Exploring Project Management Tools based on the ITLingo PSL language

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Abstract. Project management is the application of knowledge, tools and techniques to plan the activities that are needed for the project managers to ensure that each project reaches the defined level of success. In the project management area, products are expected to be delivered fast, with small increments between deliveries. In the current market, there are already countless tools that help serve this purpose, however most are still developed with a standalone approach and miss key features, such as the Work Breakdown Structure and Responsibility Assignment Matrix. Within the ITLingo initiative, the Project Specification Language was developed to work as middle ground tool, where users can transfer project plan specifications between the Project Specification Language and other tools. This language has an Excel Template that was built to implement these transfers, and with this work we developed a new version of this template, called PSL Excel Template v.2019.

Keywords: Project Management, ITLingo, PSL, Excel Template, PM Tools

1 Introduction

A project is a temporary and unique mean used by organizations to achieve a particular aim, temporary because it has a clear beginning and end, even if the resulting product may be permanent, and also unique since the service or product that stems from a project is always different from any other. Project management (PM) is the area that manages the resources to ensure that the project is successful, by meeting its requirements. According to the Project Management Body of Knowledge (PMBOK), the processes used to accomplish the task are divided into five groups, initiating, planning, controlling, execution and closing [1].

To help teams successfully create project plans, there are a number of pm tools available in the market, such as Azure DevOps and Microsoft Project, and to compete with these tools the Project Specification Language (PSL) was created.

PSL [2] is a language developed in the ITLingo initiative [3], and it aims to be a middle ground transfer tool, unlike the more popular pm tools, which adapt a standalone posture. The goal of this project is to understand the strong points and weaknesses of the most used tools that are used for the same purpose, in order to improve our own.

Currently PSL is being supported by an Excel template to test the importation and exportation with Microsoft Excel [5]. This template is the focus of our work, and to improve it we will also be looking into other Excel templates in the pm area distributed online, such as Vertex42s and Office timeline.

So, we propose to develop the PSL Excel Template v.2019, on top of the old version, v.2018, developing new features, while reorganizing the old ones, in order to improve user experience and make the template competitive with similar ones available on the market.

2 Background

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements [1]. In order to achieve this five groups of processes and nine knowledge
areas are defined in PMBOK. The process groups are initiating, planning, executing, controlling/monitoring and closing. The knowledge areas are integration, scope, time, cost, quality, human resources, communication, risk and procurement.

Most of the processes within Project management are iterative in its nature. To cope with its iterative nature, Agile project management was introduced. Agile project management is an iterative approach, which means the project is completed in small iterations, allowing for continuous delivery and incorporating customer feedback with each iteration. The most popular agile development methods are Scrum and Kanban.

Scrum is a framework for Agile project management that uses fixed-length iteration, which are called Sprints, while Kanban is also a framework that matches the work to the team’s capacity, commonly referred to as Work in Progress (WiP) Limit. It focuses on getting things done fast, by measuring the lead time, which is the average time to complete one item.

2.1 PSL Language

Within the ITLingo research initiative, the PSL language exists, which is a Domain-specific language (DSL). DSLs are languages focused on a particular problem domain [22], a couple of popular examples are SQL and HTML, as opposed to General Purpose Languages (GPL), that are applicable to a much broader variety of problems, such as Java.

As of October 2019, in the ITLingo scope there are the following DSLs: RSL, Requirements Specification Language, the language that focuses on the requirements specification and tests [9], PSL, Project Specification Language, the language focused on project specification plans and ASL, Application Specification Language which is a textual language that allows to define software applications in a rigorously and technological-independent way.

The PSL language is both a descriptive way of building a project plan and a method to prevent inconsistencies within it. There are a total of eight packages for each PSL specification, which can access each other, but only one of each package can be defined for a single specification. The eight packages are: Charter, Scope, Time, Human Resources, Communication, Cost, Risk and Quality.

2.2 Used Tools

To accomplish the task, we used 4 tools.

Microsoft Excel

Microsoft Excel, used to build the base PSL template, is a commercial spreadsheet application, that allows users to organize, format and calculate data, and is part of the Microsoft Office suite. The most important features used in the template are graphing tools, pivot tables, formulas and the ability to create macros. Visual Basic for Applications (VBA), is used to implement the macros. To better understand Microsoft Excel an online course was taken, that taught the essentials of the software titled Microsoft Excel – Excel from Beginner to Advanced, taught by Kyle Pew [23].

