# MASTER

## MATHEMATICAL FINANCE

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## INTERNSHIP REPORT

## PROJECT MANAGEMENT METRICS AND CREATION OF AN OPERATIONAL DASHBOARD

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## Ricardo da Silva Matos

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# Abstract

This report describes my 3-month internship at Unipartner IT Services S.A., that occurred from March to June 2022. This internship focused on activities mainly related to project management.

Unipartner IT Services S.A is an information technology services company that works with government organizations, financial institutions and commercial companies with the aim of solving the most demanding IT and business challenges.

During this internship, I performed a gap analysis between the information available in the client's database and a set of performance metrics that needed to be computed, with the objective of understanding what information was missing, and to improve the quality of the service provided. Understanding and analysing the project management process was an important task prior to all others: it was essential learning what to do and how to do it, depending on the characteristics of contracts and clients at hand.

I also created a dashboard in Power BI, based on the company's database (Azure DevOps), gathering all information regarding contracts, that can be presented to a client in order to illustrate the progress.

**Keywords**: Project management metrics, Key Performance Indicators, Operational Dashboard.

# Contents

## Acronym List

EV – Earned Value

AC – Actual Cost

PV – Planned Value

BAC – Budget at Completion

ETC – Estimate to Complete

EAC – Estimate at Completion

CPI – Cost Performance Index

SPI – Schedule Performance Index

EMEA – Europe, Middle East, and Africa

# 1 Introduction

This report describes my internship at Unipartner IT Services S.A. I was allocated to a project management team and my main goal was to learn about project management, apply it directly with a client and assemble a gap analysis between all contract information available at the client and the required information for computing a prescribed set of metrics.

Unipartner contains several different teams that will work with different clients and different types of projects. Depending on the needs and requests of the client, Unipartner might lead and manage the project or just manage the already existing one. This will depend on whether the client presents an existing project and simply requests development support, or just sets the intended outcomes and contracts both development and project management. The project team I was allocated corresponds to the latter.

The relevance of my activities at Unipartner comes from the fact that, nowadays, companies are increasingly connected to technologies and need to innovate and expand their capabilities in order to provide their own clients a better service. These needs and the corresponding dependence from technologies brings forth the necessity to always have solutions to existing problems, as well as preparing for problems that may occur in the future. This usually involves assessing existent solutions that need to be improved, namely by streamlining the data collecting models and databases, in order to make it easier to address new needs that the client may have in the future. Essentially, we aim at making the client's life easier when dealing with every type of occurrences.

We can divide the internship into two phases. The first one being the introduction to the different types and methods of project management and the second one the analysis and creation of the gap analysis.

The need for the first phase comes from the fact different clients have different needs, requirements and problems, therefore it is necessary to analyse and understand them in the best possible way and to determine the best course of action in handling them, not only regarding the technologic part but also managing the human resources, the costs

of the project, the timeline of the project, the project itself and any setback that may happen during the outline of the project or during the time it is actually in progress.

Completing this first task relies heavily on the ability to choose an appropriate project management methodology, one that will best fit the project at hand, allowing us to complete tasks agreed with the client, in smallest amount of time, spending the least amount of money, with the fewest possible issues.

The second phase of the internship consisted in preparing and implementing a gap analysis between the available contract information and the information needed to compute metrics (performance indicators) that can give the project management team some assurance that the project is headed in the right direction or alert them to the need of introducing changes.

It is very important to keep the clients informed about the progress of the project and to be able to provide auditable proof of this progress. It is an essential to identify any setbacks and to assess its impact on viability of the project. This will reassure the clients that their money is being well invested and that the project management team is making a good job in the development of the project in hand.

The precise metrics to be calculate will obviously depend on client's demands and/or on the type of project management methodology being used. In fact, certain metrics can only be applied to specific methodologies of project management and therefore there is no purpose in trying to compute metrics that do not provide relevant information given the methodology in use.

Apart from these two phases, I was assigned some additional tasks, not directly connected with the ones from the previous two phases. These tasks/activities involved the creation of a dashboard using Power BI to present to the client. The dashboard contained information about all the contracts involving the client and their different dates. The purpose of this dashboard is for the client to have a better notion of all the active contracts they have at hand, basic information on their scope and progress, as well as more detailed information on the contracts that the client decides to be relevant.

This report is organized in the following way: in the second chapter we will get to know more about Unipartner and its business; The third chapter will be a more theorical chapter, where it will talk about KPI's and metrics, how they were introduced and

selected; The fourth chapter will have a detailed description of all the work that was conducted during the internship, all the problems that were encountered, and the solutions that were adopted in order to fulfil the objectives of this internship. The final chapter will contain the conclusions.

## 2  Presentation of Unipartner

Unipartner is a privately held company that was created following the restructuring of Unisys' business in 2015, it has been made a Unisys Service Partner to guarantee the continuity of projects and business for a vast number of clients. This redefined Unisys' operations in EMEA, and in Portugal supports clients by an indirect presence.

Unipartner was established and is now led by five ex-Unisys commercial and services directors, counting with a team of more than 260 employees, a number that keeps on growing every single year. Being a leader in IT consulting, Unipartner distinguishes itself by the extensive number of recognitions, awards received and partnerships with important companies in the technologic area like Microsoft, that allows and helps to maintain the quality of services provided.

In figure 1 we can see some of awards and recognitions received by Unipartner in the last couple of years, these show the importance of lasting partnerships and the results that comes from that.

# Major Awards and Recognitions



**FIGURE 1. AWARDS AND RECOGNITIONS RECEIVED BY UNIPARTNER**

## 2.1 Unisys

Unisys is a global information technology company that specializes in providing industry focused solutions with leading edge security to clients in the government, financial services and commercial markets.

Founded in 1986, Unisys works with companies from different regions on various focus areas and industries, regions since North America to Europe, Latin America and Asia Pacific, focus areas such as Enterprise Computing, Business Process Solutions, Cloud, Applications & Infrastructures, Digital Workplace, Cybersecurity, and industries including Financial Services, Public Sector, Manufacturing, Travel and Transportation, Communications, Education, Healthcare and Life Sciences.

Beyond working with a vast number of companies, Unisys also presents a variety of partnerships counting with over 25 partner companies from four different regions. The Unisys Alliance Partners enables a collaboration that will bring forth innovation and development of joint solutions therefore supplying clients with new and better products and services. Throughout all collaboration between the strategic partners, solutions can be created to ensure that the clients achieve the expected performance, costs and gain a competitive advantage while managing risk.

Unisys as a partner provides top tier technology, software and services companies with the purpose of achieving joint solutions that will go in touch with the client's needs and requirements. Unisys also makes sure that clients get independent advisement, quality services, and essential capabilities to ensure that their projects succeed.

## 2.2 Services Provided

Unipartner provides services in three different industries, the first one being Public Sector, the second one being Financial Services and the third one Commercial & Industry, with the main objective of applying technologies to enable medium and large companies, and governments to solve complex business challenges with innovative solutions.

Unipartner provides, among other services, project management services, and this was the framework of my internship. When providing this type of service, the project management team will ensure that the project in hand is well managed, with the least possible setbacks, in order to achieve the client's needs with the most consistency possible. The project management team does much more than strictly managing the project, performing tasks related to adjacent areas detailed in the sequel.

One of the areas deals with the management of the project and all parts involved, such as the human resources, the allocation of time and costs, and the order of the tasks to be completed, since the acceptance of the project until its closure.

