Objectifying COBIT5 Outputs

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ABSTRACT

COBIT5 is a business framework that focuses on Enterprise Governance and Management of IT, providing a list of best practices that separates governance from management, allowing an efficient management of critical business processes while also focusing on meeting the business stakeholder's needs. Due to the nature of COBIT5, the guidelines for implementing the required Enabling Processes are generic and designed to suit most organizations while not providing detailed information on how to produce their respective outputs. The outputs' description is often generic and requires the COBIT5 practitioner, independent of his or her experience, to be familiar with terms and definitions that often are outside the scope of IT in order to fully understand what the COBIT5's authors meant when the documentation was written. Using COBIT5 and other established standards like ITIL as a foundation, we proposed a solution that objectifies and describes the outputs produced by the COBIT5 enabling processes by providing detailed definitions of what the output is and where is should be found within the enterprise, improving the available knowledge for COBIT5 process assessment. The gathered results were evaluated using the Pries-Heje et al. framework for DSRM and expert reviews. After the evaluation we concluded that is possible to extend the descriptions of the outputs in a more objective form and how they relate to other definitions from other established standards.

Keywords

Enterprise Governance of IT, COBIT5, ITIL, Governance, Process Outputs, Work Products, Process Assessment, PAM, Self-Assessment, TOGAF, ISO.

INTRODUCTION

COBIT5 is an enterprise governance and management framework developed by ISACA (Information Systems Audit and Control Association [1] that focuses on the alignment of IT strategy with the business, meeting business stakeholder needs and separating enterprise governance from management.

Over the years, Information Technology (IT) has evolved from a small supporting department within an enterprise to become a foundation for modern enterprises.

This change and the surge in demand for more advanced IT systems led to the creation of ISACA, an international professional membership association for IT professionals and IT auditors [1], and subsequently the creation of COBIT, a standard made for IT audit.

With the everchanging world of IT and the increase in adoption of COBIT by enterprises, the standard as evolved and in its latest release IT is defined as an integral part of the business.

RESEARCH METHODOLOGY

The research method selected for investigation and results gathering is Design Science and Research Methodology. Design Science Research Methodology is a research and investigation methodology that adopts the principles of defining a problem and solution research from tradition Design Science while applying research methodologies used by the scientific community. DSRM is an iterative process that is comprised of a series of steps used to "create and evaluate IT artefacts intended to solve identified organizational problems" [3].

PROCESS MODEL

DSRM aims to provide a standardized process model for DS research, tailored for problem identification and solution, completed by prior research on the selected research scope.
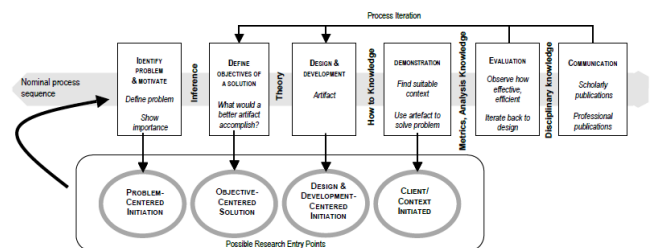

Figure 1: DSRM Process Model [4]

The process model is comprised of six steps that are used to achieve the final IS artefact that aims to solve the identified problem. The steps can be described as:

1.   Problem identification and motivation: In this step the researcher must define the research problem. Justifying the problem is strongly encouraged as it motivates the researcher for completing the further steps and achieving the solution. This step corresponds to Section 3 of this document, where we analyze COBIT5 and the provided Process Assessment Model, identifying the problem surrounding the process outputs and level 1 work products and justifying the need for improving their descriptions in the scope of a process capability assessment.

2.   Define the objectives for a solution: This step focuses on inferring the objectives from the problem analysis and specification as well as defining what is possible and feasible to implement. This step corresponds to Section 3 of this document, where after we define and describe the problem we define the objective that we want to achieve with the solution and the feasibility we can expect before we begin to design the solution.

3.   Design and development: This activity focuses on researching and producing the artifact used for the solution. This step of the DSRM process corresponds to section 5 of this document. In this section we will present a proposal that solves the problem related to COBIT5's process outputs and we explain the several components that compose the solution. We will present a mapping of COBIT5's level 1 work products and the provided descriptions paired to more complete definitions from established standards and frameworks in the likes of ITIL and TOGAF. We will also provide examples of frameworks and tools can be used to create the information items that represent certain work products.

