Project, Program, Portfolio Governance Model Reference Architecture in the Classic Approach to Project Management

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Abstract: This paper presents a reference architecture on projects, programs and portfolios (PPP) governance model. Projects support organizations in the achievement of the planned objectives. The governance model of a project, program or portfolio has a direct relation with the PPP outcome. A PPP governance model is defined as the use of systems, structures of authority, and processes to allocate resources and coordinate or control activities in a project, program and portfolio. The required roles, responsibilities, and performance criteria should be an integral part of the governance model for projects, programs, and portfolios. This research adds to the knowledge base of PPP management a proposed reference architecture, that verifies deviations between different PPP governance models at competences and roles levels. The reference architecture is organized in five layers (business governing, steering, directing, managing, and performing) identifying the roles, the roles concerns, and their competences. The reference architecture is modelled using ArchiMate. Finally, the proposed architecture is demonstrated and evaluated in a government owned company.

1 INTRODUCTION

Projects should bring value to organizations as well as the expected return of investment.
Organizations have projects, programs and portfolios, where project is understood as "a temporary effort to create a unique product, service or result" ((PMI), 2017); program is defined as a "temporary structure of interrelated projects managed together that provides advantages and contributes to the achievement of objectives" (ISO 21503, 2017); and portfolio is a collection of programs and projects grouped together to facilitate their management to meet organization objectives (ISO 21504, 2015).
For the success of projects, programs and portfolios it is necessary a proper projects, programs and portfolios (PPP) management. "Project management performance explained 44,9% of the variance in project success", (KPMG, 2003) and follow a correct PPP governance model, "approximately 6.3% of the variation of project success correlates with the stakeholder-orientation of the governance structure" (Joslin & Müller, 2016).

A governance model is the establishment of rules, policies, procedures, standards, relationships, systems and processes that influence how an organization's objectives are defined and achieved, how risks should be monitored and addressed, and how to optimize organizational performance ((PMI), 2017). This research, emphasis the governance models on PPP management systems, PPP governance model - policies, processes, procedures, guidelines, boundaries, interfaces, roles, responsibilities and accountabilities required for PPP management (ISO 21505, 2017). Considering the permeability of projects, programs and portfolios to the environment, several roles can be considered when referring to PPP governance models that promote the existence of different PPP governance models.
In order to PPP governance contribute to the organization success, it is necessary that the roles associated with the PPP governance model has the competencies associated with them. A competence is defined as the "application of knowledge, skills and abilities to achieve desired results"; knowledge is

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defined as the "collection of experiences that are possessed by an individual"; the "technical skills allow an individual to perform a task"; and ability is defined as the "use of knowledge and skills in a given context" (IPMA, 2018).

The line of research proposed by Sauer and Horner (Winter, Smith, Morris, & Cicmil, 2006), aim to "highlight the criticisms of the project management knowledge base, (…) provide a set of possible research directions that can be followed in order to enrich and increase the project management knowledge base" (Winter et al., 2006). The knowledge base that was criticized at the time is still used in many organizations and is considered in this research as a classical approach to project management, which is characterized by:

- Project and Project Management Lifecycles - There are simple models based on the project lifecycle and there is a dominant model in project management, assuming there is a model that indicates the best way of action and is common to all types of projects.
- Projects as Instrumental Processes - The project lifecycle is considered as a linear sequence of tasks to be performed.
- Focus on Product Creation - Concepts and methodologies focus on product creation, development or improvement through temporary activities. These activities are controlled and monitored considering quality, cost and time.
- Restricted Project Conceptualization - Concepts and methodologies share the restricted conceptualization that projects start from a well-defined objective and fall into unique areas.
- Practitioners as Trained Technicians - Training and development produce project management practitioners who follow detailed procedures previously described by project management methods and tools.

This research creates a reference architecture, which is expected to allow comparisons between PPP governance models, highlighting potential alignment or deviations between models. The reference architecture is also expected to present guidelines for the identification of a model that best suits the context of each organization (assuming that it uses a classic approach to project management).

This reference architecture is expected to: i) provide input for a better understanding of failing elements (roles and competences) in PPP governance models; ii) highlight additional roles and relationships, allowing for exploring patterns or roles redundancy, better understanding the value offer of one methodology over another; iii) verify how competencies required for proper PPP governance are addressed when roles are added or removed; and iv) allow access to a reality that comprises only one project, or one project ecosystem and its associated methodologies, including programs and portfolios.

