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PORTFOLIO MANAGEMENT ENABLING A DYNAMIC ORGANIZATION'S INFORMATION SYSTEMS REPRESENTATION

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Organization's business sustainability requires a dynamic approach to support business decisions. The concept of a project as an organizational transformation requires the alignment of project and portfolio management processes with this dynamic approach. Since Organization's transformations, or even small changes, are triggered by project´s deliverables (what will be delivered and when), Organization's forecasted future representation (to-be) is only possible if aligned with project´s scope and schedule accurate information. First impact of this approach is on the portfolio management control processes since they shall change the focus from the classic deviations (current status) to the forecast deliverables information. Portfolio information shall provide deliverables plans, resulting from aggregating all concurrent projects information. A second impact is on the project planning processes. Project plans are no more reliable if they are build based on the Organization's current representation, they shall be built upon planned project deliverable data status (to-be). Special attention shall be done to project risks identification and assessment processes, since these processes shall be focused on the desired future representation.

This paper is focused on project and portfolio management processes enabling the balancing IT platforms (information systems architectures, system products and networks), allowing a dynamic Organization's information systems representation.

Keywords: "Project";"Portfolio"; "Dynamic Representation"

LA GESTIÓN DE CARTERAS PERMITE UNA REPRESENTACIÓN DINÁMICA DE SISTEMAS DE INFORMACIÓN DE LA ORGANIZACIÓN

La sostenibilidad de la organización requiere un enfoque dinámico para respaldar las decisiones. El concepto de un proyecto como una transformación organizacional requiere la alineación de los procesos de gestión del proyecto con este enfoque dinámico. Dado que las transformaciones de la Organización son desencadenadas por los productos del proyecto (lo que se entregará y cuándo), la representación pronosticada de la Organización solo será posible si se alinea con información precisa del alcance y fechas del proyecto. El primer impacto de este enfoque está en los procesos de control de gestión de cartera, ya que cambiarán el enfoque en la información de entregas previstas. Un segundo impacto es en los procesos de planificación del proyecto que no son más confiables si se construyen sobre la base de la representación actual de la Organización, sino que se basarán en el estado actual de los datos entregables del proyecto (to-be). Se debe prestar especial atención a los procesos de identificación y evaluación de riesgos del proyecto, ya que estos procesos se centrarán en la representación futura deseada.

Este documento se centra en los procesos de gestión de proyectos que permiten una representación dinámica de los sistemas de información de la Organización.

Palabras clave: "Project";"Portfolio"; "Dynamic Representation"

1. Introduction

Organizations are concerned about addressing multiple market changes and improving its image on fields such as sustainability and social responsibility. This brings a shift in the organization's strategic focus, changing the management paradigm approaches, from functional and bureaucratic to project-based (Turner and Keegan, 1999) where changes and transformations are implemented by projects.

The required organization's business sustainability demands a dynamic approach to support business decisions, based on accurate and timely information and governance structures. Available information should be able to represent the organization's current and forecasted future situation, considering the existing and required resources, including financial, persons and information systems. However, to be possible such representation it's necessary the knowledge of the current situation (As-Is) and the situations resulting from the ongoing organizational changes (To-Be).

To represent the dynamic organization´s reality, design principals and instruments are required to make visible and explicit the various aspects of organization's structures and dynamics (Op´t Land, 2019). Enterprise architecture (EA) is a recognized methodology that may be used to describe the organization´s reality (Schomburg & Barker, 2011).

Information Technology Architecture teams have tried to create and maintain organization's IT representation, known in IT field as the blueprint of IT landscape. However, organizations claim that to maintain up to date information is an almost impossible task, given the continuous changes of organization´s Information Systems (IS) required to address the business sustainability (Sousa et al. 2014).

IT projects are one particularly king of organizations changes, where IS systems are build and deployed or decommissioned from production, thus changing the IT landscape architecture.

This paper presents an approach to produce and maintain IT architectural landscape up-to-date, triggered by project´s deliverables (*what will be delivered and when*). This enables IT organization's forecasted architectural representations to be aligned with project´s scope and schedule accurate information.

Although the dynamic organization´s reality needs project management and enterprise architecture inputs, these two fields are usually dissociated and have been developed without a notable concern to ensure their interconnection. This paper presents an approach to join these two domains indicating, based on an example, how project management can be used to benefit the enterprise architecture, as well as project management can benefit from the enterprise architecture.

