Title of the Dissertation

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Title of the Dissertation

Nelson Mendes

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Abstract

Here goes the abstract written in English.

Resumo

O Resumo fornece ao leitor um sumário do conteúdo da dissertação. Deverá ser breve mas conter detalhe suficiente e, uma vez que é a porta de entrada para a dissertação, deverá dar ao leitor uma boa impressão inicial.

Este texto inicial da dissertação é escrito no fim e resume numa página, sem referências externas, o tema e o contexto do trabalho, a motivação e os objectivos, as metodologias e técnicas empregues, os principais resultados alcançados e as conclusões.

Este documento ilustra o formato a usar em dissertações na Faculdade de Engenharia da Universidade do Porto. São dados exemplos de margens, cabeçalhos, títulos, paginação, estilos de índices, etc. São ainda dados exemplos de formatação de citações, figuras e tabelas, equações, referências cruzadas, lista de referências e índices. É usado texto descartável, *Loren Ipsum*, para preencher a dissertação por forma a ilustrar os formatos.

Seguem-se umas notas breves mas muito importantes sobre a versão provisória e a versão final do documento. A versão provisória, depois de verificada pelo orientador e de corrigida em contexto pelo autor, deve ser publicada na página pessoal de cada estudante/dissertação, juntamente com os dois resumos, em português e em inglês; deve manter a marca da água, assim como a numeração de linhas conforme aqui se demonstra.

A versão definitiva, a produzir somente após a defesa, em versão impressa (dois exemplares com capas próprias FEUP) e em versão eletrónica (6 CDs com "rodela" própria FEUP), deve ser limpa da marca de água e da numeração de linhas e deve conter a identificação, na primeira página, dos elementos do júri respetivo. Deve ainda, se for o caso, ser corrigida de acordo com as instruções recebidas dos elementos júri.

Acknowledgements

The Name of the Author

"You should be glad that bridge fell down.
I was planning to build thirteen more to that same design"

Isambard Kingdom Brunel

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Abbreviations

ADT	Abstract Data Type
ANDF	Architecture-Neutral Distribution Format
API	Application Programming Interface
CAD	Computer-Aided Design
CASE	Computer-Aided Software Engineering
CORBA	Common Object Request Broker Architecture
UNCOL	UNiversal COmpiler-oriented Language
Loren	Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Sed vehicula lorem commodo dui
WWW	*World Wide Web*

Chapter 1

Introduction

This chapter presents the context and motivation of this thesis, describing the main goals, it's objectives and the expected results of work.

1.1 Context and Motivation

Nowadays current markets are changing, we can see more often the globalization phenomenon and with that organizations are compelled to streamline their business in order to achieve a favorable market position and be able to maintain or increase their competitiveness.

In our everyday lives software takes an important role, he is everywhere and is needed more often. When he is in development it is important to make it more efficiently and with more quality. For organizations that have software currently in development failures and errors are not allowed and each one of them implies increased costs and resources being wasted. To avoid this scenario and to achieve maximum efficiency and agility, their processes and their methodologies need to be less time consuming and more effortless so good practices need to be followed in order to allow them focus on what really matters: value creation. This will provide them advantages and make them more trustful.

Organizations need to ensure that their products and services consistently meet customer's requirements, and that quality is consistently improved and certifications are a formal recognition of those ideals. Sadly those recognitions take too much time and effort and time being in some cases very painful and expensive.

SCAMPI is the Standard CMMI Appraisal Method for Process Improvement, the evaluation method of CMMI model. CMMI is a model for organizations to improve their processes and is required by many U.S. Government contracts, especially in software development. SCRAIM is the tool that is going to provide us the background and the base to work and simplify those kind of evaluations in order to save time and money. That way companies will deliver their products and services better, faster, and cheaper.