Next section presents this research related work. In section 3 the governance model reference architecture is proposed. The demonstration and evaluation are performed in sections 4 and 5, respectively. Section 6 presents the conclusions and the future work.

2 RELATED WORK

This chapter introduces the main areas relevant for the development of this research.

2.1 PPP Governance

The concept of governance is understood in this research as "a formal or informal model that determines how decisions are made and how actions are taken, with a view to maintaining organizational values in the face of change, whether caused by problems, changes in actors or changing environments"- OECD (Guria, 2015).

An effective PPP governance model "ensures that the project portfolio is aligned with the organization's objectives (…) and will align the interests of directors, project team and other stakeholders" (Association for Project Management, 2006). The governance model gains importance regarding the alignment between projects and organizational objectives and the delivery of project results in an efficient and sustainable manner.

"Roles, responsibilities and performance criteria should be clearly defined in the PPP governance model" (Association for Project Management, 2006). "Role" in an organization is defined within this research as a "function or something someone has" (Priberam, n.d.). In various existing governance models studied ((PMI), 2016) (Association for Project Management, 2006) (ISO 21505, 2017), it can be noted that different roles are required for correct PPP governance. In the context of this research, ISO 21505 is the model adopted. ISO 21505 roles are used as reference in other variant on the governance models (Fragoso, Vasconcelos, & Borbinha, 2018).

It is therefore essential that PPP governance is aligned with organizational governance, respecting its principles, decisions and processes ((PMI), 2016).

Organizational Governance is a model that includes, "rules, processes, norms, relationships, systems and

procedures" ((PMI), 2017). This model allows to steer an organization(ISO 21505, 2017) by influencing how the organization's objectives are defined and achieved, how risk is monitored and evaluated, and hoe performance is optimized ((PMI), 2017).
In the governance model present in ISO 21505 (ISO 21505, 2017), four key roles and their responsibilities related to PPP governance and two related Organizational Governance are presented. The roles are identified in Table 1.

Table 1: Roles related to PPP Governance and Organizational Governance.

PPP Governance	Organizational Governance
PPP Governing Body	Governing Body
Project Governing Body	Organizational Governing Body
Program Governing Body	
Project Governing Body	

2.2 PPP Management

Project management gains importance in organizations, enabling strategy implementation, business transformation and the development and continuous improvement of new products (KPMG, 2003).
The "Rethinking Project Management (RPM) (Winter et al., 2006) research line contributed to "complement the classic approach to project management represented in PMBOK ((PMI), 2017)" (Sauer & Horner, 2009) and similarly in ISO 21500 (ISO 21500, 2012), 21503 (ISO 21503, 2017), 21504 (ISO 21504, 2015) in PM2 (Edition, 2016) and APMBoK (Association for Project Management, 2006).
Knowing that there are several PPP management models, each with their own defined set of roles, it was decided to use as reference in this research the model presented in ISO's, namely ISO 21500 (ISO 21500, 2012), for project management related roles, ISO 21503 (ISO 21503, 2017), for program management related roles and ISO 21504 (ISO 21504, 2015) for portfolio management roles, because the set of roles presented is referenced in different methodologies such as (Association for Project Management, 2006) ((PMI), 2017), and is summarized in Table 2.
To help organizations compare their practices with the best ones, project management maturity models, "enable an organization to evaluate and compare its own practices with best practices and purpose improvements. A maturity model is a framework that describes the optimal progression using various levels

Table 2: Roles related to PPP Management.

ISO 21500 (Projects)	ISO 21503 (Programs)	ISO 21504 (Portfolio)
Project Sponsor	Program Sponsor	Portfolio Manager
Project Manager	Program Manager	Portfolio Management Team
Project Management Team	Program Management Team	
Project Team		

until the desired improvement is achieved" (Man, 2007). Examples of project management maturity models are: i) the Organizational Project Management Maturity Model (OPM3) (Foundation, n.d.); ii) the Capability Maturity Model Integration (CMMI) (SEI, 2010); and iii) the IT Score for Program & Portfolio Management (Gartner, 2019) (Mieritz, 2017).