4.   Demonstration: In this step, the researcher must test the produced artifact by demonstrating its application to one or more instances of the defined problem. The demonstration can be in the form of a simulation, case study, proof or any other type of activity that suits the problem. This step is present on section 5 of this thesis, where we provide a concrete example of a tool that can realize the work products according to the definition we provided when designing the mapping.

5.   Evaluation: Evaluation of the gathered results from the demonstration activity. In this activity, the solution objectives must be compared with the application of the artifact in the demonstration. The means used by the researcher for evaluating the artifact should be defined according to the nature of the problem and can take the form of quantitative results, review by expert, among others. The success of this activity defines whether the artifact meets the solution objectives and the researcher proceeds to step 6 or must proceed to step 3 and revise the produced artifact. This step is present on section 6 of this document, where we consulted experts in COBIT5 and capability assessment and where we recorded their feedback on our proposed solution.

6.   Communication: Communication of the problem and the artefact to the appropriate audience. In the case of an academic research, this step corresponds to the production of a paper. This final step of the DSRM process corresponds to the publishing of this thesis, where the problem and corresponding artifact are communicated.

PROBLEM
In this section we will contextualize the problem and perform an analysis on the former. Finally, we will define its impact on enterprise governance.

This section corresponds to the Problem Identification and Motivation phase of DSRM. In this section we will define the problem and its context.

COBIT5 provides a generic description of the outputs (What) but does not provide a defined guideline of the structure or the location of the outputs (level 1 work products) on the information items.

Implementing and assessing COBIT5 in an organization is no easy task and requires mapping the 37 COBIT enablers using the enterprise's internal control documents. The enterprise is required to provide information regarding its processes in order to assess the state of COBIT5 implementation present in the enterprise and the capability level associated with each of the 37 COBIT5 enablers.

COBIT5 provides for each enabling process a set of associated activities that should be performed as well as a set of inputs and outputs for that specific process.

For a complete and accurate assessment of IT capabilities on an enterprise, the COBIT5 practitioner must understand what to look for and ask for and the enterprise must also know what is being asked in order to provide the required information to the assessor.

In order for a process achieve level 2 or high capability, it should be implemented by the enterprise using its business processes and its outputs (level 1 work products) must be produced. This entails that the practitioner must know what a specific output is in order to look for its existence within the enterprise's processes.

Due to its nature as a best practices' framework and in order to fit any type of organization, the description of the outputs is generic, and its implementation is left to be decided by the organization.

The extended description that COBIT5 provides in PAM document for the process outputs (also known as level 1 work products) is inconsistent and heavily relies that the assessor is familiar with several domains and concepts that used to describe the work products.

While some work products have a description that is easy to understand, others have a vague description or are referenced as part of a process or information item.

