

Management of Construction and Maintenance Projects in Tunisian Public Sector : Brief Comparison Tools and Suggestions For Future Frameworks

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Abstract—Using Project Management (PM) techniques and tools has grown in developing countries and it has become an essential need especially in public sector. Tunisia, one of the growing economies in North Africa and the Middle East region since 1990s, implemented complex projects, which have a major impact on the development of the country especially in construction field. Using software tools seems useful in all the phases of project management cycle. This paper presents a brief comparison of popular PM tools used in different sectors and the ability of these tools to be adapted in Tunisian public sector for construction and maintenance projects. Suggestions for future frameworks are proposed.

Keywords—*Project Management; Construction and Maintenance Projects; Public Sector; Project Management Software; Tunisia.*

I. INTRODUCTION

In public organizations, management is constantly evolving due to the growth of the activities volume, and therefore the amount of information to be managed. To cope with this amount of information, often sensitive, about their environment and resources, these organizations are improving their strategies and ways of management. Information Systems (IS) play a crucial role and respond perfectly to their needs. IS is defined as a set of interrelated components that collect, process, store, and distribute information to support decision making and control an organization. In addition, Information Systems may also help managers and workers to analyze problems, visualize complex subjects, and create new products [1]. To be more flexible, fast and collaborative, public organizations use information technology to enhance the potential of their Information System and automate internal administration and management practices [2].

In this context, Tunisian Ministries are oriented to develop and implement tools that help manage, control and assist decision-making in a secure environment, in order to protect and facilitate its ritual activities and especially to manage and track its construction and maintenance projects.

The scope of this work is to overview the existing project management softwares as well as their correspondence with the Tunisian public sector context. To the best of our knowledge, traditional tools like Microsoft Excel files are generally used in Tunisian Ministries to control and track their construction and maintenance projects. So, the need of implementing efficient and powerful software is becoming mandatory.

The remainder of this paper is as follows: Section 2 describes the specific aspects of Tunisian Public building as well as the process of managing and tracking construction and maintenance projects and lists the malfunctions detected. In section 3, Project Management concepts are presented with a comparison of the most popular software solutions. Section 4 discusses the ability of these tools to fit and be adapted to Tunisian public context.

II. CONSTRUCTION OF CIVIL BUILDINGS IN TUNISIA

In Tunisia, the construction sector is considered as one of the driving sector and has a key position in national economy due to its participation in the dynamic implementation of buildings and infrastructure projects with a positive effect in the employment field and population's living conditions. This sector includes all the activities of design and construction of public and private buildings, whether industrial or not, and infrastructures such as roads or pipelines. Nowadays, statistics [3] has shown that Tunisian Construction sector generates an average annual turnover amounting to 5 billion dinars participates in the providing of about 7% of the Gross Domestic Product, thus it is considered as the fourth sector on a national scale. In terms of investment, it contributes to about 25% of the country's overall investment and it directly employs 40,000 people.

According to the decree governing on the construction of civil buildings n°2009-2617 [4], civil building projects in Tunisia can be divided in three categories:

- **National projects:** These projects concern all buildings that, in consequence of their importance and technical complexity, require specific research, complex techniques and specialized equipments. The Tunisian Ministry of Equipment is the delegated owner of this category. It is responsible of the projects study and execution, ensures the monitoring, control and management of them.

Several national projects were built in Tunisia such as Headquarters of Ministries, Parliament, Public health institutions, Research Centers etc.

- **Departmental projects:** These projects concern buildings of proportional complexity, which do not present technical difficulties. They are ensured by the concerned Ministerial department for its account and under its responsibility as a building owner.

- **Local or Regional projects:** The only difference between this kind of projects is that the governor is the building owner for regional buildings and the regional departments of the Ministry of equipment may ensure the follow-up of the studies and realization of these projects, at the request of the governor. The local projects are those related to the buildings concerning the municipal council. The president of the concerned municipal council is the building owner for this category of project.