2.3 Organizational Layers

"Structuring an organization is important because it defines how tasks are divided and how organizational resources will be implemented" (Daft, 2008). The organizational structure is defined as, (1) "the set of tasks assigned to individuals and departments"; (2) "dependency relationships within organizations, including lines of authority, decision-making responsibility, number of hierarchical levels, and the number of people that managers are responsible for controlling"; (3) and finally the "systems used by the organization to ensure coordination among departmental officials" (Child, 1984).
For PPP governance and management, the PM2 methodology (Edition, 2016) creates a layered structure where it is possible to relate each role to its layer, taking into account the characteristics of both. These layers are Business Governing Layer, Steering Layer, Directing Layer, Managing Layer and Performing Layer. Other methodologies indirectly also present a layered structure. For example the ISO suggests for governance a layered structure where there is a main Organizational Governance layer, which encompasses PPP Governance which in turn encompasses portfolios, programs and projects. For PPP management the ISO suggests a similar structure for projects, programs and portfolios, with a sponsorship layer, managing layer and developing layer.

2.4 PPP Management Competences

IPMA ICB is a "global standard that defines the competences required of individuals working in the

field of project, program and portfolio management" (IPMA, 2018).
Regarding projects, programs and portfolios, the competencies in IPMA ICB are divided into three domains: i) "People competences", the personal or interpersonal skills required to successfully participate or lead a project, program or portfolio (IPMA, 2018); ii) "Practice competences", specific methods, tools and techniques used in projects, programs or portfolios to make them successful (IPMA, 2018); and iii) "Perspective Competences", specific methods, tools and techniques by which individuals interact with their surroundings and lead organizations to initiate and support projects, programs or portfolios (IPMA, 2018).

2.5 Reference Architecture of the PPP Governance Model

"A reference architecture captures the essence of other existing architectures, as well as their vision and evolving needs to provide guidance in developing new architectures" (Cloutier et al., 2010). Reference architectures "allow to be effective, (…) discuss future modifications and extensions" (Cloutier et al., 2010), however this type of architecture must "be based on proven concepts" (Cloutier et al., 2010) and is considered a "standard method (…)" in line with best practice in the area " (Cloutier et al., 2010).
There are already investigations aimed at building a reference architecture of the PPP governance model, one of which is (Too & Weaver, 2014) that propose four key elements for improving project performance and therefore create value for organizations. These four elements are: (1) Portfolio Management; (2) Project Sponsor; (3) Project Management Office (PMO); (4) Project and Program Support. Also the research (Müller, Zhai, Wang, & Shao, 2016), with the aim of creating a framework that is useful for project governance, clarifies the various dimensions that the governance concept can acquire: 1) sovereignty, a popular dimension of governance often found in the general management literature, which describes the levels of external autonomy and internal control granted to projects by the governance system; 2) governance mechanisms, predominantly control oriented; and 3) the number of governance models as an indicator of the complexity of project governance implementation.

2.6 Enterprise Architecture

"An organization-level architecture is called Enterprise Architecture" (Garcia, 2017), which by definition, according to Lankhorst, consists of "a coherent set of principles, methods and models used in the design and realization of the organizational structure of a company, business processes, information systems and infrastructure" (Lankhorst, 2009). ArchiMate (The Open Group, 2017), is a language that provides a uniform graphical representation of Enterprise Architecture (Lankhorst, 2009).
This research uses the Implementation and Migration Elements as well as the Business Actor, Business Role, Business Process and Business Function, business elements and Capability, strategy element, of ArchiMate (The Open Group, 2017).

3 SOLUTION PROPOSAL

Due to the increasing number of existing PPP governance models and the different contexts in which they can be applied, there is a need to create a reference architecture to the PPP governance model. This architecture is expected to provide a baseline to identify the differences between different PPP governance models in a classical approach to project management.
The reference architecture is divided into layers, where one can have access to the roles and competencies associated with each layer. Its creation is presented in this section and is done through 7 steps next described.

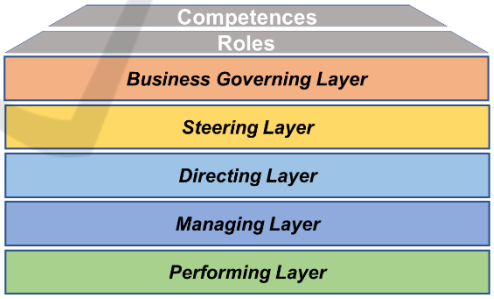

Figure 1: Constitution of Reference Architecture.