Visual Basic for Applications

Visual Basic for Applications (VBA) is the internal programming language for Microsoft Office Applications, and is part of the Corporation legacy software [11]. VBA is not a standalone tool, it is a program used to manipulate the interface of the host application, such as Excel, Word or PowerPoint. Macros are used in PSL to automate repetitive tasks that the users will need or want to perform.

Office RibbonX Editor

The Office RibbonX Editor is a free, open-source, standalone tool to edit Custom UIs of Office documents [12]. The project is an extension of a Custom UI Editor for Microsoft Office. This editor allows the user to open and edit the xml file associated with the Microsoft Office document, so we used it to develop the Custom Ribbon, which is one of the main features built in the PSL Excel Template.
SoftwareKey

SoftwareKey provides a solution to licensing management software, by supplying the clients with two tools for this purpose [13]. Each computer has a fingerprint and this tool makes it a requirement to have a license key for every computer installation. Instant Protection PLUS provides the protection to the software the user wishes to protect, with the use of license keys, encrypted with industry-standard public-key cryptography. The license distribution of the software protected through this tool alone, needs to be managed by the customer, offline or online, however the customer can purchase a SOLO server instance, for a monthly fee, that automates the distribution of the protected software and the respective license keys.

3 Related Work

To understand how to improve the PSL Excel Template we had to do research within that context. To do so, first we investigate other Excel Templates in the Project Management Area available online, to understand their strong suits and what they could’ve done better. We also compare the current software tools existing on the market, also based on the same concepts, to assess what features are the most important, and what they lack the most between each other, that we can take advantage of.

3.1 Excel Templates

First, we take a look at other Excel Templates and compare them.

3.1.1 Vertex42

The company whose website is vertex42.com is a company that creates and sells spreadsheet templates for all purposes, from business to personal to educational [14]. We focused on the ones that are in the context of Project Management.

Vertex42s overall templates include many of the key features for successful project specification definitions: dashboard, budget management, milestone tracking, Work Breakdown Structure (WBS), critical path tracking, Responsibility Assignment Matrix (RAM/RACI), Gantt Chart, sprint backlog and a Kanban Board.

Vertex42s approach is the opposite of PSLs, the templates are many, but each one is small and keeps it simple. Its simplicity is a strength, but might also be a weakness, since it does allow for many user errors, especially for new users.

3.1.2 Gantt Excel

Ganttexcel.com provides an excel template, that Is fully automated and simple to use, that allows teams to build a Gantt Chart for the scheduling of a project [15].

This automation is what stands out in this template, giving the user a very slim margin to make mistakes. When adding or modifying a task in the Gantt Chart a menu pops up where the user can input all the information needed, such as task schedule and dependencies. It also has a custom ribbon with multiple macro buttons, including one to create an up-to-date dashboard. There are also mechanisms for milestone tracking and budget management.

3.1.3 Office Timeline

Office timeline as the name suggests is a Microsoft add-on for users to create timelines, for instance Gantt Charts and Milestone Trackers, in Microsoft applications. This software makes use of Visual
Project Management, which means it uses illustrations and diagrams to represent complex data in a manner that is easier for the users to understand [16].

The features of these templates also include a dashboard, budget management, critical path tracking, a sprint backlog and also a Kanban board.

Overall the templates are simple and concise, which can lead to many user errors, but it provides an elegant template that serves their goal: to help users in presenting their work, ignoring the technical part of it.

### 3.1.4 PSL Excel Template v.2018

The PSL Excel Template that was used as a guide has been since updated and is currently on version v.2018 [4]. This version is comprised of 27 Sheets, split between different areas of the project Management area, plus 3 independent ones. And so, it is unlike the others that we’ve analysed, making it more complicated than them.

It is one of the most complete templates, seeing as it includes a dashboard, budget management, milestone tracking, a WBS and an Organization Breakdown Structure (OBS), critical path tracking mechanisms, as well as a RAM, a Gantt Chart, a product backlog and a sprint backlog.