1.2 Goals and expected results

The main goal is of this dissertation is to develop a group of methodologies, techniques and tools integrated in the SCRAIM interface, that will make evaluations and certain parts of certifications easier and less painful for the SCRAIM users. Although there are a number of life cycle and project management tools, few combine this with process management techniques. SCRAIM combines the two and will provide the users new features that will semi-automate the assessment for certification of an organization.
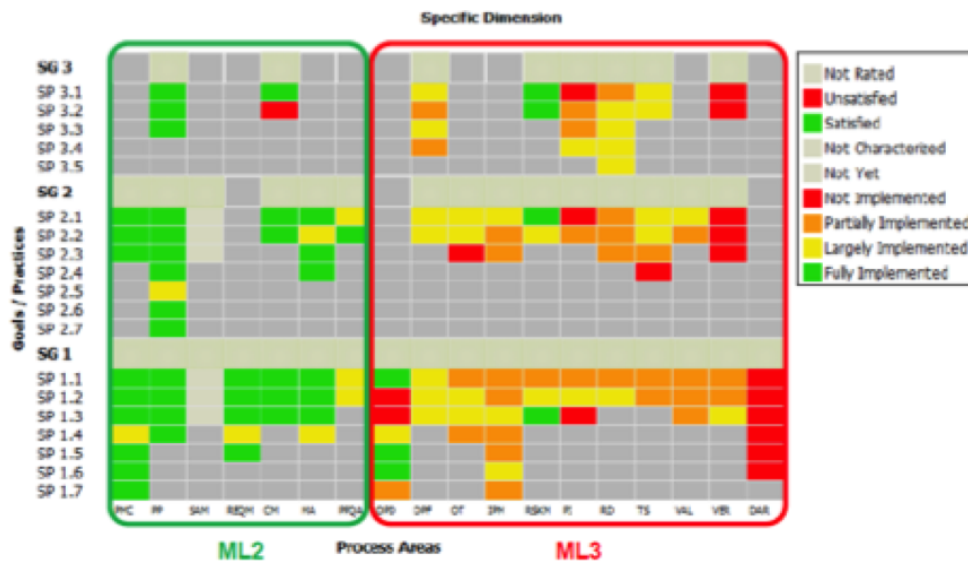
Figure 1.1: SCAMPI results

This image shows a matrix that is expected to have as output, and what is intended to do is:

- Having SCRAIM as the basis for project activity take a sample of projects;

- Analyze the project activity in SCRAIM;

- Map the information of the produced articles to CMMI;

  - Determine what are the good practices presented in SCRAIM, that can be mapped to CMMI;

  - For each one of them investigate and conclude if that practice is being followed and fully satisfied;

- Generate an matrix like the previous picture:

  - Each column represents a good practice that needs to be followed and be satisfied;

The full-automated process is not yet feasible, so human intervention is still mandatory. With the use of SCRAIM, good practices will be followed and in the end the generated information will facilitate the decision making process. We can see many advantages of this innovation, and we believe that the application of this innovation will help reducing the costs and time of one evaluation using the SCAMPI method.

1.3   Document structure

Introduction

Chapter 2

Problem analysis

The evaluation for certification is one complex process, and requires many approaches, some acquired knowledge and some experience. To understand the problem and objectives of this dissertation, it is necessary to understand what is CMMI, in particular the SCAMPI method and what is SCRAIM.

2.1 CMMI

To understand better what is CMMI we need to understand what is Capability model.

2.1.1 CMM

A CMM (Capability Maturity Model), including CMMI, is a simplified representation of the world around us. Capability Maturity Models contain essentially elements of effective processes, this elements are based on concepts developed by Crosby, Deming, Juran, and Humphrey.

The SEI (The Carnegie Mellon Software Engineering Institute that is a federally funded research and development center headquartered on the campus of Carnegie Mellon University in Pittsburgh, Pennsylvania, United States) adopted the process management premise, "the quality of a system or product is highly influenced by the quality of the process used to develop it and keep it" and defined CMMs that incorporated this premise.

2.1.2 What is CMMI

CMMI stands for Capability Maturity Model Integration and is a process of improvement training, an appraisal program and a service that is administered and sold by the Carnegie Mellon University, and for some business activities is required and mandatory like many DOD (United States Department of Defense) and U.S. Government contracts, especially in software development.

Figure 2.1: History of CMMs

Carnegie Mellon University says that CMMI can be used to guide an organization, a division and process improvement across projects. The CMMI processes and methodologies can be classified according to maturity levels.

Currently CMMI is on Version 1.3 and is registered in the United States Patent and Trademark Office by Carnegie Mellon University.

2.1.3 CMMI models and process areas

Best practices of CMMI are published in documents called models, each models is addressed to a different area of interest. The current version of CMMI, version 1.3, has three different areas of interest: development, acquisition and services.

These models are produced taking for base the CMMI framework that contains all the goals and practices used to produce the models that are part of CMMI constellations. The CMMI models contain 16 core process areas, they cover basic concepts fundamental to process improvement in any area of interest.