Another area deals with the creation of dashboards to present to the client, containing requested information or information deemed relevant by the project team. The information can involve all the active and inactive contracts, allowing the client to have a better and easier way of tracking their collaborations with Unipartner, namely the dates of renewal or termination of contracts, and whether the renewal is automatic or not.

Yet another area prepares all the information exchanged with the client and stores it in the database. It is important that new tasks, requirements/specifications, exchange of ideas, setbacks and estimated timelines are updated, organized and easily accessible, so that they are clear to everyone involved in the project, especially when new scenarios need to be considered.

Finally, the project management team must also control and manage the direct costs of the whole project, keeping track of how much is going to be spent by the client, when will these costs occur, at which phase of the project, and the amount of money available for the completion of the different tasks in each phase of the project.

In figure 2 we can see a set of different services provided by Unipartner, services that will, as a whole, make the company provide the best products and services available to the client and therefore help them achieve their goals and demands.
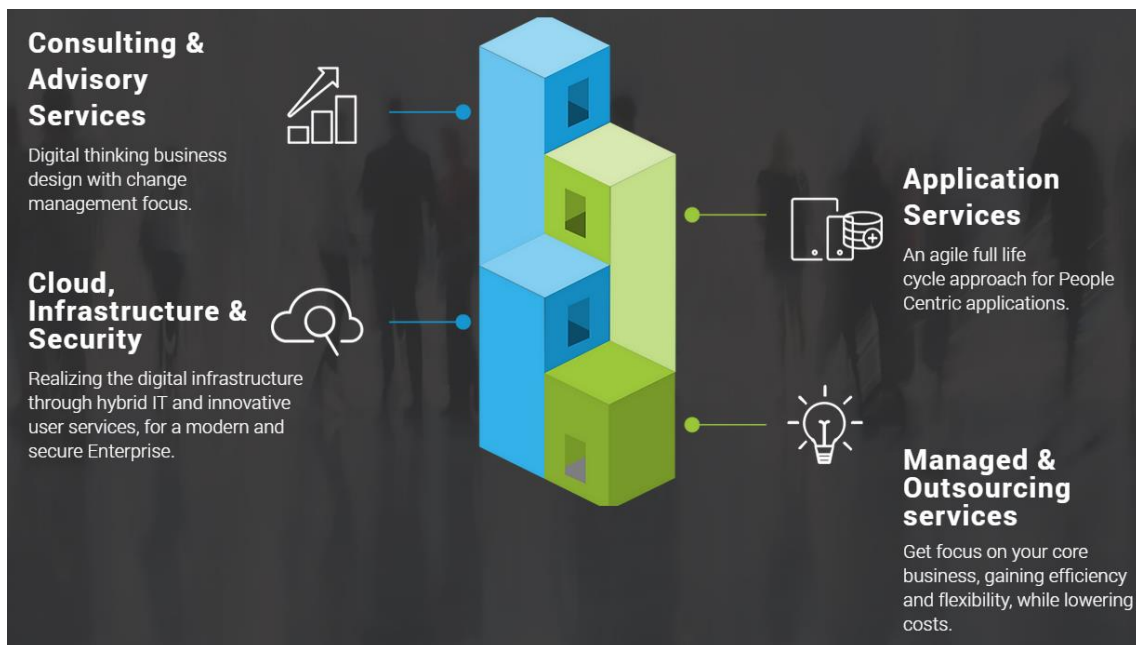


**FIGURE 2. SERVICES PROVIDED BY UNIPARTNER**

# 3 Literature Review

In this chapter we present some theoretical points about key concepts used during this internship, in particular concepts related with KPI's and metrics.

## 3.1 Key Performance Indicators - KPI's

KPI's (Key Performance Indicators) are, as the name reveals, performance indicators that show the progress towards the intended result. According to *Dragana*

*Velimirovic, Milan Velimirovic and Rade Stankovic (2011)* KPI are financial and non-financial measures that organizations use to reveal how successful they were in accomplishing long lasting goals.

By *Intrafocus (2018),* a KPI is something that can be counted and compared. It provides evidence of the success, or failure, of a strategic objective over a specific time. Key Performance Indicators provide a basis for decision making and includes setting goals/objectives. According to *Intrafocus (2018)* a KPI only has significance if it is contributing to an objective. If there is no objective, why is it being measured in the first place? Even if the processes of creating key performance indicators and objectives moves quickly and in parallel, a KPI should always have an objective.

We can now consider the different types of KPI's like lead and lag indicators, where we work to improve the leading indicators that in the future will bring lagging benefits. Leading indicators are harbingers of future success and can predict outcomes, while Lagging indicators show how successful the company/organization is and measures what already happened.

Other types of key performance indicators go from input indicators, process indicators and output indicators to outcomes indicators. Input indicators measure the resources needed for a project. Process indicators are used to measure the efficiency of a project. Output indicators are a measure that indicate the success or failure of a process Outcomes indicators are focused on measuring the impact of the project and can be classified as intermediate outcomes or end outcomes. According to *Eswar Ganesan and Ramesh Paturi (2009)*, a KPI can be classified generically into two broad categories: Strategic KPI and Operational KPI on the basis of the associated management level (top/middle/line managers) and time interval (long term/short term).

KPI's have a big importance since they help keep the team on the same path, they give a true view on the company's health from risk factors to financial indicators, allow to see successes and failures and enables to adjust in order to accomplish better results than before. *Eswar Ganesan and Ramesh Paturi (2009),* say that the general characteristics of KPI shall include: reflect organization vision and strategy, easy to interpret and actionable, decided by management and tied to roles, processes, system capabilities, products/services and programs/initiatives of the enterprise.

Some KPI's are connected to specific functions that can be related to finance or IT. For instance, the finance KPI's considers the gross profit margin or returns on stocks, while IT KPI's measure the time until resolution. The KPI's that are more effective normally follow the SMART formula (specific, measurable, attainable, realistic, time bound).

Choosing the ideal key performance indicators for each company will depend on the area of business and their goals. Since KPI's should be directly related to business goals, they should also consider the company's stage of growth and, more importantly, they should be clear for everyone involved, because they are a key indicator for business and objectives.

## 3.2  Project Management Metrics

Metrics are measures that determine the success of activities that support the KPI's, despite having an impact on outcomes, they are not the most critical measures. According to *Sham, K. (2013),* project management metrics are vital to implementing practical and sustainable project management practices and processes in any organization. The key is to keep the metrics simple, practical and relevant to the organization.

*Shell, R. D. (2014)* says that metrics on a project are important indicators as to the health of the project, and they provide details to make better decisions. These two views show why it is important to have a range of metrics that measure all the different aspects of the project, since costs, efficiency, timelines, indexes, setbacks all the way to the satisfaction of the team. All this will allow the team to have a bigger control over the project and make decisions that will benefit the progress and development of the same.

Looking at metrics we can see that they have more functions that just serve as a measure or indicator of success. Metrics can also assist as comparison tool to see what decision brings the better results, as an analysis tool helping analyse the development of the project up until the date of calculation, and in some metrics as an estimation tool helping to estimate costs at the end of the project. *Radu Marsanu (2010)* says that metrics have six different functions: measurement, comparison, analysis, synthesis, estimation and verification.

As we can see, metrics are important in more than one way in project management, not only assisting, but also guiding the best decisions to take in order to get the best possible results. *Sham, K. (2013)* says that project management metrics help us: measure and understand the maturity of the IS organization, manage projects and resources more effectively, demonstrate year-over-year improvement in performance.

