RESEARCH IN DIGITAL GOVERNANCE

USING THE DESIGN SCIENCE APPROACH

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Agenda

1. Introduction

2. Problem

3. Objective

4. Proposal

5. Evaluation

6. Conclusion

1. Introduction

Research area: implementing digital governance practices in organisations

Since 2005 I have been trying to solve this problem using several approaches, including: adopting general management practices, building new software tools, proposing change management techniques, creating new professional courses, developing maturity models, and identifying determinants.

But I have mainly used **meta-models** and **models** to design and integrate these practices.

1. Introduction

This keynote is based on the Design Science Research (DSR) approach.

- **Problem** - most organisations still manage their digital capabilities very poorly
- **Objective** - implementing (best) practices to improve the quality of digital governance using various engineering techniques, but modelling in particular
- **Proposal** - a method based on the Design Science Research (DSR) approach to facilitate the implementation of digital governance practices
- **Evaluation** - mainly performed through demonstrations in organisations
- **Conclusion** - includes the limitations and future work

2. Problem

ACM Computing Classification System

Applied Computing

Enterprise Computing

IT (aka Digital) Governance

Practices - Frameworks and Standards

COBIT, ITIL, CMMI, ISO standards

2. Problem

Implementation of digital governance practices in organisations is negligible

- E.g. in Portugal there are only 15 companies certified in level 3 CMMI-DEV

Typical solution: hire a consulting company (aka "nobody was ever fired for contracting IBM")

- Has several disadvantages (e.g. price, dependency, etc.)

Alternative solution: develop the skills internally

- Better, but time-consuming and riskier

2. Problem

Implementing new practices is much more than just implementing new processes

● Assessing the capabilities, linking to other practices, assigning roles, dealing with legal implications, implementing controls, training employees, relating with external entities, and so on…

Problem: **the difficulty in implementing digital governance practices**, particularly in (public and private) small and medium-sized organisations, such as city councils and hospitals

3. Objective

To facilitate the implementation of digital governance practices using various engineering techniques, with an emphasis on modelling
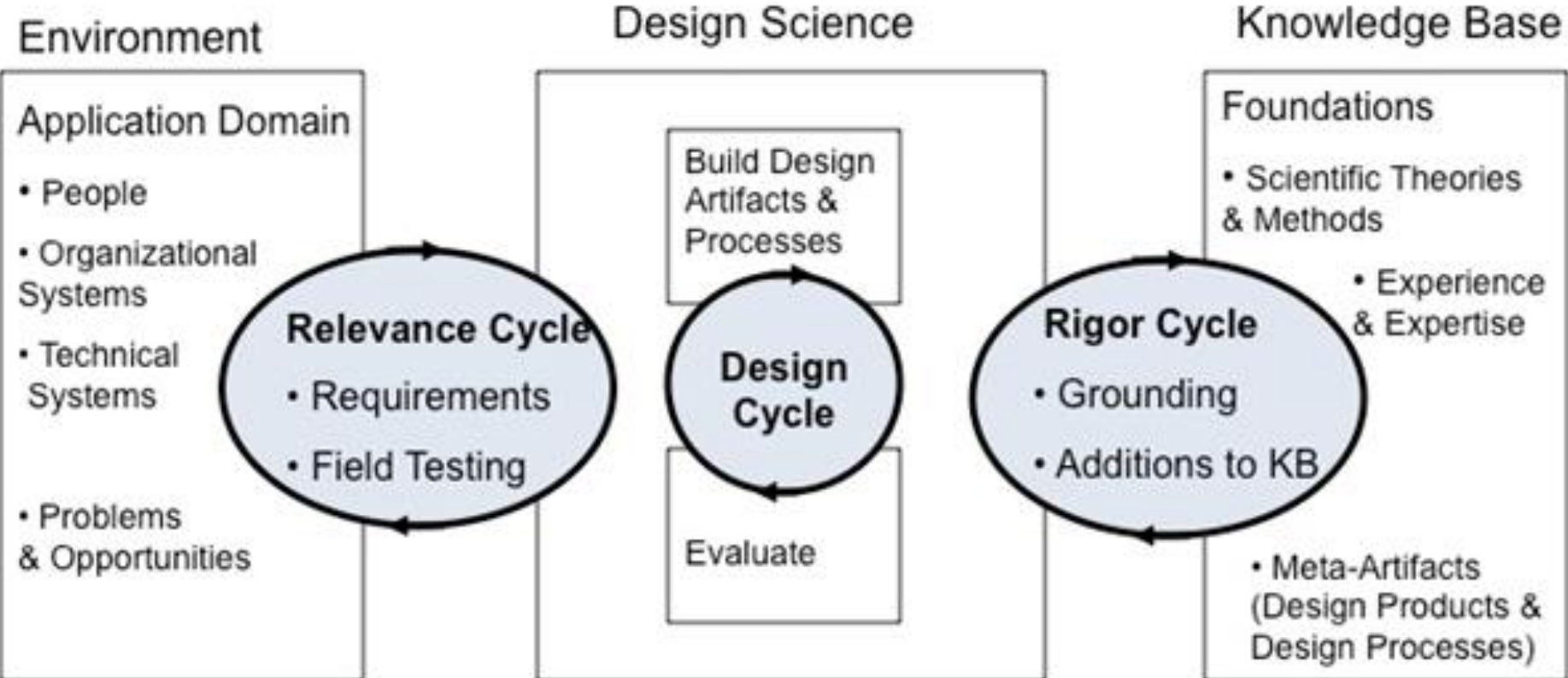
Practical relevance