| | Figure 19 - Level 1 Output Work Products (cont.) | |
WP ID	WP	Description
EDM04-WP7	Feedback on allocation and effectiveness of resources and capabilities	Information resulting from the monitoring and reporting process for ensuring resource optimisation
EDM04-WP8	Remedial actions to address resource management deviations	Part of the monitoring and reporting process for ensuring resource optimisation
EDM05-WP1	Evaluation of enterprise reporting requirements	An evaluation of both internal and external reporting requirements including legal and regulatory and will be part of the governance framework
EDM05-WP2	Reporting and communications principles	Principles will be part of the reporting in the governance framework.
EDM05-WP3	Rules for validating and approving mandatory reports	Rules will be part of the reporting in the governance framework and could be in the form of policies, operating practices, and standards and/or procedures.
EDM05-WP4	Escalation guidelines	A part of reporting in the governance framework and could be in the form of policies, operating practices and standards and/or procedures
EDM05-WP5	Assessment of reporting effectiveness	Usually found from an annual internal audit or assessment report on the effectiveness of governance
AP001-WP1	Definition of organisational structure and functions	Part of the IT management framework related to IT organisation
AP001-WP2	Enterprise operational guidelines	Part of the IT-related policies, procedures and practices for the IT management framework
AP001-WP3	Communication ground rules	Part of a monitoring and reporting process in the IT management framework
AP001-WP4	Definition of IT-related roles and responsibilities	A RACI chart will outline these roles and responsibilities.
AP001-WP5	Definition of supervisory practices	Part of the IT-related policies, procedures and practices for the IT management framework
AP001-WP6	IT-related policies	Policies and/or operating practices/standards that reflect IT operations and accountabilities
AP001-WP7	Communication on IT objectives	Part of a monitoring and reporting process for defining an IT framework
AP001-WP8	Evaluation of options for IT organisation	Part of the IT management framework related to IT organisation
AP001-WP9	Defined operational placement of IT function	Part of the IT management framework related to IT organisation
AP001-WP10	Data classification guidelines	Part of an enterprise architecture plus data retention and risk management policy
AP001-WP11	Data security and control guidelines	Part of the IT-related policies, procedures and guidelines, but specific to data security
AP001-WP12	Data integrity procedures	Part of the IT-related policies, procedures and guidelines, but specific to data security; these are the more detailed procedures.
AP001-WP13	Process capability assessments	Part of a monitoring and reporting process for defining an IT framework such as COBIT PAM
AP001-WP14	Process improvement opportunities	Opportunities to improve arising from the use of a monitoring and reporting process for defining an IT framework
AP001-WP15	Performance goals and metrics for process improvement tracking	Part of a monitoring and reporting process for defining an IT framework

Figure 2: Level 1 Work Products

Looking at the table above we can observe the inconsistency of the work product descriptions. While work products such as EDM05-WP3 and APO01-WP4 have a description that is easy to understand, other work products as APO01-WP7 and APO01-08 are vague and can have several interpretations.

Different interpretations of ambiguous descriptions can lead to different information being provided, so an objective and easy to understand description in necessary to ensure that the correct information is used on the capability assessment [1].

RELATED WORK

In this section, we will describe the tools used on our proposed solution and perform an analysis on solutions that tried to solve the problem defined in PROBLEM section.

COBIT 5

ISACA describes COBIT5 as "comprehensive framework that assists enterprises in achieving their objectives for the governance and management of enterprise IT" [5].

COBIT5 is a generic good-practices framework developed by ISACA that focuses on Enterprise Governance of IT (EGIT) that provides a set of guidelines for enterprises to better establish IT related objectives to better manage their resources a generate value. It operates on five core principles: Meeting Stakeholder Needs; Covering the enterprise end-to end; Applying a single, integrated framework; Enabling a holistic approach; Separating Governance from Management [5]. These five principles enable enterprises to manage their resources more effectively, align the enterprise's goals with the stakeholders' and provide a governance and management

framework that optimizes IT investment and benefit realization [5].

COBIT 5 includes a reference model that describes and defines in detail a set of governance and management processes related to IT that should be found in the majority of enterprises.[5]
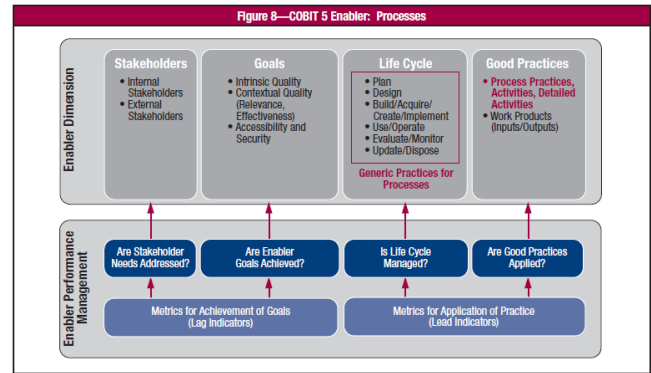

Figure 3: Anatomy of an enabling Process [5]

The set is composed by 37 core processes that enterprises need to implement and manage according to their needs in order to align their stakeholder's needs with the business' needs and provide an effective governance and management of their IT. According to the principle of separating Governance from Management, the 37 processes are separated into two categories, Governance Processes and Management Processes.