In order to be a good metric, it needs to be simple, it needs to be clear for the entire environment and team, capable of being computed with the information available in the database and provide important information that can be used to measure the development and success of the project. For *Sham, K. (2013)* all metrics should be: simple and make sense for all organization, measurable with clarity, fairness to all, and without ambiguity, and that is supported by and traceable to real data.

According to *Shell, R. D. (2014),* there are some dangers related to using metrics that can affect negatively the project management team and consequently the working project. They mention that the main drawback of metrics is that, when poorly understood, they can be used as a support for bad decisions. Projects managers must use metrics for decisions making but must also be aware of their shortcomings: sometimes, sound team collaboration can complement metrics and lead to better decisions. These authors also mention that excessive focus on metrics is like drowning in an ocean of information: metrics often become so important that too much time is taken from getting the real work done.

These issues can often be avoided due to the existence of a large number of usual metrics for each methodology and objectives. Project management can, when in doubt about the relevance or impact of a certain metric, decide to drop it and choose another one that transmits more confidence and for which there is more knowledge and information.

Choosing which metrics should be used and applied to the project at hand corresponds to a decision of the project management team. The team will analyse which methodology best fits the project and the goals to be accomplished. If it is Agile methodology the metrics will have a bigger focus on the dates of start, end and passage between different stages of the project, emphasizing the timeline and not the cost or human resources. On the other hand, if the methodology chosen is Waterfall, the metrics

will be more focused on the calculation of deviations of costs, time, effort from the estimated values established at the beginning of the project, and on the calculation of indicators that will help measure if the project is well headed in respect to the same.

From here the actual metrics that will be put in use will vary depending on the personal choices of the project management team, in order to accomplish the demands and objectives defined by the client, and takin into account the knowledge on each one of the metrics, the information needed for the calculation and the existing information in the database. This doesn't mean that every metric will work in every project, because each project has different aspects and some metrics might not be able adapt to the circumstances and will end up not being used, so there isn't any metric that is obligatory to use in every single project.

According to *Villanova University (2022)* each project manager typically has different objectives, and success metrics that work well for one business might not work for another. For that reason, it's important to tailor project metrics and reporting to your business's unique needs. They also give some tips to help in the process of choosing the project metrics: keep definitions of project management KPIs and project management metrics simple and useful, plan the long term, including setting things up for comparison to competitors, ensure that underlying data is both available and credible, communicate the need to gather project management metrics, along with your goals and purpose, and be sure you have the budget and staff to support your project metrics plan.

Most importantly, any given metric can later become a Key Performance Indicator, depending on how accurately it identifies critical decisions.

# 4  Basics of Project Management

Learning the basics of project management is an important step in the beginning of this internship, with the basics we can fully understand the complexity of it. To be able to do this, it is necessary to get familiar with the project management operating manual. This manual is specifically made considering the client in hand, explaining the difference between the two most used project management methodologies (Waterfall and Agile), the pros and cons of each one.

The existing problem here, is knowing exactly what the correct methodology is to use in the project, this decision is made after meeting with the client and listening to the demands, risks and problems they want to solve. When this decision is made there are phases and steps that each one of the methodologies follows. These are also described in the operating manual with detailed information about what happens in each one of them, to make sure that both the client and the project management team have a clear perception of the path to take.

Agile methodology is used if the project is propitious to change, if the final result is not totally known, and if the client wants to take part and be more involved in each phase. This methodology rather sees fast improvements than perfect results and works with strict deadlines. It can be seen as a work by parts, where you work on the first part from start to end, present those results and only after you can move to the next one until every single part is completed. Important to notice that every single part will show results.

Waterfall methodology needs a lot of planning from the beginning, before any work is made. The final objective is well defined, and it will not change, the project is consistent and predictable, but it is not the ideal method if there is a need for constant testing or adapting to the feedback received during the development of the project. We can look at it as work done step by step, where only at the end of the last step we will have the results to show.

The operating manual does not just talk about what the phases are and what steps to take, the manual incorporates the company database (Azure DevOps) from the start to help the client with the information transfer process, that way the information is on easy access for the project management team to use when needed. Also incorporates the attributions, characteristics and responsibilities of the different intervenients of the project depending on the methodology used. These intervenients can be from the project management team or on the client's side.

The first contact with metrics is made through this operating manual, where we can see which metrics need to be calculated following each methodology, their description and what each allows to calculate. Complex metrics present a simple example to help understand how and why we calculate them.

## 4.1 Applying the Basics

After getting in contact with the operating manual it is important to test and apply that knowledge, for that purpose fictional examples are made. Starting easy and adding complexity until reaching a complete example, while following every step from a project management point of view, will help internalize the method.

These examples are made following both Waterfall and Agile methodologies, where the human resources, the costs and the timeline of the project are manage using fictional values. To help even more, these examples can be made about topics of personal interest.

The next example is a fictional exercise made to demonstrate the work that needs to be done during the management of the project. All the data incorporated in these examples are also fictional due to client confidentiality.

Firstly, we start the exercises by making a scheme of the sequences of steps to be followed in each methodology in order to arrive to the proposed objective. In the Waterfall methodology we need to incorporate every step in this scheme, due to the result being only obtained after every step is concluded, while on Agile we only need specific steps to be concluded in order to achieve the same goal, the remaining steps can be added from that point onward.

Figures 3 and 4 show an example of these initial exercises as described above, where the common objective for both methodologies is having a game. In figure 3 we use Waterfall methodology, where all tasks need to be considered, but in order to show just an example on how it was done, some of them are hidden without compromising the order of the steps.
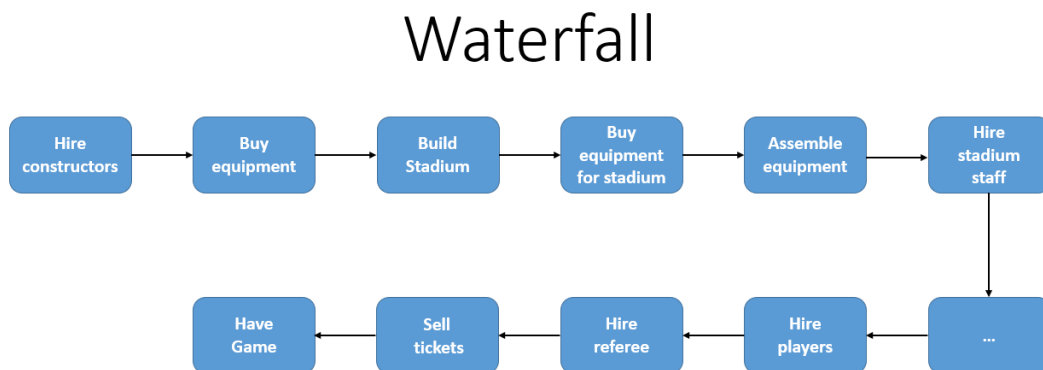
# Waterfall



