

José Manuel Catarino Barreiros Cascais Brás

**Bootstrapping enterprise models with business continuity
processes and DEMO**

Orientador: Prof. Doutor Sérgio Guerreiro (ULHT; IST/UL)

Universidade Lusófona de Humanidades e Tecnologias

Escola de Comunicação, Arquitetura, Artes e Tecnologias da Informação

**Lisboa
2017**

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Dissertação defendida em provas públicas na Universidade
Lusófona de Humanidades e Tecnologias no dia 22/ 09/ 2017,
perante o júri, nomeado pelo Despacho de Nomeação n.º:
258/2017, de 20 de Julho de 2017, com a seguinte composição:

Presidente: Prof. Doutor Rui Pedro Nobre Ribeiro (ULHT)

Arguente: Prof. Doutor José Manuel Nunes Salvador Tribolet
(IST/UL)

Orientador: Prof. Doutor Sérgio Luís Proença Duarte Guerreiro
(ULHT; IST/UL)

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Abstract

Business Continuity Plan (BCP) ensures the continuity of business processes in catastrophe or disaster situations, building organizational resilience and mitigating risks. Theoretically, BCP covers all the roles throughout the company, and identifies a blueprint of all key functions and processes with the objective of maintaining or restoring critical operations. However, due to poor documentation and misinterpretation of the complex business processes between the stakeholders, pinpointing and documenting all the key functions and processes is still a challenging task.

The research methodology used to conduct this thesis was the research of information and literature review and was supported by a case study in an insurance company. It studies and presents a new approach to complement the management of the BCP, supported by a conceptual integration of DEMO and the Business Continuity Planning. It presents an evaluation of this proposal and contributes with outcome learnings from the practice.

The aim is to complement and leverage enterprise's domain knowledge about key business processes and functional needs. The benefits of Design & Engineering Methodology for Organization should be tested in order to represent business processes at any domain, and therefore, aid managers in implementing and maintaining BCP.

Acknowledgements

The way to reach the end of this dissertation was a long journey and it was undoubtedly, after the birth of my three children, one of the most interesting and challenging projects of my life. This only could be possible with the support, help and encouragement of so many people during this time.

First and foremost, I want to dedicate this work to my daughters and son, Ana, Margarida and Lourenço Brás, to them my special thank you and a specific message: never give up on what you believe.

I also want to express my gratitude to my supervisor, Prof. Sérgio Guerreiro, for all the guidance and support, whose expertise and knowledge made this work possible. Also for all the patience and availability, during the pre-work performed before the end of this work, namely the articles elaboration and conferences presentations.

I want to thank my sister Ana Cristina who always have been there for me, my brother Carlos for his support and I dedicate a special message for him: you can do it.

I want to thank my mother Maria de Lourdes for all her support and never stop believing in me and for all the pride and love she always has for me.

Finally, I want to thank Maria for all her endless faith, patience and support.

Publications

Publications done during the thesis research:

- "Designing Business Continuity Plans using DEMO: an insurance company Case Study" [49] [8] - Enterprise and Organizational Modeling and Simulation: 12th International Workshop, EOMAS 2016, Held at CAiSE 2016, Ljubljana, Slovenia, June 13, 2016
- "Challenges for Assessing and Designing Business Continuity Plans" [7] - Poster, EMMSAD 2016, Held at CAISE16 - 28 th International Conference on advance Information Systems Engineering
- "Business Processes Design to Improve the Enterprise Business Continuity Plans an insurance company case study" [9] [4] - Advances in Enterprise Engineering XI: 7th Enterprise Engineering Working Conference, EEWC 2017, Antwerp, Belgium, May 8-12, 2017

Glossary

- Actor Role (An actor role is defined in terms of responsibility, authority, and capability [52].).
- Business Continuity Management (The process that organizations use to ensure business continuity is maintained across their organization [45] or BCM is an organization-wide discipline and a complete set of processes that identifies potential impacts which threaten an organization. It provides a capability for an effective response that safeguards the interests of its major stakeholders and reputation [41].; Documented procedures that guide organizations to respond, recover, resume and restore to a pre-defined level of operation following disruption. [43]).
- Business Impact Analysis (A process designed to assess the potential quantitative (financial) and qualitative (non-financial) impacts that might result if an organization was to experience a business disruption [11].).
- Call Tree (A document that graphically depicts the calling responsibilities and the calling order used to contact management, employees, customers, vendors, and other key contacts in the event of an emergency, disaster, or severe outage situation.).
- e3value (An ontology that helps exploring innovative e-business ideas - starting from understanding which enterprises and actors are actually involved, to an assessment of profitability for each enterprise [37]).
- Enterprise Governance (Enterprise governance is the set of responsibilities and practices exercised by the board and executive management with the goal of providing strategic direction, ensuring that objectives are achieved, ascertaining that risks are managed appropriately and verifying that the organisation's resources are

used responsibly [60].).

- Goodwill (Part of a company's value that includes things that cannot be directly measured, for example, its good reputation or its customers' loyalty - Definition of goodwill from the Cambridge Advanced Learners Dictionary & Thesaurus [12]).
- Risk (Potential for exposure to loss which can be determined by using either qualitative or quantitative measures [11].).
- Structured Walkthrough (Types of exercise in which team members physically implement the business continuity plans and verbally review each step to assess its effectiveness, identify enhancements, constraints and deficiencies [11].).
- Skeleton staff (The smallest number of people needed for a business or organization to operate [22] [13].).
- Transaction (A sequence of acts between two actor roles, including communication loop acts(request, promise, state and accept) [52].).

Acronyms

Action Model (AM).
Actor Bank Diagram (ABD).
Actor Transaction Diagram (ATD).
Action Rule Specifications (ARS).
Bank Contents Table (BCT).
Business Continuity (BC).
Business Continuity Institute (BCI).
Business Continuity Management (BCM).
Business Continuity Planning (BCP).
Business Continuity Strategy (BCS).
Business Impact Analysis (BIA).
Business Resilience (BR).
British Standards Institution (BSI).
Construction Model (CM).
Design and Engineering Methodology for Organizations (DEMO).
Disaster Recovery (DR).
Fact Model (FM).
Information Systems Audit and Control Association (ISACA).
Information Use Table (IUT).
Organization Construction Diagram (OCD).
Object Fact Diagram (OFD).
Object Property List (OPL).
Process Model (PM).
Process Structure Diagram (PSD).
Recovery Point Objective (RPO).
Recovery Time Capability (RTC).
Recovery Time Objective (RTO).
Risk Assessment (RA).
Transaction Pattern Diagram (TPD).
Transaction Product Table (TPT).

Transaction Results Table (TRT).

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Chapter 1

INTRODUCTION

A Business Continuity Plan establishes the strategies, procedures and critical actions needed to respond and manage a crisis situation [59] and expresses an organization condition to responds to unexpected disasters, disruptions or sudden business changes [17]. A crisis can result from a natural disaster, a catastrophe or might just occur from a simple accident and can cause the interruption of a service, a partial or total loss of the business [43] [39].

As a concept, business continuity (BC) has began in the sixties as IT "disaster recovery" and later was incorporated in the business environment with the motivation to safe and insure the high investments made in computer systems. A Business Continuity Plan grounds the strategies, related procedures and all critical actions needed to comply with and manage a crisis situation [59] and expressed in what state an organization is to deal with unexpected situations, that means disasters, forced outages, reorganizations and sudden changes in the business paradigm [17].

In order to ensure an ability to operate on an ongoing basis and limit losses in the event of severe business disruption, companies need to have documented Business Continuity (BC) and Disaster Recovery (DR) plans. They must be reviewed on a periodically basis and updated to reflect changes in the business environment or within the supporting IT infrastructure. In general, the BC plan need to identify critical functions, assets, processes and supporting systems in the business impact assessments, determine ways to operate key external services and internal functions in situations of disruptions, including alternative sites.

Events like September 11 2001 and hurricane Katrina in 2005 showed the vulnerability that companies that are technology dependent such as those in the finance, bank & insurance and telecommunications industry have. More recently, with the latest wave of terrorist attacks and due to this leverage risk, this theme is now discussed on a regular basis in boardrooms across the global corporate landscape as BC preparedness can mean the difference between life and death for a company.

After a disruptive situation, it is necessary to give an adequate response to the situations arising from it, and for this it is required to pre-establish the necessary measures to give an adequate response. The BC Plan allows the founding of strategies, procedures and critical actions necessary to respond and manage a crisis situation [59] and expresses an organization condition to responds to unexpected disasters, disruptions or sudden business changes [17]. These situations can result from a natural disaster, a catastrophe or might just occur from a simple accident and can cause the interruption of a service, a partial or total loss of the processes that sustain the business [39].

The British Standards Institution defines BC as the *"capability of the organization to continue the delivery of products or services at acceptable predefined levels following a disruptive event"*, also it defines business continuity management (BCM) as *"is a holistic management process that identifies potential threats to an organization and the impacts to business operations those threats, if realized, might cause, and which provides a framework for building organizational resilience with the capability for an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities"* [43].

Furthermore, The British Continuity Institute [6] states that the aim of BC is to provide a documented framework and processes to allow the organization to resume all of its business processes within its recovery time objective after a disruptive incident. Creating resilience to manage unpredictable changes within the IT and business ecosystems is fundamental to empower the business in returning to the original state in the presence of a Severe Business Disruption (SBD) occurs.

An enterprise model is an abstract representation of the enterprise. The model definition proposed by ArchiMate 3.0 [38] was used to interpret this concept. In the context of the ArchiMate language, which can be seen as a framework, it is a collection of concepts.

The ArchiMate core language distinguishes three enterprise layers: Business, Application, and Technology. The top-level hierarchical structure of the language, represented at figure 1.1, outlines:

- A model is a collection of concepts. A concept is either an element or a relationship.
- An element is either a behaviour element, a structure element, a motivation element, or a composite element.

According to the specification we must remind that these are abstract concepts and they are not intended to be used directly in models. To denote this, they are depicted in white with labels in italics. Another note is that implementation and migration elements (found on Chapter 13 of the ArchiMate 3.0 Specification) are instances of core elements [38].

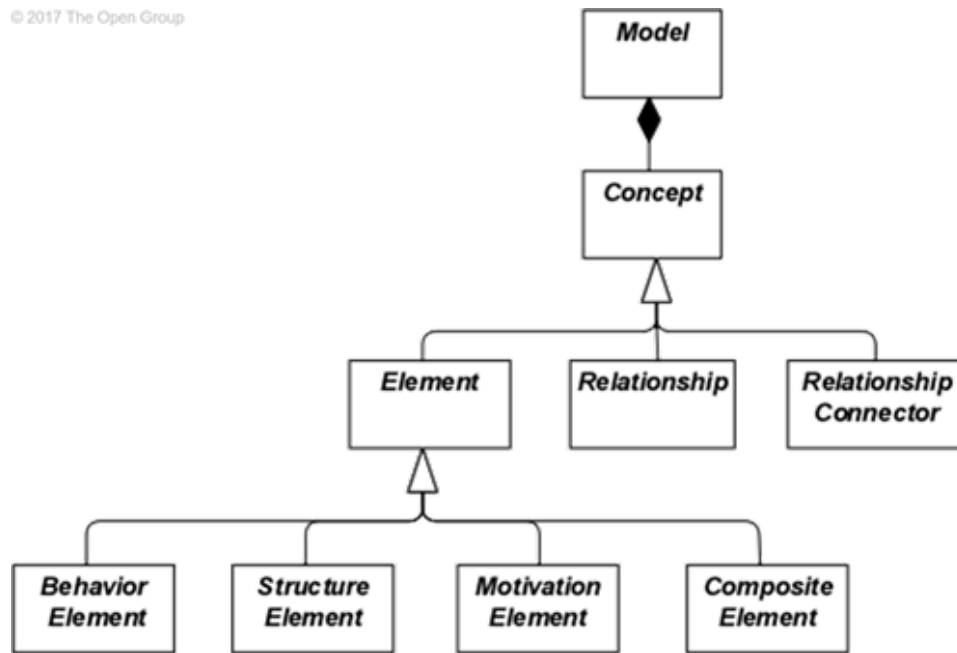


Figure 1.1: Top-level Hierarchy of ArchiMate Concept.

With these goals in mind it is fundamental to have an enterprise wide view and a tangible and consistent plan that ensures a covering blueprint of all the areas throughout the company in order to achieve the completeness of the organization's mission and a strategy to ensure the continuity of the operation. For that it is necessary to create a full map of all critical and non-critical processes in order to predict the consequences of disruption of a business function or process. Consequently, if necessary, the organization could be replicated in a different environment using deputies and understudies. In these emergency events, the previous mapped processes are resumed in order to reconstruct the vital operations and ensure the resumption of time-sensitive operations and services. Usually, a business impact analysis (BIA) includes the gathering of information to develop these recovery strategies.

Therefore, outlining all critical process and actors needed to perform those tasks is fundamental to ensure the BC and have organizational resilience [40]. One of the main challenges to implement an internal BCP is to establish the necessary knowledge about all key resources, key activities, key actors and all the interactions between them. Additionally, after a Severe Business Disruption an organization every so often needs to adapt their business to new realities and for that it needs to redesign and re-engineering their processes. Hence, it is important to have a methodology that allows an organization to change / adapt their processes, allowing the operation to continue working with the resources available.

Business Continuity Management allows an organization to build resilience to threats [36], but to build it, first, there is a need to understand the organization, the organization's

commitments and value added. What are its products, services, activities and associated resources, which are the essence to ensure the continuity of its critical activities at an appropriate level [34] [31]. Therefore, during a Business Continuity Plan life cycle, understanding the organization is crucial and is one of the steps to take during the Business Continuity Management Program Management [61]; see Figure 1.2.

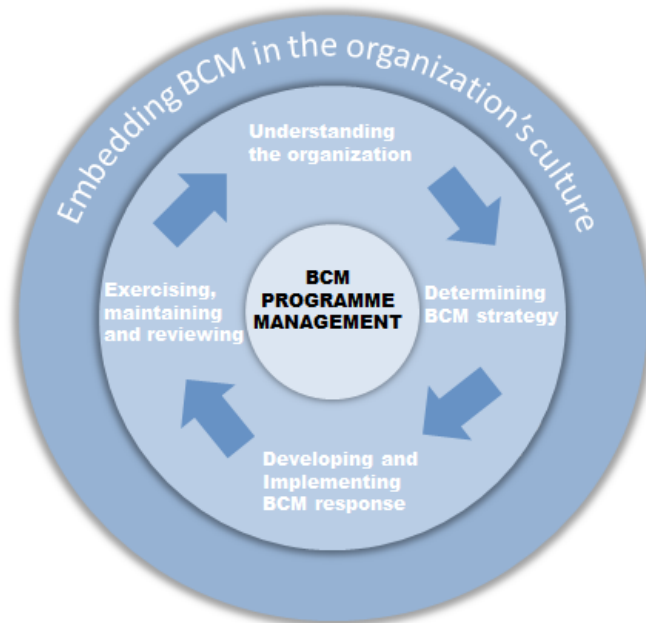


Figure 1.2: The BCM Lifecycle (Adapted from the British Standards Institution's BCM Code of Practice (BS25999-1. Now ISO22301) [6]).

With the requirements to implement and maintain a Business Continuity Management, an organization must identify organization's activities, functions, services, products, partnerships, supply chains, relationships with interested parties, and the potential impact related to a disruptive incident [30]. Additionally, its links between the BC policy and the organizations objectives and other policies, including its overall risk management strategy, must also be included [43].

The BIA is the base for the BCP and a vital piece of the process in a comprehensive Business Continuity Program. ISO 22301 stresses the importance of concluding four distinct steps to determine and assess the potential effects of an interruption to critical business operations. Figure 1.3 (Adapted from [43]) shows and highlights the overall steps to accomplish the BIA process.