COBIT 5 LEVEL 1 WORK PRODUCTS

The level 1 Work Products are nothing more than the work products produced by the 37 Enabling Processes as outputs. The COBIT 5 reference model for the processes states that every process should have one or more inputs required for its execution and must also generate work products as outputs. These outputs are crucial for the process maturity assessment as their creation and monitoring is a requirement for achieving maturity level 2 and higher levels. As stated in the problem section, COBIT 5 indicates what work products should be produced as process outputs but does not provide detailed guidelines for the former's format and representation, requiring additional knowledge for performing a complete assessment.

COBIT5 PROCESS ASSESSMENT MODEL

COBIT5 provides a process assessment model for its 37 enabling processes that is compliant with ISO/IEC 15504. This process model uses a measurement framework that assesses the maturity level of each one of the 37 enablers

according to the state of implementation and work product generation.

The COBIT5 PAM (Process Assessment Model) is composed of two dimensions – The Process Reference Model that describes enterprise governance and management of IT and the Capability Dimension that provides a measure of a process's capability to meet an enterprise's current or project goals for the specific process [6].

ITIL

ITIL is a framework designed for IT service management and operation. It provides a set of best practices and guidelines for service design, service strategy, service operation and service transition. Due to its principles, ITIL provides detailed descriptions for service and IT related concepts [6]. ITIL has the same purpose of the COBIT5's DSS family of enablers, providing a set of operational level practices. ITIL is structured around an iterative cycle, ITIL Continual Service Improvement, that gathers information from the enterprise's stakeholders and operational indicators and provides a process to design and optimize its processes according to the enterprise's needs and its vision. The complete ITIL model is represented on the image below.
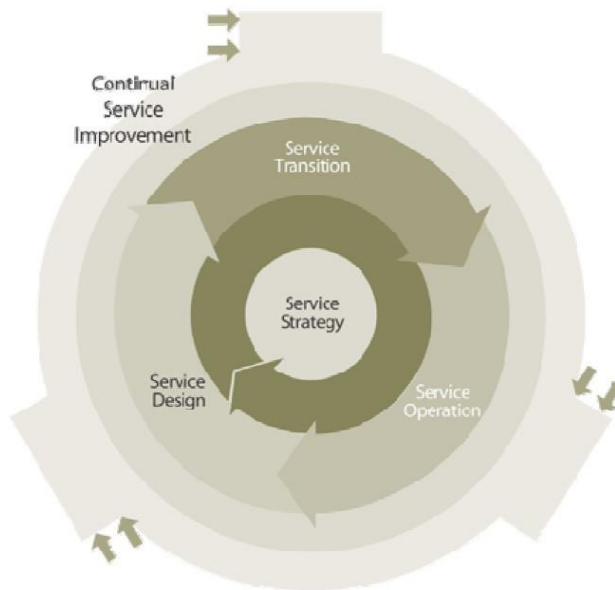

Figure 4: The ITIL Core[6]

To fully support the ITIL cycle, ITIL is divided into five main publications: Service Strategy, Service Design, Service Transition and Service Operation and Continual Service Improvement. Each one of the five fully details the processes and activities necessary for their realization.

TOGAF

TOGAF is an enterprise architecture framework. It provides the enterprises with a set of guidelines and a framework for designing and improving the IT architectures. TOGAF adopts a high-level approach to the design of enterprise architectures and it is flexible by design, allowing the

enterprises to develop a broad range of architectures using the provided framework [18]. The framework is an iterative framework that is composed of 7 key phases that allows enterprises to define in a AS-IS state its current architectures and define a roadmap to achieve the desired TO-BE architecture. The TOGAF framework is represented on the figure below.
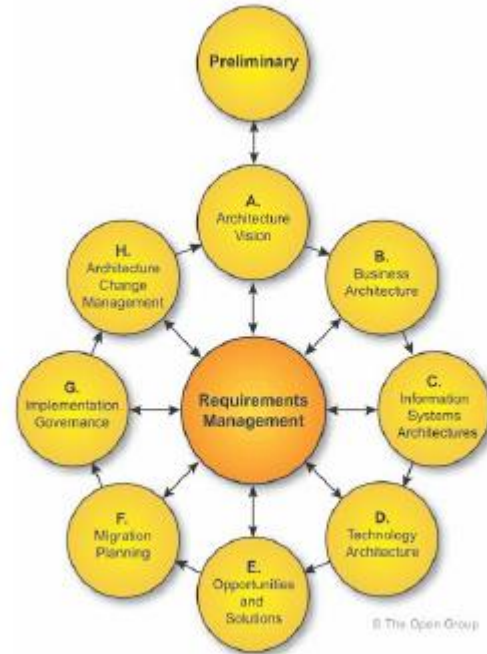