3.1 Define Architecture Layers

In order to choose layers for the reference architecture, the different existing layers are analysed. The PM2 methodology (Edition, 2016) introduces the division of the project management organization in layers that allow a clear relationship between the definition of functions and the roles associated with them and the level that they integrate within organizational structures and processes. More

specifically the PM2 layers, allow a more organizational-related approach that integrates the Business Governing Layer while the other layers are more directed to the project domain, programs and portfolios – see Figure 1.

3.2 Define Architecture Roles

Organizational governance, as the system by which organizations are directed and controlled (Guria, 2015), has in the roles associated with PPP governance and management processes the core activities carried out under the organizational governance system. These organizational roles, defined as "the roles played by individuals or groups in a project" (Association for Project Management, 2006), program or portfolio, are considered fundamental and essential in creating a reference architecture of the PPP governance model. An analysis of existing governance and management models is performed. As mentioned in (Fragoso et al., 2018), the roles present in ISO's 21500 (ISO 21500, 2012), 21503 (ISO 21503, 2017), 21504 (ISO 21504, 2015) and 21505 (ISO 21505, 2017), are used as a reference in other methodologies. These roles are presented in section 2.2 for PPP and organizational governance and section 2.3 for project, program and portfolio management, and are used in the reference architecture.

3.3 Identify Role Concerns

To identify the concerns of each role, the organization documentation is analysed (where the roles are identified) and a table is filled, where it is possible to check which concerns and responsibilities associated with each role.
This approach provides an easy access to the concerns of each role, which is useful for the next steps.

Figure 2: View of role matching with their concerns identified in the ArchiMate Business Function viewpoint.

3.4 Associate Roles with Layers

To organize roles in the respective layers, it is necessary to have access to the concerns / responsibilities of each role as well as the definition of each layer of the architecture.
The mapping is performed layer by layer:

- Business Governing Layer: Determines the vision and strategy for the entire organization. It consists of one or more management committees operating at director level. This is where priorities are set, investment decisions are made, and resources allocated. In ISO 21505 (ISO 21505, 2017), the governing body role is introduced as "a person, group or entity responsible for the governance of the organization or part of the organization" which is then associated with this layer.
- Steering Layer: Provides guidance for the project, program or portfolio, keeping each one of them focused on the goals. PPP Governing Body is "the person, group or entity responsible for the governance of projects, programs and portfolios as an organization, supported by a set of interrelated organizational processes by which an organization prioritizes, selects and allocates resources to achieve organizational objectives" (ISO 21505, 2017). An organization may have a specific governing body for the project ecosystem, the program ecosystem and the portfolio ecosystem.

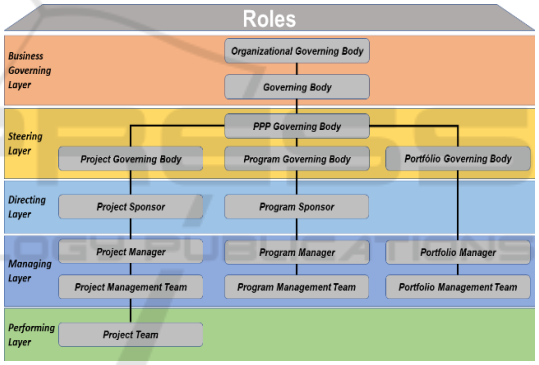

Figure 3: Mapping the roles associated with PPP Governance in the respective layers.

- Directing Layer: Sponsors the project, program or portfolio. It mobilizes the necessary resources and monitors the performance of the project, program or portfolio to achieve its objectives. Project Sponsor is defined as "the person who authorizes the project, makes executive decisions and solves problems above the authority of the project manager" (ISO 21500, 2012). The Program Sponsor is defined as the person "responsible for the overall program strategy and its implementation. defence" (ISO 21503, 2017).
- Managing Layer: is focus on the daily operations of the project, program or portfolio, organizing, monitoring and controlling the work to produce the intended deliverables and implement them in the organization. Managing Layer members report to Directing Layer. In this layer, the

project manager is the person who "leads and manages the project activities and is responsible for its completion" (ISO 21500, 2012), supported by the project management team. The program manager is the person "responsible for project performance. program and coordinating its components" (ISO 21503, 2017), supported by the program management team. Finally the portfolio manager is the person "responsible for applying the portfolio management supported by the portfolio management team" (ISO 21504, 2015).

