



CENTERIS - International Conference on ENTERprise Information Systems /
ProjMAN - International Conference on Project MANagement / HCist - International
Conference on Health and Social Care Information Systems and Technologies,
CENTERIS/ProjMAN/HCist 2018

An IT Value Management Capability Model for Portuguese Universities: A Delphi Study

Cristiano Pereira^{a,*}, Carlos Ferreira^a, Luis Amaral^b

^aUniversidade Aveiro, Aveiro, Portugal

^bUniversidade do Minho, Guimarães, Portugal

Abstract

One of the most common dilemmas faced today by organizations and their leaders is how to guarantee value from high level IT investments, i.e. how organizations ensure expected benefits from growth in IT investments. Knowledgeable about this reality, organizations seek solutions to solve this problem, either through the adoption of frameworks developed and proposed by the professional community (COBIT5; VAL IT 2.0; IT-CMF), or alternatively, by designing and implementing their own models. The aforementioned, for organizations in general, is not different in the context of Higher Education Institutions (HEIs). This paper adopts a Resource-Based View theory (RBV) to identify a set of competences and resources, which contribute to develop and conceptualize an IT Value Management Capability Model. The identified items were submitted to a panel of experts through a Delphi study in order to validate and propose a baseline to assist academic and practitioners understand essential requirements to implement an IT Value Management Capability Model (ITVMCM) in Portuguese public universities.

© 2018 The Authors. Published by Elsevier Ltd.

This is an open access article under the CC BY-NC-ND license (<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

Selection and peer-review under responsibility of the scientific committee of the CENTERIS - International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies.

Keywords: IT Governance; IT Value Management Capability; Resource-Based View; COBIT 5; VAL IT 2.0

* Corresponding author: *E-mail address:* cristiano@ua.pt

1. Introduction

Evolution in IT investments increases concern of organizations to ensure expected benefits, several studies point to cases of failure, or little evidence suggesting productivity gains from these type of investments [1]. This is a common dilemma faced by organizations and their leaders, how to guarantee value from high IT investments [2]. IT governance (ITG) is a fundamental influence on IT Value Management (ITVM), knowledgeable about this reality, organizations (public or private) seek solutions in ITG frameworks proposed by practitioners [3,4] or design their own models, adjusted to their particular reality.

The aforementioned for organizations in general is not of minor importance in the context of Higher Education Institutions (HEIs). To corroborate this statement, a study carried out by EDUCASE [5] highlights some issues related to the subject: i) Institution-wide IT strategy; ii) Balancing and rightsizing IT priorities and budget to support IT enabled institutional efficiencies and innovations in the context of institutional funding realities; and iii) IT staffing and organizational models. Organizations with decentralized structures, like Portuguese universities, need to regularly assess and renew their ITG approach to adapt business change. In a context of continuous organizational transformations, we suggested an IT Value Management Capability Model (ITVMCM) to support institutional leaders, providing guidance on main competences and organizational resources to improve IT benefits.

Most research on IT business value was guided by the Resource-Based View theory (RBV) which focuses on organizational resources as a support to institutions achieve competitive advantage [6]. Sustained on RBV, this paper aims to identify and propose an ITVMCM for public Portuguese universities. Two research questions emerge: 1) what are the competences and organizational resources that enable the development of an ITVM capability in public Portuguese universities, 2) what is the relative level of importance of each of those components?

Since ITVM models and implementations guidelines in HEIs are scarcely available, we opted for an exploratory study rather than hypothesis testing. Exploratory research was built on literature review and a Delphi method research, involving a panel of experts from the IS/IT industry, academy (professors and researchers) and a third group from university IS/IT managers.

The remainder of this paper is organized as follows: Section 2 outlines the background of the study, presenting a brief review related to ITG, IT value delivery and a brief outlook to RBV theory. Section 3 describes the research methodology, including a description on how Delphi was designed and executed. Section 4 presents a summary of results and finally, Section 5 states the main conclusions, and limitations, along with future research proposals.