A. Process of Controlling, Tracking Construction and Maintenance Projects

In this work, we are interested in the construction and maintenance of regional projects, of which several stakeholders collaborate to ensure their success: the government where the project will be built, the Ministry owner of the building, and the Ministry of Equipment which the delegated building owner. According to articles 9 and 20 in to the decree governing the construction of civil buildings [4], the Ministry of Equipment, the delegated builder owner, takes in charge the entire project, from its initiation to its achievement, upon a written agreement with the Ministry owner of the building. In this case, the control and the tracking of the works achievement is ensured by both the delegated builder owner and the Ministry owner of the building by an agent under its responsibility. This agent is responsible of the preparation of monthly reports containing the status of works and the follow-up of execution and transferred budgets. These reports are transferred to the general direction, where they will be stored and organized in Microsoft Word and Microsoft Excel files to develop dashboards for managers in order to evaluate the project process and make the right decisions.

B. Process Review

After presenting the current state of management and monitoring of construction and maintenance regional projects in Tunisia, we identified several shortcomings. The table below summarizes the main dysfunctions detected, as well as the proposed action plan for each:

TABLE I. THE DYSFUNCTIONS DETECTED AND THE PROPOSED ACTION PLANS

Dysfunction	Cause	Action plan
Slowness in the preparation of documents and the circulation of information between the Ministry and its regional administrations	- Use of traditional management tools - Lack of a real-time data collection and processing system	- Set up an Information System to manage and monitor construction and development projects - Export documents in Pdf or Excel files in real time

Risk of documents loss	- Many papers on the desks employees. - Lack of clear locations for document storage	Use of a centralized and secure database
Difficulty with visibility into projects and their progress in real time	- No detailed records for each project during all phases - Limited use of data from reports of regional agents	Improve the project monitoring process to provide more information on projects and their status
No following-up on project execution and control in real time	Lack of continuous monitoring of the budget for each project during all its phases	Improve budgetary control process
Lack of traceability and history	- Absence of a database - Absence of records for projects during all phases	Focus on backup history of all treatments on the projects and their status
No dashboard	Lack of indicators, which causes a lack of precision in the final decision	- Define clearly a set of performance indicators - Set up a powerful dashboard
Non-compliance with deadlines	- Lack of monitoring and performance monitoring of regional agents	- Registration of all actions of regional agents - Definition of indicators to evaluate the performance of all agents

To implement the right tool, it is essential now to take a step back, examine the existing literature and investigate fundamental concepts of project management as well as software solutions usually used in construction sector.

III. PROJECT MANAGEMENT : FUNDAMENTAL CONCEPTS AND MOST POPULAR TOOLS

In order to understand the concept of project management, it is first necessary to define what a project is. Based on the Guide to the Project Management Body of Knowledge (PMBOK) [5] and Harold Kerzner's book [6], a project can be seen as a series of activities and tasks that, within a defined period, consume human, material and software resources to accomplish one or more specific objectives. The project ends when its objectives have been met, otherwise the project is considered incomplete. It can also be interrupted if the customer wants to stop it. Projects are considered as a source of benefit for governments through their social, economic and environmental impact, the duration of which is longer than that of the project itself.

Project management is an ancestral science since it allowed the construction of the Egyptian pyramids [7], but it has been formalized under its current standards in the 20th century in the United States defense to manage complex projects [8]. In the industrial era, when building large construction sites such as the Statue of Liberty, the need to establish standards was felt [9]. Nowadays, project management is defined as the application of knowledge, skills, tools and techniques to the activities of the project while respecting its specific constraints [6].

A. Project Management Process

According to PMBOOK [5], Project management is composed of five process groups, starting from its initiating to its closing as shown in Fig. 1:

- *Initiation processes* performed to start a new project or phase and obtain authorization for its realization.
- *Planning processes* performed to establish project goals and scope and to define the actions necessary to ensure that the project reaches its objectives.
- *Execution processes* related to the execution of the project during which the work is carried out to complete the activities defined in the project plan.
- *Monitoring and control processes* performed to monitor, review and adjust the project performance and its progress through corrective actions.
- *Closing processes* performed to accomplish all project activities or phases in a formal way.