We are focused on the relevance of using project and portfolio management processes as an enabler to allow the up to date dynamic organization's information systems representation. Following a literature review on EA representation requirements and governance of project structures, and based on que results of EA implementation projects, we propose a set of requirements to integrate the IT portfolio management with EA.

To guarantee requirements identification of the links between the project management and EA domains, we started by reviewing the government framework of project management, as an organization perspective of this domain, with a special focus on portfolio management.

After this vision, we evaluate the second domain, EA, with an essential focus on its life cycle perspective. The requirements and inputs for future research are stated based on examples

presented using IT Atlas tool as the knowledge baseline architectural maps generator (Link, 2018).

2. Governance of projects dynamic perspective

The concept of a project as an organizational transformation requires the alignment of project and portfolio management processes with the required organization´s dynamic approach where organizations forecasted future representation is only possible if aligned with project´s scope and schedule accurate information. In this context, project-based organizations implement their strategies through projects, programmes, and portfolios, managed under an adequate project management governance model, coexisting with the organization's governance framework, including IT governance.

The organization's governance of projects, programmes and portfolios needs visibility and control, reason why Crawford and Cooke-Davies (2005, p.1) stated that: "As projects and programmes are the vehicles for implementing corporate strategies, effective governance of projects, within the corporate governance framework, becomes a serious concern for Organisations, offering to top management a clear visibility and control of non-routine corporate operations and delivery capability".

Project-based organizations are focused on effectiveness, based upon their ability to generate value from projects and programmes, and, at the same time, focused on efficiency, mainly on project management processes and shared resources optimization. To balance projects effectiveness and efficiency, project-based organizations need to define the levels of governance over projects and the required control framework (Müller, 2011) to ensure the timely visibility and control of projects and the delivery capability, as mandatory information for decision making. One of the main governance structures is the portfolio of programmes and projects, whose main role is to balance projects demands with organizational capability and capacity, providing a shared reporting system between projects´ and portfolios and consolidate portfolio information (Turner and Müller,2003, Too and Weaver, 2014).

Turner (2009) identified the management issues related to portfolio management: (1) project prioritization based on the scarcity of resources available; (2) balance resource sharing between projects and addressing of resource allocation issues, such as peaks, forecast and conflict; (3) need of sharing data or technology between different projects. The last issue is a major concern in IT projects, where dependencies between projects are often caused by software releases or shared hardware infrastructures. As part of the organization´s governance of projects framework, portfolio management includes the decisions on the acceptance, prioritization and termination of projects, according with the defined organizational rules and policies. It also facilitates projects' resource allocation and solves the conflicts between projects, based on projects prioritization (Müller, 2009), by gathering and validating capability data. Additionally, it provides feedback for decision makers based on portfolio knowledge (Too and Weaver, 2014) and on central projects' reporting systems (including projects' status reports and projects' close evaluation) (Turner, 2009). This last role was supported by Müller, Martinsuo and Blomquist's (2008) study on project portfolio control and performance, where results demonstrate that portfolio management in successful organizations has a shared reporting system between projects and portfolios.

One of the major portfolio functions is the balance of resources facilitating project shared resources allocation and solve conflicts between projects (Müller, 2009). These shared resources, coordinated under a portfolio, might be people, data or technology (Turner, 2009); leading to dependencies between projects caused by existing competences, software releases or shared hardware infrastructures.

One cannot properly plan a project that use or share IT resources without information on these organizational resources, both at the beginning of the project implementation and in particular at the project closing date. The same reason should be applied to the portfolio function of balance resources.

Tribolet et al. (2014), researching in IT area, presented the concept of "enterprise cartography" as the dynamic representation of the organization's status. In their work, the concept of project as an organizational transformation requires feedback control loops able to provide information for representing the organization's current state, its frozen future states, as well as past states. These representations enable governance structures to act based on dynamic and accurate information. The dynamic approach leads us to the need to enlarge project information from plans variances (current status) to the forecast information enabling the representation of future organization's status, using the knowledge from the project management domain to enrich the enterprise architecture domain. Project management information should be used to benefit the enterprise architecture since the artefacts and dependencies resulting from projects become a part of the enterprise architecture.