2. Theoretical foundations

2.1. The nature of IT value delivery: Evolution from governance to enterprise governance of IT

Governance denotes regulating or controlling “*something*”. That “*something*” depends on a specific governance perspective, it might be the organization as a whole (Enterprise or Corporate Governance) or it can be IT (IT Governance).

Initially, ITG describes how the board of directors and executive management consider IT in their supervision, monitor, control and direction of organizations [7]. Later, Weill and Ross [8], proposed one of the most referenced definitions of ITG, “*effective IT governance is the single most important predictor of the value an organization generates from IT*”. Simultaneously, Van Grembergen et al. [9] denote ITG transversal characteristics across all organization (Business and IT), this vision, points to a broader concept called Enterprise Governance of IT (EGIT) that encompasses organizational capacity and enabled outcomes, specifically business/IT alignment and in the end value creation out of IT-enabled investments [10].

Parallel to academic evolution, practitioners offer new approaches to ITG, developing new frameworks and standards. Two of the most known are: COBIT 5, released by ISACA in 2012 [4], and the international standard ISO/IEC 38500 [11].

From previous studies, a question emerges – what constitutes value creation from IT investments? By itself, IT investments will not generate value for business, only linking IT and non-IT resources can competitive advantage be attained [12]. The Ambiguity to identify what is value for business is one of the main reasons that makes IT value hard to obtain.

2.2. Resource-Based View

RBV theory has been one of the most well-known and powerful theories for understanding organizations over the past two decades [13]. Resource Based View claims that resources (including IT resources) enable organizations to achieve competitive advantage, but not all, only a subset known as VRIN (valuable, rare, imperfectly imitable and non-substitutable) resources [14]. A firm's resource includes not only physical assets, such as plant and location (tangible resources), but also human, knowledge and relationship resources (intangible ones). These intangible resources are unique and cannot be easily imitated, thus satisfying VRIN conditions of RBV theory [13].

In contrast to resources, Barney [15] defines capabilities as *“the firm's capacity to deploy resources, usually in combination, using organizational processes, to effect a desired end”*. Organizational capability has attracted great interest from researchers, namely in the IS field, they state that capabilities can be a major source of firm's performance [16]. Organizational capability is what you can do with what you know. According to C. Pereira et al. [17], what you know should be seen as a new concept that emerges from RBV literature, known as competences. Ashurst et al. [18] indicate that competences consist of a combination of personal skills, knowledge and experience, organizational roles and processes called practices. The concept of practice is align with how people actually work.

To create sustainable competitive advantage (value delivery), a firm needs to deploy resources, like: physical capital resources (e.g. IT investments); human capital resources (e.g. skills, knowledge, experience); and organizational capital resources (e.g. boards of directors and top management), through a set of practices, logically orchestrated to develop competences that can be integrated in IT value management capability [17].

3. Research Design

3.1. The Delphi Method

The Delphi method can be characterized *“as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem”* [19]. Multiple applications and variations on classical Delphi method can be found in the IS field [20;21].

Key features of Delphi studies are anonymity between participants with controlled feedback. Besides anonymity and controlled feedback, other characteristics of the Delphi method are: iteration, consensus and statistical group response aggregation. Two of these stand out, the possibility of anonymity and the concept of consensus. The first allows panel members to express their views and perceptions in a more honest and genuine way, without being subject to social pressures that may result from the presence of experts with more dominant personalities or status. The second because a Delphi study usually seeks to elicit consensus on the topic under research, through a series of statistical measures. The level of consensus among experts can be evaluated at the end of each round and a decision can be achieved at the end of the study.

3.2. Design of the Delphi Study

According specificities of Delphi is essential plan and prior design study, ensuring aspects on which is important reflect during design phase are not forgot. Absence of planning, decisions and options taken are negative aspects, pointed out by several authors [20;21]. Considering these criticisms, we describe the main phases in the next subsections.

3.2.1. Items List Generation

There are usually three alternatives envisaged at this level to generate a first item list: i) from literature review; ii) from group discussions and iii) from a mixed strategy that starts with a literature review process, followed by group evaluation. We opted for a literature review process to identify the initial list, resulting in 14 ITVM competences and 25 enablers. This Initial list of items and correspondent description are provided in Appendix A.