**FIGURE 3. EXAMPLE OF INITIAL EXERCISE WITH SEQUENCE OF STEPS FOR WATERFALL METHODOLOGY**

In figure 4 we see the example for Agile methodology, where we can see the difference in the steps needed to achieve the objective. Here we complete the essential tasks first, allowing us to have the game in the quickest possible time. After that, we can add the remaining ones, that will make us, once again, complete the objective further down the line, but this time in a more complex way with more components.
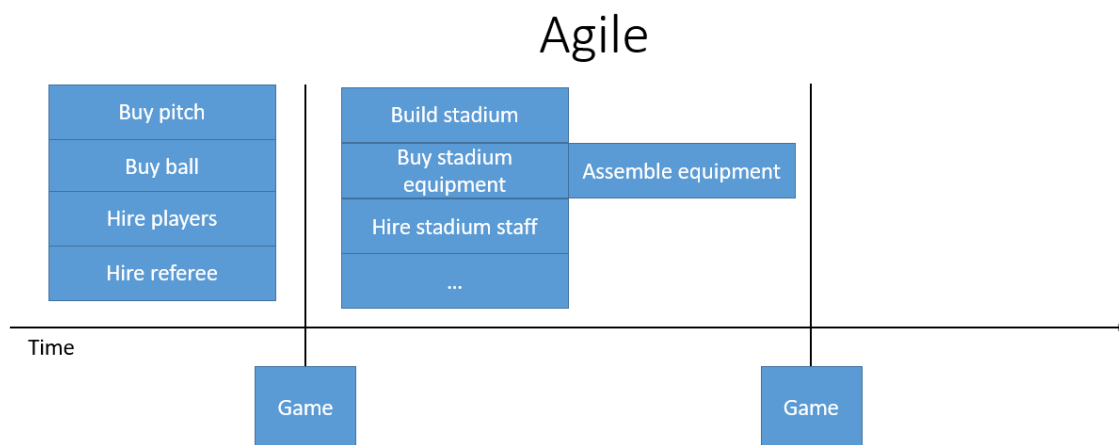
**FIGURE 4. EXAMPLE OF INITIAL EXERCISE WITH SEQUENCE OF STEPS FOR AGILE METHODOLOGY**

From here on out we can add more and more complexity to the exercises and reach examples like the ones presented next.

In the next figures we can see an example with fictional values of these types of exercises, where all components are incorporated and are following the Waterfall methodology of project management. Agile methodology is not present in this example, given the fact that the project management team is applying Waterfall methodology to the project of the client at hand, so even though it is important to understand the basics of how Agile methodology works, it is even more important to focus on the methodology in use.

In figures 5 and 6 we can see the initial part where the objective of the project is defined, in this case having a game, the ambit of the project, and the definition of the tasks needed to be done. This example contains four phases of work and three different workers that work in each one of the phases. The objective in each one of the phases is to distribute the different tasks between the workers keeping in mind that each one of them cannot

work more than 8 hours a day, that there exists tasks that are not able to be accomplished simultaneously, tasks may have precedency on other tasks, and that at the end of the timeline for the phase the costs and hours of each one of the workers must be equal in order to avoid internal conflicts within them.

Analysis & Design is the first of the four phases where it is laid down every plan and strategy that needs to be define and distributed by the different workers.

Development/Execution is the second phase, where the objective is to make an exact plan of the tasks each one of the workers must do, considering the tasks from the phase above.

Testing, Quality and Acceptance is the third phase where everything is tested and made sure that works in perfect condition, once again, it is important that each of the workers don't work more than 8 hours a day and that at the end, they have an equal cost.

Transition to Production is the fourth and final phase where the project is finally completed and is ready to entry into production and be used, in this case the game is ready to happen.

**Objective: Game**

**Âmbito:** Jogadores, Estádio, Bola, Bilhetes, Baliza; Relvado

**Análise & Desenho**

| | Tasks | Data início | Data fim | Trabalhador | Horas p/dia | Dias | Total horas por atividade | Precedência | Custo | Custo pessoa p/dia | Custo pessoa por atividade | Soma custos | Total custo por trabalhador | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.1 | Definir estratégia contratação construtore | 01/12/2021 | 10/12/2021 | A | 4 | 9 | 36 | | 1,500 € | 12 € | 108 € | 1,608 € | | |
| 1.2 | Definir plano construção estádio | 11/12/2021 | 31/12/2021 | A | 8 | 20 | 160 | 1.1, 1.3 | 100,000 € | 24 € | 480 € | 100,480 € | 696 € | A |
| 1.3 | Definir plano compra relvado | 01/12/2021 | 10/12/2021 | A | 4 | 9 | 36 | | 2,500 € | 12 € | 108 € | 2,608 € | | |
| 1.4 | Definir plano aquisição publicidade | 01/12/2021 | 15/12/2021 | C | 8 | 14 | 112 | | 750 € | 24 € | 336 € | 1,086 € | | |
| 1.5 | Definir plano aquisição câmaras televisiva: | 16/12/2021 | 31/12/2021 | C | 4 | 15 | 60 | 1.4 | 12,000 € | 12 € | 180 € | 12,180 € | 696 € | C |
| 1.6 | Definir estratégia contratação staff estádi | 16/12/2021 | 31/12/2021 | C | 4 | 15 | 60 | 1.4 | 3,700 € | 12 € | 180 € | 3,880 € | | |
| 1.7 | Definir estratégia contratação jogadores | 01/12/2021 | 15/12/2021 | B | 4 | 14 | 56 | | 50,000 € | 12 € | 168 € | 50,168 € | | |
| 1.8 | Definir plano aquisição holofotes e lugare: | 01/12/2021 | 15/12/2021 | B | 4 | 14 | 56 | | 5,000 € | 12 € | 168 € | 5,168 € | 696 € | B |
| 1.9 | Definir estratégia contratação árbitro | 16/12/2021 | 31/12/2021 | B | 4 | 15 | 60 | 1.7 | 20,000 € | 24 € | 180 € | 20,180 € | | |
| 1.10 | Definir modelo venda bilhetes | 16/12/2021 | 31/12/2021 | B | 4 | 15 | 60 | 1.8 | 220 € | 24 € | 180 € | 400 € | | |
| | **TOTAL** | | | | 140 | | 696 | | 195,838 € | 168 € | 2,088 € | 197,926 € | 2,088 € | |

**FIGURE 5. DEFINITION OF OBJECTIVE, AMBIT AND FIRST PHASE OF EXERCISE**

**Desenvolvimento / Execução**

| | Tasks | Data início | Data fim | Trabalhador | Horas p/dia | Dias | Total horas por atividade | Precedência | Custo | Custo pessoa p/dia | Custo pessoa por atividade | Soma custos | Total custo por trabalhador |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.16 | Abordar empresa iluminação | 01/01/2022 | 03/01/2022 | B | 4 | 2 | 8 | 1.8 | 0 € | 48 € | 48 € | 48 € | |
| 2.17 | Comparar melhores ofertas | 04/01/2022 | 05/01/2022 | B | 4 | 1 | 4 | 2.16 | 0 € | 48 € | 24 € | 24 € | |
| 2.18 | Comprar holofotes | 06/01/2022 | 12/01/2022 | B | 8 | 6 | 48 | 2.17 | 3,000 € | 48 € | 288 € | 3,288 € | |
| 2.19 | Montar holofotes | 14/02/2022 | 16/02/2022 | B | 8 | 2 | 16 | 2.18, 2.5 | 550 € | 48 € | 96 € | 646 € | |
| 2.20 | Contrato empresa plástico | 01/01/2022 | 03/01/2022 | B | 4 | 2 | 8 | 1.8 | 0 € | 24 € | 48 € | 48 € | |
| 2.21 | Comprar lugares | 04/01/2022 | 05/01/2022 | B | 4 | 1 | 4 | 2.2 | 2,000 € | 24 € | 24 € | 2,024 € | |
| 2.22 | Montar lugares | 17/02/2022 | 21/02/2022 | B | 8 | 4 | 32 | 2.19, 2.5 | 300 € | 48 € | 192 € | 492 € | |
| 2.23 | Realizar lista jogadores necessários | 22/01/2022 | 01/02/2022 | B | 8 | 10 | 80 | 1.7, 2.22 | 0 € | 48 € | 480 € | 480 € | 2,400 € |
| 2.24 | Abordar associação jogadores | 31/01/2022 | 04/02/2022 | B | 4 | 4 | 16 | 2.23 | 0 € | 24 € | 96 € | 96 € | |
| 2.25 | Comparar opções disponíveis | 05/02/2022 | 10/02/2022 | B | 4 | 5 | 20 | 2.24 | 0 € | 24 € | 120 € | 120 € | |
| 2.26 | Contratar jogadores | 11/02/2022 | 13/02/2022 | B | 8 | 2 | 16 | 2.25 | 50,000 € | 24 € | 96 € | 50,096 € | |
| 2.27 | Abordar federação portuguesa futebol | 31/01/2022 | 04/02/2022 | B | 4 | 4 | 16 | 1.9, 2.23 | 0 € | 24 € | 96 € | 96 € | |
| 2.28 | Analisar disponibilidade árbitros | 05/02/2022 | 10/02/2022 | B | 4 | 5 | 20 | 2.27 | 0 € | 24 € | 120 € | 120 € | |
| 2.29 | Contratar árbitros | 22/02/2022 | 28/02/2022 | B | 8 | 6 | 48 | 2.28 | 20,000 € | 24 € | 288 € | 20,288 € | |
| 2.30 | Supervisionar construção estádio | 05/02/2022 | 13/02/2022 | B | 8 | 8 | 64 | 2.5 | 500 € | 48 € | 384 € | 884 € | |
| | **TOTAL B** | | | | | 62 | 400 | | 76,878 € | 528 € | 2,400 € | 79,278 € | |