The goal of the BIA is to detect and classify which business units/departments and processes are essential to the survival of the company. Identifying correctly all business processes will help evaluating the impact of disasters on business, providing the basis for investment in recovery strategies as well allowing to invest in prevention and mitigation strategies. After perform the BIA, the critical business processes and dependencies are

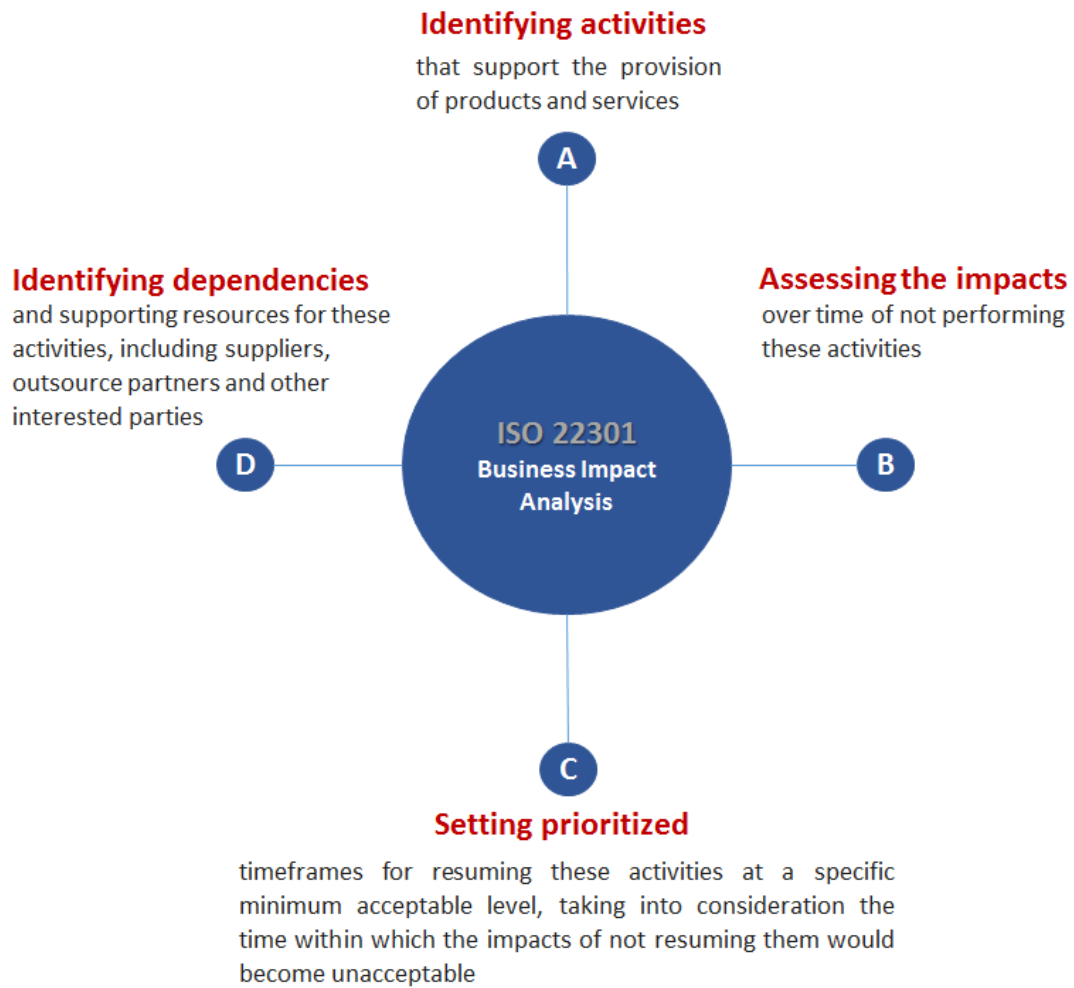


Figure 1.3: Business Impact Analysis) [43, p. 15].

identified, which will allow the organization to prioritize resources and focus on the most critical processes first, when doing planning or actual business process recovery during an SBD.

Finally, it is important to highlight that the International Organization for Standardization (ISO) Technical Committee (TC) 292, which is responsible for writing security, resilience, and business continuity standards, has just released the ISO/TS 22317:2015 - Societal security Business continuity management systems Guidelines for business impact analysis (BIA), the first and only international standard exclusively addressing the BIA.

1.1 Motivation

In the last decade business continuity process modelling and assessment is receiving more attention as the interest for having the correct representations of an organization is becoming more demanding and widespread. This trend has even increased due to the recent disruptive events that showed the vulnerability that the actual business environment faces now.

Hence, the success of a company and his continuity depends a lot of the correct management of its processes in order to support the company's value chain, as they have a series of activities that interact within the company [50], some of which have a direct and indirect interaction with the customers and suppliers - Primary Activities [19], albeit its performance is dependent on several other processes - support activities. Following a Severe Business Disruption, it matters to recover straight-away the primary activities and the essential support activities towards that goal.

All interaction generated around these activities, customers, suppliers, distributors and other internal and external stakeholders are accomplished by organizational processes. These processes are very important pieces for Business Continuity because they generate the flows of information.

Business continuity (BC) exists today as a result of both the evolution and the conjunction of a set of distinct roles [47]. Discuss around BC being part of the GRC (governance, risk & compliance) [51] or be a separate and independent discipline exists. The fact is that as a result of a natural evolution along with the need to integrate similar disciplines to provide new solutions [3] [5] is now a demand. BC needs new arguments to face the unexpected and some buzz now about BC shift or adopt new paradigms is emerging [2].

There are examples from several other disciplines that have shifted their paradigms or adopted new methodologies, with major improvements and efficiency: Enterprise Engineering with DEMO [29]; Project Management with Lean and Agile; Enterprise Architecture with TOGAF [58], Quality control with Six Sigma and so on. Some other hybrid applications were also found during this research: Lean Six Sigma or Enterprise Operational Analysis Using DEMO and the Enterprise Operating System [32], are also important examples.

Recent studies , present research results on the adoption of DEMO (design methodology and engineering for organizations) as a complement to the process of analysing the impact of processes on BC while others aim to identify essential operations in emergency response (to recover from a disaster) after earthquake and develop a general interaction model based on DEMO [48].

In this line of reasoning, the DEMO theory and methodology [29] can be used in a Business Continuity ecosystem to assess the understanding, designing and engineering implementation of a BC solution under an intellectual manageability needed: insight and

overview over the most complex tasks. DEMO theory and methodology captures business oriented transactions, allowing the understanding of the essence of an organization [29]. The traditional approaches used for BCM can this way obtain some improvements if they are based on the essential model.

To summarize, this research contributes with an integration between BC best practices and the DEMO concepts, to allow the construction of new models that enhance and serve as foundational knowledge to help building BCP. The integration of these two disciplines can allow a company to have a clearer view of the business and have a shared language that can be more easily understood by all involved stakeholders. Additionally it can allow to establish an easier way to redesign and re-engineering the business processes in the case of a disaster by supporting the management board dealing with a crisis situation.

1.2 Problem definition

An enterprise that relies on technology to support its business [16], often deals with complex business processes that cross multiple departments and disciplines, dealing with both internal and external resources. The challenge of capturing all the processes for the Business Continuity Plan is sometimes a very demanding task. Currently the traditional best practices don't follow the continuous demands that this task requests [20]. Because of the uninterrupted and increasing threats that all business fight to survive - Competition, terrorist attacks or natural phenomena, such as an earthquake, which can have a significant impact on a company, this discipline needs to be adaptive to face constant and different scenarios. A business continuity plan is based and depends on the correct assessment of all business processes to determine the cost impact of a sudden loss of key business functions.

The analysis of what is critical is done along with a Business Impact Analysis (BIA) to help assess which are the most important processes for the organization and determine which are the best recovery strategies [57].

Currently, most companies rely on technology to support its business [21] [16] and began to deal with increasingly complex enough business processes that intersect various departments and disciplines. The challenge of creating and maintaining a BC plan, identifying, classifying, in order to properly document all the processes that make up the business structure, is becoming a very demanding and complex task.

The problem is that these processes are often modelled using processing techniques that do not define mechanisms to evaluate the consistency and integrity of a business process. On the other hand, the documentation used is often inadequate, fragmented and inconsistent, leading to an erroneous assessment and misinterpretations. Many models of processes are difficult to understand by other people and to keep up to date, mainly

because they have no predefined naming guidelines or conventions. This can lead to misperceptions of the adopted notation elements. In addition, when the natural evolution process occurs, these models become obsolete, often inconsistent and by consequence difficult to maintain. On the other hand, it is necessary to provide to the management board a comprehensive view across the enterprise and at the same time, be deep enough, simplifying the representation of complex processes.

Additionally new regulatory obligations either directly applied or strongly encouraged by key customers, led organizations to start efforts to improve and document recoverability capabilities.

Regardless of how the Business Continuity Management program started to apply these new commitments, its development from a narrow focus has likely resulted in wide gaps in its ability to protect the organizations strategic and operational goals represents a close call that increased awareness that Business Continuity Management improvements are needed. As business continuity practitioner and by collecting over time the insights of key stakeholders and managers involved in the process of the continuity business plan management, key aspects to address have been identified at the actual best practices of managing a business continuity plan.

According to some of the insights from the business key stakeholders and managers these are the challenges that this research aims to give an answer:

(i) The Business Continuity Plan needs to have a consensual model representations of the business processes - (Due to the adoption of different process model representations, the interpretation of the process itself is not consensual and not easily understood - the adoption of a common methodology will standardize the documentation of this process);

(ii) Managers need to easily validate if processes comply with what is described at the business plan and check its completeness - (Managers need to verify their processes in terms of compliance and risk mitigation, for this they require complete representations of their processes and that are easily understandable);

(iii) The Business Continuity Planning needs a common driver for the understanding and communication, regardless of context or domain differences, of how to express business flows and activities - (Business Continuity Planning requires a common driver for understanding and communication, regardless of domain context or differences, how to express business flows and activities - (due to the existence of different forms of model representation of a process, the existence of a standard to represent all process facilitates the communication and understanding);

(iv) Tools to provide management an overview of the whole business but at the same time be deep enough, are needed. It is necessary to analyse and decide more easily when is required to approve a Business Continuity Plan - (A complete view of a process in a single model with all the necessary elements that compose it, streamlines and improves

understanding);

(v) Reduce the complexity of the representation of complex processes - (The way to have a complete view of a process often requires several representations of the stages of the process).

1.3 Contributions

This thesis work is expected to contribute with the following:

(i) Integrate two different methodologies to leverage Business Continuity Management using DEMO (The integration of the two methodologies will be more positive as opposed to the use of both in an isolated way since we can take advantage of the positive points of each one and complete the lines that both have);

(ii) Help to identify critical information useful for the Business Continuity processes assessment (The process of identifying the critical processes and their dependencies will be more accurate);

(iii) Facilitate discussions about the Business Processes.

1.4 Thesis Statement

This section explains the formulation of the thesis hypothesis but for that it is imperative to explain some of the core concepts that will be of great use for the research purposes.

During this research, concepts related to Business Continuity and the Design and Engineering Methodology for Organizations, their needs and expectations will be explained and co-related among them, in order to look for connection points. The evolution of the complexity of business processes and their means of support require now a better preparation for the unexpected and an adequate response for disruptive events. Good knowledge of the business, proper documentation, superior preparation for the effects of a disaster are crucial points that will be mentioned during this thesis.

1.5 Thesis Hypothesis

- Design and Engineering Methodology for Organizations plus the Business Continuity Management methodologies can reduce wrong impact calculations and improve communication related to poor documentation that supports a Business Continuity plan and therefore leverage enterprise knowledge.

1.6 Methodology

This section explains the research methodology used to gather information related to the subject presented at this research investigation.

This thesis seeks, through a review of specialized literature and a case study as research methods, to present a reflection of the contributions that the combination of the area of business continuity and process design together might offer for the development of theory and practice in these two areas.

The use of the case study as a research method highlights the contributions that unique cases can offer. It is hoped that the exposition of the elements contained in this thesis may help researchers to better evaluate the contribution that this research using a single case can bring to other researchers as well as to the development of knowledge and practice in business continuity and process design.

Methodologically, the original information which was collected, accessed and used during the course of the research, and originated the findings and final report of this research. The collection and the analysis of data for this research was done doing meetings with process key stakeholders. They are the owners of the needed knowledge that will help in developing more in-depth understanding of the processes to be modelled. Also some semi-structured contacts on the subject with peers, was done and internal documents were also analysed and reviewed.

In resume the methodological approach was done using:

i) Identification of the problem - based on the feedback given from the participants of the annual BC exercises and from managers. The need to produce outputs based on their business processes, (Business Impact Analysis assessment and surveys) and to ensure that the BC plan addresses the processes and all necessary activities are accurate (structured walk-through and checklists), where identified as areas for improvement. The existing documentation that supports these activities is often referred to as poor or excessive and not easily understood by all involved. A common language between all stakeholders is needed when representing business processes.

(ii) Interviews with the process owners;

(iii) Defining objectives - the objectives were defined based on business needs and by reviewing literature, in order to identify the possible solutions for the problem. Also the Business Impact Analysis demands to identify activities that support the provision of products and services as well as identifying dependencies and supporting resources for these activities, can possibly be covered by DEMO.

(iv) Research of information;

(v) Literature review;

(vi) The use of a case study;

(vii) Collecting data from internal documentation (to help analysing other integration

attempts with modelling tools, to collect and document critical processes);

(viii) Asking questions to key stakeholders of critical processes;

(ix) Understanding key stakeholders, by observing and interviewing them (it was necessary to first understand and take into account the priorities and concerns of all different stakeholders and this was done using observation techniques. Afterwards it was necessary to do a stakeholder mapping and analysis: identifying different stakeholders level and influence in the organization);

(x) Engaging stakeholders, This process was done by organizing annual exercises to review and validate the process steps for each area. These exercises are mandatory for companies that have a business continuity program.

(xi) Designing and developing the solution - DEMO was identified as a possible solution for the aspects raised above.

(xii) Collecting information to build the DEMO models - the information to generate the ATD model presented at this case study was based on the existing documentation collected from RTFs related to the business process and also with one-on-one interviews with the stakeholders of the process.

(xiii) Compilation of findings as result of literature review, that result on the identification of a set of limitations that could be solved by the DEMO/BIA integration, results are presented on table 5.1.

(xiv) Compilation of findings as result of the analysis of the conducted case study, the results are presented on table 5.2.

(xv) Present the solution found - the new methodology was presented and explained and it was necessary to perform several interactions to this first model before being able to present the final version of the ATD model.

1.7 Thesis structure

The thesis work is organized in seven chapters, described as follows.

Chapter 1, introduces the ontological approach to BC combined with the concepts of DEMO theory and methodology, where the case study was founded. Also explains the research methodology used and in section 4 the design is presented and the decisions explained.

Chapter 2 is the literature review of the essential background of the topics covered.

Chapter 3 present conceptual foundations, particularly about BC concepts and the case study advances.

Chapter 4 explains the research methodology used and in section 4 the design is presented and the decisions explained.

Chapter 5 presents the learnings obtained from the case study

Chapter 6 concludes and presents future work.

Chapter 7 Has all annexes needed for the thesis research work.

Chapter 2

LITERATURE REVIEW

New solutions to define, implement and manage Business Continuity Management in the scope of complex organizational business processes [33] [14] have been receiving an increasing interest by the industry, *e.g.*, the TOGAF 9.1 standard [58] that included the principle of BCP within the architecture principles framework. Moreover, some evidences that ontological models are being attempted and tested to fulfil the goals of Business Continuity Planning are found in the literature. In the specific enterprise engineering field, Riege and Aier [54] explore the Enterprise Architecture (EA) contingency factors and the dominating EA application scenarios that are followed in the EA method engineering. The authors point EA models as a realization tool to support the Business Continuity Planning initiatives. Depending on the degree of realization approach followed by an organization, EA is referred as adequate to deliver transparency, *e.g.*, regarding market segments, product catalogues, and business functions of the organization and their interdependencies. At the same time, Winter and Schelp [62] stress the importance of EA when applying to different organizational applications. The context of compliance management, BCP, enterprise governance, risk management, IT service management [10] are pointed as core application examples that can benefit from using EA-based approaches.

2.1 Enterprise Architecture

Nowadays most of the companies need a good, balanced and integrated design of the enterprise to face constant challenges and have business performance.

In concept, Enterprise architecture (EA) identifies the main components of the organization using a holistic approach for the successful development and execution of a strategy. This permits an organization to have an overview of its business that aims companies to detect and fix existing problems, reduce duplication of processes and plan for the future. The objective is to more effectively model the impact of changes and gain efficiency. To achieve this goal, it is necessary to evaluate which components work together to achieve

the defined business objectives and how information systems are organized to support the organization's business processes. This can be done through analysis, design, planning and implementation of the company [46].

EA applies architecture principles and practices to guide organizations through the business, information, process, and technology changes necessary to execute their organizations strategies and are the foundation for both business and IT architectures, standards, and policy development [44].