- tackles concrete problems faced by organisations
- evaluates the artefacts through demonstrations

Scientific rigour

- takes advantage of the existing knowledge and experience, in both the research community and professional community

3. Objective

Environment

Application Domain
- People
- Organizational Systems
- Technical Systems
- Problems & Opportunities

Design Science

Build Design Artifacts & Processes

Relevance Cycle
- Requirements
- Field Testing

Design Cycle

Evaluate

Rigor Cycle
- Grounding
- Additions to KB

Knowledge Base

Foundations
- Scientific Theories & Methods
- Experience & Expertise
- Meta-Artifacts (Design Products & Design Processes)

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4. Proposal

A method based on the Design Science Research (DSR) approach to facilitate the implementation of digital governance practices

- **Relevance Cycle** - requirements, field testing
- **Design Cycle** - build and evaluate artefacts
- **Rigor Cycle** - grounding, additions to the KB

4. Proposal

Environment

* Too many frameworks and standards, overlapped
* Practitioners with lack of know-how and experience
* Many tools but difficult to configure, learn and use
* Resistance to change

Example of a problem:
* need for expensive consultants and auditors

Design Science

Digital Governance practices
* ontologies and models
* process maturity models
* service outsourcing
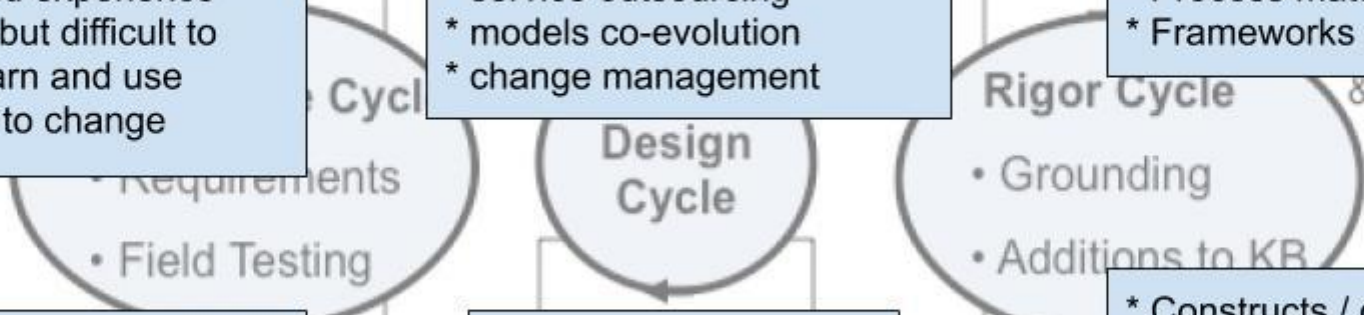* models co-evolution
* change management