**FIGURE 6. DEFINITION OF SECOND PHASE FOR ONE OF THE WORKERS**

In figure 7 it's shown the next step to take after the four previous phases are completed, it is necessary to make a risk plan to prevent any problem related to the project. The risk plan will allow the project management team to have solutions ready to be applied if any task or plan fails. These solutions might rely on other companies, partnerships or on simple solutions, like fixing or replacing a broken piece of equipment. If this plan was only made during the actual development of the project itself and not of the blueprint, the team would not be able to reach the solutions in time, so it is important that the risk plan is made prior to the start of production, in order to assure that every possible problem has been accessed and has a solution ready to execute.

To make this plan it is necessary to look at every step and task that is going to take place during the project, analyse every possible part that can go wrong and establish a possible mitigation plan and solution in case it fails. There is a vast number of solutions that can be arranged and several directions that those solutions can follow so, if necessary, we can have more than one solution to each possible problem.

## Risk Plan

| Risk | Mitigation Plan | Solution |
|------|-----------------|----------|
| Falta Recursos Humanos | Contrato empresa forneça trabalhadores na hora | Contratar mais trabalhadores |
| Pouca quantidade cimento | Contrato empresas construção outros materiais | Construir estádio mais pequeno em madeira |
| Holofotes estragados | Contrato empresa iluminação | Fazer jogo durante dia / arranjar existentes |
| Lugares insuficientes | Contrato empresa plástico | Utilizar existentes / produzir mais |
| Relvado estragado | Contrato empresa especializada | Tratamento relvado |
| Rega avariada | Contrato empresa relvados/rega | Regar relvado com outra técnica |
| Staff estádio em falta | Contrato empresa forneça trabalhadores na hora | Contratar novos membros |
| Balizas estragadas | Parceria empresa desporto | Comprar novas ou arranjar existentes |
| Falta publicidade | Contrato empresa marketing | Baixar preços |
| Avaria das câmaras | Contrato empresa televisiva | Comprar novas ou arranjar existentes |
| Bola furada | Parceria lojas desporto | Adquirir mais com antecedência |
| Jogadores doentes | Parceria associação jogadores | Contratar mais do que estritamente necessários |
| Bilhetes em falta/demasia | Contrato empresa marketing | Fazer mais / devolver dinheiro aos compradores |
| Árbitro não aparece | Parceria federação portuguesa futebol | Adiar jogo |

FIGURE 7. RISK PLAN

Figure 8 demonstrates how the human resources costs are considered for every one of the four phases of the project talked above, and each one of the workers in them. The purpose of this task is to make sure that each one of the workers work the same amount of days, hours and that at the end of the phase they have the same cost.

Here we can see that in the Development/Execution phase worker B has one less day of work than worker A and C, while it presents the same amount of hours worked and the same total cost, this will allow for the difference of days worked to be ignored given that is only a one-day difference and that both total hours and costs are the same. Ideally this difference does not exist.

# Human Resources Costs

## Analysis and Design

| Worker | Days | Total Hours | Cost p/day | Cost p/hour | Total Cost |
|--------|------|-------------|------------|-------------|------------|
| A | 29 | 232 | 24 € | 3 € | 696 € |
| B | 29 | 232 | 24 € | 3 € | 696 € |
| C | 29 | 232 | 24 € | 3 € | 696 € |
| Total | 87 | 696 | 72 € | 9 € | 2,088 € |

## Development / Execution

| Worker | Days | Total Hours | Cost p/day | Cost p/hour | Total Cost |
|--------|------|-------------|------------|-------------|------------|
| A | 63 | 400 | 48 € | 6 € | 2,400 € |
| B | 62 | 400 | 48 € | 6 € | 2,400 € |
| C | 63 | 400 | 48 € | 6 € | 2,400 € |
| Total | 188 | 1200 | 144 € | 18 € | 7,200 € |

## Testing, Quality and Acceptance

| Worker | Days | Total Hours | Cost p/day | Cost p/hour | Total Cost |
|--------|------|-------------|------------|-------------|------------|
| A | 4 | 32 | 48 € | 6 € | 192 € |
| B | 4 | 32 | 48 € | 6 € | 192 € |
| C | 4 | 32 | 48 € | 6 € | 192 € |
| Total | 12 | 96 | 144 € | 18 € | 576 € |

## Transition to Production

| Worker | Days | Total Hours | Cost p/day | Cost p/hour | Total Cost |
|--------|------|-------------|------------|-------------|------------|
| A | 3 | 24 | 48 € | 6 € | 144 € |
| B | 3 | 24 | 48 € | 6 € | 144 € |
| C | 3 | 24 | 48 € | 6 € | 144 € |
| Total | 9 | 72 | 144 € | 18 € | 432 € |

FIGURE 8. EXAMPLE OF HUMAN RESOURCES MANAGEMENT FOR EVERY PHASE

# 5  Metrics Matrix

Moving into the next step in this internship we now focus on the metrics both for the Agile and Waterfall methodologies, trying to understand, in a more detailed view the importance, the definition and the reasons that made us choose these metrics. For this we use the operating manual referred before that contains important information on the metrics and how to calculate them, there also exists an extra document containing more metrics that can be useful or not depending on the methodology used.

It is important to comprehend the metrics for both methodologies, because even if we are working with only one methodology, Waterfall in this case, there can be a future project that will incorporate Agile methodology instead, and if we already have the information and the knowledge on those metrics, there won't be any loss of time trying to understand them in the spot.

First step in the construction of the metrics matrix is to fully understand and divide all usable metrics by methodology and create a table with that information. Figures 9 and 10 represent these two tables, one for Waterfall, one for Agile, each one with the different metrics that need to be calculated and their corresponding formula.