2.2 Enterprise Ontology

Nowadays it is fundamental to an organization not only to understand how the organization works but also to capture and retain knowledge [18]. This can be done by modelling its business processes with the use of an ontology for describing the elements, concepts, structures of the enterprise and the business itself. This knowledge can be captured and represented by modelling, here called the organizational model [24].

In conceptual terms, Enterprise Ontology is a way of perceiving the construction and operation of a company independently of its realization and implementation [28]. It is basically the highest-level constructional model of an enterprise, and the implementation model being the lowest one. By using an ontological model, it is possible to reduce its complexity dramatically, compared to the implementation model [4].

It is also a way of gaining knowledge about how the organization works, allowing the development of a global awareness about the organization, as it allows the sharing of knowledge among individuals. This can be done through the representation of different organizational aspects, such as business processes, resources (Technological artifacts, suppliers, key stakeholders etc.) and by representing the organizational structure. Only by applying this notion of Enterprise Ontology can substantial strategic changes of enterprises be made intellectually manageable [23].

In resume, Enterprise ontology allows an organization to focus on the operation of an organization in a way that is completely independent of the organization's realization and implementation. A theory that is implicit in the notion of a corporation presented by Jan Dietz is called the PSI theory [15]. The author uses this theory to construct a methodology that provides an organization-level model, which is a coherent, comprehensive, consistent, and concise model of the organization, which only shows its essence. This methodology is called the Design Methodology and Engineering for Organizations (DEMO). It allows a reduction of its complexity making an organization, more easily manageable and transparent, synthesizing and showing consistency across all fields within the organization, such as business processes, workflows, organizational structure, interdependencies, and key people.

2.3 DEMO theory and methodology

The ontological design approach presented in this research follows a separation of business processes (*SoP*) approach founded in the DEMO theory and methodology [29]. From the business processes point of view, DEMO introduce capabilities to deal rigorously with the dynamic aspects of the process-based business transactions using an essential ontology that is compatible with the communication and production, acts and facts that occur between actors in the different layers of the organization. A DEMO business transaction model encompasses two distinct worlds: *(i)* the transition space and *(ii)* the state space.

In addition Demo provides intellectual manageability allowing to understand the fundamental construction and operation of the enterprises organisation. This means to know who are the key members of the organization and understand how they communicate between them. This applies to people in the environment that constitute an enterprises organization (staff, customers and suppliers) [27]. Jan Dietz in his work points five techniques for managing with the complexity of enterprises. Very useful for dealing with chaotic and stressful situations after a serious interruption of the business, as it reduces its complexity. It also will permit to be agile, stay competitive and cost-effective. As Jan Dietz calls, "intellectual techniques sapiences":

- Separation of concerns.
- Use of abstraction.
- Devising proper concepts.
- Verification by instantiation.
- Validation from ontology.

On the one hand, the DEMO transition space is grounded in a theory named as Ψ -theory (PSI), where the standard pattern of a transaction includes two distinct actor roles: the Initiator and the Executor. Figure 2.1 depicts this basic transaction pattern. The goal of performing such a transaction pattern is to obtain a new fact. The transactional pattern is performed by a sequence of coordination and production acts that leads to the production of the new fact. In detail, encompasses: *(i)* order phase that involves the acts of request, promise, decline and quit, *(ii)* execution phase that includes the production act of the new fact itself and *(iii)* result phase that includes the acts of state, reject, stop and accept. Firstly, when a Customer desires a new product, he requests it. After the request for the production, a promise to produce the production is delivered by the Producer. Then, after the production, the Producer states that the production is available. Finally, the Customer accepts the new fact produced. DEMO basic transaction pattern aims

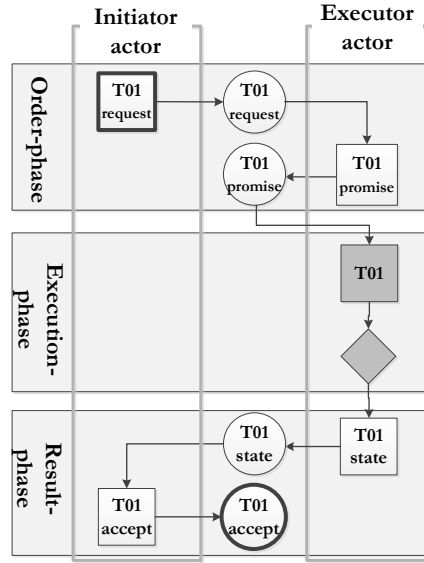


Figure 2.1: The DEMO standard pattern of a transaction between two actors with separation between communication and production acts (Adapted from [29]).

specifying the transition space of a system that is given by the set of allowable sequences of transitions.

Furthermore, the DEMO state space delivers the model for the business transactions facts, which are products or services, and are obtained by the business transaction successful execution. Throughout the business transaction execution more intermediate facts are required.

Nevertheless, the ontology used on this research satisfies the following quality requirements (C₄E) [29]: Coherence - composes a whole; Comprehensiveness - all relevant elements are represented; Consistency - it doesn't contain any contradictions or irregularities; Conciseness - as the model only contains the necessary elements and Essence - it is independent of realization and implementation of the enterprise. DEMO-3 allows and representing an organization from an ontological perspective and consists in the integration of four partial models, creating a whole view of an organization. Each one has a specific view of the organization: Construction Model, Action Model, Process Model and Fact Model [26] as showed at Figure 2.2 and resumed on Table 2.1.

2.4 The DEMO Models

The Construction Model (CM), more specifically and according to [28] contains all identified transaction kind and the associated actor roles defined from an ontological perspective. The CM is composed by two models, namely the interaction model (IAM) and the Intersection Model (ISM) [1], they both show the active and passive influences between

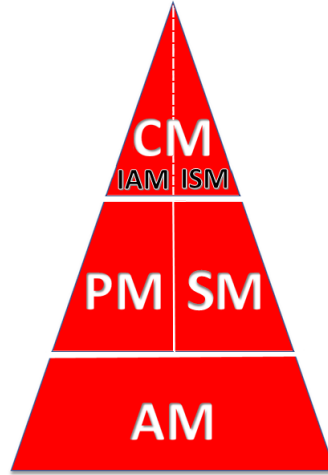


Figure 2.2: The ontological model of an organisation in DEMOSL-3

actor roles. It shows the composition, the environment, the interaction structure and the interstriction structure of his elements. It is the most concise model as it has only the necessary elements to represent the whole process. The CM of an organization, and specifically for this process, is represented by a Transaction Result Table (TRT) and the Actor Transaction Diagram (ATD), both compose part of the IAM. The ISM (that is the terminus of the CM) will be the remaining part and it is composed by the Actor Bank Diagram (ABD) and the Bank Contents Table (BCT). The identification of the production and coordination banks is done by the BCT and the ABD inserts these banks into the ATD, that will result on the Organization Construction Diagram (OCD).

These two models are produced at the end of the process because the Demo methodology, in terms of the way the models are produced is anticlockwise, starting with the IAM of the CM with the ATD and the TRT to define the boundaries of the enterprise, the participant actor roles and all identified transactions and finish with the ISM. Next step will be the PM, according to [28], the specification of the state space and the transition space of the C-world. The AM, placed at the bottom of the triangle, comes next and this model consists on a set of action rules which are expressed in a pseudo-algorithmic language. The State Model (SM) will be following step and is expressed in the OFD and the OPL. *The Process Model (PM)* details the coordination event kinds and the applicable rules, including the cardinality of the events and contains only the event rules between transaction processes, represented by links between process steps. It is represented by the Process Structure Diagram (PSD) that designates the process steps for each transaction and the relations related with the transactions, and also all the actors that take part of it, on the other hand the IUT is responsible to identify the object classes, the fact types and the result types, and relate them with the process steps. As an option a Transaction Pattern Diagram (TPD) is used to complement the model. *The Action Model (AM)* sets the action rules that will base the actors while dealing with their appointments, specifying

MODEL		DIAGRAM / TABLE	CONTENTS
CM	Interaction (IAM)	Actor Transaction Diagram (ATD)	Actor Roles, Transaction types and their connecting links
		Transactions Results table (TRT)	Transaction and Results types
	Interstriction (ISM)	Actor Bank Diagram (ABD)	Information banks, actor roles and information links
		Bank Contents Table (BCT)	Object classes, fact types, result types and production banks
PM	Process	Process Structure Diagram	C-act/C-result, P-act/P-result, casual and conditional links and responsibility areas of actor roles
		Information Use Table	Process steps and object class, fact types or result types
AM	Action	Action Rules Specification (ARS)	Action rules
SM	State	Object Fact Diagram (OFD)	Information banks, actor roles and information links
		Object Property List (OPL)	Object classes, fact types, result types and production banks

Table 2.1: DEMO Models Resume

the production and/or coordination acts that should be fulfilled represented by means of Action Rule Specifications (ARS). *The State Model (SM)* explicits the ontological model of the state space and the transition space of its production world and is represented in an Object Fact Diagram (OFD).

2.5 DEMO - The classic Pizzeria Example

It will be used a classic example like the Pizzeria [28], that exemplifies a simple case of a company supplying physical goods to customers, to explain the ontological model concepts. So the first step to build an ontological view the company will be the CM as the starting point that is located at the top of the triangle (figure 2.2)). It will provide us the identification of all transaction kind and associated actor roles and it is achieved, first by using a direct observation of the performing of organization's processes along with interviewing all the stakeholders, managers and also by observing the customers. The results about the process, i.e. how it is done, how they do their work, and the results of each transaction will be identified and listed in a Transaction Result Table (TRT) , that can be view on table 2.2. An Actor Transaction Diagram (ATD), figure 2.3, will be done to identify actors roles and their transactions. Here we can see that four actor and transactions will be necessary to execute the order, preparation, delivery and payment of a pizza. These are the first steps to build the CM and compose the Interaction Model (IAM) that shows the active influences between actor roles, i.e., the execution of transactions. Additionally to the IAM the Interstriction Model (ISM) will be needed because it shows the passive influences between actor roles i.e., the taking into account by an actor role of

existing facts when being active. Here we will find the Actor Bank Diagram (ABD) and the Organization Construction Diagram (OCD).

After that, the Process Model with the Process Structure Diagram (PSD)(figure 2.4) will specify the transaction and the state space of the C-world. The Action Model (AM) will provide us the Action Rules Specification (ARS) and the State Model with the Object Property List (OPL) in conjugation with the Object Fact Diagram (OFD). The transition space of the P-world is derived from the C-world. The PSD and a IUT (Table 2.3) which in order are: identifying each transaction's steps and it's inner relations, and information's on these relation will be prepared result will be enterprise ontology.

Transaction Type	Result Type	Starts	Executs
T01 - Completion	R01 - purchase P has been completed	B-A01	B-A02
T02 - preparation	R02 - purchase P has been prepared	B-A02	B-A03
T03 - payment	R03 - purchase P has been paid	B-A02	B-A04
T04 - delivery	R04 - purchase P has been delivered	B-A01	B-A02

Table 2.2: Transaction results table of the pizzeria.

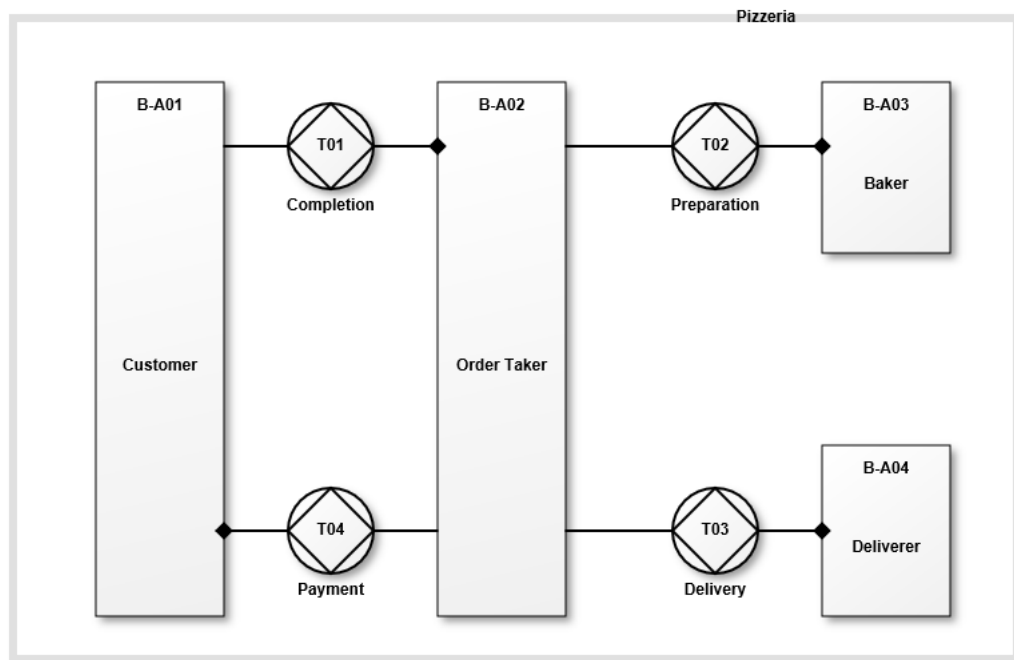


Figure 2.3: ATD model of the Pizzeria

Moving forward, it is needed to represent all key actors that are responsible to execute each step of the business process. This representation allows an organization to monitor or control the process and act if necessary. This is done using the Process Structure Diagram (PSD) model.

The PSD model is exemplified at figure 2.4, where all the transaction type of the process related steps that should be taken to the delivery a pizza are represented.

Object class, fact type, or result type	Process Steps
PURCHASE	T01/rq T02/rq T03/rq T04/rq
CUSTOMER	T01/rq
C is the customer in P	T01/rq T04/rq
PIZZAKIND	T01/rq T02/pm
totalprice	T02/rq
delivery address	T04/pm

Table 2.3: IUT of the pizzeria.

2.6 Corporate Governance

Presently corporate governance has a significance importance as increasingly legislation, regulations, and external standards exist and require organizations to adapt their processes. Now large and medium organizations need to provide proof of control measures implemented to external auditors and assessors. The need to be compliance with these laws, regulations, and standards is a key matter and concern of business continuity planning/disaster recovery (BCP/DR) personnel.

The corporate governance of an organization consists of two dimensions:

1. Compliance or corporate governance.
2. Performance or corporate governance.

Applying these two dimensions to good corporate governance is important and fundamental to the success of an enterprise to achieve the corporate strategy. However, good self-governance alone may not be enough to make a successful organization, because if it is not properly supported, there is a danger that insufficient attention will not be given to the need for organizations to create and insure wealth or Stakeholder value. Strategy and performance are also important. The key message of corporate governance is that an organization balances the two dimensions of compliance and performance needs to ensure long-term success.

Therefore, the need to be aligned with the organization's strategy is one the examples. On the article "EX-ANTE and EX-POST Model Development and Monitoring of the Portuguese Air Force Effort Regime" [53] regarding the Portuguese Air Force needs to control, monitor and execute critical processes in order to achieve the necessary results is a good example.

In this case, there are supervisory mechanisms established for the board to ensure that good corporate governance processes are effective. This can also be applied to Business Continuity.