To mitigate or reduce bias in responses that can be introduced and eventual incompleteness of the generated list, two decisions were taken. First, in Round 1 experts could propose new items, not included before and second sort alphabetically competences and enabler's items that constitute initial list.

3.2.2. Structure of the Questionnaire

To meet the study goals, we separate the questionnaire in two parts. In part I, we list organizational competences, part II refers to enablers that contribute to the development of ITVM competences. Apart from these, a third step was included, (free text area), where experts could identify and describe new potential relevant items not included in the initial list. The Ranking technique used to evaluate the submitted items follows the Q-Sort method, through structured procedures that make respondents analyze the importance of items in an aggregated form and not isolated.

3.2.3. Panel Constitution

Particular attention to the composition and panel size are aspects to consider while defining the expert panel. Worrell et al. [21], consider panel size between 10 and 30 experts as a usual number used in multiple Delphi studies. In effect, size depends on the requirements identified in the panel composition process, as well as on the characteristics of each individual member.

To generate the panel of experts we based on the procedure suggested by Okoli and Pawlowski's [20], which resulted in 93 potential experts to whom an invitation message was sent, of these, 33 (35%) belong to IS/IT Industry, 37 (40%) to academy (professors and researchers) and 23 (25%) to university IS/IT managers.

3.2.4. Mode of Execution

Decision on how data collection would take place fell on web-based option. Advantages of this option, over a traditional mail, is obvious, namely, efficiency of the process and minimization of costs. We used the tool E-Delphi in order to interact with experts and execute all phases of the Delphi study.

3.2.5. Stopping Criterion

As stated before, at the end of each round an assessment of consensus among experts should be carried out. If consensus is not significant, a new iteration occurs, if consensus is satisfactory, the study ends. Despite the apparent simplicity of this method, it is not always easy to achieve the desired level of consensus. To support evaluation two statistical measures were selected: to evaluate the level of agreement of expert's opinion in each round the Kendall's W coefficient was selected; to evaluate the level of stability of global opinion between rounds the Spearman's Rank correlation coefficient (Spearman rho) was selected. The level of agreement varies between zero (no agreement) and one (perfect agreement). A high value of W means experts are judging the level of importance of items in similar way. Spearman rho correlation coefficient varies between zero (no stability) and one (perfect stability).

Besides typical statistical measures to evaluate consensus, Diamond et al. [22] refer a maximum number of rounds as stop criteria. Usually three rounds, before expert panel fatigue becomes an issue [20].

3.3. Execution of the Delphi Study

This section briefly describes the implementation of the Delphi study. It aims to characterize central moments carried out within this research. Table 1 summarizes the main figures of the study.

Table 1 – Characterization of rounds

		Round 1		Round 2		Round 3	
Response rate		42 experts (47%) from a total of 90 experts initially invited		25 experts (60%) from a total of 42 experts from previous round		21 experts (84%) from a total of 25 experts from previous round	
Total questionnaire items		39		39		39	
Global level consensus		Very Low		Low		Moderated	
Level of importance competences	Kendall's W	0,18 (p<0.001)	low consensus	0,24 (p<0.001)	low consensus	0,34 (p<0.001)	moderated consensus
	Spearman rho	not Applicable	not evaluated	0,91 (p<0.001)	very high stability	0,95 (p<0.001)	very high stability
Level of importance enablers	Kendall's W	0,23 (p<0.001)	low consensus	0,30 (p<0.001)	moderated consensus	0,30 (p<0.001)	moderated consensus
	Spearman rho	not Applicable	not evaluated	0,92 (p<0.001)	very high stability	0,93 (p<0.001)	very high stability

In temporal terms, the study took place over twelve weeks (December 2017 to March of 2018). The first moment of interaction was the sending of invitations to participate in the study to 93 experts by e-mail, three of them declined their participation. In Round 1, the questionnaire was sent to 90 experts. In subsequent rounds, the questionnaire was only sent to experts who completed the previous round. Response rates obtained were of 47% in Round 1, 60% in Round 2 and 84% in Round 3. After Round 1, only one new item proposal emerged. After examining the existence of similarities or overlaps between the initial list and the proposed item, we assumed that the new proposed item was already considered, therefore, we did not include it. In conclusion, the initial list, stated in Appendix A, turned out to be the final list evaluated by the experts.