## Waterfall

| Metric | Formula |
|--------|---------|
| Schedule Variance | Real date - Estimated date |
| Cost Variance | Cost of the task - Estimated cost of the task |
| Scope Variance | Change requests that result in scope change |
| Atuals | Measurement of already incurred for time, effort and cost |
| CPI | EV / AC |
| SPI | EV / PV |
| ETC | (BAC - EV) / CPI or EAC - AC |
| EAC | BAC / CPI or ETC + AC |
| Effort Variance | Effort incurred in the task - Expected task effort |

**FIGURE 9. FORMULAS OF CALCULATION FOR WATERFALL METRICS**

| Agile | |
|---|---|
| **Metric** | **Formula** |
| Cycle Time | Sprint duration |
| Work Item Age | US duration at each stage |
| Flow Efficiency | % Downtime (1-(Downtime/Total Time))*100 |
| Customer Lead Time | Time since team accepts commitment until customer delivery |
| System Lead Time | Time since team accepts commitment until delivery to phases outside team responsibility |
| Cycle Lead Time | Average time in each stage |
| Deploy Fail Rate | Number of defects detected after US implementation in production |
| Work in Progress | Number of US simultaneously in progress |
| Planned to Done Ratio | Number of planned US that were realized |
| Backlog Aging | Average time of existence of US |
| Escaped Defect Rate | Number of defects detected after conclusion of US |
| Blocked Time | Sum of total downtime of every US in last 2 weeks |
| Velocity | Volume of US delivered vs. planned in each sprint |
| Throughput | Number of US delivered within a certain period |
| Touching Time | US time in team action lines |
| Waiting Time | US time in team waiting lines |

**FIGURE 10. FORMULAS OF CALCULATION FOR AGILE METRICS**

Now moving into the metrics matrix itself, there is one more step that needs to be executed before starting to construct the matrix, that is removing from the database a copy of all the existent fields of information. To obtain the list it is necessary to access de database and copy all fields of information that are connected to it. After having the list, it is time to cross check it with all the metrics one by one and see which are the fields that each metric needs to pick information from.

Creating the matrix is a complex task since there exists a vast number of fields that are empty, others that don't exist anymore but are still on the database, some present one name in the list and a different one in the database, and most of them don't have a description, making the task even harder. The sole purpose of this task is to simplify the database by removing the fields not needed and help the project management team to know which fields contain the information for the metrics they want to calculate.

In figures 11 and 12 we can see examples of the metrics matrix for both Waterfall and Agile methodology. It can be noted there are fields that help calculate one metric, some help calculate more than one, and some might even not help at all. These fields, that don't have any purpose are now remove from the database in order to help the project management team deal with less unnecessary information.

| Fields of Information | Cycle Time | Work Item Age | Flow Efficiency | Customer Lead Time | System Lead Time | Cycle Lead Time | Work in Progress | Planned to Done Ratio | Backlog Aging | Deploy Fail Rate |
|---|---|---|---|---|---|---|---|---|---|---|
| Start date sprint | x | | | | | | | | | |
| End date sprint | x | | | | | | | | | |
| Entry date of stages | | x | | | | | | | | |
| Leaving date of stages | | x | | | | | | | | |
| Entry date of "card" on stages | | | x | | | | | | | |
| Leaving date of "card" on stages | | | x | | | | | | | |
| Creation date of ITR | | | | x | x | | | | | |
| Commitment date | | | | x | | | | | | |
| Dates of passage to stages of external responsibility | | | | | x | | | | | |
| Departure date from external responsibility stages | | | | | x | | | | | |
| Start date of stages | | | | | | x | | | | |
| End date of stages | | | | | | x | | | | |
| Number of US through stages | | | | | | x | | | | |
| Date of passage to Production | | | | | | | | | | x |
| Date of passe to Review | | | | | | | | | | |
| Issues in Production | | | | | | | | | | x |
| State of US | | | | | | | x | x | | |
| Number US planned | | | | | | | | x | | |
| Creation date of US | | | | | | | | | x | |
| Acceptance date | | | | | | | | | | |

FIGURE 11. METRICS MATRIX FOR AGILE METHODOLOGY

| Fields of Information | Waterfall | | | | | | |
| | Schedule Variance | Cost Variance | Effort Variance | CPI | SPI | ETC | EAC |
|---|---|---|---|---|---|---|---|
| Real start date planning phase | x | | | | | | |
| Real end date planning phase | x | | | | | | |
| Start date of feature | x | | | | | | |
| End date of feature | x | | | | | | |
| Start date of requirements | x | | | | | | |
| End date of requirements | x | | | | | | |
| Start date of tasks | x | | | | | | |
| End date of tasks | x | | | | | | |
| Real start date of tasks | x | | | | | | |
| Real end date of tasks | x | | | | | | |
| Final Cost | | x | | | | | |
| % Completed Work | | | | x | x | | |
| % Completed Work (planned) | | | | | x | | |
| Estimatated hours | | | x | | | | |
| Additional hours resulting of change requests | | | x | | | | |
| Start date of ITR | | | | | | | |
| Issues | | | | | | | |
| State of ITR | | | | | | | |
| Phase where issue was found | | | | | | | |

**FIGURE 12. METRICS MATRIX FOR WATERFALL METHODOLOGY**

## 5.1  Gap Analysis

Analysing and creating the gap analysis is the main task of this internship, with the purpose of solving one important existing problem. Now that we built all the necessary knowledge from the tasks mentioned above, we can accomplish it.

Finally, the problem of missing information in the database related to metrics calculation will be solved, using the metrics matrix from figures 11 and 12, and both of the tables shown in figures 9 and 10, we can see what metrics can be calculated directly with the information given by the client, if there are fields that need to be completed with information yet to be given, or if it is necessary to do calculations with the available information prior to the ones that will give us the metric in question. This work will allow metrics with missing information to be fixed, by asking the client to fill those fields right at the beginning, at the same time they fill all other fields of information necessary for the creation of the project.

In the next figures, we can see this gap analysis and the existing differences between what can be directly calculated, what still needs to be calculated or filled, in order to get the metrics that we want to calculate.

Figure 13 shows an example for Waterfall methodology of this gap analysis, where we can see the middle column being the information that we can obtain directly from the database, and the right column the information that we need to calculate or that is still missing from the database. On ETC and EAC we notice that there isn't any information available in the database. To fix and prevent this problem from happening in the future, we can now make extra fields of information mandatory for the client to fill right at the beginning.

| | Metric: | What we obtain directly from database | Missing / need to calculate |
|---|---|---|---|
| | Schedule Variance: | Real dates of passage between stages | Estimated dates of passage between stages |
| | | Real start and end dates of planning phases | Estimated start and end dates of planning phases |
| | | Estimated start and end dates of features | Real start and end dates of features |
| | | Estimated start and end dates of requirements | Real start and end dates of requirements |
| | | Estimated and real start and end dates of tasks | |
| | | | |
| | Cost Variance: | Final cost | Estimated cost |
| | | | |
| | Effort Variance: | Macro estimate of the effort (hours) of the ITR | Real effort in hours, (calculated by the sum of hours spent on all activities) |
| | | Additional effort (hours) resulting of change requests | |
| | | | |
| | CPI: | % Completed Work | Actual Cost (AC) |
| | | | Budget at Completion (BAC) |
| | | | Earned Value (EV), (calculated from BAC and % Completed Work) |
| Waterfall | | | |
| | SPI: | % Completed Work | Budget at Completion (BAC) |
| | | % Completed (planned) | Earned Value (EV), (calculated from BAC and % Completed Work) |
| | | | Planned Value (PV), (calculated from BAC and % Completed (planned)) |
| | | | |
| | ETC: | | Budget at Completion (BAC) |
| | | | Earned Value (EV) |
| | | | Cost Performance Index (CPI) |
| | | | |
| | EAC: | | Budget at Completion (BAC) |
| | | | Cost Performance Index (CPI) |