- Performing Layer: responsible for the work of the project, program or portfolio, producing the deliverables and implementing them in the organization. Performing Layer members report to the Managing Layer. Associated with this layer is the Project Team role that "carries out the project activities" (ISO 21500, 2012).

3.5 Associate Competences with Roles

To associate which competencies are required for each role, it is essential to consider the competency indicators present in IPMA ICB, as well as the concerns of each of them.
Through a comparative analysis between the concerns of each role as well as the indicators of each competence, a mapping between the roles and the skills is performed.

3.6 Associate Competences with Layers

Through the mapping of roles in layers and the association of competencies with roles, a mapping of layered competencies - see appendix A for the detailed mapping.
For each layer of the architecture, the roles that belong are identified, after that the competencies of these same roles are also identified and finally the competencies are associated with these same layers.

3.7 Model in ArchiMate by Layer the Roles and Their Competencies

To correctly model in ArchiMate, it is necessary relate the terms "role" and "competence" with the elements present in ArchiMate, namely the elements "business role" and "capability" – see Table 3.

Table 3: Mapping of Role and Competence concepts, with the repetitive elements of ArchiMate.

Reference Architecture concept	**Element in *ArchiMate***
"Role" - "Function or something that someone has" (Priberam, n.d.)	"Business Role"- "Responsibility to perform a specific behavior" (The Open Group, 2017)
"Competence" - "applying knowledge, skills and abilities to achieve desired results" (IPMA, 2018)	"Capability" - "represents a resource (knowledge, skills, abilities) that an element of the active structure, such as an organization, person or system has or should have" (The Open Group, 2017)

Figure 4: ArchiMate mapping viewpoint of roles and competencies.

4 DEMONSTRATION

The demonstration of the use of the PPP governance methodology is performed in a Government owned company which for confidentiality reasons is named DemoCorp. DemoCorp is an organization with 740 employees, that has in the PMO (Project Management Office) the governance model that controls an ecosystem with portfolios, programs and projects, promoting organizational alignment and increasing the levels of efficiency and effectiveness in project development. DemoCorp is rated at maturity level 4 according to Gartner's IT Score for Program & Portfolio Management maturity model.
The demonstration is carried out step by step, through a process similar to the one described in the "Solution Proposal" section. The DemoCorp methodology is represented in the layers of the reference architecture supporting a comparative analysis between the methodology of DemoCorp and the PPP governance model used in the reference architecture – see figures 5 and 6.
With the demonstration one may conclude that the number of roles is less in the DemoCorp model compared to the reference architecture governance model. Upon further analysis the following findings are identified:

- In the business governing layer, there is one more role in the DemoCorp model than in the reference architecture's PPP governance model.
- There are also fewer roles in the project ecosystem than in the DemoCorp model. In the

Managing Layer there is no project management team that assists the project manager which can cause work overload on the project manager. Steering Layer also doesn't have a Project Governing Body, with Project Management Officer's role being responsible for its functions. However, a project sponsor is added to realize the benefits of the project in the organization linking the project and its implementation in the organization.

- In both the program and portfolio ecosystems, a role in the Managing Layer is removed and there is no program management team or portfolio management team, which means that both program and portfolio managers may be overloaded. In these ecosystems there is no program governing body or portfolio governing body. Similar to the project ecosystem, its functions are performed by the project management officer.

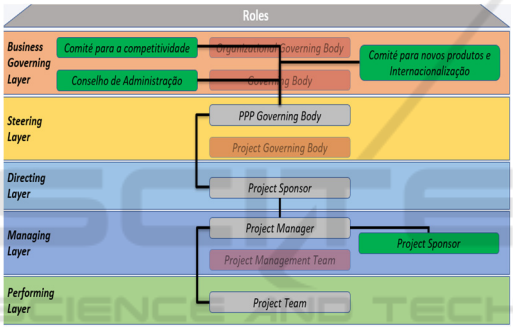

Figure 5: Analysis of role deviations (project ecosystem).