As stated in section 3.2.5, we have evaluated the consensus level at the end of each round using two statistical measures, Kendall's W and Spearman's rho. Supported by Schmidt, [23] to interpret Kendall's W, the following consensus categories were considered: (1) very low or low for $0,01 < W < 0,29$; (2) moderated for $0,30 < W < 0,50$; (3) high or very high for $0,51 < W < 0,99$. Stability of global opinion between rounds is considered very high for Spearman rho $> 0,90$ [24]. Taking into account the values of the statistical tests performed, global level of consensus evaluated in Round 1 and 2 were very low and low, respectively. Evaluation at the end of Round 3 revealed a moderated global level consensus. Bearing in mind the high number of items involved (39 items), the very high stability in global panel rank between rounds and the substantial decrease in participants at the end of Round 3, we considered this a tolerable level of consensus and, therefore, considered it a positive panel convergence, thus leading to the conclusion of the Q-Sort Delphi study.

4. Research Results and Discussion

Results reflect the opinion and experience of 21 experts who participated in all three rounds, 20% belong to the IS/IT Industry, 66% to the academy group and 14% to the university IS/IT managers group. The evolution in items rankings are summarized in Table 2. We used the exploratory cluster analysis technique ("*Ward's Method*" with the measure of similarity "*Square Euclidean Distance*") to organize data in significant groups and support our analysis. Dendogram's results allows us to identify four clusters for competences and five clusters for enablers.

Table 2 – Ranking of importance of items

ITVM Enabler Items Ranking					ITVM Competence Items Ranking				
Round 1	Round 2	Round 3	Enabler	Cluster	Round 1	Round 2	Round 3	Competences	Cluster
2	1	1	E22	Most	1	2	1	C4	
1	2	2	E14	Significant	7	4	2	C5	Most
4	3	3	E19		2	1	3	C3	Significant
5	8	4	E3		3	3	4	C14	
3	4	5	E10	Significant	8	5	5	C1	Significant
10	6	6	E23		4	7	6	C7	
6	7	7	E9		9	9	7	C13	
8	5	8	E25		6	6	8	C9	Neutral
7	9	9	E2		5	8	9	C8	
16	14	10	E16	Moderated	10	10	10	C10	
18	12	11	E8		11	12	11	C11	
11	11	12	E21		12	11	12	C2	Less
14	16	13	E17		13	13	13	C12	Significant
19	17	14	E18		14	14	14	C6	
13	15	15	E6						
22	21	16	E7	Neutral					
9	10	17	E5						
17	13	18	E1						
12	20	19	E12						
15	19	20	E11						
20	18	21	E15						
21	22	22	E4	Less					
25	25	23	E13	Significant					
23	24	24	E24						
24	23	25	E20						

In addition, we requested experts to rank competences according to the level of importance they considered that best contributes to ITVM organizational capability in Portuguese HEIs. After the first phase, a second request, related to the first, was made, in order to rank the enablers according to what experts assumed as the best in the development of competences ranked previously.

From Table 2, some relevant aspects should be highlighted. First, the importance recognized to competence C4, which, in all rounds, occupied the top positions, emphasizing the importance of an ITVM model framed with ITG. This corroborates the importance pointed out by Maes et al. [12], regarding the adoption of a model to implement such type of practices. Secondly, the consistency in all rounds associated to the first five positions in the ranking of competences. Only two exceptions: the exclusion in Round 2 of competence C8, which in Round 1 ranked in the 5th position and finished, in Round 3, in position 9, as well as competence C7, initially in position 4, that finished the study in position 6. In the opposite direction, C5 and C1 started outside the top five and ended in Round 3 in the 2nd and 5th position respectively. More evident are the results regarding the items placed in less significant positions of the ranking, which in the three rounds are occupied by the same set of competences (C10, C11, C2, C12 and C6).