The material in core process areas it is almost the same for all constellations of CMMI, the rest of the material need to be adjusted to a specific area of interest, so the material wont be the exactly the same.

2.1.4 CMMI model framework

CMMI framework is a basic structure that organizes and groups the CMMI components, elements of the current models, rules, methods for model generations, appraisal methods and training material, contains too process areas that will vary for each one of the CMMI areas that will be used. Process areas are the areas that cover the organization processes.

For the latest version of CMMI for Development (Version 1.3) there are 22 Process Areas, which represents the product aspects and the coverage for the organizational processes.

2.1.5 Maturity levels in CMMI for development
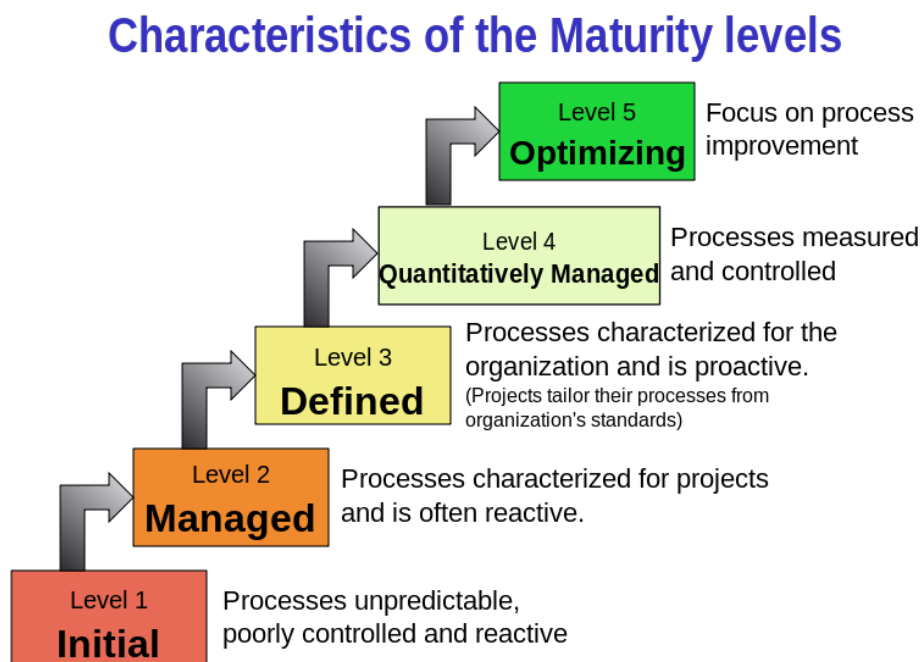
Figure 2.2: CMMI maturity levels

Processes under the CMMI methodology are rated and grouped according levels, called maturity levels. There are five levels of maturity levels defined as: Initial, Managed, Defined, Quantitatively Managed, Optimizing. These maturity levels that are rated are presented and awarded for levels 2 through 5. The following process areas listed show us the maturity levels for CMMI for Development:

- Maturity Level 2 - Managed

  - CM - Configuration Management

  - Measurement and Analysis

- – PMC - Project Monitoring and Control

- – PP - Project Planning

- – PPQA - Process and Product Quality Assurance

- – REQM - Requirements Management

- – SAM - Supplier Agreement Management

- Maturity Level 3 - Defined

  - – DAR - Decision Analysis and Resolution

  - – IPM - Integrated Project Management

  - – OPD - Organizational Process Definition

  - – OPF - Organizational Process Focus

  - – OT - Organizational Training

  - – PI - Product Integration

  - – RD - Requirements Development

  - – RSKM - Risk Management

  - – TS - Technical Solution

  - – VAL - Validation

  - – VER – Verification

- Maturity Level 4 - Quantitatively Managed

  - – OPP - Organizational Process Performance

  - – QPM - Quantitative Project Management

- Maturity Level 5 - Optimizing

  - – CAR - Causal Analysis and Resolution

  - – OPM - Organizational Performance Management

2.1.6 Appraisal

Organizations cannot be certified in CMMI, so there is something called appraisal and an organization is appraised.

In an appraisal the organization gets awarded a maturity level from one to five or a capability level achievement profile. As said before many organizations are required to get some kind of recognition and others find value measuring their progress such determine how well the processes adopted by the organization are compared to CMMI best practices, to meet contractual and customers requirements and to know which areas they can improve and appraisals are the right way to do it.