3. Enterprise Architecture

As there is a need to ensure a pool of resources for project execution as well, as more projects are developed, they update the pool of IT portfolio resources, that is, artefacts and dependencies resulting from projects become part of the enterprise architecture being, in the future, resources used for future projects.

Enterprise architecture (EA) is defined as "the organizing logic for business processes and IT infrastructure reflecting the integration and standardization requirements of the organization´s operating model" (Ross, 2006, p.47). It is a methodology used to describe, among the most important, elements such as: the business actors, functions, roles, and processes; the applicational services required to perform those business processes; the technology supporting those services. Using EA, IT architects may present models explaining how business processes, data, services, applicational components and technology components are linked. With these models (EA) enables the alignment of Business and IT, building a repository of the key elements making such alignment explicit and visible to all stakeholders. Key EA elements types are grouped in the three most common layers:

- Business layer: Representing actors, roles, processes, and products.

- Information systems layer: Representing applications, repositories, and integrations.

- Infrastructure layer: Representing nodes and networks.

In organizations that are heavily reliant on IT, as it is the case in almost every industry with a heavy weight in services, there is a great difficulty in maintaining the list of updated information system layer and infrastructure layer elements, because with several hundred IT projects annually, it is very complicated to keep IT status up to date. However, the current and future status of IT is fundamental to the planning of the next projects and therefore fundamental to the project management itself.

Given the inherent complexity of IT, information is often represented in architectural maps so that they can be clearly defined and understood by all elements of the organization. One example of an architecture framework is the ArchiMate (Open Group, 2009, 2015); presenting a structure to classify the Organisation elements and how they are related, creating a meta-model (as shown in Figure 1).

Figure 1: Meta-model Concepts
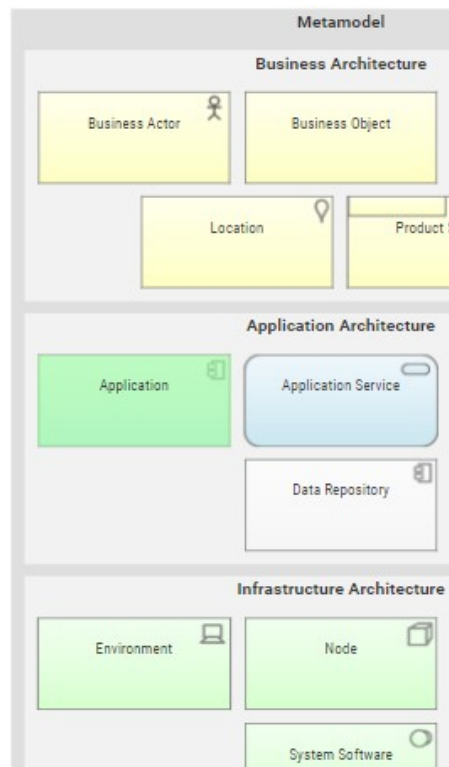
Architectural views and blueprints (maps) are fundamental EA concepts that allow projects teams to know organization elements needed to plan their projects, since they allow the representation of lifecycle of elements. Architectural view is a graphical representation of the organization architecture from a given point of view, at a given moment in time. Blueprint is the set of all architectural views from a given point of view over all possible moments along the time, making architecture elements to have a lifecycle.

In Figure 2 we present an example of a Business Process layered blueprint over the Account Management process shown in two moments in time. The right site of the picture shows elements types that will be decommissioned between the two moments, resulting from a project output occurred in between. Each map has a time slider allowing the visibility of how its contents evolve over time. By pre-assigning a colour to each artefact lifecycle stage, the map shows the lifecycle state of the represented elements at any point in time.

All blueprints should have a time slider that allows the visualization in some point in time. One can go from AS-WAS, to AS-IS to TO-BE simply by moving the slider to the desired date. At each position of the time slider, the blueprint should show the architecture elements in the state corresponding to that point in time.

The lifecycle view of architecture elements has a number of benefits:

- The EA is compliant with organization dynamics, translating at any moment the impact of the ongoing projects on those still in pipeline.

- The EA presents a future status resulting by project portfolio status.It's like a crystal ball, showing the future resulting from the consolidation of the promises of the projects yet to be completed.

- Transformation of organizations takes place day by day resulting from the project deliverables. EA shall allow this transformation to be materialized in Architectural blueprints continuously, from AS-IS to the numerous TO-BEs resulting from projects still to be completed.