2.7 Business Continuity Management

The Business Continuity Management (BCM) is a discipline that permits a company to align its business to GRC frameworks. "BCM Lifecycle shows the stages of activity that an

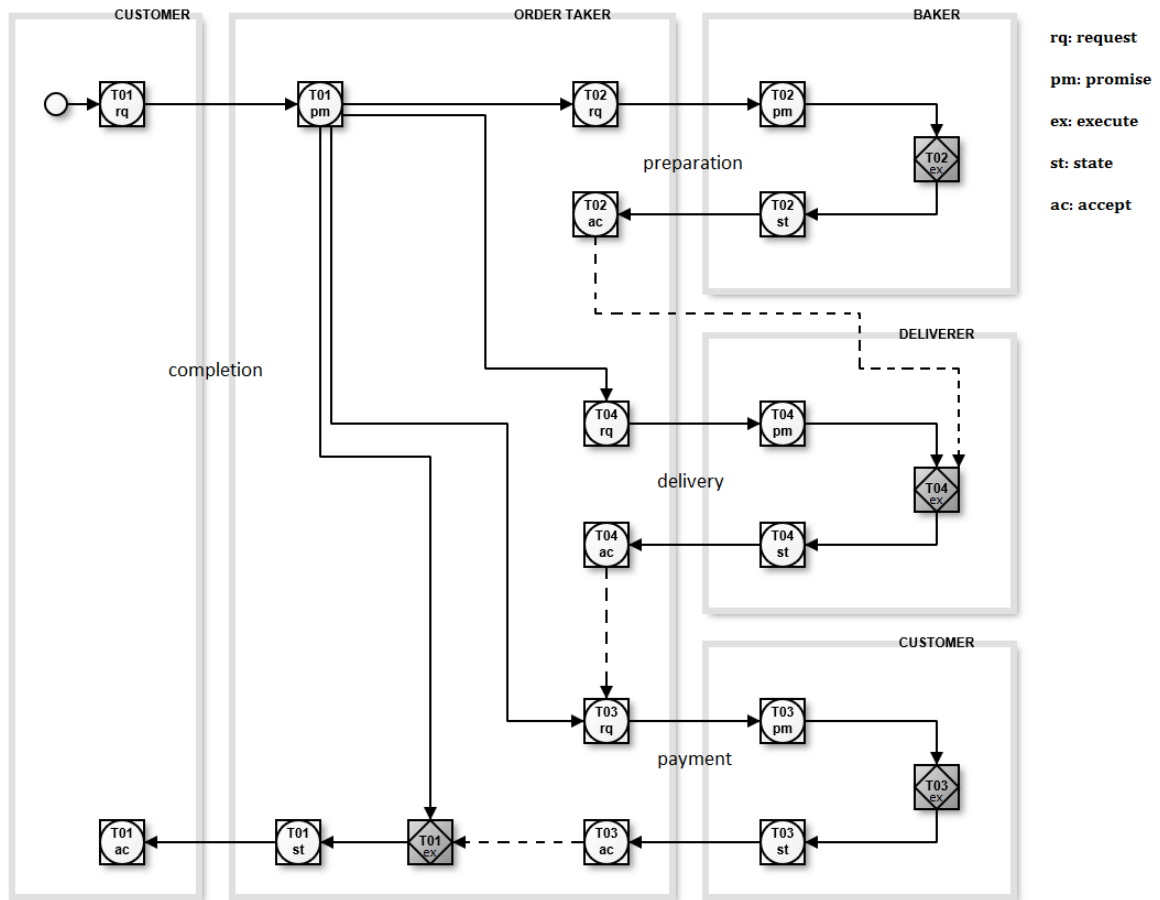


Figure 2.4: PSD model of the Pizzeria

organization moves through and repeats with the overall aim of improving organizational resilience. These stages are referred to as the Professional Practices and are made up of Management and Technical Practices.” [41]

ISO 22301:2012 is the international standard for Business Continuity Management Systems (BCMS), and replaced the BS 25999-2, which was withdrawn in 2012. This standard provides a framework for managing business continuity in an organization regardless of her type or size. Organizations that want to establish, implement, maintain and improve a Business Continuity Management System, ISO 22301 applies [43]. Its structure focuses on specific key areas which are crucial for business continuity planning, clause four of the standard is particularly interesting for this study, because it is focused on the context of the organization to determine external and internal issues that could have an impact on the organization. This part stresses the potential impact that a Severe Business Disruption can have on the expected results on the overall of the organization’s activities. One of the features of this standard is that it allows an organization to obtain accredited certification against this standard. This means that it will be able to demonstrate to legislators, regulators, customers, and other stakeholders its compliance and also that they are following

to good practice in Business Continuity Management.

The outputs from the Business Impact Analysis (BIA) and Risk Assessment (RA), which establishes and maintains the capability to resume business operations upon a disruption of service or event, will be the base and permit to develop and implement a resiliency strategy. This strategy should reflect and include the following objectives regarding the business continuity/disaster recovery planning:

- All process shall include the recovery, resumption, and maintenance of all aspects of the business, not just recovery of the technology components.
- Involve the development of recovery strategies and the prioritization of business objectives and critical operations that are essential for recovery.
- Regular updates to the business continuity/disaster recovery plan based on changes in business processes, audit recommendations, and lessons learned from exercising/testing.
- Represent a cyclical, process-oriented approach that includes a business impact analysis (BIA), a risk assessment, risk management, and risk monitoring and exercising/testing.
- Incorporate the input from the ISO 22301, FFIEC-Business Continuity Planning/IT Examination Handbook (Federal Financial Institution Examination Council) [35], and industry best practices.

2.7.1 Business Impact Analysis

The Business Impact Analysis is a process that is used to determine the effects of an interruption of business processes in each business unit and to the organization as a whole. According to FFIEC, a BIA shall include three primary goals [35]:

- "Determine Criticality-Every critical business function must be identified, and the impact of a disruption must be determined. While non-critical business functions and processes may likely warrant a lower priority rating, consideration should be given to the impact of interdependencies between various departments and functions before ultimately determining their criticality and priority."
- "Estimate Maximum Downtime-Management should estimate the maximum downtime that the financial institution can tolerate while still maintaining viability. Management should determine the longest period of time that a critical process can be disrupted before recovery becomes impossible. In some instances, the BIA process may provide evidence that a business interruption can be tolerated for a shorter period of time than originally anticipated."

- "Evaluate Resource Requirements-Realistic recovery efforts require a thorough evaluation of the resources required to resume critical operations and related interdependencies as quickly as possible. Examples of resources include facilities, personnel, equipment, software, data files, vital records, and third-party relationships."

This analyses provides information on the short and long-term in an organization allowing:

- Estimate the financial impact of each business unit, assuming the worst-case scenarios for each case.
- Estimate the intangible impacts (operational) for each business unit, also assuming the worst scenarios for each case.
- Identify what are the critical processes for each business unit organization and what is the affordable recovery time period estimated for each business unit.

The collection of this information provides important data to the organization to help develop a business continuity strategy. The ISACA (Information Systems Audit and Control Association) is one of the international organizations that provides information about the area of business continuity and have a document that presents a set of basic values for reference, in order to provide tangible and intangible terms that may assist in data collection and to estimated value specification of exposure for each of the impact key categories in the business [42], and these are:

- Revenue Losses
- Additional expenses
- Legal and regulatory
- Goodwill
- Customer service

This data is used to compare companies and help calculate the impact of a disruptive event in the business. Other scales and tables are also used to assess and manage the risk of losses caused by interruption of services. Since according to the categories of risk using certain criteria to estimate the respective impacts. Table 2.4 is a compilation from various sources [55] [56] in conjunction with internal references, to serve as an example of possible data to be collected for analysis. They contain data that normally are used as references for each of the categories indicated in the table and where applicable. The objective of the research using DEMO together in developing a Business Continuity Plan, aims to enable the BIA to reflect a more accurate calculation of the impact of a disruptive

event in the business, with an emphasis on all critical aspects of business processes . In summary, to perform an analysis of the business impact (BIA) as fully and credibly, all important aspects of a process, possible interactions and dependencies are required to correctly calculate the impact of a disruptive event in a business. Since the DEMO uses business processes as the main focus of its methodology, this characteristic makes it an essential tool to leverage the study and analysis of impacts on business.

Table 2.4: Impact Criteria

Category	Impact Criteria	Negligible	Minor	Moderated	Major	Severe
Finance	What are the financial impacts if you can not run this business process? Some examples are the loss of revenues, expenses of the increase in working hours due to events, etc.	Potential loss of <10.000,00	Potential financial loss of 10.000,00 - 50.000,00	Potential financial loss of 50.000,00 - 200.000,00	Potential financial loss of 200.000,00 - 500.000,00	Potential financial loss of 500.000,00 +
Human	What impacts in human terms for the process? Some examples relate to loss of important functions permanently.	Potential for minor injuries requiring first aid treatment	Potential injury or illness resulting in medical care and several days off work	Potential for injury or illness resulting in short-term hospitalization	Potential serious long-term injury	Potential for death, permanent disability or health problems
Legal/ Regulatory / Compliance	Does the organization may be violating any law and / or regulation, if it can not execute a business process? Some examples are the failure to comply with constitutional laws, local ordinances, regional or international regulatory requirements or laws.	Minor internal dispute that can be remedied without external intervention	Potential for compliance, contractual or regulatory violations with external implications	Confirmed compliance, contractual or regulatory breaches. Specific activities necessary to remedy the situation	Significant penalties and / or costs to correct the legal violations and / or compliance breaches	Severe penalties for the company and / or staff

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Table 2.4 – *Continued from previous page*

Category	Impact Criteria	Negligible	Minor	Moderated	Major	Severe
Operational	What is the impact on the distribution chain of the company's products? Some of the example result in operational impediment to the entire distribution chain or decrease in service quality.	No noticeable impact of absence on operational functions	Short-term disruption to the operational functions	Significant disruption to the operational functions	Extended disruption to operational functions	Collapse of operational functions
		No noticeable impact on the supply chain	Short-term disruption to the logistics network	Significant delays to the logistics network	Extended delays to supply chain	Total supply chain failure
		Minimal change in working conditions	Short-term increase in working hours	Sustained deterioration in working conditions	Long term deterioration in working conditions resulting in increased sick leave and potential resignations	Unacceptable working conditions, resulting in injury / illness in the workplace and resignation

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Table 2.4 – *Continued from previous page*

Category	Impact Criteria	Negligible	Minor	Moderated	Major	Severe
Reputational	What is the impact on reputation, market perception and / or brand of the organization image, if it is not possible to carry out one of the business process? Some examples are the impact on stock prices, negative opinions of analysts, negative publications in the press, media or brand	Adverse impact that can be remedied immediately	Adverse impact of short-term profitability and / or strategic direction	Adverse impact with potential for significant damage	Impacts that require long-term correction of attention	Irreversible damage to brand and reputation
Customer Satisfaction / Customer Confidence	Will customers question their willingness to continue to do business with the organization if it is not possible to run the business process? Some examples are impact to customer satisfaction, the impact to buy additional products, unmet expectations, etc.	The failures are isolated and limited to a small number of internal staff	Failure limited to a small number of customers or a business relationship.	Systemic failure impacts a specific customer group, transaction types, or agents. Excludes sales practices.	Systemic failure impacts multiple product groups, transaction types, or an entire distribution channel. Includes sales practices.	Catastrophic failure impacting broad spectrum of customer groups, and distribution channels.

Continued on next page

Table 2.4 – *Continued from previous page*

Category	Impact Criteria	Negligible	Minor	Moderated	Major	Severe
Market Perception / Brand image/ Reputation	What reputation, market perception and/or brand image will the organization have if it could not perform a business process? Will you continue to rely on the organization and create credible market strategies? Some of the examples is the lack of credibility and market confidence due to negative impacts.	Localized concern - no impact on the long-term viability	Detrimental to short-term profitability and / or strategic direction. Impact is isolated to a small group of existing customers. Damage is reversible.	Detrimental to profitability in the medium term and / or strategic direction. Negative impact is regional, is in the public domain, but with limited publicity	Require change in strategy and objectives with significant long-term impacts. Negative impact is regional with widespread publicity, or national or global, with limited publicity	Business viability in question. Negative impact is national or global and is widely publicized

2.7.2 Business Continuity Plan

Many people think of the disaster recovery plan and that a business continuity plan is the same. The plan of business continuity is broader. It is an holistic view of the company that encompasses several sub-plans where the disaster recovery plan is encompassed. DR plan focuses mainly on restoring IT infrastructure and operations after a crisis, being only part of a business continuity plan, as a BC plan looks at the continuity of an entire organization. The IEP (Internal Emergency Plan) is for example focused on "Preparing for emergencies and response" and is designed to facilitate the safe evacuation of all occupants from the company facilities. The CMP (Crisis Management Plan) is related on managing the subsequent crises that arose from a disaster, and the CP (Contingency plan) on finding a contingency solution for the losses.

A Business Continuity Plan shall establish documented strategies, procedures and critical actions for responding to a crisis situation or disruptive incident and how a company will continue or recover its activities within a predetermined timeframe. This framework of critical actions and procedures shall address the requirements of those who will follow them. The business continuity plan shall then contain:

- Defined roles and responsibilities for people and teams having authority during and following an incident.
- A business management decision for activating the response.
- Details communication plan on how and under what circumstances the business will communicate with employees/contractors, key interested parties and emergency contacts.
- How the business will continue or recover its prioritized activities within predetermined timeframes.
- A process to resume to normal operations once the incident/crises is over.

The Business Continuity Plan Requirements should be:

- Based on a comprehensive Business Impact Assessment (BIA) and Risk Assessment (RA).
- Completed for Critical, High, Medium identified processes.
- Reviewed and approved by Line of Business senior management at least annually.
- Available to all key employees responsible for supporting the business during a recovery.

- Specific to what immediate steps should be taken during a disruption.
- Flexible to respond to unanticipated threat scenarios and changing conditions.
- Focused on the impact of various threats that could potentially disrupt operations rather than on specific events.
- Effective in minimizing service disruptions and financial loss through the implementation of mitigation strategies.
- Low or non-strategic processes, do not need to document a recovery plan with a strategy.
- Validated by exercising.

Chapter 3

BUILDING A BUSINESS CONTINUITY STRATEGY

The aim of this section is to provide important information to assist the understanding of the organization's needs and constraints, while building a BC strategy.

3.1 Insights from Stakeholders and Managers

During the normal Business Continuity program life cycle, represented in figure 3.1, some important steps are to be completed every year:

- (i) Project Management;
- (ii) Risk Analysis and Review;
- (iii) Business Impact Analysis;
- (iv) Business Strategy;
- (v) Plan Development;
- (vi) Program Management;
- (vii) Business Continuity test with the designated area team members;
- (viii) Disaster Recovery test with IT members;
- (ix) Tabletop exercises with area managers;
- (x) Call tree exercise with all company members and key suppliers;
- (xi) Structured walkthrough with management and area members;
- (xii) Risk Assessment.

Regarding some of the designated points, they show up as a challenge to be created and maintained. Managers and area members often consider it confusing, challenging and very demanding. BIAs and the structured walkthrough are the topmost complains on this list. The BIA from one side is very demanding regarding all the details needed to establish the impact that a specific process can have on each business unit and to the organization as a whole, but on the other hand also need to have a vision of the inside



Figure 3.1: The Business Continuity Life cycle (Adapted from the BCM Institute).

and an overview of the organization to validate if they are coherent and consistent with what is described in the processes in which they were grounded. Based on the existing processes the analysis done to them will provide information on the short and long term effects of a disaster.

The structured walkthrough exercise is done with management and team members to identify and correct weaknesses of the plan. Involves management and representatives from each of the functional areas coming together to review the plan and to decide if the plan connected to their area is accurate and comprehensive and can be executed when required. Assess the documentation for errors, missing information and inconsistencies across the plan can be identified. Reviewing a plan that sometimes has a significant numbers of pages of information is quite grievous and time consuming. Top management quite often reinforces that although they need to guarantee that the plan is concise and consistent with the company requirements they need a more easy way to establish a coherent understanding of the company regarding business systems, information related to them, communication and organization.

3.2 Recovery Strategies

An organization needs to develop and implement strategies that will help his business to recover from an incident or crisis. These recovery strategies must provide evidence of a clear understanding of the business's recovery objectives and reflect what the business effectively needs to continue operating. It must then prioritise critical business functions and record a recovery time for each in order to provide Recovery Time Objective (RTO) and Recovery Point Objective (RPO). This process will highlight the actions that should be listed at the recovery plan. As an example, table 3.1 resumes some types of common situations that may occur as result of disruptive events and their applicable mitigations solutions.

Type	Response	Consideration
Loss of Personal	• Temporary / alternative location • Transferring workload to alternate facility • Skeleton staffing • Defer the workload	• May include local or regional incidents • Are all employees trained to perform the work?
Loss of Primary Facility	• Work from home • Reallocate to alternate facility • Reallocate to alternate site • Transfer workload to alternate facility • Defer the workload	• What if there is a widespread power outage • Do associates have laptops to work from home? • Does alternate facility have the space and/or training needed? • Does alternate facility have the necessary infrastructure?
Loss of upstream / downstream process	• Response defined by operations leadership and process owner	• Who would be impacted (e.g., Finance, HR, etc.) • Is the smallest number of staff needed identified for a business process to operate? • Are all resources identified and risks mitigated?
Loss of technology	• Response defined by operations leadership and process owner	Are all resources identified and risks mitigated? Are DR plans updated and tested?
Loss of critical vendor	• Response defined by operations leadership and process owner	• Is the strategy consistent with the contract with the vendor? • Do the critical vendors have a BC plan? Updated with tests done annually?