Figure 5: TOGAF ADM phases[18]

TOGAF also provides detailed descriptions for enterprise architecture concepts that are present on several COBIT5 enablers. These concepts can be found throughout the seven phases of TOGAF.

PROPOSAL

In this section we will propose a representation for COBIT5's work products for their identification when analyzing an organization's information items and processes.

The proposal of this thesis is: Describe in an easy to understand representation the description of COBIT5s work products using definitions from established standards and mappings.

This section corresponds to Design and Development phase of the DSRM methodology.

Observing the level 1 descriptions present on COBIT5's PAM (Process Assessment Model) we can spot several inconsistencies on the description of the work products.

Some work products are described with little detail and others are only referenced as part of a process or a document.

The main objective of this proposal is to define in more detail what each work product is and where it is expected to be found on the enterprise's information items. We started by retrieving the information that COBIT5 provides for each work product, including its description and key concepts that are required to be detailed in order to fully understand the work product. Observing the detailed description that COBIT5 provides in its glossary for the outputs, we observed that although not all, most of the descriptions specify that the work product is a part of another concept, leaving to the reader the need for knowledge regarding the work product concepts.

Outcome/ Work Product	COBIT5 Output/Work Product	COBIT5 PAM Description	Detailed Description	References
APO01 WP2	Enterprise operational guidelines	Part of the IT-related policies, procedures and practices for the IT management framework	List of guidelines and practices defined by the enterprise for achieving the enterprise's goals.	ITIL Service Operation [8]
APO03 WP10	Implementation phase descriptions	Part of the implementation plan for enterprise architecture	Description of the steps and actions required to achieve the desired architecture.	TOGAF - Phase F: Migration Planning [18]
APO05 WP4	Funding options	Reviewing source of funds statements as they relate to the investment portfolios	The funding sought by the business and IT for services delivered, based on the agreed value of those services. Financial Management calculates and assigns a monetary value to a service or service component so that they may be disseminated across the enterprise once the business customer and IT identify what services	ITIL Service Strategy 5.1 - Financial Management[6]
			are actually desired.	
APO09 WP3	Service catalogues	All IT services and relevant target groups are documented in a catalogue.	A database or structured Document with information about all Live IT Services, including those available for Deployment. The Service Catalogue is the only part of the ITIL Service Portfolio published to Customers and is used to support the sale and delivery of IT Services. The Service Catalogue includes information about deliverables, prices, contact points, ordering and request Processes.	ITIL Service Design[7]
APO010 WP2	Supplier catalogue	Usually a supplementary system that typically identifies suppliers and associated contracts and categorises them into type, significance and criticality. Supplier and contract evaluation criteria	A database or structured Document with information about all active and considered suppliers, containing information about the current, previous or proposed contracts.	COBIT5[12]

		should be established.		

Although ITIL is able to fully describe some of the work products that are present in the APO process, ITIL shows its limitations when presented with the waterfall structure of COBIT5's enabling processes, therefore we needed to provide our own descriptions for the remaining work products that need to be verified and agreed-on by the experts.