- EA platform should import data form project plans and reports to maintain an up-to-date AS-IS and TO-BE, according with actual projects status.

- EA platform should help portfolio managers to do a what if analysis, as a base to prioritise projects

Figure 2: The Business Process Layered View – using Atlas system
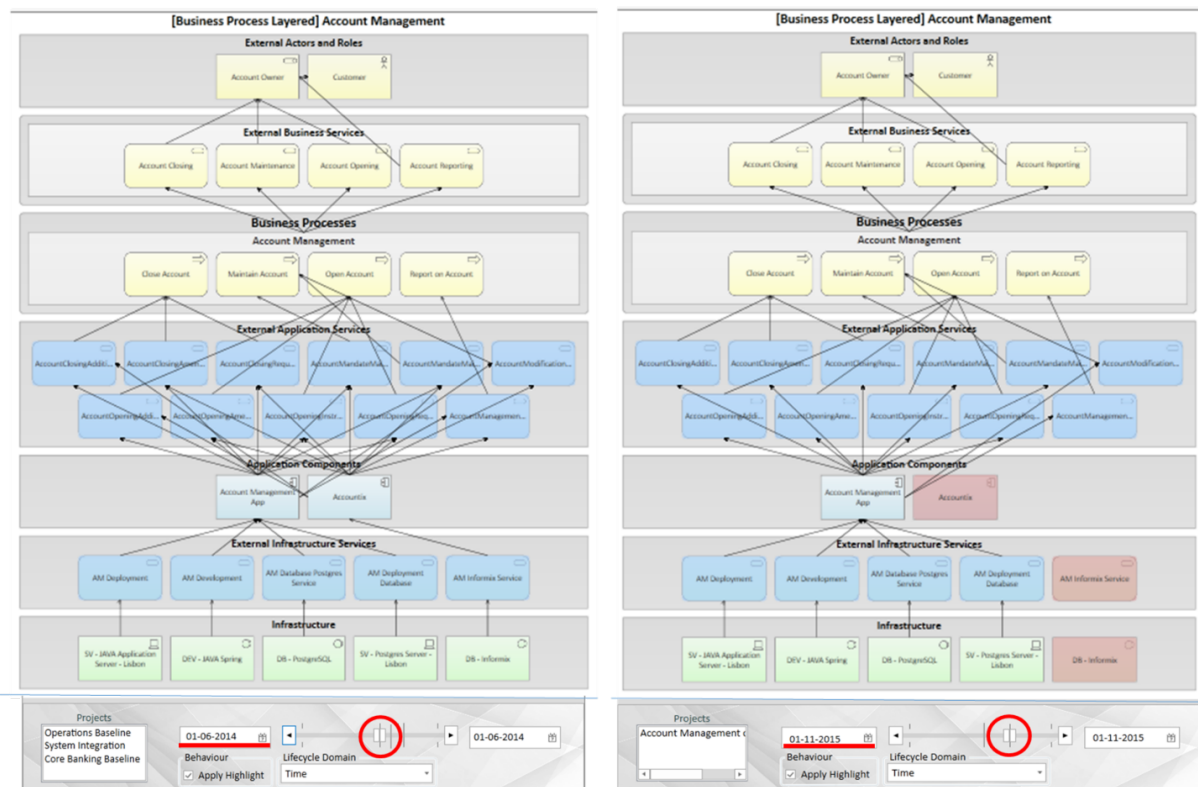
4. Portfolio prioritization, plan, and control – an example using Atlas System

To build an example of projects and EA information interdependencies let us consider an organization's portfolio of projects with current and expected projects. The upper part of the Figure 3 illustrates a scheduling where an arrow represents a portfolio component. In this representation, we focus the attention on two portfolio components, project Y and project X. Project X is scheduled to start at a future time **Tm** and to end at a moment **Tn**, and Y is an ongoing project that is expected to be concluded between those two dates.

Considering now that project X intends to add a new architecture element, and that project Y aims at replacing one architecture element by another. Since project Y ends before project X, the project X plan must take into account project Y output, the architectural change resulting from project Y.

By loading project X plans, architects can see the impact of this project in the Organisation architecture generated blueprints and the project manager can understand his project architectural dependencies and risks.