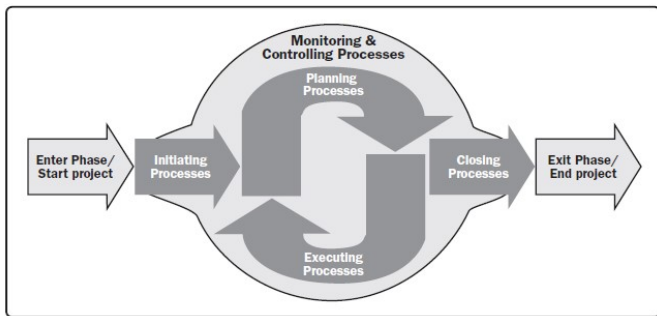


Fig. 1. Project Management process groups [5]

As we mentioned in section II, The Tunisian Ministries that agrees to set up regional buildings are only concerned with the monitoring and control processes. In the next subsection, we will investigate the most usually used project management software with a comparative study, in order to find the appropriate software for the Tunisian public sector.

B. Most Popular Project Management Software

The use of project management techniques in different areas has increased and continues to grow. Several studies have shown the interest of several professionals for the development and use of better methods and techniques for good planning, control and monitoring of their projects [10] [11]. In Nigeria [12], a recent study has shown that project management techniques and tools that were performed in the public sector, need to be enhanced because of their limited performance that causes the projects failure in many cases.

Efficient Project management software has become essential to manage projects successfully and help managers in their decision-making. Nowadays, there exist a wide range of software tools that can fit with different needs and support a whole project management process or a specific part of it. Several studies have examined Project management software, including commercial as well as open source and free tools [13] [14]. The use of those softwares is influenced by many factors such as size and complexity of projects, firm size, initial year of Project management software use, and extent of Project management software use [15]. Mishra and Mishra [16] have made a comparative study and presented the features of twenty popular project management tools. Some of these are more oriented towards software project managers, whereas others are generic by nature and can be used in almost any sector. They presented the tools side by side in a table to represent and compare their provided features. Primavera P6 [17] and MS Project [18] had the highest rank among the used tools by different industries around the world [19] [20] which express the customer satisfaction due to software's performance, but they still propose other future research to improve their features [21] [22].

Based on these works results and the Capterra site that provides ranking of the best existing software solutions in different areas each year, we may conclude that these tools cannot fit perfectly to Tunisian context as shown in Table II below.

TABLE II. OVERVIEW OF PROJECT MANAGEMENT SOFTWARE

Characteristics	Primavera P6	MS Project
Paying	yes	yes
Proprietary	yes	yes
Web based	no	no
Easy to operate	no	yes
Configurability	no	no
Generation of performance indicators	yes	yes
Indicators customization	no	no

Despite their performance, Primavera P6 and MS project are expensive commercial tools and do not offer the possibility to their users to be adapted to their specific needs, to add or cancel modules that may be useless. Moreover, these tools enable to monitor projects progress with fixed performance indicators. However, the Tunisian Ministries have their own indicators based on the specificities of their construction and maintenance projects. Planning and scheduling modules are worthless since Tunisian ministries manage regional projects as we mentioned in section II, and only the Ministry of Equipment is concerned by these tasks.

IV. CONCLUSION AND FUTURE DIRECTIONS

To sum up, there exist a variety of Project management softwares, open source or proprietary, which help project managers in different areas. Besides, we conclude that in literature, the most popular software tools used by project managers are Primavera and MS project. However, despite their performance, these tools seem insufficient for the Tunisian public context. It would be interesting to develop a customized, unique and low cost tool that ensures automation and improves control and tracking of its projects based on Tunisian construction of civil buildings and providing dashboard in real time to evaluate these projects. Improve and facilitate communication between the regions and the general direction would be a great asset. This tool must be flexible, configurable and scalable to provide a level of service that meets the needs of users and to offer an open solution to future developments.