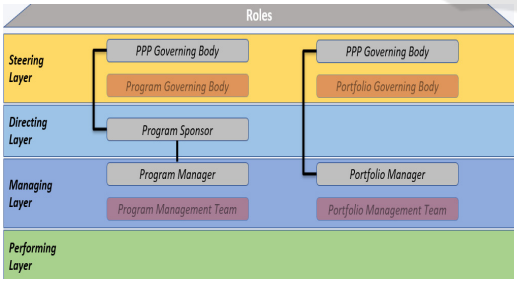

Figure 6: Analysis of role deviations (program and portfolio ecosystem).

At the level of missing competencies or competencies added through the demonstration one can conclude that the number of competences is less in DemoCorp model compared to the reference architecture governance model (respectively 91 and 122 competences). Performing a further analysis, one found that in the set of both governance models, 156 competences were identified, of which 64 are in accordance with both models, 27 are introduced by DemoCorp governance model and 65 only appear in the governance model of the reference architecture.
Through the demonstration it is possible to verify that DemoCorp PPP governance methodology has some gaps, both in terms of roles and competencies associated with it. In terms of roles, there is an absence of teams that help portfolio managers, programs and projects, as well as a specific governing body for both projects, programs and portfolios. Regarding competencies, it is noted that there are 65 competencies not considered in DemoCorp methodology, suggesting a revision of the methodology processes in order to decrease this figure.
It is important to notice that the addition of roles and the 27 skills that are only included in the DemoCorp model can be justified by its context and needs.

5 EVALUATION

The evaluation of this research is performed considering DemoCorp demonstration. The evaluation is performed in three steps. In section 5.1 the artefacts that support the solution, namely the reference architecture, are evaluated. In section 5.2 the evaluation of the solution objectives is performed. In section 5.3 the proposed solution is compared with existing ones.

5.1 Reference Architecture Assessment

To assess the reference architecture, PPP management professionals were asked to perform a similar process to steps 3.4 - Associate Roles with Layers and 3.5 - Associate Competencies with Roles. These two steps were chosen because they are the structural steps in the creation of the reference architecture.
The result of step 3.4 coincided 100% with the reference architecture and with the step 3.5 we concluded that of the total of 317 competences addressed by the reference architecture and by the respondent or both, 57.4% comply, i.e. according to both (reference and respondent architecture), 6.6% are only addressed by the reference architecture and 36% are only addressed by the respondent.
The fact that only a low percentage (6.6%) of competences is not addressed by the respondents is a good indicator for validating the association of skills with roles in the reference architecture (because it shows that most of the competences present in the reference architecture were identified by the respondents).

5.2 Solution Benefits

The proposed solution provides a reference architecture that can serve as a basis for comparing PPP governance models. This reference architecture allows to verify the failing elements that may be influencing the functioning of the PPP governance model and also to find deviations that may be related to the context of the organization that holds the PPP governance model to be compared.

It facilitates the identification/ understanding of failing elements in PPP governance models in a classical approach to project management. Through the demonstration in section 4 we find that it is possible to perform an analysis of both competencies and roles associated with the PPP governance model. We can see which roles and competencies have been added or are flawed in DemoCorp methodology based on the reference architecture presented in section 3.

It highlights additional roles and relationships by comparison, allowing to explore role patterns or redundancy, better understanding the value offer of one methodology over another. By adding and removing roles (that the method allows to identify), patterns may be created considering the different contexts of project execution. An example of this is the addition of the project sponsor, and associated skills, working with the project manager to ensure that all project benefits are absorbed by the organization. This addition can be considered a necessary standard when dealing with a certain type of projects.

Another benefit of the proposed solution is on the verification on how the skills required for proper PPP governance are addressed when roles are added or removed. ArchiMate modelling makes it easier to analyse competency handling when roles are added or removed.

Finally, the proposed solution allows access to a reality that comprises only one project, or one project ecosystem and its associated methodologies, including programs and portfolios. The method allows comparing PPP governance models that encompass both a project-only ecosystem, an ecosystem with programs and projects, and an ecosystem with portfolios, programs and projects.