Design Cycle

Organisations:
* Private companies
* Public institutes

Knowledge Base

* Design Science research
* Enterprise engineering
* Modelling methods
* Process maturity models
* Frameworks e standards

* Constructs / ontologies
* Meta models / canvas
* Process architectures
* Software architectures

Cycl ... Requirements
• Field Testing

Rigor Cycle & Expertise
• Grounding
• Additions to KB

4. Proposal

4.1 Relevance Cycle

Research usually begins by identifying problems and opportunities in organisations

- the criteria for evaluating the artefacts should also be defined

The proposed artefacts should also be evaluated in organisations, particularly through demonstrations

- evaluation results can, and should, be used as a starting point for a new research cycle, repeating the relevance cycle

4. Proposal

Examples
- Determinants in the adoption of enterprise systems (ISMJ 2015)
- Ontologies to represent and analyse models (KAIS 2017)
- ITIL's meta-model (ICSOC 2014) and TIPA in Archimate (SAC 2015)
- Several ITIL models in Archimate (CBI, EDOC, IJISMD, SAC, etc.)
- Maturity models for ITIL (SERVICES 2010), Scrum (ICSEA 2011), Cloud (CLOUD 2013), digital transformation (CBI 2015)
- Mechanisms for Enterprise Governance of IT in SMEs (CBI 2018)
- IT governance patterns (HICSS 2014) and enablers (DPRG 2019)
- GDPR implementation determinant factors (DPRG 2019)
- Model of Enterprise Risk Management (JEIM 2019)

4. Proposal

4.2. Rigor Cycle

Takes advantage of the existing knowledge and experience, including theories, methods, models, tools and other artefacts

- Research methods (inc. Design Science, Action Research, Delphi Method, Case Study, Literature Reviews, etc.) belong to this knowledge base

After being evaluated, the proposed artefacts are added to the knowledge base

- Not only to the scientific community but also to the organisations that fund the research effort, as well as professional conferences and journals

4. Proposal

Examples

Most proposed artefacts are based on research methods, the Archimate modelling language, and existing digital governance practices

- Models of risk (JEIM 2019), costs (CoopIS 2018), COBIT (EMCIS 2017), ITIL (CBI 2014), CMMI (CoopIS 2018) and ISO 2700x (EMCIS 2017)
- Research in research methods (DESRIST 2013, BMC 2017)
- New decision support model for COBIT 5 (AMCIS 2018)
- Contributions to the **practitioners' KB** (ISACA Journal 2018)
- **Software add-ons** to existing tools (CBI 2017, EDOC 2017, ISD 2018)