Appraisals using a CMMI model must comply with the requirements set out in the Appraisal Requirements for CMMI (ARC) document. There are three classes of appraisals, A, B and C, all of them compare the processes used in the organization to CMMI processes and best practices, that way is identified improvements to make. From all three classes of appraisals the most formal is class A and it is the only one that can output a level rating.

When an appraisal is done teams use a CMMI model and an ARC document. The results from the teams are used to plan improvements for the organization.

Statistics are made and updated every six months in a maturity profile since the release of CMMI show us that the median times to move from Level 1 to Level 2 is 5 months, from that to Level 3 more 21 months.

2.1.7 SCAMPI

SCAMPI is the abbreviation for Standard CMMI Appraisal Method for Process Improvement and is an appraisal method that meets all the ARC requirements. In SCAMPI appraisals there are three types of distinct classes: Class A, B and C appraisal methods. The most rigorous method and officially recognized as that is the Class A method, it is the only method that can result in a benchmark quality rating. SCAMPI B and C provide organizations improvements less formal than the class A, however still can identify improvements to be done.

Results SCAMPI appraisal can be published on the CMMI web site of SEI, if the organizations approves this. This appraisal supports the conduct of ISO/IEC 15504, Software Process Improvement and Capability Determination (SPICE), a set of technical standards documents for the computer software development process and related business management functions.

The ARC Class A appraisals is normally conducted by SCAMPI A appraisal. The SCAMPI A Method Definition Document is where its defined rules to ensure the consistency of the appraisal ratings, so the same maturity rated in two companies means they are equal in methodologies and business processes.

2.1.7.1 SCAMPI A

As said before the class A appraisal is the only full comprehensive appraisal method that involves an ARC class A method and uses CMMI models as reference models.

This appraisal will allow organizations to gain insight about their capability by identifying the strengths and weaknesses of its current processes, prioritize improvement plans, focus on those improvements, correcting weakness that will generate risks, derive capability rating as a maturity level rating and identify risks relative to capability and maturity determinations.

This appraisal follows this principals:

- Start with a process reference model.

- Use a defined appraisal method.

- Involve senior management as an appraisal sponsor.

- Observe strict confidentiality and non-attribution.

- Approach the appraisal collaboratively. (When SCAMPI is used for Supplier Selection or Process Monitoring modes, it may not be possible to use a collaborative appraisal approach.)

- Focus on the sponsors business objectives

There are some terms to consider with special meaning, Organizational Unit (OU), Organizational Scope, Subgroup, Basic Unit, Support Function, Objective Evidence, Instantiation, Database of Objective Evidence, Practice Characterization.
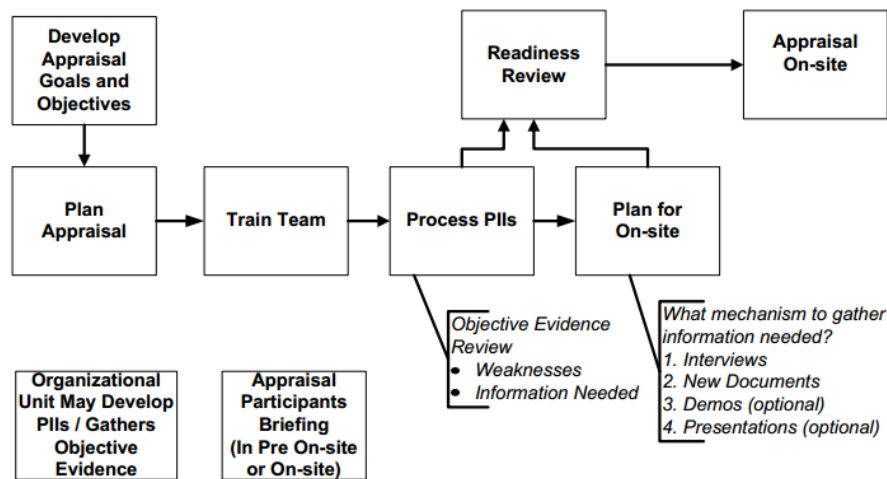
Definir cada um deles?

Figure 2.3: SCAMPI A activities

Objective evidence are "footprints" which are indicators of the implementation or institutionalization of model practices. SCAMPI appraisals use objective evidence as the focus to verify practice implementation. Verifying practice implementation is the review of Objective Evidence to determine whether a practice is implemented within a basic unit, support function, and/or organization.