FIGURE 13. GAP ANALYSIS FOR SOME WATERFALL METHODOLOGY METRICS

Figure 14 shows the same example but this time for Agile methodology, we can see that some metrics don't present any information missing or any extra calculations to be done. This is the optimal result we want to achieve with the making of the gap analysis and all the work leading to it.

| Metric: | What we obtain directly from database | Missing / need to calculate |
|---|---|---|
| Cycle Time: | Start and end date of sprint | |
| Work Item Age: | Entry and exit dates in stages | |
| Flow Efficiency: | Dates of passage of the "card" between stages | Stop Time |
| | | Total Time |
| Customer Lead Time: | Creation date of ITR | |
| | Commitment date | |
| System Lead Time: | Creation date of ITR | Time in days spent in stages of external responsibility |
| | Dates of passage to stages of exterior responsibility | Total sum of days spent in stages of external responsibility |
| | Departure dates from these stages | Difference between total days and total days spent in stages of external responsibility |
| Cycle Lead Time: | Start and end dates of stages | Days of the US in each stage |
| | Number of US that passed the stage | Sum of total days in each stage |
| Deploy Fail Rate: | Date of passage to Production | Sum of total defects found in Production |
| | Number of defects detected after passage to Production | |
| Work in Progress: | Number of US simultaneously "in progress" | |
| Planned to Done Ratio: | Number of US planned at the beginning of the sprint | Ratio of planned US that were concluded |
| | Number of concluded US | |
| Backlog Aging: | Creation date of US | Total sum of US existence in days |
| | Number of US | Metric calculation date |

(The "Agile" label spans the leftmost column for all rows.)

FIGURE 14. GAP ANALYSIS FOR SOME AGILE METHODOLOGY METRICS

The work to get the information present in the middle column was already made with the construction of the metrics matrix referred above, on the other hand the information on the right column needs to be discovered at this point. For that we have to pick one of the metrics, then according to its calculation formula we need to look at the metrics matrix and see which are the fields of information that contain necessary information for the metric. After that we need to check what information is still missing that is needed for the calculation.

For example, looking into figure 13 to the Schedule Variance metric, we know from figure 9 its formula of calculation (Real date – Estimated date), so we go to the metrics matrix of figure 12 and see if this specific metric has any field of information in the database where it can go pick information, that will be our middle column. As we can see we have real dates of start, end, passage and some estimated dates, for example we have a field named "Real start date of planning phases" and another named "Real end date of planning phases". Now, the only thing we need to calculate this metric for the planning phases, are the estimated start and end dates, to get them we are going to need to ask the client to deliver that information into the database by filling extra fields that are added into the initial template of information. These estimated start and end dates are what we put into the right column.

Another example, also looking into figure 13 but this time to the CPI metric. Again, we look in figure 9 and see its formula (EV/AC), now we go to the metrics matrix of figure 12 and see if any of the existence fields corresponds to the information needed and we can see that there exists one containing the "% of completed work", that again will be our middle column. To get the rest of the necessary information we need to ask the client for the Actual Cost and Budget at Completion, that they will introduce in the new initial template with extra fields added. There is also the need to calculate the Earned Value, this will only be available to be calculated after getting the other missing information since the Earned Value is calculated based on the BAC. After the calculation we can finally obtain the CPI metric.

We do this work for every Waterfall and Agile metric, allowing us to actually see what information is missing from the database, what information needs to be calculated prior to the metrics calculation, and what changes need to be applied to the initial template filled by the client.

From these two figures we can recognize the differences between the two methodologies on terms of metrics calculations. Metrics from Waterfall methodology are more financially oriented and need more prior calculations in order to be calculated, while Agile metrics are more focused on dates of passage between stages and are more likely of being already in the database.

In terms of defining the hierarchy between all the different metrics, the task will depend mostly on the point of view of each project manager and what methodology they are using in the project they have in hands. This means that a project manager that is dealing with a project that follows Agile methodology will put in their priority Agile metrics, and a project manager that is dealing with a Waterfall project will have Waterfall metrics as the number one priority. Therefore, in order to overcome this possible issue, a discussion with members of the team that are more focused in these topics is important, this will allow us to listen to different points of view and discuss the multiple possibilities, ultimately reaching a consensus about the hierarchy of the metrics.

## 5.2 Operational Dashboard

An Operational Dashboard, created in Power BI, not connected directly with the work that led to the gap analysis, was also made.

Using Power BI to the creation of this dashboard allows to obtain personalized analysis on an enterprise scale, enables quick update of the data and publication of the results, allows you to easily create a data model that defines the relationships between complex datasets. We can access our data directly from the database or from many different sources and at the end we get a more appealing visual presentation of the data requested by the client.

Creating the dashboard had the goal of presenting to the client a variety of data related to contracts, namely information about the number the active and inactive contracts, the type of renewal of each one, the core each contract belongs to, important dates and time left until those dates; all these are grouped by colour depending on the time remaining. The information presented is requested by the client in order to make it easier for them to see what is happening with the contracts they have in hand and see if and when it is necessary to act.

Figure 15 shows an example of the excel the client provides containing all the information needed to create the dashboard, information mainly about the dates of the contract, the type of renewal, the core that the contract belongs to and if is still active or not. In order to maintain the client confidentiality, all the data and information is altered, but the example follows the same principles as if it were real data.

| ID. Contract: | Description: | Active: | Due Date: | Days until due: | Date of Complaint: | Days until date: | Automatic Renewal: | Manual Renewal: | Core: |
|---|---|---|---|---|---|---|---|---|---|
| CT001 | Spring Maintenance - Accounting | S | 01/10/2020 | -741 | 01/09/2020 | -771 | S | N | A |
| CT002 | Equipment Maintenance | S | 01/12/2020 | -680 | 30/09/2020 | -742 | N | S | C |
| CT003 | Maintenance OW | S | 21/12/2020 | -660 | 15/10/2020 | -727 | N | S | D |
| CT004 | Cybersecurity Awareness Training | S | 01/03/2021 | -590 | 10/11/2020 | -701 | S | N | E |
| CT005 | Fed Database | S | 01/05/2021 | -529 | 01/04/2021 | -559 | S | N | H |
| CT006 | AMS - Distibuted Platforms | S | 01/06/2021 | -498 | 10/04/2021 | -550 | S | N | I |
| CT007 | AMS Core AMM | S | 01/06/2021 | -498 | 28/04/2021 | -532 | S | N | A |
| CT008 | Global Channel (SMS) | S | 01/07/2021 | -468 | 01/05/2021 | -529 | N | S | E |
| CT009 | Trust Platform | S | 01/12/2021 | -315 | 01/10/2021 | -376 | N | S | H |
| CT010 | Kodax | S | 20/12/2021 | -296 | 01/12/2021 | -315 | N | S | H |

**FIGURE 15. EXAMPLE DATA PROVIDED BY CLIENT FOR DASHBOARD CREATION**

We can now upload this information to Power BI and start creating the dashboard with the requests of what the client wants to see. If in the process we notice that there is still some information missing that is indispensable for the creation of the dashboard, we return to the client and ask them to complete the excel with that information or send us another one containing the desire information.

Figure 16 shows how the dashboard should look after we finish creating it, keeping in the mind what are the points that the client wants to see from the beginning.