What concerns the enabler items ranking evolution, the most significant enablers are E22 and E14, permanently in the first two positions in all the three Rounds. These are the two most important organizational resources to develop ITVM competences. Finally, we can highlight the strong consistency across the three rounds regarding the less significant enablers (E4, E13, E24 and E20). The same stability is verified in the top five positions in all rounds. An exception is E3, which in the 2nd Round, ranked in the 8th position, returning to the Top 5 in Round 3.

With the purpose of setting up a minimum baseline to assist academic and practitioners understanding the essential requirements or items, to implement our ITVM capability model in Portuguese universities, we based on C. Pereira et al. (6), and describe, in the next paragraph, the main relationships between the greatest significant enablers that contribute to deploy the most important competences. Following our results, we conclude that E22 and E14 contribute to deploy C4 and C3. The 3rd ranking enabler E19 contributes to deploy C14 and C1. Enabler E3 also helps in the deployment of competences C14 and C5. Like E22 and E14, enabler E10, contributes to deploy competences C4 and C3. The sixth ranking enabler, E23, contributes to deploy C5 and C1, ITVM competences. The enabler of the cluster, classified as significant, E9, contributes to the four first competences (C4, C5, C3 and C14).

Two categories of enablers are not presented in the proposed minimum baseline: i) Culture, Ethics and Behavior and ii) Infrastructures and Services, which does not mean that they are not important. From this results we verify that enabler E2 (Culture, Ethics and Behavior category) is categorized by experts as moderated, while enabler E7 (Infrastructures & Services) with a neutral impact. The lack of enablers from the category Culture, Ethics and Behavior, in the most significant or significant cluster was a surprise to us. According to C. Pereira et al. [17] this category is important to maximize the benefits of IT adoption, to reevaluate the investment portfolio. Several studies have seen organizational culture as an important factor that may explain significant variations in IT business value and is essential to change organizational culture, once this change involves people's value, attitudes and behaviors.

5. Conclusions

From an academic point of view, this study gives an exploratory light on the issue of IT value management to support Portuguese HEIs, providing guidance about “what” improves value from IT investments. This study revealed that, according to the experts panel HEIs could leverage a wide range of ITVM competences and enablers to support the development of an organizational ITVM capability, important to achieve value creation of IT-enabled investments. As stated in section 1, ITG has a great influence on ITVM, to corroborate this, we verify that E22 and E14 contribute to deploy competence C4, in other words, knowledge and the implementation of ITG frameworks and processes help institutions to gain competences to create ITVM practices. C4 is in line with issues acknowledged by international HEIs (7), especially institutional adaptiveness related to repositioning the role of IT leadership as a strategic partner of institutional leadership. It was a surprise for us that C12, was considered one of the less significant competences, which opposes results and conclusions from [25]. Concluding, each HEI has to select its own set of ITG practices, suitable for their dimension, culture and level of ITG/ITVM maturity. Of course, this research has limitations. First, the study is limited to the Portuguese context, to extend the study to international HEIs would be a plus. Second, to identify which resources and/or competences would be appropriate for different organizational contexts: public, private, profit or non-profit, could be interesting to explore in future research.

Acknowledgements

This work has been supported by COMPETE: POCI-01-0145-FEDER-007043 and FCT – Fundação para a Ciência e Tecnologia within the Project Scope: UID/CEC/00319/2013.

