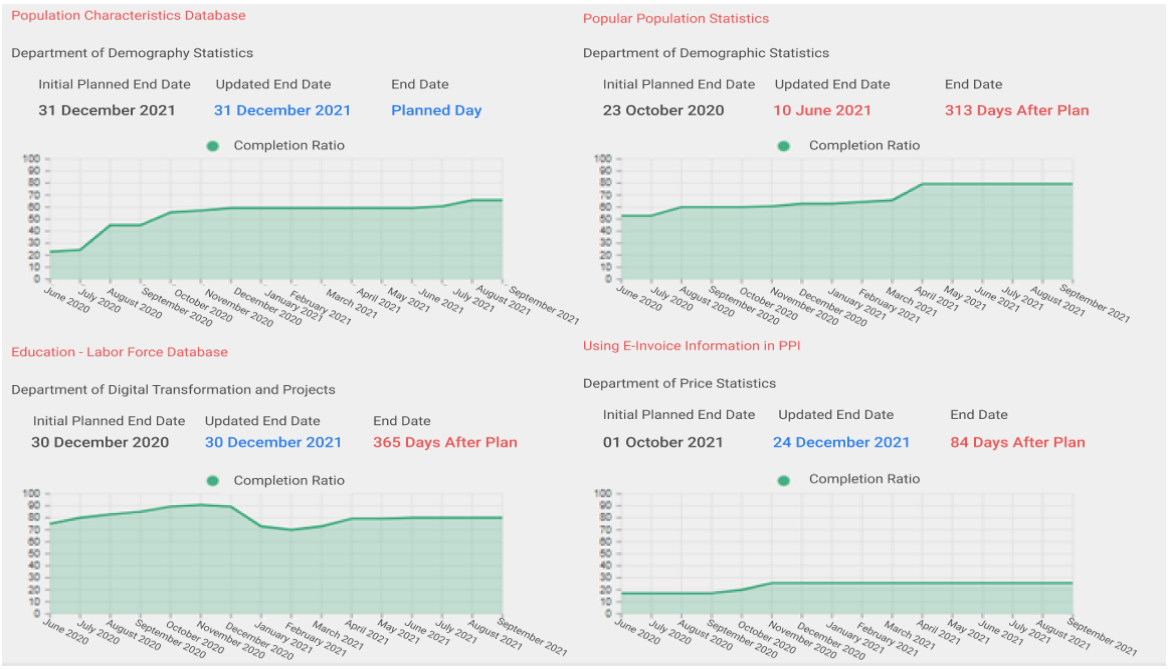
4.3. Monitoring and Controlling Process: TurkStat Portfolio Management and Monitoring System

Since available features on Easy Redmine have not met the needs of TurkStat especially in monitoring and reporting, an in-house PPM tool, TurkStat PM&MS has been developed as a second layer on Easy Redmine (Please see Figure). TurkStat PM&MS uses the APIs of Redmine as a second layer on Easy Redmine. Therefore, it easily gets and sets data from Easy Redmine data sources. This needs-oriented, less costly hybrid system has yielded remarkably successful results in the phases of planning, leading, monitoring and control processes of projects under the knowledge areas of PMI.

There are progress graph tabs on the interface of TurkStat PM&MS that provide information by mount-based charts (Please see Figure 3) about the status of projects, programs and portfolios. The progress graphs are also sent monthly to all shareholders of projects. Tracking the projects delay rates enable the project team and managers to review their work. In addition, deadline changes in the project plan are easily identified through the progress reports graph.