Another way of adding additional knowledge for a specific work product is by providing and example or template to help the COBIT5 practitioner understand what to look for and ask for when performing a capability assessment. As an example, we will used APO01 Work Product 1 – Innovation Plan. The description that COBIT5 provides for this work product is well structured and detailed, however we can improve on the description by providing a template that will serve as a reference. Instead of creating a template for this work product, we concluded that Business Model Canvas matches the description of the work product and is a good example of an innovation plan as we can observe below.
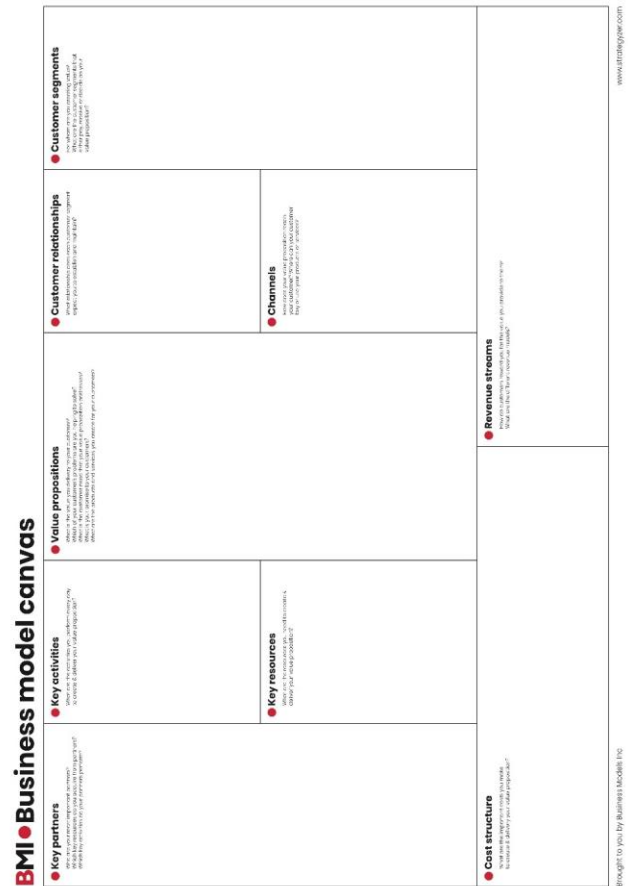

Figure 6: Business Model Canvas [19]

Using this methodology, we expanded the research to the remaining APO processes. Due to the nature of the APO family of processes, their level of granularity varies, with some processes being more low level and related to business operation and management and others more high level, almost reaching the level of the EDM family of processes.

EVALUATION

The evaluation of the proposal corresponds to the Evaluation Phase of the Design Science and Research Methodology. In this section we will describe how the different components of our proposal will be evaluated.

The evaluation of our proposal will be performed using the following steps:

1. Expert Review: Present the design artifact to experts in the field of research, which consists in Enterprise Governance of IT, COBIT5 and ISO/IEC standards.

2. Pries-Heje et al. framework: Formal scientific evaluation using a framework made for Design Science Research.

Pries-Heje defines three research questions that need to be answered before applying its framework for Design Science Research Evaluation [13]:

• What is actually evaluated: The artifact is the center of the evaluation and therefore must be clearly defined. The artifact can be regarded as a design or a process.

• How is it evaluated: The chosen evaluation method. It can be naturalistic or artificial.

• When was it evaluated: The researcher must decide if the evaluation is performed ex ante (before the design of the artifact) or ex post (after the design of the artifact).

The design artefact of our proposed solution that will be evaluated will be the following: The mapping of COBIT5 Outputs using other standards and ArchiMate models.

Given the nature of our problem and its underlying proposed solution, implementing and evaluating its impact in an enterprise is not feasible within the timeframe that this research is bound to follow. In terms of risk, implementing an experimental framework for internal control can pose a severe risk for any enterprise. Therefore, the chosen evaluation method will be artificial evaluation. The evaluation will be performed by Expert Review, where several auditors with experience in COBIT5 and ISO standards will provide feedback on the proposal and its feasibility.

The evaluation is ex post since given the nature of the research problem, the evaluation will be performed after the design of the artefact.

FIRST ITERATION EVALUATION RESULTS
After we finished mapping the APO work products using descriptions from other standards and relevant knowledge, we presented the artefacts to experts on COBIT5 for their evaluation and if they agreed with the descriptions and the mapping.

One of the experts agreed with the mapping and the descriptions for the work products. The expert also suggested the use of SFIA standard to reference when mapping human resource related work products. The expert also suggested that we provided a few concrete examples for work products as a proof of concept and to add value and credibility to the mapping. The expert also suggested that we highlighted work products whose description is ambiguous and / or are duplicated. Lastly, the expert pointed out that we were overly relying on the ITIL standard, namely ITIL Continual Service Improvement, to achieve the mapping of the outputs. The expert suggested the use of additional references to ISO 27001 for Information Security and ISO 9001 for Risk.

