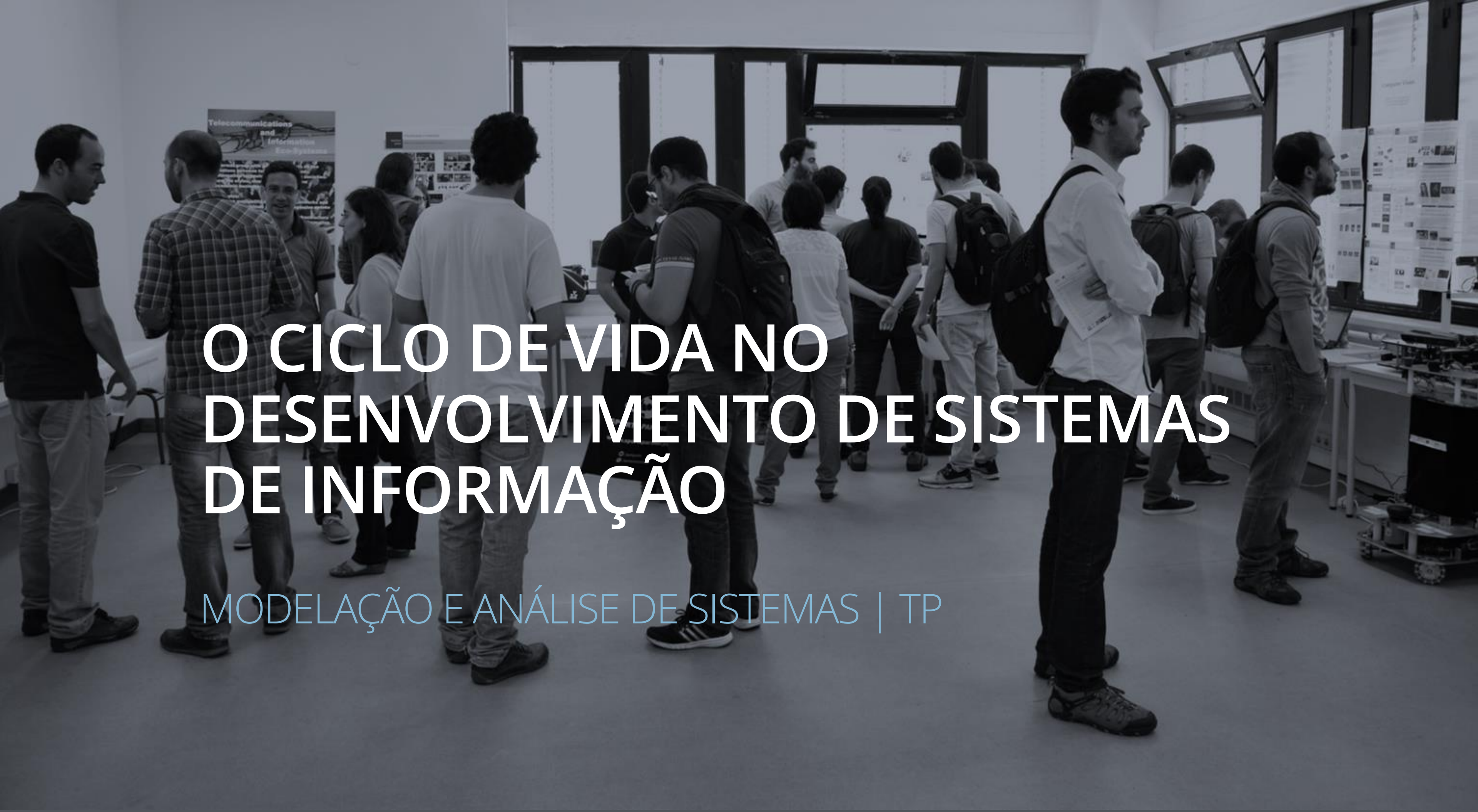

O CICLO DE VIDA NO DESENVOLVIMENTO DE SISTEMAS DE INFORMAÇÃO

MODELAÇÃO E ANÁLISE DE SISTEMAS | TP

ILÍDIO OLIVEIRA ico@ua.pt
v2018-02-15

universidade de aveiro
departamento de eletrónica,
telecomunicações e informática
deti

MODELAÇÃO E ANÁLISE DE **SISTEMAS**

“SOFTWARE RUNS THE WORLD”

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deti

Technological change has never occurred as rapidly, or on as large a scale, as today.

“Technological innovation enables – indeed, requires – companies to boost their agility and thus their competitiveness. That’s why CEOs’ top priorities in 2016 should be to digitize the core components of their business and rethink organizational design and governance processes. Catching this fast-moving – and rapidly growing – “digital wave” is the only way to avoid getting left behind.”