Figure 3 presents possible forms to allow project managers to input information to the Enterprise Architecture Repository.

Figure 3: Project Information to Update Architecture Views

The central part of figure 4 shows the Enterprise Architecture Repository receiving information from various sources of information and producing architectural maps. Each map has a time slider that shows the evolution of the architecture elements over time. The right corner of the figure 4 shows single blueprints with the time slider at Tm and Tn positions, corresponding to project X begin and end dates respectively.

Figure 4: Loading Project Plans to sustain TO-BE Architecture Views
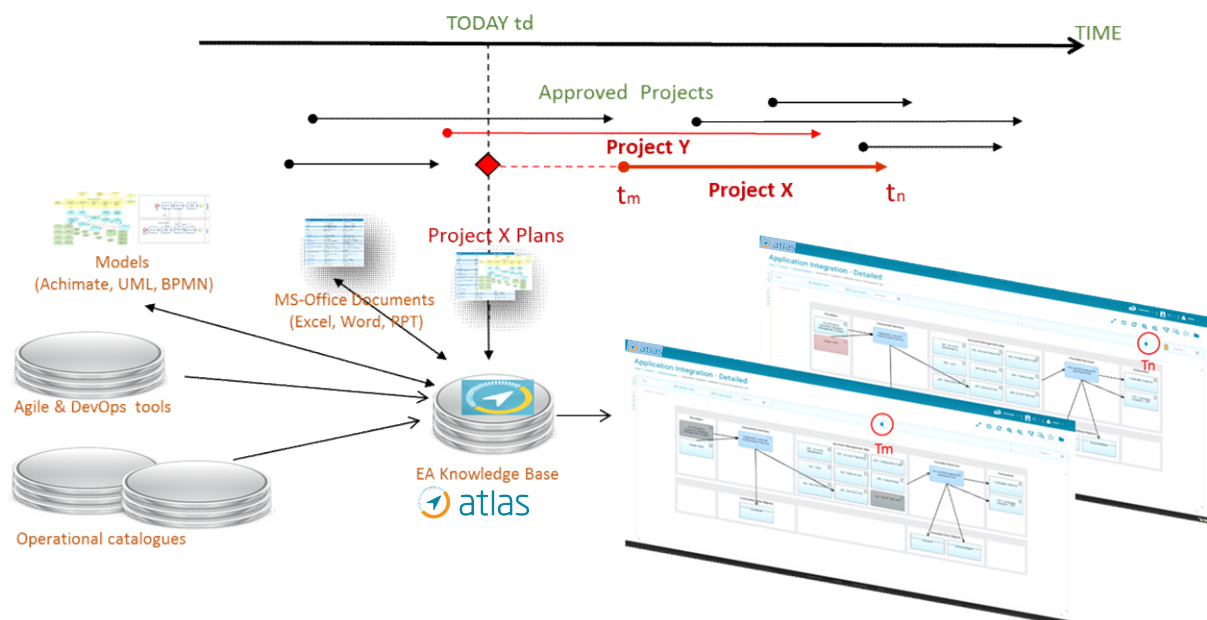
So, when the time slider is set to Tm, the blueprint shows the component to be created by project X and Y as under-development (grey) and, when the time slider is set to Tn, the blueprint shows created artefacts as alive (light blue) and project Y removed artefact as dead (red).

The time slider can also be used to present a gap analysis model, representing the evolution of each artefact in a given period. In the figure 5, we can see the same blueprint in gap mode between the time Tm and Tn.