4. Proposal

4.3 Design Cycle

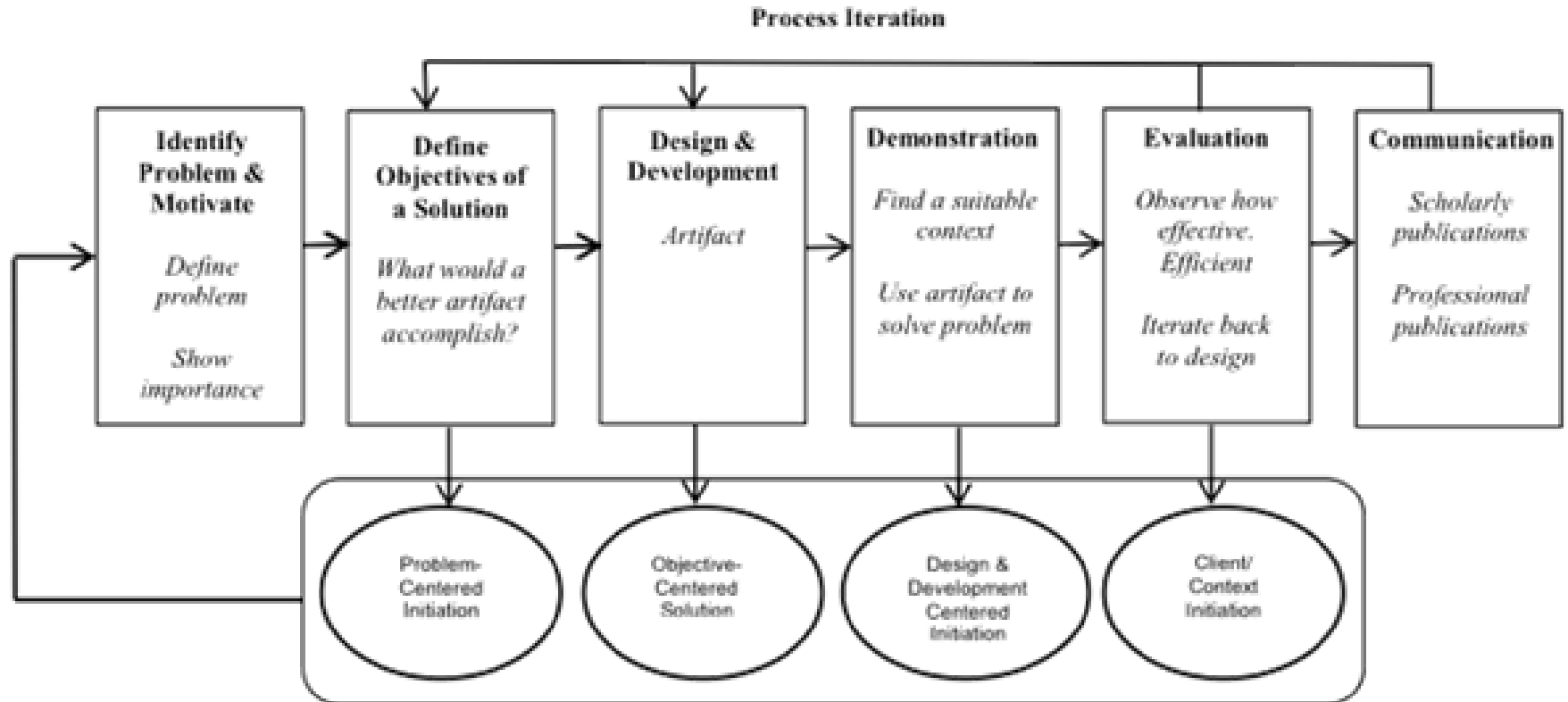In this cycle artefacts are constructed and evaluated

- Constructed - to solve organisational problems and based on the KB
- Evaluated - usually with demonstrations (practical applications in organisations, typically based on pilots) that are evaluated against criteria (usefulness, usability, etc.)

4. Proposal

4.3.1 Research Method

The proposed method to implement the **Design Cycle** is based on the specific six-step **Design Science Research (DSR) method** (Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007)

4. Proposal

Process Iteration

Identify Problem & Motivate	Define Objectives of a Solution	Design & Development	Demonstration	Evaluation	Communication
Define problem *Show importance*	*What would a better artifact accomplish?*	*Artifact*	*Find a suitable context* *Use artifact to solve problem*	*Observe how effective. Efficient* *Iterate back to design*	*Scholarly publications* *Professional publications*

Problem-Centered Initiation

Objective-Centered Solution

Design & Development Centered Initiation

Client/ Context Initiation

4. Proposal

Examples of demonstrations

- TIPA model demonstrated at the largest hospital in Lisbon (SAC 2015)
- Maturity model for digital transformation in public organisations (CBI 2015)
- Model for business continuity evaluated in the Tax Authority (CBI 2017)
- Requirements elicitation with focus groups (ECIS 2013)
- Scrum adoption with gamification (AMCIS 2018)
- Selecting a software tool for ITIL using MCDA (ISD 2018)
- Viewpoint for representing costs in enterprise architectures (CBI 2018)
- Using Scrum for implementing IT Governance with COBIT 5 (EDOC 2018)
- Model for risk management (JEIM 2019)

4. Proposal

Examples of interviews (ex-ante)

- IT governance patterns (HICSS 2014) - interviews
- Determinants in the adoption of enterprise systems (ISMJ 2015) - interviews
- Integrated IT governance and management (EDIC 2012) - case studies
- CSFs for IT outsourcing (IJEIS 2015) - interviews and cognitive mapping

Principles: Evolution of Enterprise Architectures using Ontologies (CBI 2017)

Literature review: EA Model Co-Evolution Operations Catalog (AMCIS 2018) and GDPR determinant factors (DPRG 2019)

5. Evaluation

Evaluates (mainly using demonstrations) whether the proposed research method can actually solve the problem identified, i.e. the difficulty in implementing digital governance practices