Table 3.1: Strategy types of common situations

3.3 The Case study description

In addition to the investigation carried out by the literature review, a typical (potentially fictitious) Business Process of the insurance activity, involving different departments and external suppliers, was used as a case study. In this process, it was documented all the business flows, dependencies and activities between departments that were recaptured and documented using the DEMO methodology.

The BP and existing documentation (based on Rich Text Figures (RTF)) were analysed and investigated, targeting all the major stakeholders that would be covered, and DEMO was used to re-evaluate, complete and re-validate the entire process, where applicable.

The business process used and existing documentation on similar business processes (which are usually made based on RTF - Rich Text Figures) were analysed and investigated, aiming all key stakeholders that would be involved. DEMO was used to reassess, complete and revalidate this process, wherever applicable. This case study is hypothetical implemented on a corporate company that offers insurance solutions products through several channels: agents, third-party distributors such as brokers and banks and also by using direct marketing channels. A global Business Continuity Plan is supposedly developed and is maintained. Each country individually, has the responsibility to adjust their BCP to local laws and regulators requirements. A formal process that includes a continuous review of internal controls is in place to enforce the corporate policy on continuity. The implemented BC program must follow internal rules to fulfil with the organization's BC principles.

The documentation process is a procedure that is in line with the internal requisites to have all local processes described, documented and reviewed as needed. All processes must be described in a way that the organization can easily understand them. All the tasks that compose the process must define how it works and how individuals from different groups work together to achieve the business goal for the described process.

The method to capture business processes is a arduous assignment to accomplish. Stakeholders tend to use their natural "language" very much related to their specific area to describe their internal processes. Occasionally this implies misinterpretation by other departments that they interact with, since there isn't a common understanding about the way to capture business processes. Managers also need to easily audit and validate that the process complies with what is described at the business plan and check its completeness.

On the other hand, an increasing number of processes are being undertaken by external providers, which in some cases, the documentation for these specific processes, sometimes does not exist or have poor documentation. It also exists the need to validate if what has been requested to the provider is what is really being delivered. Figure 3.2, represents the original existent documentation based on rich text files (RTF), for the full customer

service life cycle process. It has an augmentation of one of the figures and has been adapted in a way to be possible to be presented here.

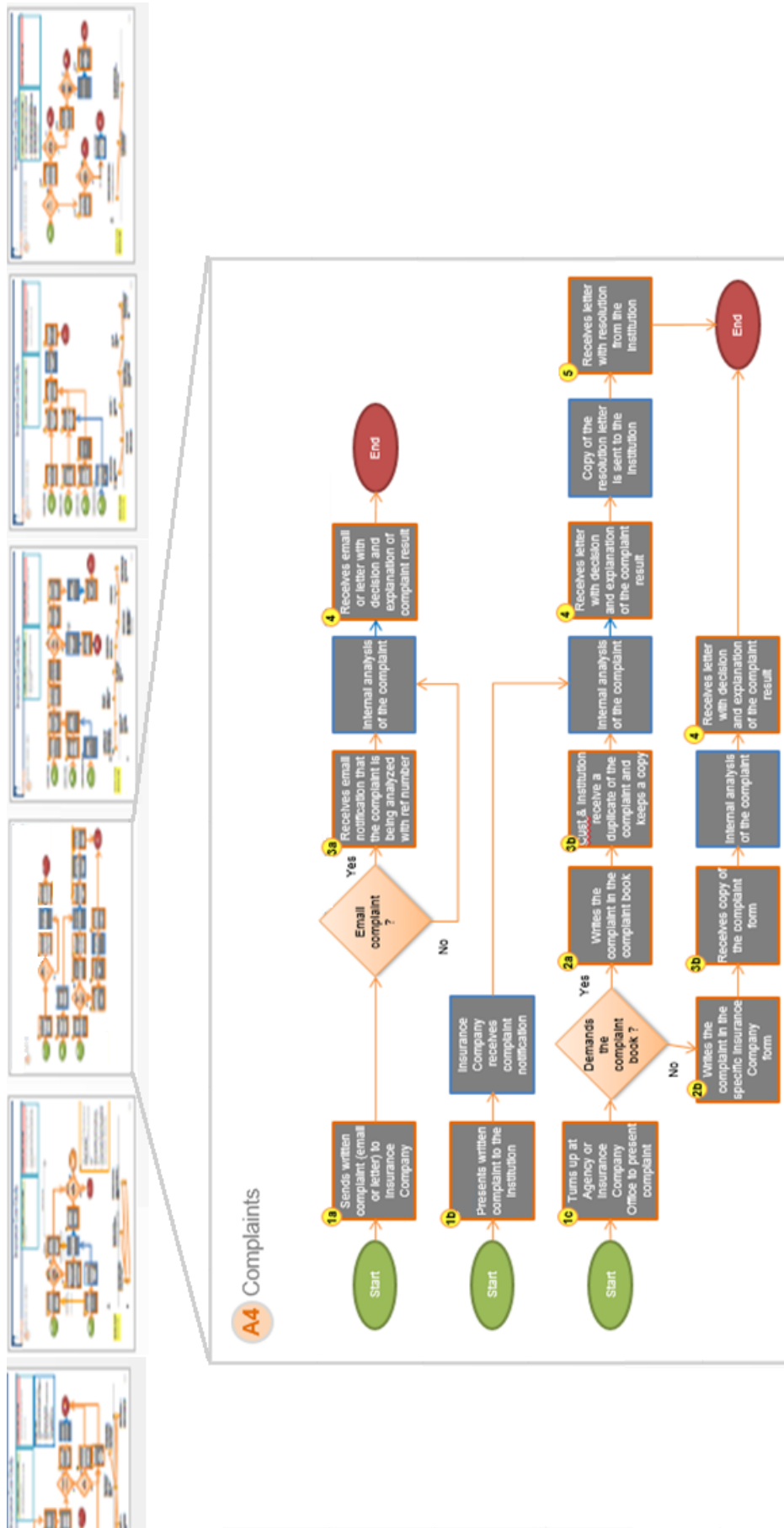
By consequence of the normal BC life cycle, which includes the annual schedule BIA assessments, some undocumented processes or steps of the process are detected and need to be correctly documented. Sometimes these new processes or changes that need to be done are difficult or too complex to perform. The reason is if the existent documentation is insufficient or poor, and these processes are too complex (dependent on, or performed by external sources, having several dependencies between them or too long and broad). This can create undefined and unclear zones of knowledge leading to the lack of information to build recovery strategies with the correct mitigation actions or rules to rebuild the process.

Taking advantage of fact that always exists the need to document these new processes, it was decided to launch and test a new methodology to assess and

In order to find a solution to some of the constrains related with the implementation and maintenance of a BCP, a pilot experiment is being carried out to analyze the relevance of DEMO in helping management validating the representation of business processes.

The approach to develop this pilot was done by using the procedures, described as follow:

- (i) In the absence of a described process the DEMO methodology will be used to produce the description of the business process;
- (ii) In the absence of a fully described process (which serves a particular purpose), but still there are some data from the process-related documents, it will be complemented with data from the related structured activities that produce that specific service or product. After that a full and complete description of the entire process will be done using the DEMO models;
- (iii) When a described process exists, then a reverse engineering of described business processes is performed. The existent schemas or flowcharts and the result will be compared;
- (iv) Tasks and activities involved in IT-heavy operations for all processes covering critical areas, will be described.



Chapter 4

DESIGN OF BUSINESS TRANSACTIONS

The case study used at this thesis, belongs to a corporate company that has complex business process that interact with several departments and suppliers of services, offering solutions products through several different channels: agents, third-party distributors such as brokers and banks and also by using direct marketing channels. The global Business Continuity Plan has been developed and is maintained and adapted by each country individually, which has the responsibility to adjust their Plan to local laws and regulations requirements. A formal process that includes a continuous review of internal controls are in place to enforce the corporate policy on continuity. The implemented Business Continuity program must follow internal rules to fulfil with the organization's Business Continuity principles.

To construct an ontological view of the process used as a case study, the Construction Model was used as a starting point that provided the identification of all types of transactions and associated actors. This first step was achieved, first using a direct observation of the organization's process execution and interviewing all stakeholders, managers, customer observation and existing documentation. The results in the process, that is, how it is done, how they do their work, and the results of each transaction were identified and listed in a Transaction Results Table (TRT), which can be displayed in Table 4.1. An actor transaction diagram (ATD) was performed to identify actor roles and their transactions. Here we can see that it took eighteen actors and transactions to execute a request for complaint, its analysis, and adequate response to the request made. These are the first steps to construct the CM and compose the Interaction Model (IAM) that shows the asset in the influences between actors, that is, the execution of transactions.

4.1 DEMO ATD - Actor Transaction Diagram of Customer's service lifecycle

In order to first understand the whole process, it was necessary to collect all transactions, identify actors, their respective roles on each transactions and action rules related to them. Then it is necessary to link all the information together to build a complete view of the business process in place. Figure 4.1 exhibits a new representation for the pretended full process of the customer's service life-cycle by using the DEMO ATD model supported by table 4.1. It represent the whole process in a single view in opposition to the original representation of the process that had six figures.

It was necessary to perform several interactions to the first ATD model to eliminate some of the redundant transactions and clearly identify all necessary actors. At the end, the information gained at the presented model by having a full view of the whole process, plus subsequent DEMO models, will be used for a better and easier identification of key business processes and help on prioritization of his principal components of the recovery process.

4.2 DEMO TRT - Actor Transaction results Table

The Transaction Results Table was created from the analysis of the information collected at the interviews with stakeholders, customers and documentation related to the process. This table has the transactions and results types columns that represent each transaction and their results collected from the main tasks of the process. This table represents the full customer's service lifecycle of a complaint, that can be formal, informal and all the consequences related to them. During the analysis phase several actors had to be taken into account because the result of certain transactions has made them emerge. The first two transactions (T01 & T02) represent the initial steps of the process, Informal and formal complaints and their results type by consequence of these acts. These coordination acts are represented by actors that are responsible to provide actions related to each transaction, represented as the initiator and executor and aim to achieve a particular result (new product or service).

The State Model is represented with the Object Property List (OPL) in conjugation with the Facts Model (FM).

Transaction Type	Result Type	Starts	Executs
T01 - Customer Informal complaint order	R01 - Insurance company IC receives complaint C	CA01	CA04
T02 - Formal complaint Order	R02 - Complaint C is registered at complaint book CB	CA01	CA04
T03 - Received complaint management	R03 - Receives list of complaints C from the contact center	A15	CA05
T03 - Received complaint management	R03 - Receives list of complaints C from the regulator	A13	CA05
T04 - Internal analysis order	R04 - Complaint analyses starts CA	CA05	CA05
T05 - Provide records	R05 - Records R are supplied	A06	A11
T06 - Issues	R06 - Record R is consulted	CA11	CA05
T07 - Customer complaint copy dispatch	R07 - Sends copy C to Client	CA05	CA01
T08 - Medical advice start	R08 - Technical advice TA is given	CA06	A10
T09 - Archival	R09 - Compliance C blueprint is archived	A11	A17
T10 - Product support start	R10 - DM product suport DMPS is provided	CA02	A16
T10 - Product support start	R10 - F2F product suport F2FPS is provided	CA02	A08
T11 - PII profile management	R11 - PII data PD is confirmed	A07	A11
T12 - Profile management	R12 - Customer data CD are updated at the insurance policies	A08	A09
T13 - Records update	R13 - Customer records R are updated	A08	A09
T14 - Payment	R14 - Receives a payment P	A09	CA03
T15 - Policy cancelation	R15 - Cancellation request CR is received	CA01	CA09
T16 - Direct Debit cancelation	R16 - Direct Debit DD is cancelled	CA01	A18
T17 - Sends key transactions	R17 - Information of Non-payment NP by the customer is received	A18	CA09
T18 - Customer contact	R18 - Client receives a retention call RC	A16	CA01
T19 - Regulator complaint copy dispatch	R19 - Sends copy C to Regulator	A05	A13
T20 - Regulator formal complaint order	R20 - Complaint C is received by the regulator	CA01	A12
T21 - Informal complaint order	R21 - Contact center receives the complaint C	CA01	A14

Table 4.1: Transaction results table - Customer Care.

4.3 DEMO FM - Fact Model (Business Objects and Business Facts)

The Fact Model of an organisation is an ontological model of the state space and the transition space of its production world (P-world). A state of a world is a set of things of all types of fact that were identified (declared and derived), as well as the existence rules and laws that apply. [25].

Regarding the case study, the process in study gain relevance by having a clear and schematic view of the conjugation of all the rules that are imposed by the regulator and apply to these type of processes and all the steps containing the production event kinds (results of transactions).

4.4 DEMO OCD - Organizational Construction Diagram

The OCD diagram has designed the ontology of the solution found in relation to the actors, the production banks, the coordinating banks, the process boundaries and the information flows related to it.

At the initial state of the process representation (using RTF), the manifest absence of complementary information related to the actors that are responsible for the process are here mentioned (CPB19 to CPB26), and represents shared information between them:

CPB 19 - Insurance Bank Accounts (Critical assets to maintain and safeguard - sometimes has critical and sensitive information about clients)

CPB 20 - Insurance Suppliers (List of suppliers that make part of the process chain)

CPB 21 - Clients Data (Critical asset to to maintain and safeguard because has critical and sensitive information about the client)

CPB 22 - Bank Partners (List of banks that make part of the process chain)

CPB 23 - Transfer Rules (List of rules that compose the process of Bank transfers between banks sand institutions)

CPB 24 - Insurance Sector Rules (Set of rules that allow insurers to manage the business with a much closer alignment between available capital and assumed risks, while promoting competitiveness and encouraging the improvement of the products that are offered to consumers.)

CPB 25 - Storage Protocols and Rules (The loss of confidential data is a risky operation for any business. The establishment of rules and protocols in the case of the safekeeping of information by an external entity is crucial)

CPB 26 - Net Promoter Score (Feedback that an organisation collects from the customer experience and predicts business growth. This permits the business to align their

strategy if the results are unexpected.)

It is quite important to collect and maintain this type of information concerning to a process. This is also an important valuable asset to save.

This new representation of the process permitted to execute changes in the business transactions models and the adoptions of new business rules.

4.5 Delivered artifacts

The ontological design presented here has been created using all designated rules and conventions found in the original requisites, and contain the minimum possible entities needed to complete the process and all correspondent relationships. Some of that actors share common transaction due to the regulator specification or due to the transaction specification. T01, T03 and T07 are examples of shared transactions that in some cases are executed or initiated by one of the actors depending the origin of the complaint but needed some simplification of its representation. The developed model is easier to change even when there is a change in the business or a request change done by the local regulator.