Figure 3

Progress graphs of TurkStat PM&MS

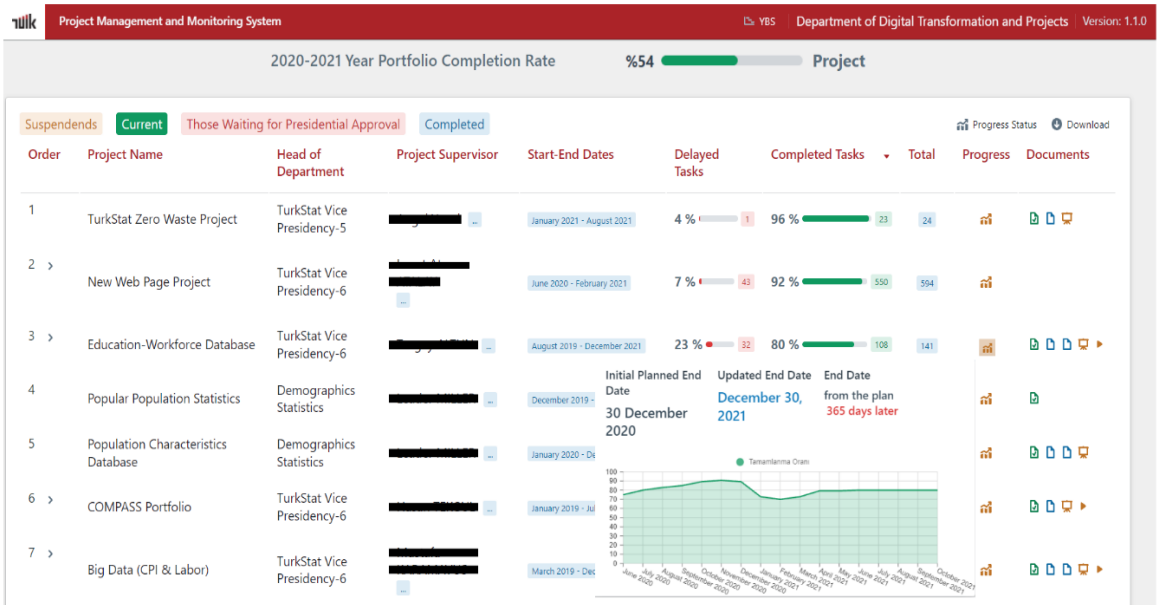


Thanks to the Progress Graph, the completion rates of the projects between the first planned and updated finish dates can be examined. The progress graphs allow users to view the project end-to-end.

Apart from progress graphs of TurkStat PM&MS, pending, continuing, awaiting approval, and completed projects, programs and portfolios can be also easily monitored through the interface (Please see Figure). In addition to these, names of project managers, stakeholders, team members, start and end dates of projects, delay rates and completion rates of tasks could be directly seen on the main page of TurkStat PM&MS. It also provides access to several documents of the projects such as project charters, information notes, presentation files and presentation videos of the projects with one click. These documents could be reached by the "Documents" title on the right side of the interface, as it can be noticed on Figure . However, access to the documents of the projects is provided depending on the authorization provided by the Redmine application.

Figure 4

Interface of TurkStat Portfolio Management and Monitoring System (PM&MS)



Lastly, top management or project managers may not always check the project progresses by access PM&MS interface. For that reason, automatic e-mails containing progress graphs are sent to the managers and project teams on the 25th of each month. In addition, notification e-mails contain links which enable switch to TurkStat PM&MS by one click.

Apart from these, authorized employees could also reach detailed Gantt charts of the projects by clicking the project names which can be seen on the left side of the interface. When the project name is clicked, Redmine log-in interface is opened. After a successful sing to Redmine, Easy Redmine Gantt chart appears on the screen as the first layer of the system.

5. Conclusion and Future Work

Continuous consideration of key success factors of Project Portfolio Management is vital to ensure a successful PPM. Having a suitable PPM software is one of the key success factors of PPM (Abbasi & Al-Mharmah, 2000). Therefore, organizations should search and evaluate various tools exist in the market. Nevertheless, off-the-shelf software (also called commercial software) PPM tools may not always meet the needs of organisations as in this TurkStat case.