Out of the five group processes in PMBOK it focuses on Planning the most.

### 3.1.5 Discussion

We compared the templates according to their ability to support each group process, shown in table 3-1, + means it is sufficient, ++ means it’s good and +++ means it is excellent.

<table>
<thead>
<tr>
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<th>Vertex42</th>
<th>Gantt Excel</th>
<th>Office Timeline</th>
<th>PSL Excel Template v.2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiating</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Planning</td>
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<td>Executing</td>
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<td>Controlling</td>
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<td>Closing</td>
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</table>

PSL Excel Template is currently lacking on the Executing and controlling part of the project plan, so we attempted to use what we learned from the templates that strive in this aspect, to further improve PSL Excel Template v.2019.

### 3.2 Popular PM Tools

Next we investigated the popular pm tools to understand what makes them stand out from others.

#### 3.2.1 Azure DevOps

Azure DevOps is one of the Microsoft Azure solutions, it has been rebranded since September, 10 2018, previously known as Visual Studio Team Services (VSTS) [17].
In terms of features Azure DevOps include a dashboard. One board for work items, where the tasks can be given a prioritization, and one Kanban board with four columns: New, Active, Resolved and Closed. It also includes Sprints, a sprint backlog and a product backlog.

3.2.2 JIRA

JIRA is a project management software developed by ATLASIAN, that when launched was targeting software developers, however it has evolved to also be suitable for non-IT project management [18].

It is the most complete in terms of features. It includes a dashboard that shows the Key Performance Indicators, a board that can be adapted into a Kanban or a Scrum board. Its roadmap can be moulded into a Gantt Chart and it also has a sprint and product backlog.

3.2.3 MS Project

MS Project is the Microsoft project management software. It is part of the Office family, but it is not bundled with the Office suite [19].

Its most notable feature is the Gantt chart, that allows for a very easy to read calendar of the work needed to be done, and the possibility of including milestones. There is also a team dashboard where teams can coordinate the sprints, including their backlogs. There is also an option to fit the project to the Kanban or the Scrum methodology.

3.2.4 Asana

Asana is the simplest tool of these, it was developed in order to simplify how teams in companies work together. This tool focuses on team collaboration and coordination, and so it is not recommended for a single person usage [20].

Out of all of the tools Asana is the most customizable one. It is possible to adapt the project to suit the Kanban or the Scrum methodology. It has a Roadmap, that along with the boards can be used as the Product Backlog, or even the Sprint Backlog.

3.2.5 SmartSheet

SmartSheet is a cloud-based application, that allows users to build multiple sheets to track all project details by means of creating timelines, managing tasks and also creating and monitoring boards, that can be dashboards, Kanban boards, or a simple Backlog [21].

This tool is the most similar to an excel template, seeing as the whole project is divided into sheets, each focusing on a specific area of a project. It is very flexible by allowing the same data to be displayed in various different ways.

3.2.6 Discussion

The following table describes the comparison between the tools features, + means it is sufficient, ++ means it’s good and +++ means it is excellent, while empty cells means it is not present.
Table 2 - Comparison between the tool’s features.

<table>
<thead>
<tr>
<th>Features/Tools</th>
<th>Azure DevOps</th>
<th>JIRA</th>
<th>MS Project</th>
<th>Asana</th>
<th>SmartSheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dashboard</td>
<td>++</td>
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<td>Budget</td>
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<td>+</td>
<td>+++</td>
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<tr>
<td>Milestone Tracking</td>
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<td>Work Breakdown Structure (WBS)</td>
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<td>Organization Breakdown Structure(OBS)</td>
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<tr>
<td>Critical Path</td>
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<td>Responsibility Assignment Matrix (RAM/RACI)</td>
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<tr>
<td>Gantt Chart</td>
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<td>Product Backlog</td>
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<td>Sprint Backlog</td>
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<td>Kanban Board</td>
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</table>

4 PSL Excel Template v.2019

This chapter describes the features that were implemented, including our objective for each one and the reasoning behind them.

4.1 Minor Sheet adjustments

This section describes a number of small tweaks in the sheets that were meant to provide consistency and improve user experience.