Appendix A. List of items evaluated by the experts panel

ID	Competences Items – Part I	Description
C1	Benefits planning and delivery	Competence to identify, plan and ensure realization of benefits. Ability to understand expected benefits and manage their performance throughout the life cycle of the investment.
C2	Business performance improvement	Competence to establish a philosophy of continuous improvement of ITVM practices. Ability to identify, implement and control corrective actions required to optimize value of IT initiatives.
C3	Establish an enlightened IT relationship with stakeholders	Competence to manage and align IT function with stakeholders. Ability to establish a culture of collaboration, partnerships, with internal and external entities.
C4	Establish an IT value management model	Competence to create an ITVM model, within institution's governance context. Ability to define policies, roles and responsibilities, ensure IT decision-making is in line with institution's strategy.
C5	Establish business strategic direction	Competence to ensure that institution's strategy incorporates new opportunities triggered by IT. Ability to align institution's strategies with IT strategies (e.g., budgets, resources)
C6	Financial planning	Competence to define and establish financial planning practices for effective management of IT assets. Ability to manage and make available financial information (e.g. acquisition and ownership costs) to prepare business cases for new IT investments.
C7	Identify IT insights and innovations	Competence to recognize ideas and improvement opportunities triggered by emerging technologies. Ability to capture, collect, classify and understand new ideas.
C8	IS/IT staff development	Competence to optimize skills and knowledge of IT collaborators. Ability to train, develop, and certify human resource skills, ensure technical, organizational, and personal skills.
C9	Managing change	Competence to keep up organizational changes. Ability to evaluate, adjust and produce changes resulting from evolution and correctness during the implementation of business cases.
C10	Post implementation evaluation	Competence to monitor performance of investment mix. Ability to set goals, metrics, monitor and report evolution and implementation of projects results (e.g. expected value vs. realized value).
C11	Prioritize	Competence to prioritize proposed investments. Ability to analyze and prioritize investment mix based on criteria, such financial cost, associated risk, alignment with strategy and potential value.
C12	Structure a business case	Competence to draw a business case document. Ability to define content that must be present in a business case (e.g., expected benefits, costs and risks) to enable efficient decision-making.
C13	Structure IT services and projects	Competence to define and manage IT services and projects. Ability to specify project management model, scope, resources, indicate project managers and teams, funding, timelines and interdependencies between projects, plan and control deviations from initial planning.
C14	Structuring IT portfolio and IT investment criteria	Competence to constitute and characterize portfolio or "collection" of IT investments. Ability to establish benchmarks and investment categories based on size and relative weight.
ID	Enabler Items – Part II	Description
E1	Culture, Ethics and Behavior - Incentives and rewards	Promotes incentive mechanisms and rewards to encourage employees adopt appropriate behavior, through incentive schemes and rewards.
E2	Culture, Ethics and Behavior - Communication and awareness	Directly related to individual and collective behaviors. Adapt communication of desired behaviors and values to the culture of institution, communicating effectively, regulations, norms and rules. Leadership should raise awareness of desired behavior through example.
E3	Information - Budget and IT investment criteria	Information and disclosure of IT budget as well criteria for classification of investment proposals.
E4	Information - Constitution/bylaws/statutes	Information or documentation about laws and institution statutes, which must be met when making decisions and executing investments.
E5	Information - Investment performance appraisal and reporting	Information produced and disclosed on evolution of execution, performance and conclusion of investments and information of realized benefits (realized value).