Therefore organizations firstly should be aware of the other success factors of PPM such as (a) organisational structure (Ford & Randolph, 1992; Hyvari, 2006; Sinclair, 1984; Stuckenbruck, 1979), (b) prioritization of projects, programs and portfolios (Pinto & Prescott, 1988), (c) top management support (Ahmed & Azmi, 2017; Project Management Institute, 2017; Zwikael, 2008), and (d) determining the scope and gathering the right people on board (Belassi & Tukel, 1996; Blichfeldt & Eskerod, 2008; Hyvari, 2006). Moreover, (e) several PPM methodologies such as PMI, PRINCE2 and

PM2 should also be examined, and the most suitable methodology should be selected according to the needs, habits and the culture of the organization. Furthermore, (f) public sector organisations should also meet the expectations of public. This is an additional PPM success factor for public organisations (Crawford & Helm, 2009; Rosacker & Rosacker, 2010). In fact, public expectation for enhanced accountability that results in greater transparency for public organizations is high in developed societies. Since accountability brings formal and precise measures of performance to public institutions. As a result, accountable public organizations turn on policy traceability and goal clarity about their present and future public funded projects to meet public expectations. At this point, PPM tools contribute the traceability of public projects through enabling organizations to keep track of their projects in terms of scope, time, cost, human resources and risk.

We have attempted to share our experience in establishment of a PPM system in TurkStat, which is a public sector institution from Türkiye. After evaluating the most popular PPM tools and PPM methodologies, Redmine tool and PMI methodology have been adopted by the Institution. Nevertheless, since several PMI knowledge areas such as risk management, cost management, shareholder management and human resource management have not been met by Redmine. Then Easy Redmine application and its plugins have been purchased to meet these needs.

Even though, Redmine and Easy Redmine have met several needs of the organization, specific demands come from both top managers and PPM managers have forced TurkStat to re-consider its organisational structure as one of the success factor. As Hyvari (2006) argued that having matrix-based or project-based organizational structures is the best-suited for an effective PPM. Nevertheless, establishing a new department and selecting key professionals from different departments within an organization and dedicating them to a single project is an expensive solution (Stuckenbruck, 1979). The support of top managers is a powerful way to handle this resource availability issue (Belassi & Tukel, 1996). Therefore, we firstly prioritised our projects according to the expectations of the top managers. Consideration of this success factor has helped us to gain top management support to establish a new department Digital Transformation and Projects, and also to select key professionals from different departments to this new department. Afterwards, the key professionals have been assigned to the prioritised projects carried out by Digital Transformation and Projects Department.

Digital Transformation and Projects Department to develop a tailored software interface. Finally, TurkStat PM&MS, an in-house software interface has been developed by TurkStat. TurkStat PM&MS uses the APIs of Redmine. Hence it easily gets and sets data from Easy Redmine data sources thus all shareholders including top managers, head of departments, portfolio and project managers and other members could reach project names, project members, stakeholders, start and end dates of projects via TurkStat PM&PS main page. TurkStat PM&MS with its user-friendly interface generates automatic progress reports, displays delay rates and completion rates of project tasks, enables reaching project documents with one click. This needs-oriented, less costly hybrid system has yielded remarkably successful results in the phases of leading, monitoring and control processes of projects under the knowledge areas of PMI such as management of scope, time, cost, human resources, and risks. Besides the advantages of the system, some knowledge area activities still cannot be managed by the hybrid system like quality and procurement management and for this gap areas other supportive tools e.g., MS Excel are used. The two-layer approach (Easy Redmine and TurkStat PM&MS) can be an example of the best practice solution for other public institutions with limited resources as well.

Finally, a range of organizational, managerial, and educational preparations mentioned in this paper should be performed through considering key success factors to implementing an PPM concept in an organization. These preparations are necessary to properly manage entire projects just with a software even if it has many features.

Compliance with Ethical Standards

Conflict of Interest: The authors declare that there is no conflict of interest.

Ethics Committee Permission: Ethics comittee approval is not required fort his study.

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