REFERENCES

- [1] Laudon, Kenneth C., Jane P. Laudon, Mary Elizabeth Brabston, Margo Chaney, Lisa Hawkins, and Shelley Gaskin. "Management Information Systems: Managing the Digital Firm." Seventh Canadian Edition 7th. Pearson, 2012.
- [2] Viborg Andersen, Kim. "Reengineering public sector organisations using information technology." Comparative public administration. Emerald Group Publishing Limited, 2006. 615-634.
- [3] BTPEXPO, «Dossier de presse,» 2016. [online]. Available at: www.btpexpo.com.tn.
- [4] Decree n° 2009-2617 dated 14 September 2009, governing the construction of civil buildings.
- [5] Rose, Kenneth H. "A Guide to the Project Management Body of Knowledge (PMBOK® Guide)—Fifth Edition." Project management journal 44.3 (2013).
- [6] Kerzner, Harold. Project management: a systems approach to planning, scheduling, and controlling. John Wiley & Sons, 2013.
- [7] Cobb, Charles G. The project manager's guide to mastering Agile: Principles and practices for an adaptive approach. John Wiley & Sons, 2015.
- [8] Charvat, Jason. Project management methodologies: selecting, implementing, and supporting methodologies and processes for projects. John Wiley & Sons, 2003.
- [9] «Histoire de la statue de la Liberté,» [online]. Available at : www.statue-de-la-liberte.com.
- [10] Lee, Jinjoo, Sangjin Lee, and Zongtae Bae. "The practice of R&D management: An empirical study of Korean firms." R&D Management 16.4 (1986): 297-308.
- [11] Olawale, Yakubu Adisa, and Ming Sun. "Cost and time control of construction projects: inhibiting factors and mitigating measures in practice." Construction Management and Economics 28.5 (2010): 509-526.
- [12] Olateju, Olawale I., Ibraheem A. Abdul-Azeez, and Salimonu A. Alamutu. "Project Management Practice in Nigerian Public Sector-An Empirical Study." Australian Journal of Business and Management Research 1.8 (2011): 1.
- [13] Pereira, André Marques, Gonçalves, Rafael Queiroz, Von Wangenheim, Christiane Gresse and Buglione, Luigi. "Comparison of open source tools for project management." International Journal of Software Engineering and Knowledge Engineering 23.02 (2013): 189-209.
- [14] Gonçalves, Rafael Queiroz, and Christiane Gresse von Wangenheim. "DotProject+: open-source software for project management education." Proceedings of the 39th International Conference on Software Engineering Companion. IEEE Press, 2017.
- [15] Liberatore, Matthew J., and Bruce Pollack-Johnson. "Factors influencing the usage and selection of project management software." IEEE transactions on Engineering Management 50.2 (2003): 164-174.
- [16] Mishra, Alok, and Deepti Mishra. "Software project management tools: a brief comparative view." ACM SIGSOFT Software Engineering Notes 38.3 (2013): 1-4.
- [17] User Manual: "Primavera® P6™ Project Management" Copyright © Primavera 1999 - 2009. All rights reserved.
- [18] <http://www.microsoft.com/project/en/gb/project-pro-2010-new-features.aspx>
- [19] Fabac, Robert, Danijel Radošević, and Igor Pihir. "Frequency of use and importance of software tools in project management practice in Croatia." Information Technology Interfaces (ITI), 2010 32nd International Conference on. IEEE, 2010.
- [20] Nouf AlMobarak, Rawan AlAbdulrahman, Shahad AlHarbi and Wea'am AlRashed. "The Use of Software Project Management Tools in Saudi Arabia: An Exploratory Survey." International Journal of Advanced Computer Science and Applications (IJACSA) 4.7 (2013).
- [21] Liberatore, Matthew J., Bruce Pollack-Johnson, and Colleen A. Smith. "Project management in construction: Software use and research directions." Journal of construction engineering and management 127.2 (2001): 101-107.
- [22] Muhammad Sajad, Sadiq Muhammad, Naveed Khawar and Iqbal Muhammad Shahid. "Software Project Management: Tools assessment, Comparison and suggestions for future development." International Journal of Computer Science and Network Security (IJCSNS) 16.1 (2016): 31.