PROJECT SYNDICATE
THE WORLD’S OPINION PAGE

PRINT

DOMINIC BARTON

Dominic Barton is the global managing director of McKinsey & Company.

JAN 15, 2016

Catching the Digital Wave

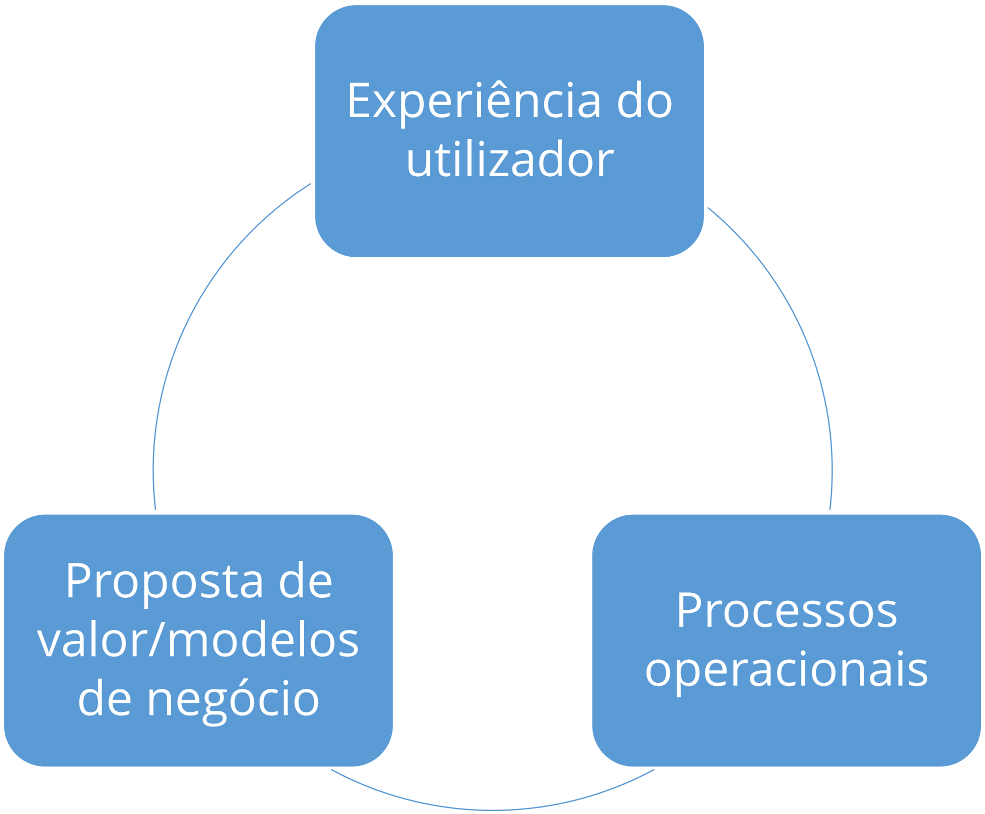
NEW YORK – Technological change has always posed a challenge for companies. But, as we saw once again in 2015, it has never occurred as rapidly, or on as large a scale, as today. As innovation sweeps across virtually every sector, from heavy industry to services, it is transforming the competitive landscape, with the most advanced companies – rather than the largest or most established players – coming out on top.

For incumbents, the threat of displacement is very real. The average tenure of a company on the S&P 500 has fallen from 90 years in 1935 to less than 18 years today. Disruptive new players like Uber, which has upended the taxi industry, are tough competitors, often staking out market share by shifting more surplus to consumers. This is part of a broader trend of intensifying competition that, according to recent research from the McKinsey Global Institute, could reduce the global after-tax profit pool from almost 10% of global GDP today to its 1980 level of about 7.9% within a decade.

http://prosyn.org/lxXI6OW

Transformação digital

A utilização de TIC para melhorar de forma decisiva o desempenho ou proposta de valor de uma empresa