Figure 5: Architectural views in GAP Analyses mode
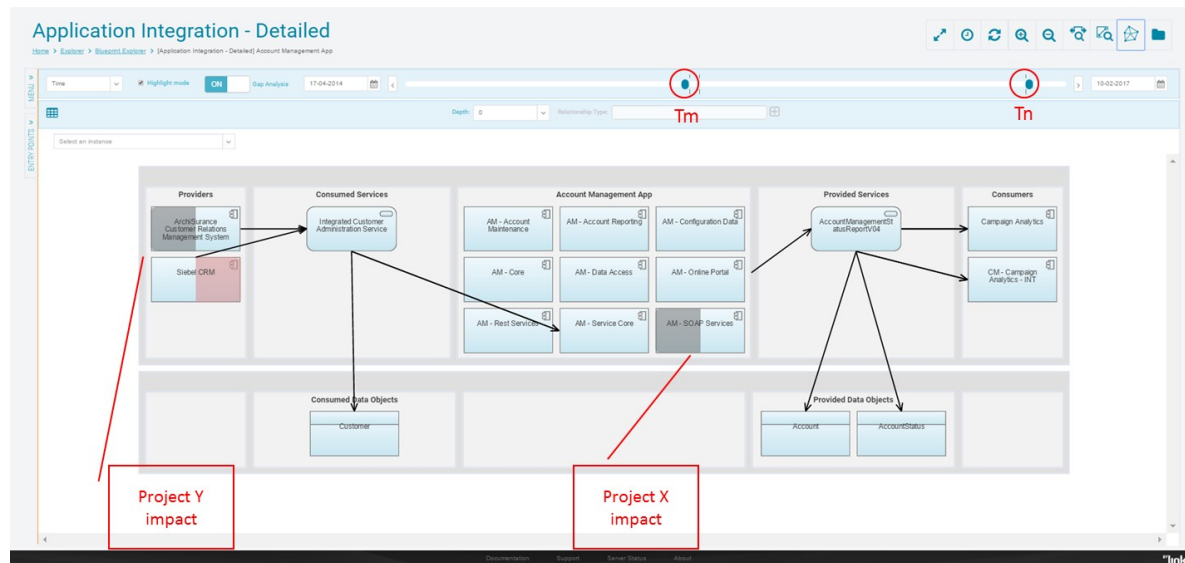
This analysis is clearly relevant to support portfolio management decision making processes, not only based on scheduling constraints, but also related to project costs and project risk identification. Project prioritization shall be supported by a clear representation and forecast of architectural resources used, created, or removed by each portfolio component.

Portfolio components, if related with projects requiring the use of EA resources or with the purpose to create or remove architectural resources, need to base their plan on information about those elements and not only the actual situation (As-Is) but mainly the situation when the project is supposed to deliver final or intermediate outputs (To-Be).

Feeding the EA repository with project plan information is necessary to maintain accurate information, but it´s not enough since plans will change during project lifecycle. Portfolio components control information shall provide control information to the repository. At least any change to the planed milestones dates and when the project reached the relevant milestones, resulting on the realization of the promise EA transformation.

As an example, consider again project X, which plans include moving to production an architectural element on the date Tn. This promise is made at the beginning of the project by setting the go-live date of the artefact to be created to Tn. Any change of Tn shall be communicated to maintain the relevance of the EA representation. The loading of this architectural element on the date Tn shall be confirmed changing its state from a promise to a statement about the reality.

The presented example is a case study to support the development of a solution able to support both enterprise architects and portfolio managers.

7. Conclusion

The organization representation reality is based on principles and instruments to deal with the changes and transformations. The relevance of those changes and transformations in the project management field was the driver to include in IPMA individual competence baseline a new management competence called "Change and Transformation" where change is defined "improvement of a current situation, keeping the past in mind" and transformation as "the emerging development of new situations, based on a vision of the future" (IPMA, 2015, p.184) The purpose of the competence element is to enable the project, programme and portfolio managers to help societies, organizations and individuals to change and transform their organizations, thereby archiving benefits and goals.

Since organizations will likely change faster than we can represent them, any attempted representation becomes obsolete before its completion.

Since organization's transformations, or even smaller changes, are triggered by project´s deliverables (what will be delivered and when), organizations forecasted future representation (to-be) is only possible if aligned with project´s scope and schedule accurate information. To the portfolio of IT projects, plans and control information are the primary factor of updating the EA repository. Project plans are no more reliable if they are build based on the   organization's current representation, they shall be built upon planned project deliverable data status (to-be) (Zachman, 1997; Dietz, 2006; Sousa et all, 2017). IT Projects outputs should explicitly present a list of objects to be made productive and a list of ones to be decommissioned, if any. These lists need to identify the architecture elements to be created, removed, or changed and their interdependences that might results in changes, over the project lifecycle, to organization´s architectural representation, allowing a dynamic approach to support business decisions. Available, accurate and timely information shall be able to represent the organization's current and forecasted future situation, considering the existing and required resources, financial, persons and information systems.