E6	Information - Service Level Agreements (SLA)	Information and advertising of requirements and service levels agreed between suppliers (internal / external) and customers or users of IT services.
E7	Infrastructures & Services - Sourcing Decision	Related to decision making about model services, systems and IT infrastructures, namely with internal resources or outsourcing of solutions and services.
E8	Organizational Structures - Board	Group of executives responsible for governance and general control of resources. In context of public universities in Portugal, is equivalent to governing body, general council of the university.
E9	Organizational Structures - C-suite executive	Organizational structures of executive level composed of directors for each area of activity. In the context of HEIs, the service director structures (administrator and service directors) and /or the rector team (rector / vice-rector / pro-dean) with executive responsibilities.
E10	Organizational Structures - IT strategic committee	Group of senior executives appointed by board of directors/general council, ensures general council informed of IT issues. Responsible for executive management of services, assets and portfolio of IT investments. Committee usually chaired by a board member rather than IT director.
E11	Organizational Structures - Project Management Office	Responsible for support project managers, evaluates and reports project execution (costs, human resources, quality, time), define methodologies, standards and tools used in project management.
E12	Organizational Structures - Value Management Office	Act in management of IT investment portfolio, assesses and advises on investment opportunities. Support IT strategic committee evaluating business cases, track investments, report progress and value generated.
E13	People and Skills - Knowledge of financial management	Related to skills and competences in the area of financial management in public institutions.
E14	People and Skills - Knowledge of frameworks for governance of IT	Related to skills and competences, individual and collective, in IT governance and management frameworks (e.g. project management, innovation management, IT vendor management)
E15	People and Skills - Knowledge of HR management	Related to skills and competences in the area of HR management in public institutions.
E16	Principles, Policies & frameworks - Enterprise Governance Principles	Practical guidelines for governance and day-to-day management, apply across business and IT (e.g. ISO / IEC 38500; OECD Principles of Governance), provide instructions from board of directors and executive officers that clarify objectives and institution values.
E17	Principles, Policies & frameworks - Management and resource allocation policies	Establishes criteria and terms for allocating resources to investment projects, financial or human resources, defining practices to develop improvement of individual performance.
E18	Principles, Policies & frameworks - Monitoring and Reporting Policy	Establishes and communicates practices for monitoring and reporting benefits realized during investments life cycle.
E19	Principles, Policies & frameworks - Portfolio and IT Investments Policy	Formulates institution policies (IT / business), identification acceptable level of risk and level of costs versus expected benefits, categorizes and evaluates risks and investments to select according defined criteria.
E20	Principles, Policies & frameworks - Vendor Management Policy	Establishes terms and good practices of "sourcing" and relationship management with IT suppliers.
E21	Process - Ensure Benefits Delivery	Optimize potential value of IT processes, services and assets resulting from IT investments. Manage realized value, in face of costs and benefits, guarantee delivery of services and solutions with value for institution.
E22	Process - Governance and IT Management	Clarify and maintain mission and vision of IT in institution. Defines organizational structures (roles and responsibilities) of governance, management and use of IT, specifies IT management activities, procedures, respective skills, and competencies. Ensure that IT-related decision-making aligned with institution's objectives, IT management processes supervised and regulatory and legal requirements fulfilled.
E23	Process - Manage Portfolio and Projects	Manage project portfolio in a coordinated way, considering each category of investment, resources and financial constraints. Evaluate, prioritize, plan, control and execute projects and close them with a post-implementation review. Manage demand for resources and funding in entire portfolio involving and communicating with all stakeholders.
E24	Process - Manage Suppliers	Manage relationship with IT suppliers. Manage relationships, contracts, supplier performance review and monitoring, minimize risk and ensure competitive pricing for IT goods and services.
E25	Process - Managing Innovation and Organizational Change	Manage adoption of innovation and organizational changes triggered by IT. Analyze, validate and implement innovation opportunities in business processes and services, maximizing probability of success of organizational changes. Prepare and commit all stakeholders to change.