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SGQ

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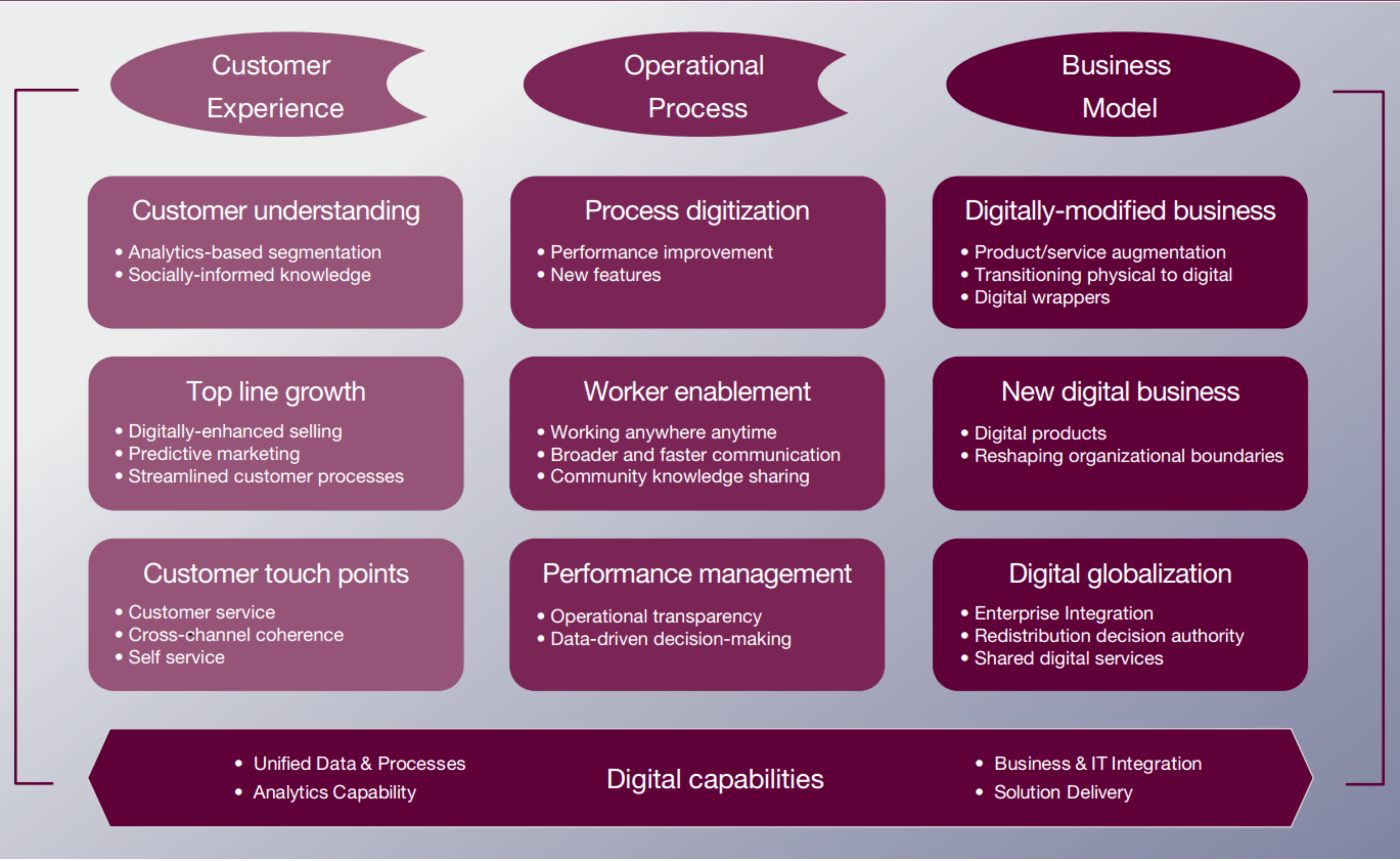
A partir de 26 de Janeiro, a Universidade de Aveiro (UA) implementa o Subsistema para a Garantia da Qualidade das Unidades Curriculares relativo ao 1º semestre do ano letivo 2014/2015.

A partir dessa data e até ao dia 22 de fevereiro, a UA promoverá o lançamento dos inquéritos pedagógicos junto dos estudantes. Os inquéritos são preenchidos eletronicamente, via PACO (http://paco.ua.pt/) ou diretamente em http://sgq.ua.pt.

Participa! A tua opinião é fundamental!


UBER

Figure 3: Building blocks of the digital transformation



I Oliveira (2017)

"Digital Transformation: A Roadmap for Billion-Dollar Organizations", MIT Center for Digital Business

Dados vs. **Informação**

Dados: os factos, em cru

Observações/medidas sobre a realidade

E.g.: “PA do doente é 120/80 mmHg”

Conhecimento

Compreensão das relações entre os dados

Explicar padrões que ocorrem nos dados

E.g.: “Se a PA > 140/90 em três momentos separados ➔ hipertensão”