Research projects are examples of the practical application of the proposed method within organisations

5. Evaluation

Examples in IT Management

The demonstrations of the artefacts created using the proposed research method to facilitate ITIL adoption started in 2006 at EDP (the national electricity producer, distributor and retailer) and continued in 2009 at Turismo de Portugal

A proposal for an ITIL maturity model and a meta-model and several models for ITIL were demonstrated at several organisations in 2010-2015

More recently a proposal for selecting a tool and adopting ITIL were demonstrated in a bank and IT services provider

5. Evaluation

Examples in IT Governance

Research on COBIT 5 started only in 2013 (when COBIT 5 was published) and proposals are difficult to demonstrate in Portugal - due to few organisations implementing (or even considering) COBIT

- Integrated IT Governance and IT Management Framework (EDOC 2012)
- IT Governance patterns in banks (HICSS 2014) and hospitals (IJITBAG 2014)
- Model of COBIT 5 (EMCIS 2017) and business continuity (CBI 2017)
- Using Scrum for Implementing IT Governance with COBIT 5 (EDOC 2018)
- Baseline Mechanisms for Enterprise Governance of IT in SMEs (CBI 2018)

5. Evaluation

Examples in Software Development

- Requirements elicitation with focus groups (UKAIS 2009, ECIS 2013)
- Requirements elicitation with gamification (Procedia 2012, EC 2014)
- Scrum adoption with gamification (VS-Games 2017, AMCIS 2018, ISD 2018)

A proposal for a CMMI reference model (CoopIS 2018) was presented in the Capability Counts conference organized by the CMMI Institute in 2018

5. Evaluation

Examples in Multi-frameworks

Most organisations need to implement several frameworks and standards, thus my main research focus in the last two years has been to **model and integrate the best-known IT governance frameworks and standards** – such as COBIT, ITIL, ISO 2700x, ISO 31000, and so on.