Artifacts are ● A tangible form of objective evidence indicative of work being performed that represents either the primary output of a model practice or a consequence of implementing a model practice

Examples: ● Example work products listed in CMMI practices ● Target products of an "establish and maintain" specific practice ● Documents, deliverable products, training materials, meeting minutes, etc.

Affirmation are ● An oral or written statement confirming or supporting implementation (or lack of implementation) of a model practice provided by the implementers of the practice, provide via an interactive forum in which the appraisal team has control over the interaction. Examples: ●

oral affirmations include interview responses, presentations, and demonstrations, as long as these presentations and demonstrations are provided in an interactive setting. • written affirmations include written statements provided by the implementers of the practice to the appraisal team via an interactive forum.

For some practices, documents are accepted as artifacts even if they are not the primary intended result of performing the practice. For example: • CM SP1.2 Establish a configuration management system (this could be represented by a schematic or a description of the library system from a CM plan) • PI SP1.2 Establish the product integration environment (this could be represented by a schematic, a description from an engineering plan, or a picture) • GP 2.5 Train people (this could be represented by training records showing that specific individuals have completed specific training)

Practice Characterization (table)

Appraisal sponsor - Sponsors appraisal - Owns appraisal results - Signs ADS Middle managers - From line or staff management positions - Interviewee and data provider - *Review preliminary findings Basic Unit leaders - Leadership responsibilities for a project, service, etc. - Interviewee and data provider - *Review preliminary findings Support Function - Practitioner - Interviewee and data provider - Review preliminary findings

Appraisal Team – Key Roles Team Leader - Overall responsibility for appraisal - SEI-certified SCAMPI leader appraiser and has appropriate experience and required training - Signs Final Findings and ADS Team members - Satisfy requirements for team members relative to experience and training - Assume one or more specific roles - Signs Final Findings

Team Leader Responsibilities Overall responsibility for the appraisal Ensures planning activities are complete Assigns team roles Ensures SCAMPI appraisal process followed Monitors schedule and performance Facilitates team resolution of conflicts and impasses Interfaces with sponsor Reports results to SEI

Problem analysis

Chapter 3

Visualização de Sinópticos SVG

Este capítulo deve começar por fazer uma apresentação detalhada do problema a resolver[1] podendo mesmo, caso se justifique, constituir-se um capítulo com essa finalidade.

Deve depois dedicar-se à apresentação da solução sem detalhes de implementação. Dependendo do trabalho, pode ser uma descrição mais teórica, mais "arquitetural", etc.

3.1 Secção Exemplo

Neste capítulo apresentam-se exemplos de formatação de figuras e tabelas, equações e referências cruzadas.

Apresenta-se de seguida um exemplo de equação, completamente fora do contexto:

$$CIF_1: \quad F_0^j(a) \quad = \quad \frac{1}{2\pi\iota} \oint_\gamma \frac{F_0^j(z)}{z-a} dz \tag{3.1}$$

$$CIF_2: \quad F_1^j(a) \quad = \quad \frac{1}{2\pi\iota} \oint_\gamma \frac{F_0^j(x)}{x-a} dx \tag{3.2}$$

Na Equação 3.2 lorem ipsum dolor sit amet, consectetuer adipiscing elit. Suspendisse tincidunt viverra elit. Donec tempus vulputate mauris. Donec arcu. Vestibulum condimentum porta justo. Curabitur ornare tincidunt lacus. Curabitur ac massa vel ante tincidunt placerat. Cras vehicula semper elit. Curabitur gravida, est a elementum suscipit, est eros ullamcorper quam, sed cursus velit velit tempor neque. Duis tempor condimentum ante.

Phasellus imperdiet, orci vel pretium sollicitudin, magna nunc ullamcorper augue, non venenatis dui nunc quis massa. Pellentesque dolor elit, dapibus venenatis, viverra ultricies, accumsan cursus, orci. Aliquam erat volutpat. Mauris ornare tristique leo. Maecenas eros. Curabitur velit nunc, tincidunt vitae, dictum posuere, pulvinar nec, diam. In suscipit mauris a nunc. Pellentesque gravida. Morbi quam lacus, pretium eget, tincidunt vulputate, interdum sed, turpis. Curabitur quis