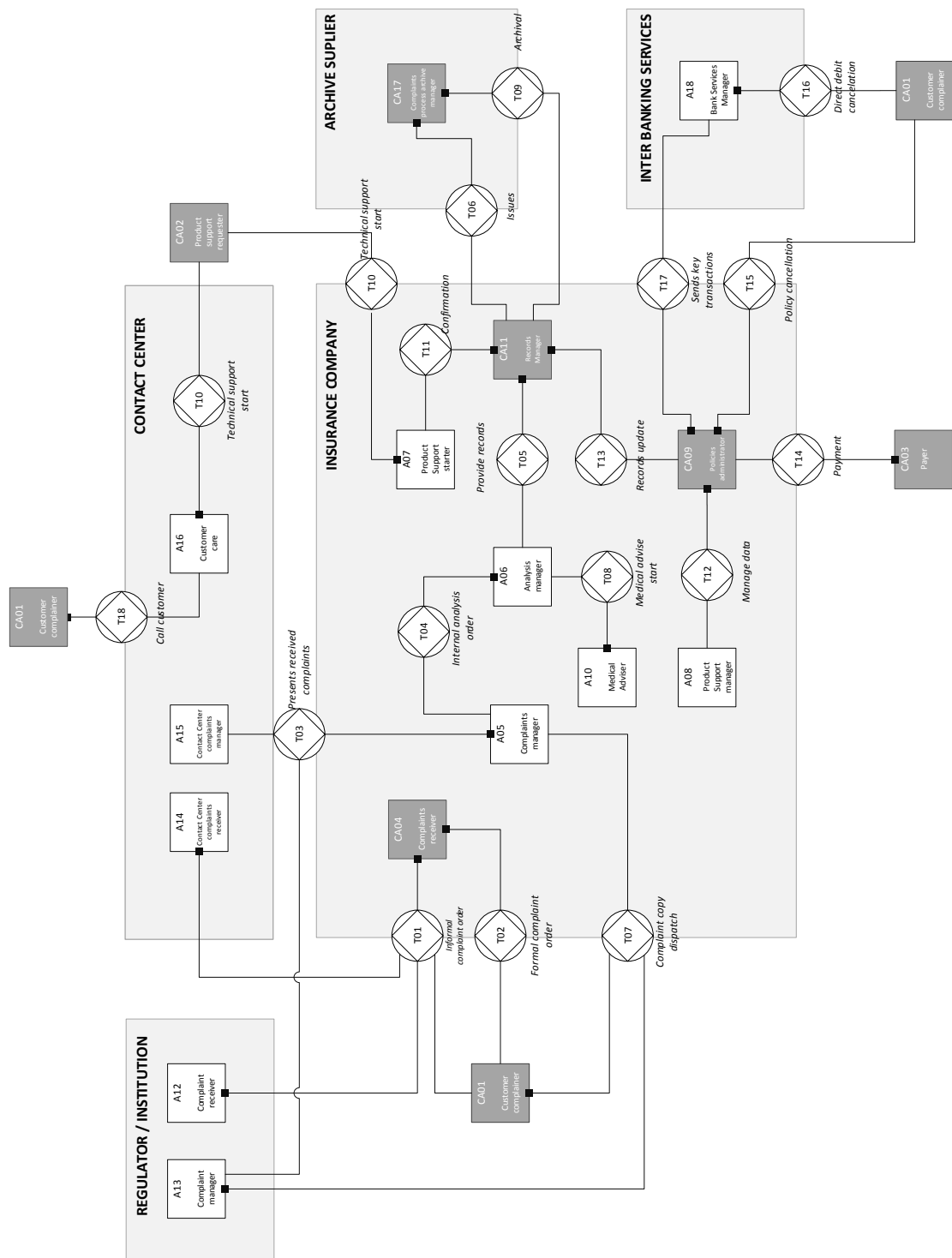


Figure 4.1: DEMO ATD - Customer's service lifecycle

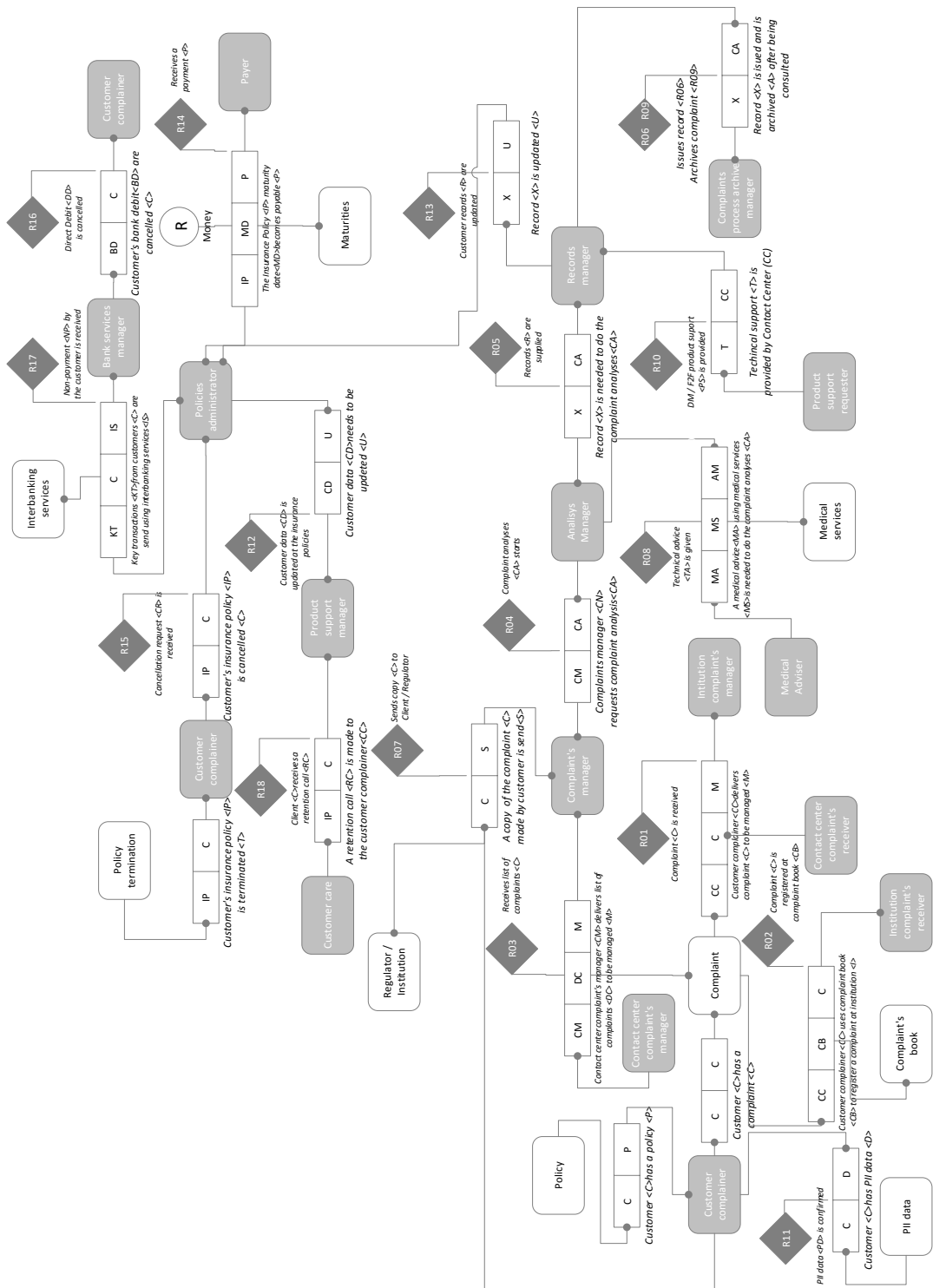


Figure 4.2: DEMO FM - Object Fact Diagram

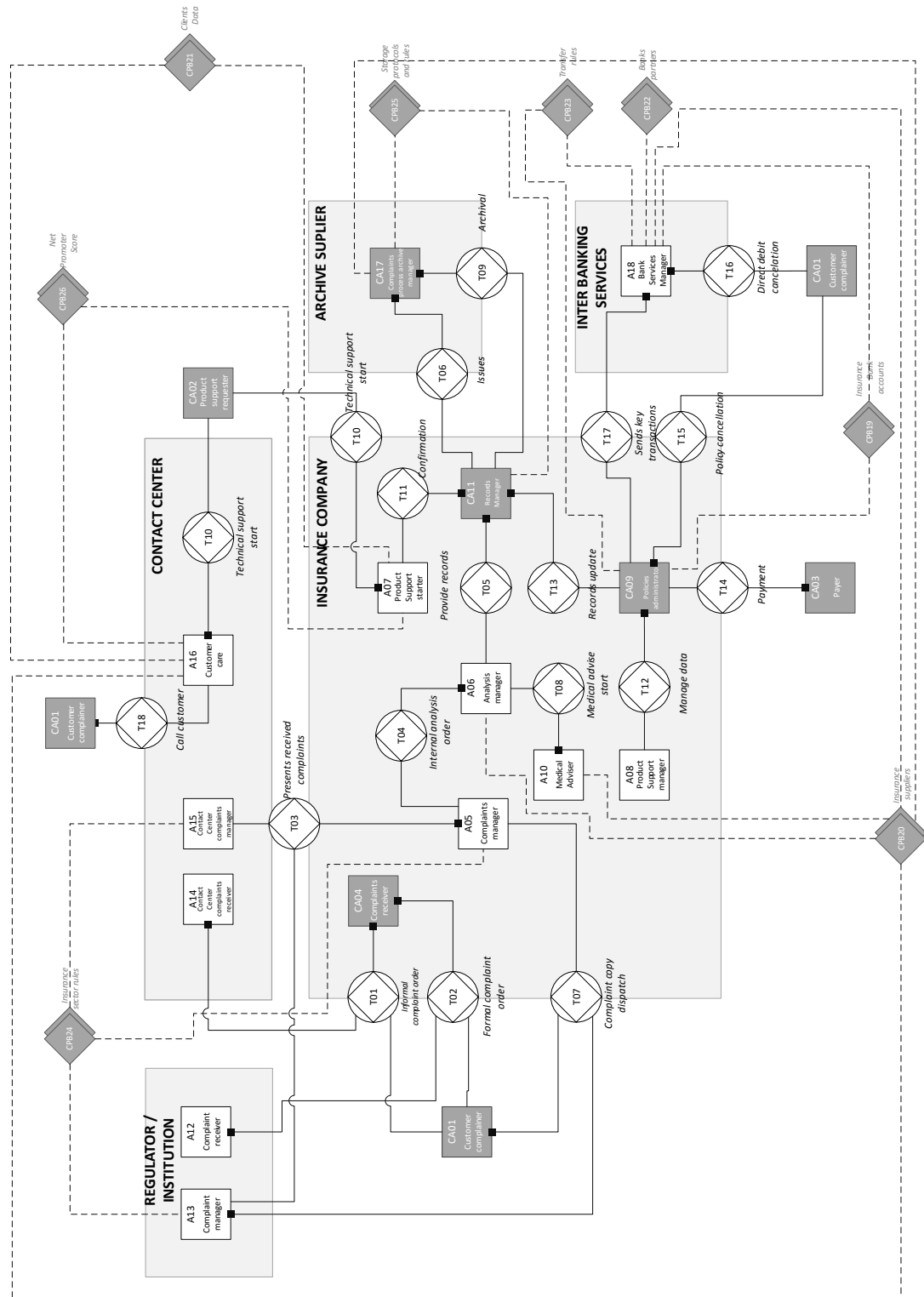


Figure 4.3: DEMO OCD - Organizational Construction Diagram

Chapter 5

EVALUATION

The research carried out under the DEMO integration with the Business Continuity (BC) process, more specifically in its conjunction with the business impact analysis allowed to highlight some benefits by using the two methodologies together.

Over the last decades, the analysis of business functions was based exclusively on a business impact perspective of the loss of a certain business process, as developed during a Business Impact Analysis (BIA), the base standard used to determine the criticality of the Business processes and functions. The purpose of a Business Impact Analysis is to assess the impact that a business process has on the organization in general and to develop recovery objectives. It was not designed to provide a complete assessment of the company structure nor dependencies between those functions and processes.

In other words, the Business Impact Analysis does a poor job of assessing the likelihood of disruption to business processes and the effectiveness of controls and mitigation of possible risks already in place. In addition, it rarely, if ever, evaluates the risk of business continuity against a mix of other enterprise-level risks.

5.1 Integration of Demo and Business Continuity

The case study highlighted that the integration of both Business Continuity Management (BCM) and Design and Engineering Methodology for Organizations (DEMO) into strategic planning efforts have found that Business Continuity Management (BCM) enhances both their value creation and the protection of its objectives. The confidence that comes from identifying and adequately addressing the impacts on the business enables them to more boldly execute those strategic plans and to communicate them more easily to the organization. But to gain that confidence requires the melding of DEMO and BCM methodologies, on points that both can benefit.

5.2 Results from the Literature Review

The literature review allowed to detect a set of situations that by comparing the two methods, showed the limitations and weaknesses of each:

Limitations	Benefit by using DEMO/BIA integration
Lack of representation of the external players role. This effect is highlighted when comparing the BIA with the OCD DEMO models.	This limitation is well solved in Figure 5.1 - Organization Construction Diagram (OCD), where all the actors involved in the business processes are fully expressed, including external actors together with the banks shared between them. These banks are not taken into account in a BIA study. Nevertheless they are mandatory to prepare a proper BC plan.
Impact quantification for the business offered by the BIA, but not offered by DEMO.	It is required in this case additional resources to other solutions, for instance: e3value, in which this case the BIA allows assess and collect evidences.
Lack of detail and granularity of the BIA documents	Higher levels of granularity defining the DEMO compared to models and data models that are typically used by the BIA.
Lack of state models used in the BIA calculation of risks and impacts on business. DEMO uses a formal state model to declare the rules, types of essential facts and relevant to real-world objects in its field of application	In DEMO, a state model is specified using an "object-fact diagram" (OFD) that is able to show the essential modelling of the world.
The BIA does not show evidences of documentation where the dependencies between BP are sufficient to calculate the impact of disruptions into business processes.	DEMO models highlight evidences of the dependencies of all the actors of the process. Offering a full detail of the conversation between actors within a business transaction.

Table 5.1: Limitations findings and DEMO/BIA solution from the literature review

5.3 Results from the case study

From the analysis of the case study conducted, the results were important to allow a better understanding of the problem and the difficulties that the business continuity function finds and leads, either in day-to-day basis, or to do the necessary anticipation of potential crises:

On the other hand, from the analysis of the conducted case study, the results were important to allow a better understanding of the problem and also to show the difficulties that the business continuity function finds and leads, either in the day-to-day basis, or to do the necessary anticipation of potential crises. These results are summarized in table 5.2.

The use of a DEMO models will allows management to have a more broad and comprehensive view of all Business Processes, permitting them to better assess the plans consistency, and to verify if it addresses all necessary activities to support Business Processes. By using an OCD model it is easier to audit and confirm if the plan and the described processes are consistent and correct. Also permits to assess and audit whether the capture of the necessary resources and their interactions and dependencies have been

Limitations	Benefit by using DEMO/BIA integration
Lack of an inventory of external databases to the organization properly connected to the business processes to allow the BIA to estimate the impact of the loss of this information.	DEMO help in qualifying and quantifying these data. With DEMO this is easier to detect because they are associated with the processes, this aspect reveals to be of great importance because it is an asset in terms of control and management of this information.
Lack of a proper inventories of business rules and their mapping in the respective processes in a systematic way	It is evident by comparison with the existing documentation that DEMO models uses which are better organized - supported by the DEMO models (Action Model (AM) and Process Model(PM)) and its base methodology
Legal and Compliance related issues that arise due to often unauthorized and improper access to customer data, which can be done during and after recovery from disaster	These unauthorized access are incomplete documentation of reflection and failures and communication of rules and business standards in the documentation that supports the BP. In this case, the modelling allows using DEMO through OCD diagram (shown in figure 5.1 - DEMO OCD) which refers to the databases used in the process and AM and PM models support the following business rules and regulations
If a disaster occurs, the failures after a recovery must be mitigated. These can be derived from non-compliance with the legal aspects and regulation of the entities regulating the banking and insurance business. This needs to be easily identifiable and be aggregated to each processes description. One example can be the times required to respond in case of a complaint from a customer and its accessory penalties in case of default.	DEMO allows a response to this need by using the model states to map all business process transactions in time and the AM and PM models for the rules and regulations.