The main objective of this research is to **facilitate their simultaneous implementation**, in particular, by taking advantage of the overlapping of mechanisms such as processes and roles.
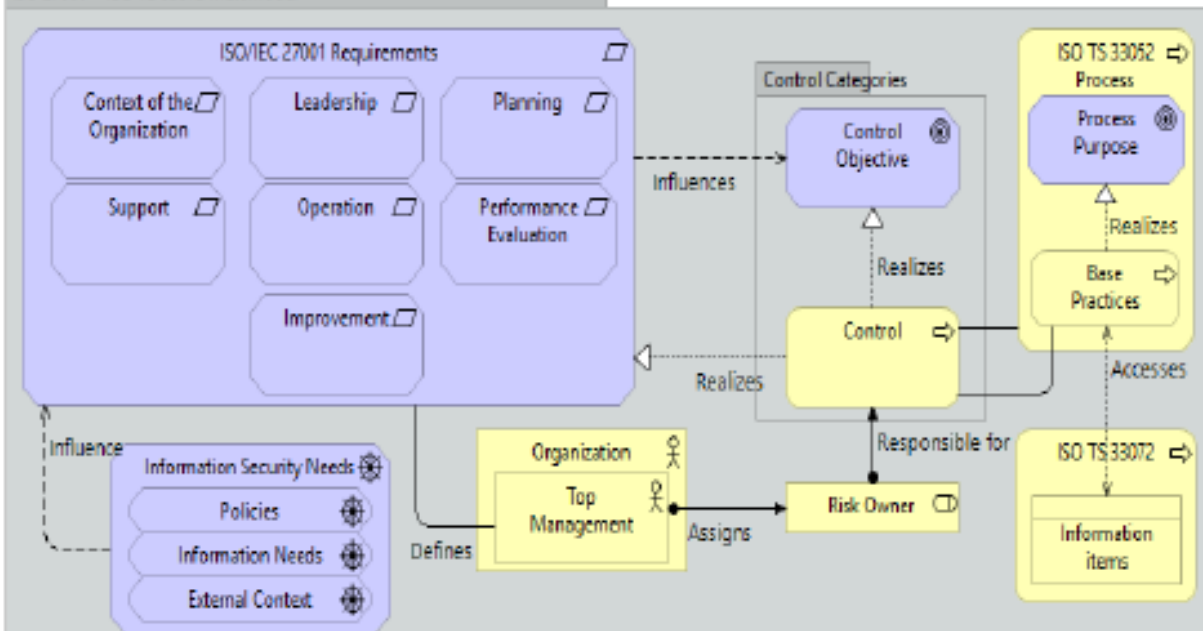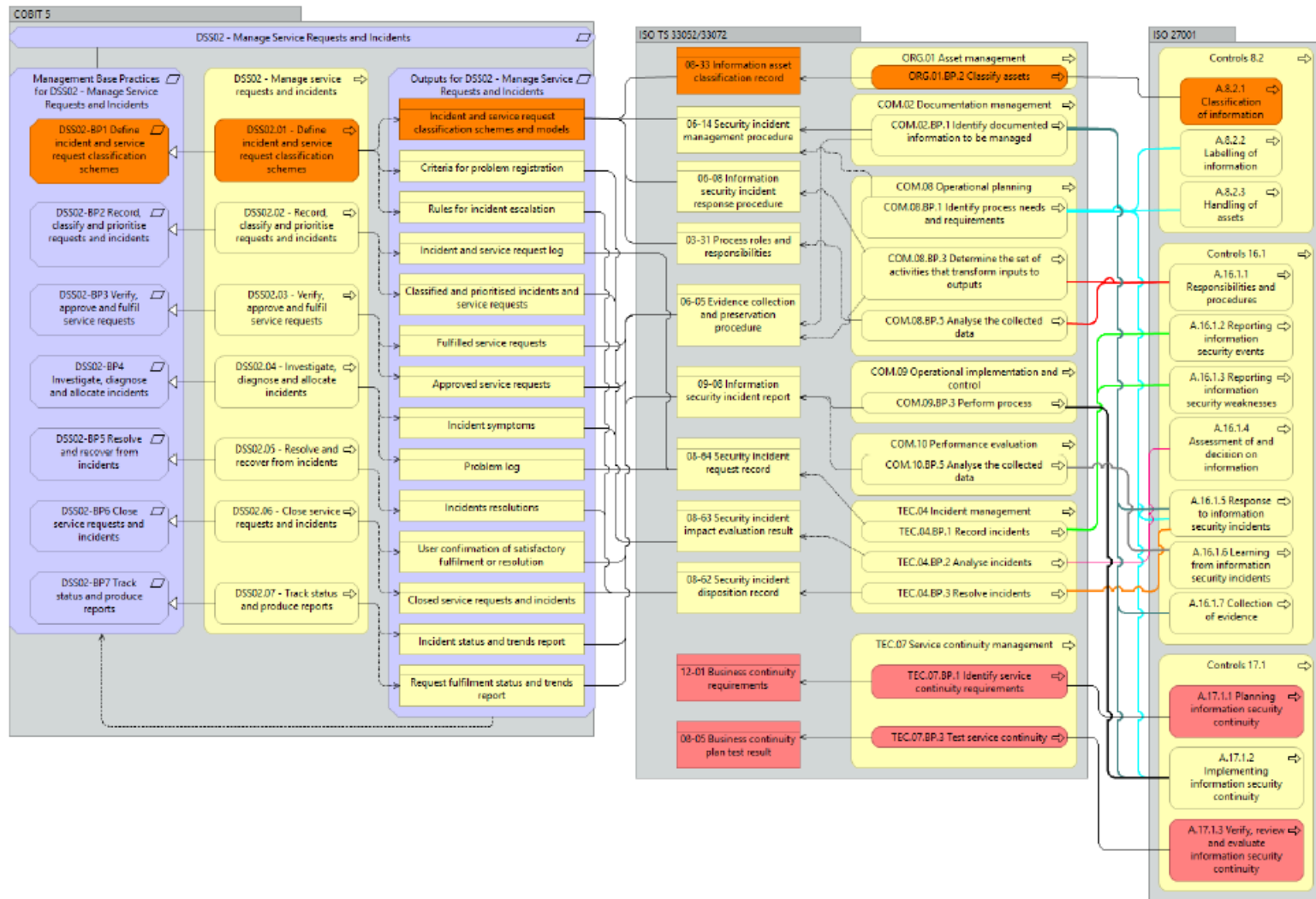
5. Evaluation