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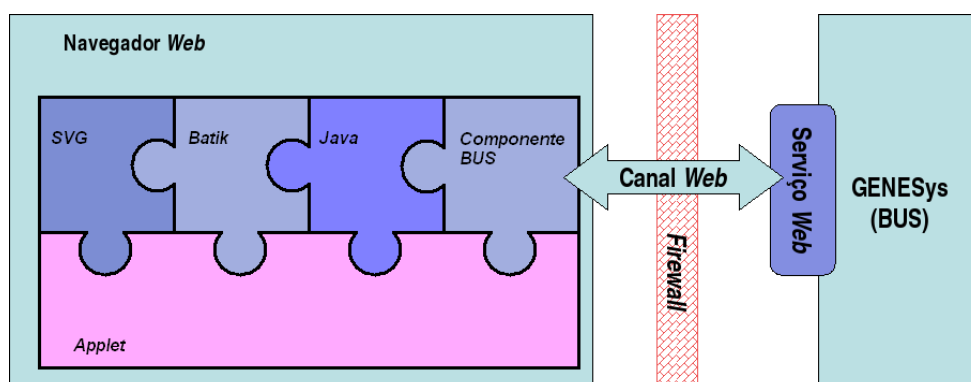[1]Na introdução a apresentação do problema foi breve.

Figure 3.1: Arquitectura da Solução Proposta

est. Sed lectus lorem, congue vel, dignissim laoreet, blandit a, nisi. Aenean nunc ligula, tincidunt eu, hendrerit vel, suscipit non, erat. Aliquam gravida. Integer non pede. In laoreet augue id leo. Mauris placerat.

A arquitetura do visualizador assenta sobre os seguintes conceitos base [**?**]:

- **Componentes** — Suspendisse auctor mattis augue *push*;

- **Praesent** — Sit amet sem maecenas eleifend facilisis leo;

- **Pellentesque** — Habitant morbi tristique senectus et netus.

3.1.1 Exemplo de Figura

É apresentado na Figura 3.1 um exemplo de figura flutuante.

Loren ipsum dolor sit amet, consectetuer adipiscing elit. Praesent sit amet sem. Maecenas eleifend facilisis leo. Vestibulum et mi. Aliquam posuere, ante non tristique consectetuer, dui elit scelerisque augue, eu vehicula nibh nisi ac est. Suspendisse elementum sodales felis. Nullam laoreet fermentum urna.

Duis eget diam. In est justo, tristique in, lacinia vel, feugiat eget, quam. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Fusce feugiat, elit ac placerat fermentum, augue nisl ultricies eros, id fringilla enim sapien eu felis. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Sed dolor mi, porttitor quis, condimentum sed luctus.

3.1.2 Exemplo de Tabela

É apresentado na Tabela 3.1 um exemplo de tabela flutuante e na Tabela 3.2 um exemplo de tabela flutuante, um pouco mais complicada.

Integer quis pede. Fusce nibh. Fusce nec erat vel mi condimentum convallis. Sed at tortor non mauris pretium aliquet. In in lacus in dolor molestie dapibus. Suspendisse potenti. Pellentesque

Table 3.1: Uma Tabela Simples

Acrónimo	Significado
ADT	*Abstract Data Type*
ANDF	*Architecture-Neutral Distribution Format*
API	*Application Programming Interface*

sagittis porta erat. Mauris sodales sapien id augue. Nam eu dolor. Donec sit amet turpis non orci rhoncus commodo. Etiam condimentum commodo libero.

Mauris pede. Curabitur faucibus dictum nibh. Proin tincidunt diam vitae mauris. Sed hendrerit dolor vel ipsum. Nullam dapibus. Vivamus tellus diam, egestas sit amet, vulputate non, vulputate id, eros. Nunc sit amet nibh eget nibh imperdiet ornare. Cras vehicula mattis ipsum. Sed diam arcu, semper at, gravida vitae, fermentum et, nulla. Aenean massa orci, tristique nec, rutrum id, fringilla eget, erat. Curabitur nulla ipsum, aliquam sed, rutrum vitae, semper quis, ante. Fusce at nunc in dolor condimentum tempor. Duis sit amet massa.