Setup Print Area. One of the problems encountered in PSL Excel template v.2018 was the fact that the sheets weren’t optimized for printing and exporting uses. So, we set a custom Print Area for each sheet and built a Custom Ribbon, which is explained in section 4.5.

Movable Objects. Next some informative cells that had troublesome positioning, so we used textboxes to group them together and make them movable so the user can position them himself. There were 2 cases of this, one was the Risk table in the Risk.Risks sheet and the other was the legend of the RAM Matrix in the Resources.RAM sheet.

Sheet Order. We rearranged the order of the sheets, to keep a consistency with the Custom Ribbon. In PSL Excel Template v.2018 the sheets pertaining traditional project management and agile project management where tangled together, so we decided to separate them, putting the traditional ones first and the agile ones last.

New Charts. In the previous version of the template there were already charts displaying information of certain sheets, and to keep the consistency we added more charts that should have been there from the start and added them to the Dashboard sheet.
4.2 Configuration Group sheets

In the PSL Excel Template v.2018 there are four sheets in the Configuration group, which is composed of sheets that provide support information to be used by other sheets. However, we found that they were not consistent. While some were meant to be changed by the user, others weren’t.

To fix this inconsistency we built another group: User Configuration, .userConf., to incorporate the sheets that were meant to be subject to user interaction. To this group we added one sheet from the Configuration group .conf.Holidays, and another two from other groups, Quality.Metrics and Cost.Rates. To the original Configuration group, we added a new sheet, to hold information that supports the Dashboard sheet, .conf.Dashboard, making it a total of five sheets in the group.

4.3 Sheet Protection

One of the common errors we noticed in the Excel Templates studied was the fact that the users could input data in cells that either hold hidden formulas or are automatically updated through macros. To prevent these errors, we implemented the Excel mechanism that allows to protect sheets and consequently their cells.

We added protection to every sheet, with different parameters depending on the interaction the user needs to have with each one. Before adding the protection, we locked every cell that the user must not change. There are also sheets with cells that have hidden formulas.

4.4 Licensing and Trial Version

As previously mentioned PSL’s goal is to be competitive in the project management market, and in order to legally redistribute our software we need to license it.

To do so we used the licensing software provided by SoftwareKey, Instant Protection Plus 3. With this software it is possible to lock the access to the full Excel document, with the use of a DLL, which stands for Dynamic-link library, which is Microsoft’s implementation of a shared library in Windows, and complemented by VBA code. As such, this licensing method forces the document to lock the access to the VBA code behind a protected password.

Since the most popular tools all had a trial version, we decided to build one ourselves that limits the user interaction with the document.

4.5 Custom Ribbon

To optimize the sheet for printing and exporting uses, and inspired by ganttexcel’s template, we built a custom ribbon to move all the macro buttons there, that were previously in the middle of the sheet.

To build the ribbon we used Office Ribbon X, which allows us to access to access the xml file associated with the Excel file, where we can make the desired changes.

The custom ribbon is currently composed of 3 tabs, which hold 23 groups and 41 buttons. 2 tabs are for General Macros, while the other is meant for agile sheet macros. 19 of the 23 groups each have buttons for a different sheet, and so are named after their respective sheet and are only enabled when they are active.

The remaining 4 groups are in the general tab since they don’t affect specific sheets. One of the groups hold the macro that is discussed in section 4.6, Generate Report in Word. The remaining 3 are gathered in the “Other”. 2 of them are helpful macros, while the other one is a macro to import a logo onto the document and to distribute it to all the relevant sheets.
4.6 Generate Report onto Word

This feature was mainly developed for the sake of transferring information between team members or even customers, allowing the user to quickly share the wanted information, within a few simple steps.

To communicate information relevant to one area or even one sheet to other team members we saw fit to build a feature that could allow just that. Furthermore, this feature even allows to share information with people that should not have access to the document.

The macro is accessible through a button in the Custom Ribbon, named “Generate Report onto Word”, which prompts the user with a checkbox for each sheet, which the user then can decide which ones to check.

4.7 Analysis of the Current Situation

Another feature that we added to help in the Executing and Controlling areas, was a way for users to quickly perceive the projects current situation. For this purpose, we enhanced the already created Dashboard sheet and created a new one: Weekly Schedule.