Some papers published about this topic:

- Map between COBIT and COSO (EMCIS 2016)
- Common meta-model for COBIT and ITIL (EMCIS 2017)
- Map between COBIT and ITIL (ISD 2016, HCITP 2019)
- Map between COBIT and ISO 2700x (EMCIS 2017)

I was responsible for a research project with an IT consulting company in which we modelled and mapped (using automated semantic analysis) COBIT, ITIL, ISO 2700x and ISO 31000 using a common maturity model based on the ISO 330xx and AHP. A tool was also being built to support an intelligent maturity assessment.

ISO 27001 + ISO TS 33072 Metamodel

ISO/IEC 27001 Requirements

Context of the Organization
Leadership
Planning
Support
Operation
Performance Evaluation
Improvement

Influences

Control Objective

Realizes

Control

Control Categories

ISO TS 33052 Process

Process Purpose

Realizes

Base Practices

Accesses

ISO TS 33072

Information items

Responsible for

Realizes

Information Security Needs
Policies
Information Needs
External Context

Influence

Defines

Organization
Top Management

Assigns

Risk Owner

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6. Conclusion
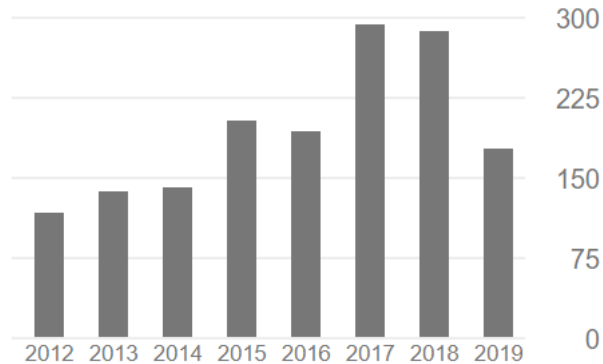
6.1 Contributions

Publications

18 papers in top journals (Q1) and conferences (A) in the last five years

Theses

9 PhD theses

150 MSc theses

6. Conclusion

Projects

In the last few years I have been responsible for several research and consulting projects in this area, including:

- **IMPROVER** European Research project (450K euros for INOV)
- XGamify research project with **Xpand IT** (190K euros)
- COBRA2 research project with **Compta** (100K euros)
- Implementing COBIT 5 and EA for the **Ministry of Finance** (50K euros)
- Implementing ITIL for a **bank** and COBIT 5 for another **bank**

6. Conclusion

Course

Since 2008 I have been responsible for a course about IT governance

- Based on active learning - not possible without all this research effort
- Successful course - very high scores from the students, high approval rates and average grades

6. Conclusion

6.2 Limitations

The main limitation is the **international recognition** of this research effort, in particular the number of papers published with non-Portuguese authors

- Two papers published in 2018 with professors from Brazil (AMCIS) and Colombia (SPICE) and one paper published in 2019 with a professor from the Netherlands (EDOC)

- One Phd student from Brazil and another from Cape Verde, and one PhD student (co-supervisor) in Brazil

6. Conclusion

Another limitation concerns my research area that (amazingly) has started to attract in the last few years less interest from organisations

IT is increasingly seen as "a necessary evil" and IT Governance frameworks and standards are not prepared to deal with digital transformation

- I have already started to do **research in digital transformation** by taking advantage of the extensive knowledge and experience acquired in IT Governance during the last few years, resulting in **3 papers about digital transformation in 2019**

6. Conclusion

Finally, the traditional collaboration model for doing research with companies (based on public funding to companies for research projects) is becoming exhausted, in particular in this research area

- I have already started to test novel collaboration models, such as "innovation as a service" and even "venture financing"

- One research project from a company in Australia

6. Conclusion

6.3 Future Work

My sabbatical in the last academic year had four main objectives:

1. **Travel to make my research more international** – by paying several visits to foreign research groups

2. **Evolve the research area** – by designing a new framework for digital transformation

6. Conclusion

3. **Develop new teaching methods** – by learning and experimenting new practices that take advantage of existing online courses

4. **Collaborate with new companies** – by testing new collaboration models with companies and public organisations