Table 5.2: Limitations findings and DEMO/BIA solution from the case study

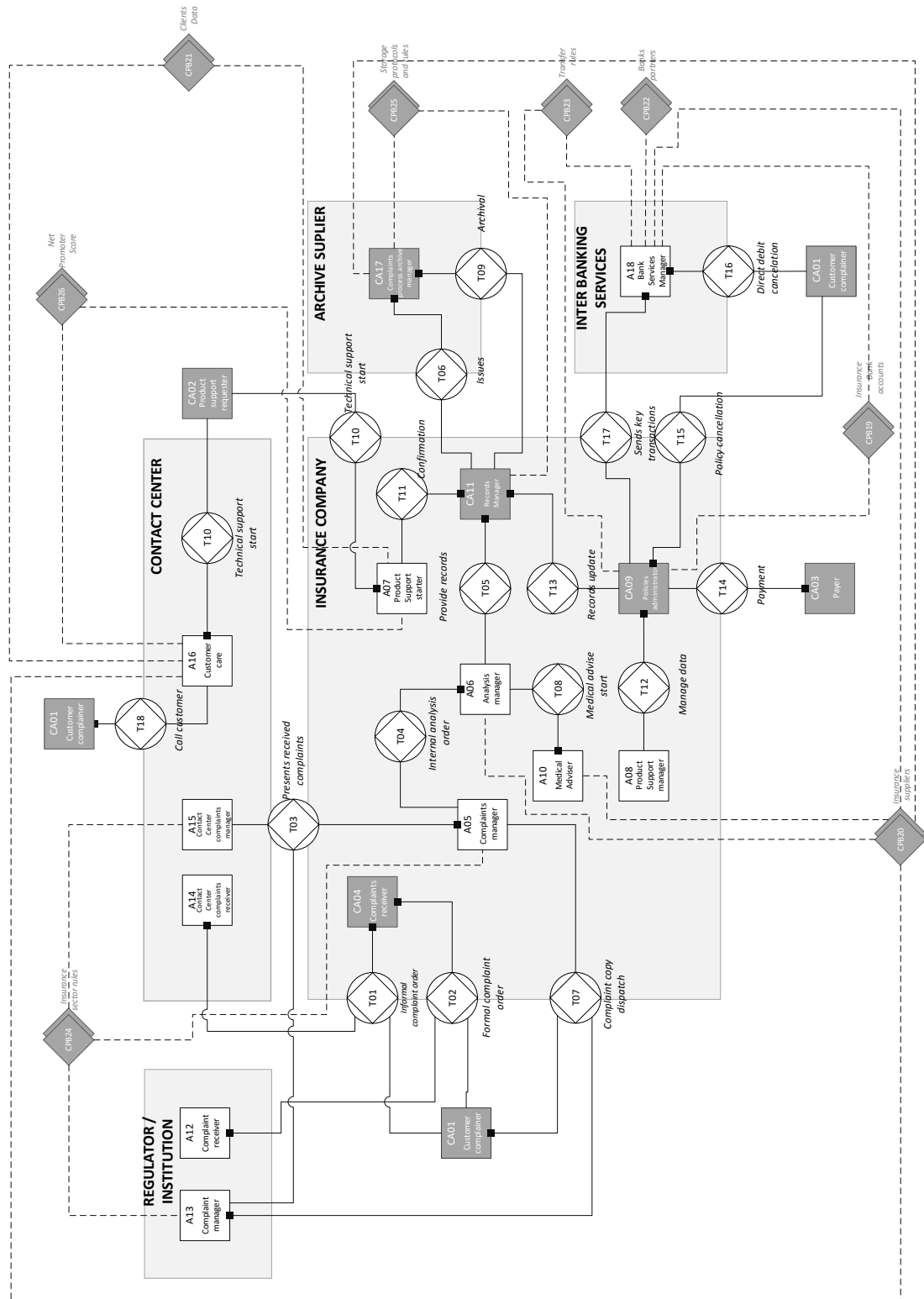


Figure 5.1: DEMO OCD - Organizational Construction Diagram

properly carried out.

The combination of these two frameworks can allow an organization to have a more complete view of the structure of his business and also can serve to have a common language that can be more easily understood by all involved stakeholders. In addition to this it allows an easier way to redesign and re-engineering the business processes in the case of a major disruption by supporting the management board dealing with a crisis situation and fundamentally rethink how they will do their work.

Regarding the problems addressed in beginning of this research work and referring to the challenges raised by the key stakeholders and managers, the following outcomes results were attain:

(i) The BCP needs to have a consensual model representations of the business processes; Regarding to this, it was identified that the new method caught the attention of managers and stakeholders as it provides an easier way to describe the overall process, dependencies between departments and provides a common driver to express business flows and activities. It will mitigate the misinterpretation among departments that interact to accomplish a shared processes.

(ii) Managers need to easily validate if processes comply with what is described at the business plan and check its completeness; Concerning to this issue, the DEMO ATD model was able to present the process in a more comprehensive representation of the process. The result here was the combination of a correct business requirements assessment, completed with the ATD model which allowed to add additional information from a new group of stakeholders. These new representations were not present at the existing original RTF of the process and were captured during the interviews done with the stakeholders. In this aspect this was a good enhancement comparing to the original representation as permitted to bring new facts for new artifacts and by consequence allowing them to be accountable for the business continuity program.

(iii) The BCP needs a common driver for the understanding and communication, regardless of context or domain differences, of how to express business flows and activities; The case study permitted to introduce the EE discipline and DEMO methodologies and guided their evolution inside the organization. According to Jan Dietz, only through of an ontology of the company, which is the understanding of the construction and operation of a business, in a way that is independent of the realization and implementation, can substantial strategic changes of enterprises be made intellectually manageable. The integration with BCP permits at the same time, capture and preserve knowledge (essential to mitigate risk), allowing the organization to share it more easily, because will have a common language among all the stakeholders. Simultaneously it can allow them to discuss design issues and optimization opportunities during the process.

(iv) Tools to provide management an overview of the whole business but at the same

time be deep enough, are needed. It is necessary to analyse and decide more easily when is required to approve a BCP; It was identified that this new representations and semantics used has enhanced a better understanding of the full process as a whole and an overview of the whole business by extending this methodology.

(v) Reduce the complexity of the representation of complex processes; The use of an enterprise ontology to understand the essence of the organization will help manager to better deal with complex processes. The division of the organization into its three aspect organizations (Business, Informational and Documental) provides the means to reduce the complexity of the organization and its business process models. The business process used for the case study is far from being a very complex process, nevertheless it was possible to reduce its complexity and highlight key aspects of the process and provided the means to future work.

Figure 5.2 was used to highlight the areas where DEMO can be useful on the BCP. The use of a DEMO model to the area “Testing and Exercising”, which is decomposed on figure 5.3, allows management to have a wide and simplified view of all business processes, empowering them to better evaluate the plans consistency, verify if it addresses all necessary activities to support business processes and if it is correctly constructed. Using the ATD model in conjunction with the available descriptions of each process is easier to audit and confirm that the plans are consistent and accurate.

In the area corresponding to the Business Impact Analysis (right side of the figure), is pointed the figure of the ATD Model in order to show up where DEMO leverages the identification of all activities related to products and services that support the business processes and all dependencies related to the processes of all stakeholders (phase A & D) by using the DEMO ATD design. It will turn phases B and C easier to accomplish as all activities are more accurately done.

The BIA process exhaustively needs to detect all possible interactions and dependencies of a particular process, so you can calculate the impact of a SBD in business and if they are impacted. The ATD model allows for an easier way to assess and audit whether the capture of the necessary resources and their interactions and dependencies have been properly carried out.

Figure 5.3, the table with the exercises used to test and do the exercises for the BCP lifecycle, pinpoints where DEMO can be used.

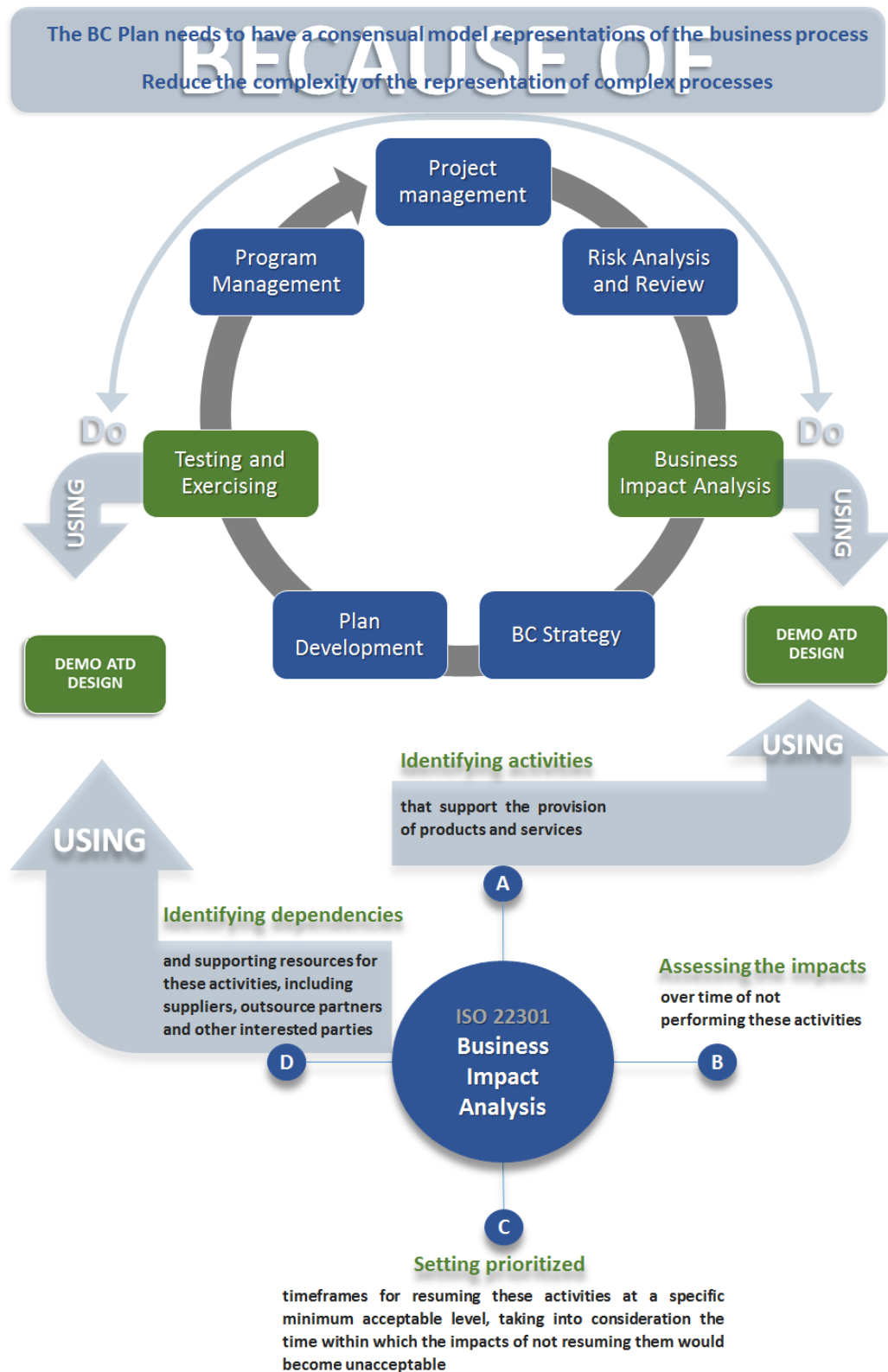


Figure 5.2: Represents fig. 3.1 & 1.3, adapted to show where DEMO is relevant

Exercise Type	What is it?	Benefit	DEMO
Checklist	Distribute plans for review	Ensures plan addresses all activities	Using ATD Design
Structured Walkthrough	Thorough look at each step of the BCP	Ensures planned activities are accurately described in the BCP	Using ATD Design
Simulation	Scenario to enact recovery procedures	Practice session	N/A
Parallel	Full test, but primary processing does not stop	Ensures high level of reliability without interrupting normal operations	N/A
Full Interruption	Disaster is replicated to the point of ceasing normal operations	Most reliable test of BCP	N/A
Call Tree	A structured (system) that enables a list of persons, roles and/or organizations to be contacted	Tests the response to an emergency	N/A

Figure 5.3: "Exercises type" - Adapted from ISO 22301 Whitepaper(2012) [43]pg.6.

Chapter 6

CONCLUSIONS AND FUTURE WORK

This research illustrates the potential of the DEMO methodology: knowledge which exists and is applied at the business ecosystem to design and model business processes and aid to remedy organizational issues like the challenge of creating an accurate Business Continuity Plan by capturing all involved business processes and do a correct Business Impact Analysis. Create appropriate measures to mitigate all issues raised and responses to crisis situations. Create appropriate documentation and a common language to support all these actions. The traditional method of capturing and analyse their impacts on the business needs to be improved by using new approaches to have a continuous improvement of organization's recovery capability. This research points that the used of DEMO in conjunction with the BC program to be beneficial to complement and validate the BC Plan.

For the presented case study of a typical business process for the Insurance Industry, the ATD model permits to identify organization's activities, dependencies and relationships with all interested parties. It made possible to show all potential interactions in a single model. By using DEMO ATD design in conjugation with the BC methodology allows to validate if the process fulfilled all the requirements in a single view. This collaboration also permits to illustrate some new representation of iterations and key actors not previously represented (CA11 (Records manager)- T13 (Records update); CA17 (Complaints Process archive manager) - T06 (Issues) / T09 (Archival); A10(Medical Adviser) - T08 (Medical Advise Start) as examples). These actors and transactions were not represented in the process for several reasons: either they were considered marginal or implicit. Sometimes they were part of another business process, not being taken into account for the calculation of the impact of the loss of this process. The representation of all actors of the process all together permitted to detected missing flows undetected at the traditional

representations. Also, the language used allows the understanding between all stakeholders and encouraged the dialogue among parties. By using a new methodology, it will permit to reduced and simplified all the links between entities and actors, contributing to decrease the complexity of the business process.

The process used at this case study was based on the existing documentation collected from six RTFs that was used to illustrate all the necessary steps regarding a full customer complaint journey. The DEMO ATD model created used these information along with one-on-one interviews with the process owners and with the stakeholders of the process. The result obtained from the ATD model, permits a more realistic and simplified representation of all accountable aspects of a business process. Thus empowers the Business Impact Analysis to reflect a more accurate calculation of the impact of a Severe Business Disruption on the business. After applying the ATD model, a complete and comprehensive description of the business process under study, become only in one page, reducing by almost 85%.

Moreover, the DEMO models can also be used to discuss the organization design issues and can likewise be viewed as optimization opportunities for the processes being evaluated.

The results found in the literature indicate that the business impact analysis (BIA) is likely to have flaws that need to be mitigated in advance, at the risk of being made an inadequate assessment during the analyses. A clear example is the lack of breadth and completeness in the processes supporting documentation, which leads to misinterpretations and sometimes there is a failure in the clear and broad identification of business processes, areas where DEMO and business continuity can be used together to mitigate / reduce these problems.

In the case of the DEMO, scales and additional references can be used by the business impact analyses, in particular the scales and respective reference values for each of the category. This can help to extend the DEMO state models by providing measures and identification of scales, additional restrictions and a more explicit coverage, thus promoting the granularity of the relevant business aspects as well as new rules of formal derivation.

So this way the integration of DEMO with Business Continuity Plan pretends to leverage the knowledge of the business processes in place, in order to have a more broad and common understanding on the existing business processes. The goal is that the subsequent implementation, documentation and management of the business processes can then be translated for any other domain and easily be understood by all involved stakeholders.

Although the initial results indicate positive benefits to combine the DEMO and the

Business Continuity Management (here focused on the Business Impact Analysis methodology), a set of research questions require further analysis and methodical results. In particular, the role of the DEMO models and its real applicability in regards to the benefit of its use with the Business Impact Analyses. In this particular case, it requires a more concrete and in-depth study. The possibility of using the DEMO to make re-engineering processes in case of a real disaster occurs and some of the processes be affected, it is one of the possible areas of interest and for the development of new researches and investigations.

For organizations that have a mature knowledge of the business, they can also do a dynamic approach of the organization configuration by building pre-scenarios using the DEMO models and found a solution for each one found:

- (i) The first step would be to realize the CMM level 3 for the organization and to have the well-defined business processes, using extensive modelling and shared reasoning through validation.
- (ii) Extend these ontological models with infological and datalogical transactions, for this specific implementation. including resources and external databanks descriptions.
- (iii) Devise a list of all possible disruptive incidents.
- (iv) For each possible Disruptive Incident and each Business Process, analyse the impact on the business and determine if is it a Severe Business Disruption.
- (v) Redesign the implementation with a specific DEMO model in such a way that the Severe Business Disruption is mitigated.
- (Vi) For each Disruptive Incident event that occurs, the organization would enforce immediately the appropriate set of redesigned DEMO models.