Firstly, we start by putting the information related with the number of active contracts and how many of them have automatic and manual renewal, after, we can create a table where the most important information is shown. In here we group the days by colour, where if the contracts are less than 30 days away from the deadline it appears in yellow, and if the deadline has already past it will show in red. This will update with the days and will help the client stay alert with the deadlines of the contracts, because when they see yellow, they will know that there is less than a month left to act if necessary. Continuing with the thoughts of helping the client have a better view of the contract's situation, we create two pie charts where the first one provides information on the number of active contracts and divides them by intervals of time until expiration. These intervals are decided by the project management team. The second pie chart will show the number of contracts to expire by their core, helping the client have a better perception of where those expiring contracts are inserted. Finally, we set two slicers on top of the page that will allow the client to select any time interval they want to look at, for example, if the client only wants to look at the information about the contracts that have already expire, it only needs to choose that tab on the slicer and both pie charts and the table will update to demonstrate only on that interval.

Some information on the dashboard might need to be treated. We might need to calculate the days until the deadlines from the current date of construction. The information on the number of active, automatic and manual renewal can be obtain through basic functions that will count specific rows of our data and give us the total number regarding what we want to obtain. These functions avoid the work of searching one by

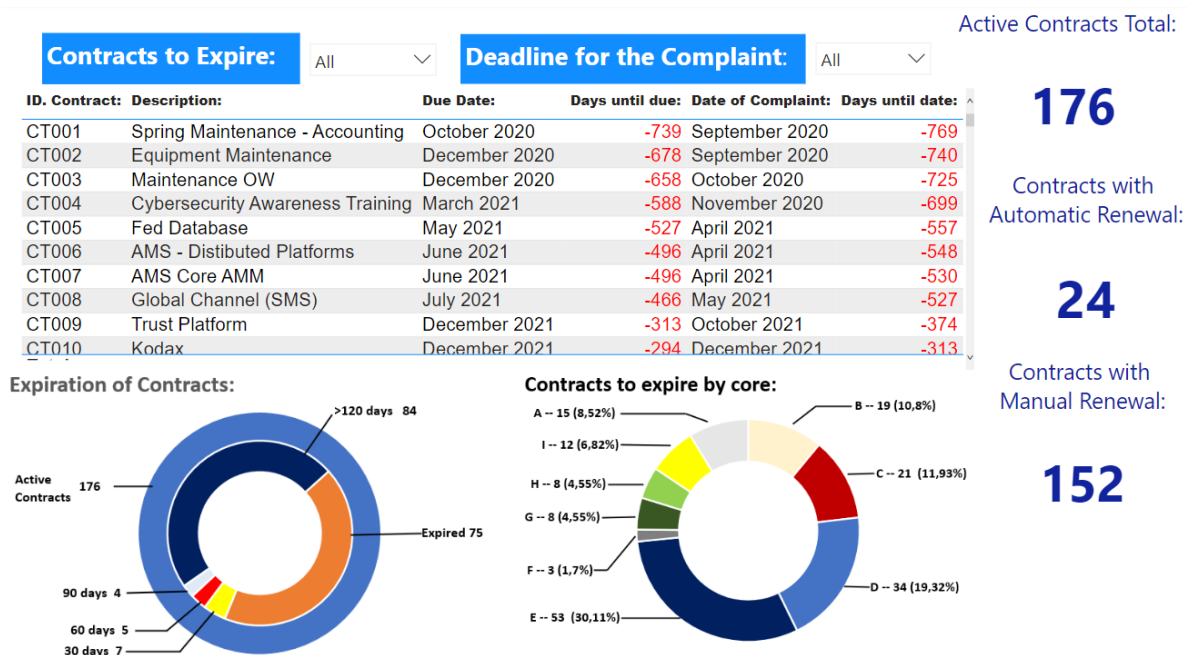one if the contract belongs or not to the characteristics that we are looking to present in the dashboard.



**FIGURE 16. EXAMPLE OF COMPLETED DASHBOARD**

# 6 Conclusions

In conclusion, the internship accomplished at Unipartner IT Services S.A., had the main objectives of understanding the complexity of project management, all the work that is required to do prior to the actual project development, and the creation of a gap analysis. These tasks have a high importance because without this work the project management process would take more time and cost more than needed, allows the client to see all needs and requests satisfied, and allows them to provide the best services to their own clients.

Due to the lack of information given by the client in the company database, and in order to solve this problem it was proposed the creation of a gap analysis between all fields of information available and the metrics needed to be calculated. This will allow the project management team to access what can be calculated directly, indirectly, and what information is missing that is essential in order to apply other metrics or even to complete the calculous of metrics already in use.

Understanding the complexity of project management was the first step in order to reach the gap analysis. The purpose of this task was to understand how a project is managed from the first meeting with the client to the point of production, the different needs and requirements each client has, the multiple approaches in terms of methodology, the responsibilities and obligations of the diverse parts inside the project management team, the vast number of aspects that need to me managed throughout the project and the pros and cons of the possible different approaches. All this work will then give us the necessary knowledge on how to successful manage a project and help us better comprehend metrics and solve the problem of the previous task proposed.

The creation of the dashboard had high importance since it was made at request of the client and presented to them, the goal was to present different types of information regarding the contracts dealt by the client in order to help them have an easy accessibility and understanding of a group of complex information. Once the dashboard is approved by the client the team starts working on the next one with the new set of requests on the information to be displayed.

All the work and tasks done during this internship helped notice all the complex work that happens every time a new project is accepted or anytime a client changes opinion in relation to something in the project that was already in development. Making this work even harder is the fact that each project management team deals with more than a project simultaneously, it can be projects from the same client or not, and they can follow the same or different methodologies.

Therefore, ensuring that each project is completed in the least amount of time possible, with the minimum costs and mistakes while making sure that everything is spot on following the client's requests and needs, takes a great amount of experience, and a team capable of solving any type of issue and introduce new innovative solutions.

With more time in this internship, new metrics could be introduced to the calculations, allowing new points of analyse over the development of the project, a new initial template could be created giving the client the obligation to fill more fields of essential information into the database, solving the problem of missing information that came up with the gap analysis. An actualization of the database by removing all fields that are no longer in use, would make it easier for the team to figure out which fields each

metrics tap into, writing a new operating manual that included all changes made to the database and metrics with a detailed explanation of the steps to take would also be necessary task to do in continuation of the internship.

# 7 References

Sham, K. (2013). Practical approach to project management metrics. Paper presented at PMI® Global Congress 2013—North America, New Orleans, LA. Newtown Square, PA: Project Management Institute

Shell, R. D. (2014). The mystery behind project management metrics. Paper presented at PMI® Global Congress 2014—North America, Phoenix, AZ. Newtown Square, PA: Project Management Institute.

Radu MARSANU, (2010). "Project Management Metrics," Oeconomics of Knowledge, Saphira Publishing House, vol. 2(2), pages 10-15, April.

Velimirović, D., Velimirović, M. and Stanković, R. (2011). "Role and Importance of Key Performance Indicators Measurament," Serbian Journal of Management, vol 6(1), pages 63-72.

Ganesan, Eswar and Paturi, Ramesh, (2009). "Key Performance Indicators Framework - A Method to Track Business Objectives, Link Business Strategy to Processes and Detail Importance of Key Performance Indicators in Enterprise Business Architecture". AMCIS 2009 Proceedings. 736.

Villanovau.com. (2022). *5 Key Project Management Metrics*. [online] Available at: https://www.villanovau.com/resources/project-management/project-management-metrics/.