Curabitur convallis nulla quis risus. Nulla mollis porttitor purus. Fusce ultricies odio at ligula pellentesque suscipit. Nulla velit libero, blandit a, aliquet quis, hendrerit id, arcu. Phasellus porttitor porttitor purus. Suspendisse velit tortor, fringilla sit amet, commodo a, ultrices et, mi. Donec eu metus in erat ornare adipiscing. Praesent varius mi ac nunc. Vestibulum leo lacus, elementum in, vestibulum sit amet, hendrerit at, justo. Sed sit amet neque. Donec libero risus, commodo sit amet, dignissim ut, tincidunt a, eros. Ut non lacus quis tortor mattis ullamcorper. Vivamus consequat augue vel erat. Sed tincidunt. Sed leo eros, ornare a, pulvinar non, mattis quis, nibh. Aliquam faucibus mi ac nisi.

Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Duis aliquet, libero sit amet ornare viverra, augue erat interdum dolor, vitae tincidunt lorem erat a lacus. Sed lectus nisi, auctor in, hendrerit a, molestie vel, lectus. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Duis lacinia tempor dui. Vivamus rhoncus, tellus a viverra dignissim, pede dui adipiscing odio, non faucibus metus mi gravida eros. Nullam a tellus ut velit elementum tempus. Aenean rutrum convallis tellus. Vestibulum nulla ante, dapibus ut, lobortis ut, varius sed, nisl. Fusce lobortis. Sed ac lorem. Nulla tincidunt nulla eget leo. Maecenas ac lectus eu neque ultrices pharetra. Curabitur a risus nec arcu placerat tempor. Suspendisse magna nisl, viverra a, adipiscing eget, ornare ultricies, ligula. Maecenas eu ligula vitae eros convallis dignissim.

Loren ipsum dolor sit amet, consectetuer adipiscing elit. Praesent sit amet sem. Maecenas eleifend facilisis leo. Vestibulum et mi. Aliquam posuere, ante non tristique consectetuer, dui elit scelerisque augue, eu vehicula nibh nisi ac est. Suspendisse elementum sodales felis. Nullam laoreet fermentum urna.

Duis eget diam. In est justo, tristique in, lacinia vel, feugiat eget, quam. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Fusce feugiat, elit ac

Table 3.2: Uma Tabela Mais Complicada

	Iteração k de $f(x_n)$			
k	x_1^k	x_2^k	x_3^k	comentários
0	-0.3	0.6	0.7	-
1	0.47102965	0.04883157	-0.53345964	$\delta < \varepsilon$
2	0.49988691	0.00228830	-0.52246185	$\delta < \varepsilon$
3	0.49999976	0.00005380	-0.523656	N
4	0.5	0.00000307	-0.52359743	
$\vdots$	$\vdots$	$\ddots$	$\vdots$	
7	0.5	0.0	**-0.52359878**	$\delta < 10^{-8}$

placerat fermentum, augue nisl ultricies eros, id fringilla enim sapien eu felis. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Sed dolor mi, porttitor quis, condimentum sed luctus.

3.2   Secção Exemplo

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Duis eget diam. In est justo, tristique in, lacinia vel, feugiat eget, quam. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Fusce feugiat, elit ac placerat fermentum, augue nisl ultricies eros, id fringilla enim sapien eu felis. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Sed dolor mi, porttitor quis, condimentum sed luctus.

3.3   Resumo e Conclusões

Resumir e apresentar as conclusões que se podem tirar no fim deste capítulo.

Chapter 4

Implementação

Este capítulo pode ser dedicado à apresentação de detalhes de nível mais baixo relacionados com o enquadramento e implementação das soluções preconizadas no capítulo anterior. Note-se no entanto que detalhes desnecessários à compreensão do trabalho devem ser remetidos para anexos.

Dependendo do volume, a avaliação do trabalho pode ser incluída neste capítulo ou pode constituir um capítulo separado.

4.1 Secção Exemplo

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Integer hendrerit commodo ante. Pellentesque nibh libero, aliquam at, faucibus id, commodo a, velit. Duis eleifend sem eget leo. Morbi in est. Suspendisse magna sem, varius nec, hendrerit non, tincidunt quis, quam. Aenean congue. Vivamus vel est sit amet sem iaculis posuere. Cras mollis, enim vel gravida aliquam, libero nunc ullamcorper dui, ullamcorper sodales lectus nulla sed urna. Morbi aliquet porta risus. Proin vestibulum ligula a purus. Maecenas a nulla. Maecenas mattis est vitae neque auctor tempus. Etiam nulla dui, mattis vitae, porttitor sed, aliquet ut, enim. Cras nisl magna, aliquet et, laoreet at, gravida ac, neque. Sed id est. Nulla dapibus dolor quis ipsum rhoncus cursus.