Both project management field (Shomburg & Barker, 2011) and enterprise architecture field (Ugwu, 2017) studied the need to integrate project managers and IT enterprise architects work. Both conclude the need to ensure proper data flow between the two roles requiring the use of a common language, with the purpose to provide support and oversight to each project, ensuring that all guidance is well coordinated and communicated to the it project teams.

Subsequent studies will be conducted focusing on the problem to link project management and enterprise architect domains, using project deliverable data to enrich an organisation's enterprise architecture and, in turn, use the architecture representations to increase project manager's understanding of the enterprise architecture as an input for planning future projects. Enterprise architects may use the knowledge from the project management domain to enrich the enterprise and maintain architecture domain and allowing project managers to use enterprise's architecture knowledge to better plan and control their current and future transformation initiatives specially to evaluate project portfolio impacts.

7. Bibliography

Crawford, L. H., & Cooke-Davies, T. J. (2005). Project governance: The pivotal role of the executive sponsor. *Originally published as a part of 2005 PMI Global Congress Proceedings*. Toronto.

Dietz, J (2016). Enterprise Ontology - Theory and Methodology, Springer.

IPMA (2015). IPMA Individual Competence Baseline. International Project Management Association.

Link (2018). http://www.linkconsulting.com/eams/, accessed in April 2018.

Muller, R., Martinsuo, M., Blomquist T. (2008), Project Portfolio Control and Portfolio Management Performance in Different Contexts. *Project Management Journal*. 39(3) 28-42

Müller, R. (2009). Project Governance. Aldershot, UK: Grower Publishing.

Müller, R. (2011). Project Governance. In Morris, P., Pinto, J., & Söderlund, J. (Eds.), The Oxford Handbook of Project Management (pp 297-320). Oxford, UK: Oxford University Press.

Open Group (2009) TOGAF, the open group architecture framework, version 9. Van Haren Publishing

The Open Group. (2015). "ArchiMate R 2.1 Specifcation". Van Haren Publishing, Zaltbommel, www.vanharen.net.

Op't Land M. (2009) Enterprise architecture: creating value by informed governance Springer (ed.). Springer

Op't Land, M., Proper, E., Waage, M., Cloo, J., Steghuis, C. (2009). Enterprise Architecture Creating Value by Informed Governance. Springer.

Ross, J.W., Weill, P.,& Roberson, D. C. (2006). Enterprise architecture as strategy. Boston, MA:Harvard Business Press.

Schomburg, K. & Barker, T. (2011). Integrating the IT PMO with emperprise architecture for better governance. Paper presented at PMI Global Congress 2011 – Nort America, Dallas, TX. Newtown Square, PA:Project Management Institut.

Sousa, P., Lima, J., Sampaio, A., Pereira, C., (2009). An Approach for Creating and Managing Enterprise Blueprints: A case for IT Blueprints. *The 21st International Conference on Advanced Information Systems, Lecture Notes in Business Information Processing, vol. 34,* pp. 70{84, Springer-Verlag, The Netherlands.

Sousa P., Sampaio, A. Leal, R. (2014). A case for a Living Enterprise Architecture in a Private Bank, *In proceedings of the 8th Workshop on Transformation & Engineering of Enterprises (TEE 2014)*, July, Geneva, Switzerland.

Sousa, P., Tibolet, J., Guerreiro, S. (2017). Enterprise Cartography: From Theory to Practice. *Technical paper under revision.*

Too, E. G., Weaver, P. (2014). The management of project management: A conceptual framework for project governance. International Journal of Project Management, 32(8), 1382-1394.

Tribolet, J., Sousa, P., & Caetano, A. (2014). The Role of Enterprise Governance and Cartography Enterprise Engineering. Enterprise Modelling and Information Systems Architectures Journal (EMISA), special issue on Business Informatics, 9(1).

Turner, J. R., & Keegan, A. (1999). The versatile projectbased organization: governance and operational control. European Management Journal, 17(3), 296–309.

Turner, J. R. & Müller, R. (2003). On the nature of the project as a temporary organization. International Journal of Project Management, 21 (1), 1–8.

Turner, J.R. (2009). The handbook of project-based management (3rd ed.). New York, NY: McGraw-Hill.

Ugwu, K. (2017). Understanding the complementary relationship between enterprise architecture & project management. Architecture & Governance Magazine. accessed in April 2018

Zachman, John A. (1997). "Enterprise architecture: The issue of the century".