5.3 Related Work Comparison

5.3.1 Roles

In contrast to the studied PPP governance models, namely the APMBoK and PM2 models, which address an ecosystem where there are only projects, the PPP governance model used in the reference architecture, similar to the PMBOK model, besides supporting a project ecosystem, it also supports a program ecosystem and a portfolio ecosystem.

5.3.2 Competences

IPMA ICB, which is the main source for the competencies used in the reference architecture, presents the cross-referencing of the competences presented with ISO 21500 (from which the roles and their concerns / responsibilities associated with project management were taken) and with ISO 21504 (from which the roles and responsibilities / concerns associated with portfolio management were taken). After analysing the result of this intersection with what is presented in the reference architecture, we find that with respect to the ISO 21500 the identified roles don't perform two competences ("Self-reflection and Self-management" and "negotiation") which are addressed in the intersection of ISO with IPMA ICB. With respect to ISO 21504, the roles identified therein perform all the competences addressed at the intersection of this ISO with the IPMA ICB. The reference architecture by also mapping the competencies of IPMA ICB with the roles taken from ISO 21503 and ISO 21505 also makes a possible intersection of these ISOs with IPMA ICB.

5.3.3 Architecture Levels

None of the studied researches present simultaneously the two levels present in the reference architecture or present only the level with the essential roles for the correct governance of PPP or present only the level with the competences. Therefore, this architecture is innovative because it allows the roles to be associated with the skills they must perform.

5.3.4 Other Comparing Models

The reference architecture proposed may also be compared with maturity models since they the evaluation of PPP governance methodologies by assigning them a level of maturity.

All maturity models are concerned with PPP governance processes and with the creation the creation of a structure, that allows for this same governance. None of them deepens this same structure, namely the roles it should contain and the skills they must perform.

Therefore this research allows to compare the PPP governance structures considered essential in the

maturity models, at a level of roles and competencies that it should contain

6 CONCLUSIONS

The research proposes a reference architecture for comparing PPP governance models in a classical approach to project management. Thus, this research allows to verify deviations between models and select which one best suit the context of each organization.
The reference architecture created is divided into layers and encompasses the roles identified in ISO's 21500, 21503, 21504 and 21505, referred in several other widely accepted project management methodologies, as well as competencies associated with them.
Enterprise architecture becomes important in this research because it allows the representation of the roles identified by relating them to the ecosystem to which they belong (portfolios, programs or projects), and the responsibilities associated with them. For this representation the ArchiMate language was used.
The proposed architecture was applied at DemoCorp, to compare its governance model with the reference architecture, where it was verified that there is removal and addition of roles (for example, the removal of project, program and portfolio management teams and addition of the project sponsor). It was also found that of the 156 competencies identified in the set of both PPP governance models, 64 are common to both models, 27 are associated only with the DemoCorp governance model and 65 are associated only with the reference governance model.

6.1 Contributions

The main contribution that this research is a reference architecture of the PPP governance model associated with a classic approach to project management. This architecture is divided into layers and allows roles to be associated with each layer.
Another contribution is the ability to provide input for a better understanding of the elements in PPP governance models.
Additionally the ability to highlight additional roles and relationships by comparison, allowing the exploration of role patterns or redundancy, and better understanding the value offer of one methodology over another is another contribution.
Finally the ability to check how competencies required for proper PPP governance are addressed when roles are added or removed is also a contribution.

6.2 Limitations

In the development of the proposed method, limitations were encountered. These limitations are, the fact that there may be a role that belongs to more than one layer. This hasn't been addressed, but with some flexibility the method may continue to be used; when assigning competencies to roles, each of them has a list of indicators and the same competency can be associated with one role due to one indicator and associated with another role due to another indicator; and in most cases the attribution of competencies to roles is not something that is straightforward after analysing concerns and responsibilities, which brings to this stage of the method some degree of uncertainty.

6.3 Future Work

Based on the results of this research, the authors point out the some future work opportunities. The use of the proposed reference architecture in various contexts to be able to find deviations from the reference architecture and thus be able to create patterns of roles and competencies needed in certain contexts is path to explore.
Another future work is the to conduct a deeper investigation that allows skills to be linked to roles in a more direct and less dubious way.
Finally the increase in the knowledge base of the reference architecture, by analysing the variations of the indicators of each competency (as the same competency may be associated with different roles due to different indicators) is a planned future work.