4.2 Mais uma Secção

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Quisque purus sapien, interdum ut, vestibulum a, accumsan ullamcorper, erat. Mauris a magna ut leo porta imperdiet. Donec dui odio, porta in, pretium non, semper quis, orci. Quisque erat diam, pharetra vel, laoreet ac, hendrerit vel, enim. Donec tristique luctus risus. Fusce dolor est, eleifend id, elementum sit amet, varius vitae, neque. Morbi at augue. Ut sem ligula, auctor vitae, facilisis id, pharetra non, lectus. Nulla lacus

```
 1  map(String key, String value):
 2  // key: document name
 3  // value: document contents
 4  for each word w in value:
 5  EmitIntermediate(w, "1");
 6
 7  reduce(String key, Iterator values):
 8  // key: a word
 9  // values: a list of counts
10  int result = 0;
11  for each v in values:
12  result += ParseInt(v);
13
14  Emit(AsString(result))
```

Listing 4.1: Example map and reduce functions for word counting

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4.3 Resumo ou Conclusões

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Chapter 5

Conclusões e Trabalho Futuro

Deve ser apresentado um resumo do trabalho realizado e apreciada a satisfação dos objetivos do trabalho, uma lista de contribuições principais do trabalho e as direções para trabalho futuro.

A escrita deste capítulo deve ser orientada para a total compreensão do trabalho, tendo em atenção que, depois de ler o Resumo e a Introdução, a maioria dos leitores passará à leitura deste capítulo de conclusões e recomendações para trabalho futuro.

5.1 Satisfação dos Objetivos

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5.2 Trabalho Futuro

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Appendix A

Loren Ipsum

Depois das conclusões e antes das referências bibliográficas, apresenta-se neste anexo numerado o texto usado para preencher a dissertação.

A.1   O que é o *Loren Ipsum*?

Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley of type and scrambled it to make a type specimen book. It has survived not only five centuries, but also the leap into electronic typesetting, remaining essentially unchanged. It was popularised in the 1960s with the release of Letraset sheets containing Lorem Ipsum passages, and more recently with desktop publishing software like Aldus PageMaker including versions of Lorem Ipsum [**?**].

A.2   De onde Vem o Loren?

Contrary to popular belief, Lorem Ipsum is not simply random text. It has roots in a piece of classical Latin literature from 45 BC, making it over 2000 years old. Richard McClintock, a Latin professor at Hampden-Sydney College in Virginia, looked up one of the more obscure Latin words, consectetur, from a Lorem Ipsum passage, and going through the cites of the word in classical literature, discovered the undoubtable source. Lorem Ipsum comes from sections 1.10.32 and 1.10.33 of "de Finibus Bonorum et Malorum" (The Extremes of Good and Evil) by Cicero, written in 45 BC. This book is a treatise on the theory of ethics, very popular during the Renaissance. The first line of Lorem Ipsum, "Lorem ipsum dolor sit amet. . . ", comes from a line in section 1.10.32.

The standard chunk of Lorem Ipsum used since the 1500s is reproduced below for those interested. Sections 1.10.32 and 1.10.33 from "de Finibus Bonorum et Malorum" by Cicero are also reproduced in their exact original form, accompanied by English versions from the 1914 translation by H. Rackham.

A.3   Porque se usa o Loren?

It is a long established fact that a reader will be distracted by the readable content of a page when looking at its layout. The point of using Lorem Ipsum is that it has a more-or-less normal distribution of letters, as opposed to using "Content here, content here", making it look like readable English. Many desktop publishing packages and web page editors now use Lorem Ipsum as their default model text, and a search for "lorem ipsum" will uncover many web sites still in their infancy. Various versions have evolved over the years, sometimes by accident, sometimes on purpose (injected humour and the like).

A.4   Onde se Podem Encontrar Exemplos?

There are many variations of passages of Lorem Ipsum available, but the majority have suffered alteration in some form, by injected humour, or randomised words which don't look even slightly believable. If you are going to use a passage of Lorem Ipsum, you need to be sure there isn't anything embarrassing hidden in the middle of text. All the Lorem Ipsum generators on the Internet tend to repeat predefined chunks as necessary, making this the first true generator on the Internet. It uses a dictionary of over 200 Latin words, combined with a handful of model sentence structures, to generate Lorem Ipsum which looks reasonable. The generated Lorem Ipsum is therefore always free from repetition, injected humour, or non-characteristic words etc.