Due to time constraints, we were not able to fully present our results and were only able to present part of the APO family of processes. The second expert also agreed with the descriptions of the work products and with the initial mapping. As an improvement suggestion, the expert suggested exploring work product characteristics other than their description, namely its location on the information items or processes. The expert also pointed out the nature of COBIT5 and why some of the work products may appear duplicated on the same process or even ambiguous to being a result of the waterfall nature of COBIT5's processes.

We then concluded that we needed to provide more examples of templates for work products to increase the value of our research.

SECOND ITERATION EVALUATION RESULTS
After we presented the results to the first two experts, we added additional information to our mappings and gathered templates for Innovation Plan, Communication Plan and Service Level Agreement. We also revised our descriptions of the outputs, revising the work products that we previously considered ambiguous. We then presented the updated proposal to the last expert.

The last expert also agreed with the problem definition and the descriptions of the work products and also recognized the usefulness of providing additional knowledge to the definitions of COBIT5. However, the expert also noted that providing templates is only useful for a limited number of work products that are information items. Other work products, namely processes, states or enterprise architectures, cannot be exemplified with a template and therefore require other methods in order to be exemplified. The expert suggested using ontologies or enterprise architecture models to model key concepts of COBIT5 and its work products and use the models to compare to the models from the descriptions provided by the other standards.

After we presented the results to the expert, we concluded that our research has limitations in what type of work products it can provide examples for and how we can extend the research using other representations that can cover every type of process output present in COBIT5.

CONCLUSION
In this thesis, we researched the viability of improving the documentation of COBIT5. Fully understanding a best-practices standard such as COBIT5 is not possible and despite the efforts of ISACA to revise and improve their documentation, there are still a lot of concepts that are ambiguous, and their meaning is based on the interpretation of the assessor.

COBIT5's process outputs and their PAM counterparts, the level 1 work products, are a prime example of limitations of COBIT5's design.

LESSONS LEARNED
COBIT5 provides descriptions of the process outputs that for a practitioner that has enough knowledge of IT Governance and Management technical terms and in most cases this description is enough information when performing a

process capability assessment. Due to its nature, COBIT5 references and borrows a lot of information from established standards related to IT and the authors made the decision to keep the description of technical terms simple and instead reference other standards that can help an assessor to better understand COBIT5.

Using other standards and frameworks such as ITIL or ISO standards, it is possible to achieve a more complete description of the work products and what ISACA and the COBIT5 authors defined as process outputs and work products.

Mapping COBIT5's work products using related standards allows the practitioner to better understand what concepts and information items relate to the process work products and the use of templated as an example further illustrates the work product.

MAIN LIMITATIONS

COBIT5 provides descriptions of the process outputs that for an assessor that has enough knowledge of IT Governance and Management technical terms and in most cases this description is enough information when performing a process capability assessment. Due to its nature, COBIT5 references and borrows a lot of information from established standards related to IT and the authors made the decision to keep the description of technical terms simple and instead reference other standards that can help an assessor to better understand COBIT5.

Using other standards and frameworks such as ITIL or ISO standards, it is possible to achieve a more complete description of the work products and what ISACA and the COBIT5 authors defined as process outputs and work products.

Mapping COBIT5's work products using related standards allows the assessor to better understand what concepts and information items relate to the process work products and the use of templated as an example further illustrates the work product.

FUTURE WORK

Although we only modeled a small group of work products, the work found in this thesis can be expanded by modelling all of the remaining COBIT5's work products, further expanding the knowledge of COBIT5 and providing useful information for knowing what to ask and look for when performing a Process Capability Assessment on an enterprise's processes. Our proposal results proved that it is possible to extend the definitions of COBIT5's process outputs using relevant / related standards and frameworks.

Other option for further work is to follow the suggestion of the experts and model the COBIT5's outputs using Enterprise Architecture notation, such as ArchiMate. This second option not only extends our research, but also extends the research present on Cadete's [11] and Lourinho's [10] master thesis.

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