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APPENDIX

Layer	Competence
Projects	
Managing Layer	Result orientation
	Personal integrity and reliability
	Personal communication
	Leadership
	Teamwork
	Conflict and crisis
	Resourcefulness
	Relationships and engagement
	Governance, structures and processes
	Compliance, standards and regulations
	Power and interest
	Culture and values
	Requirements, objectives and benefits
	Design
	Scope
	Time
	Quality
	Finance
	Plan and control
	Resources
	Stakeholders
	Procurement and partnership
	Risk and opportunities
Performing Layer	Personal integrity and reliability
	Risk and opportunities
	Plan and control
Directing Layer	Result orientation
	Personal integrity and reliability
	Personal communication
	Relationships and engagement

	Leadership
	Conflict and crisis
	Governance, structures and processes
	Strategy
	Scope
	Requirements, objectives and benefits
	Plan and control
	Risk and opportunities
	Organisation and information
Business Governing Layer	Strategy
	Governance, structures and processes
	Compliance, standards and regulations
	Culture and values
	Personal integrity and reliability
	Leadership
	Teamwork
	Conflict and crisis
	Relationships and engagement
	Result orientation
	Requirements, objectives and benefits
	Scope
	Organisation and information
	Plan and control
	Stakeholders
Steering Layer	Strategy
	Culture and values
	Compliance, standards and regulations
	Governance, structures and processes
	Result orientation
	Leadership
	Resourcefulness
	Personal integrity and reliability
	Personal communication
	Finance
	Resources
	Requirements, objectives and benefits
	Scope
	Plan and control
	Organisation and information
	Quality
	Procurement and partnership
	Risk and opportunities
	Change and transformation
	Stakeholders
Programs	
Managing Layer	Governance, structures and processes
	Power and interest
	Personal integrity and reliability
	Personal communication
	Relationships and engagement
	Leadership
	Teamwork
	Conflict and crisis
	Negotiation

	Result orientation
	Design
	Requirements, objectives and benefits
	Organisation and information
	Resources
	Plan and control
	Finance
	Stakeholders
	Select and balance
Directing Layer	Strategy
	Personal integrity and reliability
	Personal communication
	Relationships and engagement
	Leadership
	Teamwork
	Conflict and crisis
	Result orientation
	Design
	Requirements, objectives and benefits
	Organisation and information
	Plan and control
	Stakeholders
Steering Layer	Strategy
	Governance, structures and processes
	Compliance, standards and regulations
	Culture and values
	Personal integrity and reliability
	Personal communication
	Leadership
	Teamwork
	Result orientation
	Resourcefulness
	Design
	Requirements, objectives and benefits
	Scope
	Time
	Organisation and information
	Quality
	Finance
	Resources
	Plan and control
	Procurement and partnership
	Risk and opportunities
	Stakeholders
	Change and transformation
	Select and balance
Business Governing Layer	Strategy
	Governance, structures and processes
	Compliance, standards and regulations
	Culture and values
	Personal integrity and reliability
	Leadership
	Teamwork
	Conflict and crisis

	Relationships and engagement
	Result orientation
	Requirements, objectives and benefits
	Scope
	Organisation and information
	Plan and control
	Stakeholders
Portfolios	
Managing Layer	Strategy
	Governance, structures and processes
	Compliance, standards and regulations
	Culture and values
	Leadership
	Conflict and crisis
	Negotiation
	Result orientation
	Design
	Requirements, objectives and benefits
	Time
	Organisation and information
	Resources
	Plan and control
	Risk and opportunities
	Stakeholders
	Change and transformation
	Select and balance
Steering Layer	Strategy
	Governance, structures and processes
	Compliance, standards and regulations
	Culture and values
	Personal integrity and reliability
	Personal communication
	Leadership
	Resourcefulness
	Teamwork
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	Finance
	Resources
	Procurement and partnership
	Plan and control
	Risk and opportunities
	Select and balance
	Stakeholders
Business Governing Layer	Strategy
	Governance, structures and processes
	Compliance, standards and regulations
	Culture and values
	Personal integrity and reliability

	Leadership
	Teamwork
	Conflict and crisis
	Relationships and engagement
	Result orientation
	Requirements, objectives and benefits
	Scope
	Organisation and information
	Plan and control
	Stakeholders