References

- [1] C. Wilkin, J. Campbell, S. Moore, and W. Van Grembergen, “Co-Creating Value from IT in a Contracted Public Sector Service Environment: Perspectives on COBIT and Val IT,” *J. Inf. Syst.*, vol. 27, no. 1, pp. 283–306, Jun. 2013.
- [2] C. Pereira, C. Ferreira, and L. Amaral, “Estruturas Organizacionais para Gestão do Valor das TI: Um Modelo Conceptual para as Universidades Públicas em Portugal,” in *15ª Conferência da Associação Portuguesa de Sistemas de Informação - CAPSI 2015*, 2015.
- [3] ITGI, *Enterprise Value: Governance of IT Investments, The Val IT Framework 2.0*. 2008.
- [4] ISACA, *COBIT 5 - A Business Framework for the Governance and Management of Enterprise IT*. 2012.
- [5] S. Grajek, “Top 10 IT Issues, 2018: The Remaking of Higher Education,” *EDUCAUSE review*, 2018.
- [6] S. Nevo and M. Wade, “Firm-level benefits of IT-enabled resources: A conceptual extension and an empirical assessment,” *J. Strateg. Inf. Syst.*, vol. 20, no. 4, pp. 403–418, Dec. 2011.
- [7] S. Ali, P. Green, and A. Robb, “Information technology investment governance: What is it and does it matter?,” *Int. J. Account. Inf. Syst.*, vol. 18, pp. 1–25, Sep. 2015.
- [8] P. Weill and J. W. Ross, *IT Governance - How Top Performers Manage IT Decision Rights for Superior Results*. Harvard Business School Press, 2004.
- [9] W. Van Grembergen, S. De Haes, and E. Guldentops, “Structures, Processes and Relational Mechanisms for IT Governance,” in *Strategies for Information Technology Governance*, IGI Global, 2004, pp. 1–36.
- [10] S. De Haes and W. Van Grembergen, *Enterprise Governance of Information Technology - Achieving Alignment and Value, Featuring COBIT 5*. Springer International Publishing, 2015.
- [11] ISO/IEC, “ISO/IEC 38500:2015 - Information technology - Governance of IT for the organization.” 2015.
- [12] K. Maes, S. De Haes, and W. Van Grembergen, “Developing a Value Management Capability: A Literature Study and Exploratory Case Study,” *Inf. Syst. Manag.*, vol. 32, no. 2, pp. 82–104, Apr. 2015.
- [13] R. Ashrafi and J. Mueller, “Delineating IT Resources and Capabilities to Obtain Competitive Advantage and Improve Firm Performance,” *Inf. Syst. Manag.*, vol. 32, no. 1, pp. 15–38, Jan. 2015.
- [14] J. Barney, “Firm Resources and Sustained Competitive Advantage,” *J. Manage.*, vol. 17, no. 1, pp. 99–120, 1991.
- [15] J. B. Barney, “Looking inside for Competitive Advantage,” *Acad. Manag. Exec.*, vol. 9, no. 4, pp. 49–61, 1995.
- [16] P. Mikalef and A. Pateli, “Information technology-enabled dynamic capabilities and their indirect effect on competitive performance: Findings from PLS-SEM and fsQCA,” *J. Bus. Res.*, vol. 70, no. October 2016, pp. 1–16, Jan. 2017.
- [17] C. Pereira, C. Ferreira, and L. Amaral, “IT Value Management Capability Enabled with COBIT 5 Framework,” in *Information Systems*, vol. 299, M. Themistocleous and V. Morabito, Eds. Springer International Publishing, 2017, pp. 431–446.
- [18] C. Ashurst, E. Doherty, and J. Peppard, “Improving the impact of IT development projects : the Benefits Realization Capability Model,” *Eur. J. Inf. Syst.*, vol. 17, no. 4, pp. 352–370, 2008.
- [19] H. A. Linstone and M. Turoff, *The Delphi Method: Techniques and Applications*. Reading, Mass. : Addison-wesley, 1975.
- [20] C. Okoli and S. D. Pawlowski, “The Delphi method as a research tool: an example, design considerations and applications,” *Inf. Manag.*, vol. 42, no. 1, pp. 15–29, Dec. 2004.
- [21] J. L. Worrell, P. M. Di Gangi, and A. A. Bush, “Exploring the use of the Delphi method in accounting information systems research,” *Int. J. Account. Inf. Syst.*, vol. 14, no. 3, pp. 193–208, Sep. 2013.
- [22] I. R. Diamond, R. C. Grant, B. M. Feldman, P. B. Pencharz, S. C. Ling, A. M. Moore, and P. W. Wales, “Defining consensus: A systematic review recommends methodologic criteria for reporting of Delphi studies,” *J. Clin. Epidemiol.*, vol. 67, no. 4, pp. 401–409, Apr. 2014.
- [23] R. Schmidt, “Managing Delphi Surveys Using Nonparametric Statistical Techniques,” *Decis. Scienses*, vol. 28, no. 3, pp. 763–774, 1997.
- [24] G. Dhillion, R. Syed, and F. de Sá-Soares, “Information security concerns in IT outsourcing: Identifying (in) congruence between clients and vendors,” *Inf. Manag.*, vol. 54, no. 4, pp. 452–464, 2017.
- [25] C. Pereira, C. Ferreira, and L. Amaral, “Shape a Business Case Process: An IT Governance and IT Value Management Practices Viewpoint with COBIT 5.0,” in *17ª Conferência da Associação Portuguesa de Sistemas de Informação*, 2017, pp. 60–75.