Weekly Schedule is a sheet where the user can identify what is happening this week in the project, such as the meetings, and the objectives that are due this week, both the deliverables and the milestones.

The Dashboard sheet was organized into 2 groups: general and scheduling. General holds all the project general information, such as start and end date, current progress, planned cost and actual expenses, including the charts that display information regarding the status and types of the requirements, milestones issues and deliverables, while Scheduling holds the graphs that show the meetings and the Gantt Chart.

5 Evaluation

To understand the progress of the work developed we evaluated the template by using it for two projects.

5.1 MyTGuide Project

MyTGuide is a simulation of a project, which was the 2017/2018 group project for the Information Systems Project Management class. It is a project within the FreeTime company, that plans to launch a new service supported by the MyTGuide digital platform. The project involves the development of two new products, one targeting the tourists, Guided Tour Reservation (GTReservation), and the other for the tour guides, Guided Tour Offer. We built the project plan specification in both PSL Excel Template v.2018 and PSL Excel Template v.2019.

We started defining the project plan for MyTGuide to get familiar with the tool, using the work we did for the Information Systems Project Management class, in the beginning of the thesis. We revisited the document later to finish it for evaluation purposes. There were a few complications over the course of the evaluation such as macro buttons that can sometimes overlap when columns sizes are adjusted. The timetable sheet also created some confusion when trying to create precedencies between activities.

When building the same project in the new version, the experience went smoother, however this can also be justified by already having experience with the template.

There were however clear improvements. The way the macros are built it is very important that the table headers are not changed. In the previous template, we unknowingly broke some 39 macros, by doing just that, forcing to reroll the document several times. With these cells being locked, we avoided this mistake.

A lot of the improvements that were made from the previous version didn’t have great impact on this experience, such as the current situation analysis features, and the generation of the report to word,
seeing as these features focus on the execution and control processes, and this simulation was done as if the project had already ended.

5.2 MSc Thesis Project

To test the tools evolution, we used our own project to build a project plan in the PSL Excel Template. We started defining the project plan in the beginning of the thesis and concluded it with the evaluation. At the beginning we started with 6, 2-week sprints, but later changed to 4-weeks for the remaining 5, to fit the feature implementations schedule.

This evaluation allowed us to test for bugs, which were quickly fixed. The bugs encountered were cells having the lock property on, in sheets that needed to have whole columns deleted, and having that property on a single cell, would not allow the user, and sometimes macros, delete them correctly.

5.3 Comparison and Discussion

In this section we compare PSL Excel Template v.2019 to the other templates analysed previously, including PSL Excel Template v.2018.

Since we focused mainly on improving executing and controlling processes, we tested these features while building the MSc Thesis Project. A common problem we saw in the templates we analysed before was the user interface not being optimal, such as implicit rules that are not explained, like cells with hidden formulas that cannot be changed. We tried to minimize this by locking cells, such as column headers, since during the project we broke some macros by doing changing them without knowing. Overall, and as shown on Table 5-1, we can say that the main goal of improving the executing and controlling processes was reached, as well as improving the user interface.

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6 Conclusion

In this final chapter we discuss the conclusion of the research and implementation of the PSL Excel Template v.2019 as well as the future work that still remains to do.

6.1 Discussion

The PSL Excel Template v.2019, developed in this work, the template used to test the transfers between Excel and the PSL language, was built on top of the v.2018, receiving significant improvements, especially in regards to executing and controlling processes, with the addition of features such as the improvement of the dashboard and the addition of the weekly schedule and the generate report onto word macro. It also improved the user interface with the addition of the Custom Ribbon and other sheet adjustments, such as the addition of movable objects, the new configuration group and a new consistent sheet order.
6.2 Future Work

This template has been vastly improved, but there are still some areas that can be improved. The trial version is an interesting concept that was only touched on in this work, it can still be further explored by using the code from the licensing tool and giving users different limitations such as not allowing a number of macros to be used, or even remove access to specific sheets. From the PSL language standpoint this has been the second iteration that this Excel template has gone through with no changes made to the language itself, thus limiting the import or even export capabilities of it. Also, in our evaluation we only had one points of view, which is not enough when evaluating a promising tool. More tests, and with real end-users, should be conducted in order to find aspects that can be improved.

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