Chapter 7

ANNEXES

7.1 Demo Models

7.2 DEMO PSD - Process Step Diagram

7.3 DEMO ABD - Actor Bank Diagram

7.4 DEMO OCD - Organizational Construction Diagram

7.5 DEMO ARS - Action Rule Specifications

7.6 DEMO BCT - Bank Contents Table (page 1)

7.7 DEMO BCT - Bank Contents Table (page 2)

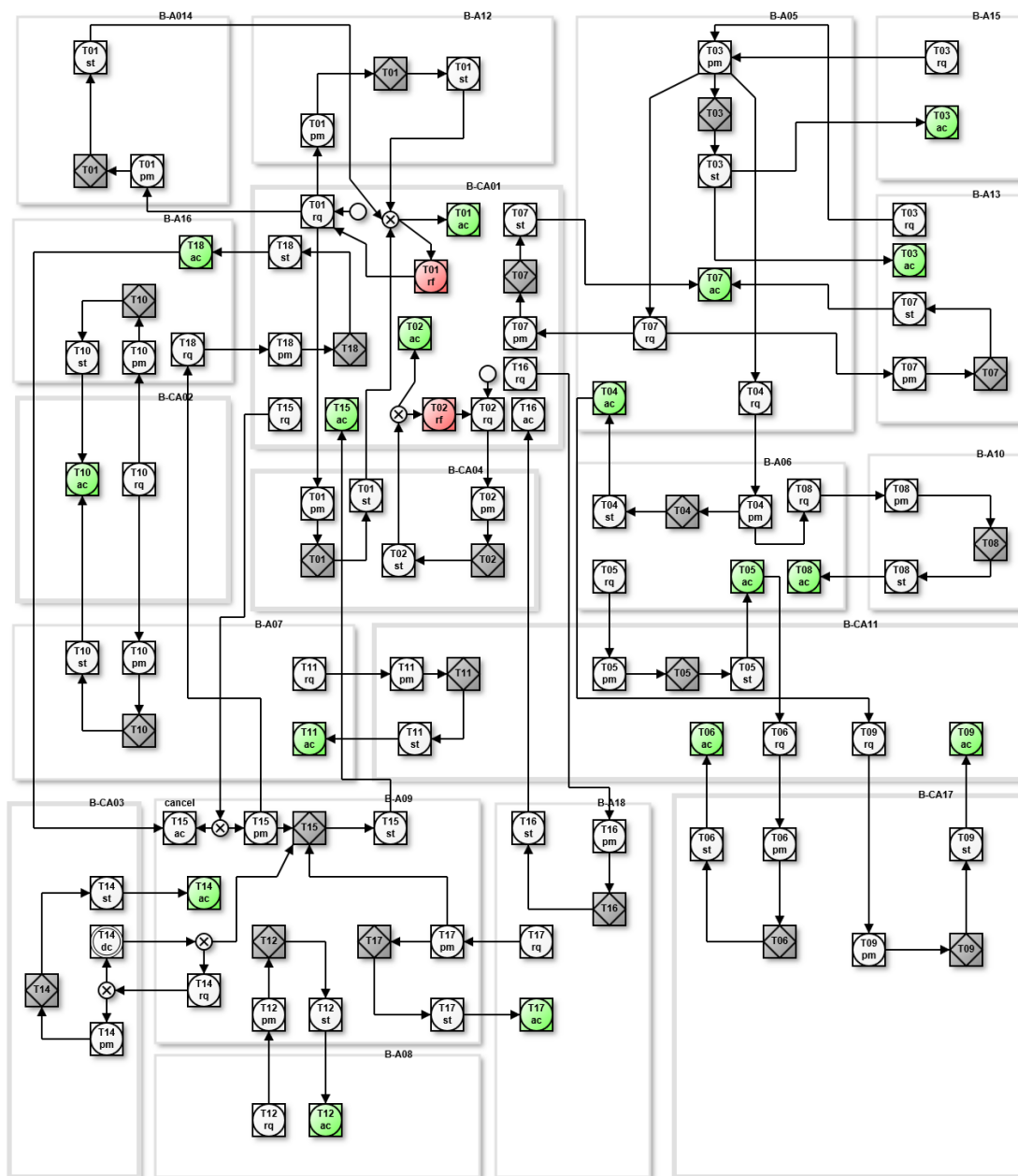


Figure 7.1: DEMO PSD - Process Step Diagram

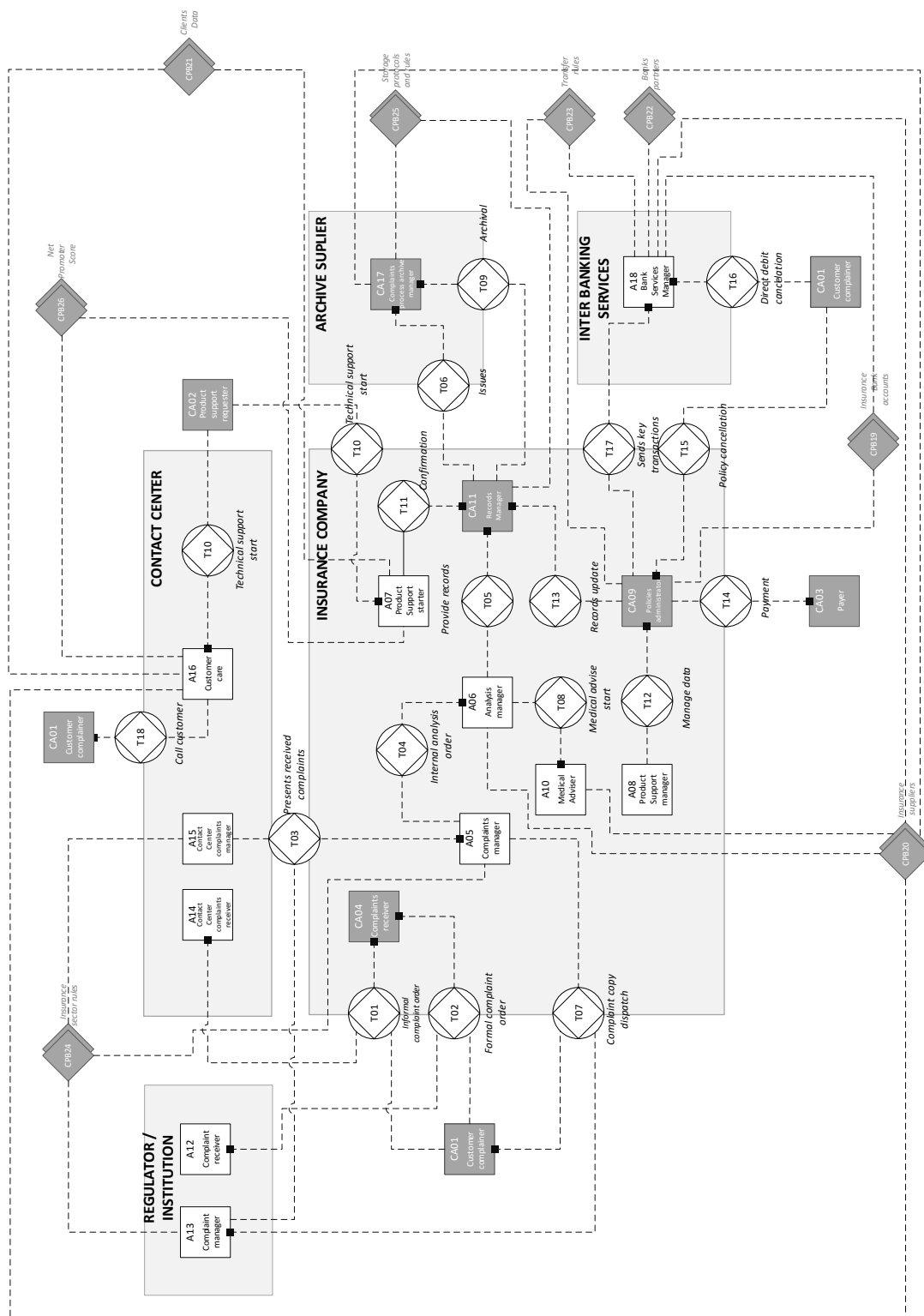


Figure 7.2: DEMO ABD - Actor Bank Diagram

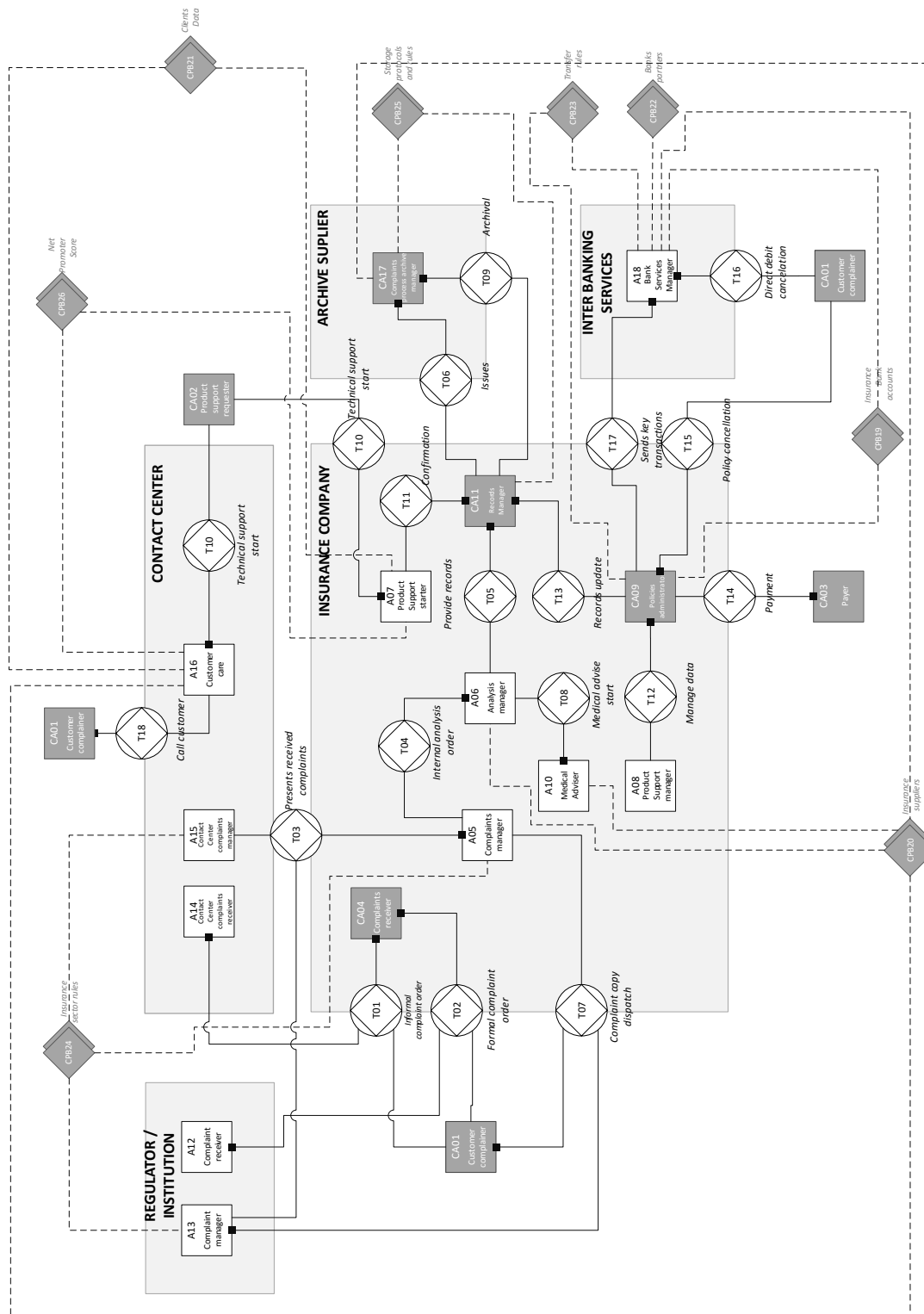


Figure 7.3: DEMO OCD - Organizational Construction Diagram

T01/rq

when	Informal complaint order IC	<u>is requested</u>	T01/rq
with	customer A presents informal complaint IC by calling Customer Care customer A presents informal complaint IC by calling Sponsor Team customer A presents informal complaint IC by calling Insurance Company		
asses	justice:	the performer of the request is the customer A	create complaint
	sincerity:	<no specific condition>	
	truth:	An informal complaint call IC is received	
if	<i>complying with request is considered justifiable</i>		
then	<u>promise</u>	Analyse complaint C	T01/pm
else	<u>decline</u>	Analyse complaint C	T01/dc

T01/pm

when	Informal complaint order IC	<u>is promised</u>	T01/pm
asses	justice:	the performer of the promise is the executer of the analyses of the complaint	
	sincerity:	An active policy exists	
	truth:	A complaint call was received	
if	<i>complying with promise is considered justifiable</i>		
then	<u>execute</u>	Informal complaint order IC	T01/ex
	<u>state</u>	Informal complaint order IC	T01/st

T01/st

when	Informal complaint order IC	<u>is stated</u>	T01/st
asses	justice:	the performer of the state is the executer of the analyses of the complaint	
	sincerity:	The complaint has the customer identification, a description of the complaint, a date and local	
	truth:	A complaint was registered	
if	<i>complying with state is considered justifiable</i>		
then	<u>accept</u>	Informal complaint order IC	T01/ac
else	<u>reject</u>	Informal complaint order IC	T01/rj

T01/ac

when	Informal complaint order IC	<u>is accepted</u>	T01/ac
asses	justice:	the performer of the accept is the creator of complaint C	
	sincerity:	<no specific condition>	
	truth:	Compliant C is registred and notified	
if	<i>complying with acceptance is considered justifiable</i>		
then	<u>accept</u>	result of complaint C	T01/ac
	<u>request</u>	Presents received complaint to insurance	T03/rq

OBJECTS, FACT TYPES; RESULTS	P-bank
R01 - Insurance company IC receives complaint C	PB01
Complaint	PB01
Institution complaint's manager	PB01
Contact center complaint's receiver	PB01
Complaint's receiver	PB01
Customer	PB01
Customer complainer <CC> delivers complaint <C> to be managed <M>	PB01
R02 - Complaint C is received by the regulator / Contact Center / Insurance Company	PB02
Institution complaint's receiver	PB02
Complaint's receiver	PB02
Customer	PB02
Complaints book	PB02
Complaint	PB02
Customer complainer <CC> uses complaint book <CB> to register a complaint at institution <I>	PB02
R03 - Receives list of complaints C	PB03
Contact center complaint's Manager	PB03
Complaint's Manager	PB03
Contact center complaint's manager <CM> delivers list of complaints <DC> to be managed <M>	PB03
Complaint	PB03
R04 - Complaint analyses starts CA	PB04
Complaint's manager	PB04
Complaints manager <CN> requests complaint analysis <CA>	PB04
Analysis Manager	PB04
R05 - Records R are supplied	PB05
Analysis Manager	PB05
Record <X> is needed to do the complaint analyses <CA>	PB05
Records manager	PB05
R06 - Record R is consulted	PB06
Records manager	PB06
Complaints process archive manager	PB06
Record <X> is issued and is archived <A> after being consulted	PB06
R07 - Sends copy C to Client / Regulator	PB07
Regulator / Institution	PB07
A copy of the complaint <C> made by customer is send <S>	PB07
Customer complainer	PB07
Complaint's manager	PB07
R08 - Technical advice TA is given	PB08
Analysis Manager	PB08
A medical advice <MA> using medical services <MS> is needed to do the complaint analyses <CA>	PB08
Medical Adviser	PB08
Medical services	PB08
R09 - Compliance C blueprint is archived	PB09
Records manager	PB09
Complaints process archive manager	PB09
Record <X> is issued and is archived <A> after being consulted	PB09

OBJECTS, FACT TYPES; RESULTS	P-bank
R10 - DM / F2F product suport PS is provided	PB10
Technical support <T> is provided by Contact Center (CC)	PB10
Product support requester	PB10
Records manager	PB10
R11 - PII data PD is confirmed	PB11
Customer <C>has a policy <P>	PB11
Policy	PB11
Customer complainer	PB11
Customer <C>has PII data <D>	PB11
PII data	PB11
R12 - Customer data CD are updated at the insurance policies	PB12
Customer data <CD>needs to be updated <U>	PB12
Policies administrator	PB12
Product support manager	PB12
R13 - Customer records R are updated	PB13
Records manager	PB13
Record <X> is updated <U>	PB13
Policies administrator	PB13
R14 - Receives a payment P	PB14
Payer	PB14
Maturities	PB14
The Insurance Policy <IP> maturity date<MD>becomes payable <P>	PB14
Policies administrator	PB14
R15 - Cancellation request CR is received	PB15
Customer complainer	PB15
Customer's insurance policy <IP> is cancelled <C>	PB15
Policies administrator	PB15
R16 - Direct Debit DD is cancelled	PB16
Customer's bank debit<BD> are cancelled <C>	PB16
Bank services manag	PB16
Customer complainer	PB16
R17 - Information of Non-payment NP by the customer is received	PB17
Policies administrator	PB17
Key transactions <KT>from customers <C> are send using interbanking services<IS>	PB17
Bank services manager	PB17
R18 - Client receives a retention call RC	PB18
A retention call <RC> is made to the customer complainer<CC>	PB18
Product support manager	PB18
Customer care	PB18
Insurance Bank accounts	CPB19
Insurance suppliers	CPB20
Clients data	CPB21
Bank partners	CPB22
Transfer rules	CPB23
insurance sector rules	CPB24
Storage protocols and rules	CPB25
Net Promoter Score	CPB26

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