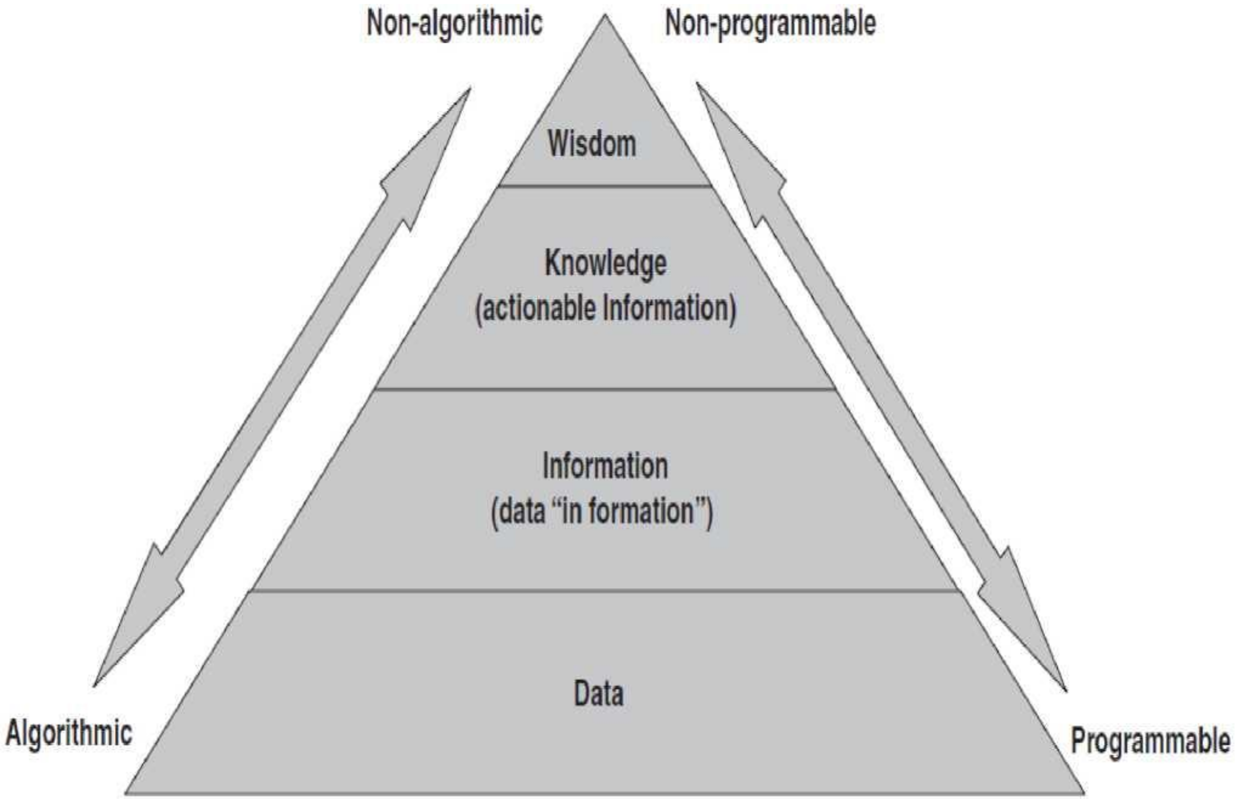
Informação

Coleção de factos organizados de maneira a que apresentam mais valor, para além dos factos em si.

A informação é obtida do processamento dos dados

E.g.: “Este mês, foi verificado um aumento de 20% de casos de hipertensão na clínica”

The DIKW Model



Rowley, J. (2007) The wisdom hierarchy: representations of the DIKW hierarchy. *Journal of Information Science, 33, 2,163-180.*

we shall refer to a **datum** as a single observational point that characterizes a relationship.[5] It generally can be regarded as the value of a specific parameter for a particular object (e.g., a patient) at a given point in time. The term **information** refers to analyzed data that have been suitably curated and organized so that they have meaning. Data do not constitute information until they have been organized in some way, e.g., for analysis or display. **Knowledge**, then, is derived through the formal or informal analysis (or interpretation) of information that was in turn derived from data. Thus, knowledge includes the results of formal studies and also common sense facts, assumptions, heuristics (strategic rules of thumb), and models—any of which may reflect the experience or biases of people who interpret the primary data and the resulting information.

The observation that patient Brown has a blood pressure of 180/110 is a *datum*, as is the report that the patient has had a myocardial infarction (heart attack). When researchers pool such data, creating information, subsequent analysis may determine that patients with high blood pressure are more likely to have heart attacks than are patients with normal or low blood pressure. This analysis of organized data (information) has produced a piece of knowledge about the world. A physician's belief that prescribing dietary restriction of salt is unlikely to be effective in controlling high blood pressure in patients of low economic standing (because the latter are less likely to be able to afford special low-salt foods) is an additional personal piece of *knowledge*—a **heuristic** that guides physicians in their decision making. Note that the appropriate interpretation of these definitions depends on the context. Knowledge at one level of abstraction may be considered data at higher levels. A blood pressure of 180/110 mmHg is a raw piece of data; the statement that the patient has hypertension is an interpretation of several such data and thus represents a higher level of information. As input to a diagnostic decision aid, however, the presence or absence of hypertension may be requested, in which case the presence of hypertension is treated as a data item.

[5] Note that *data* is a plural term, although it is often erroneously used in speech and writing as though it were a collective (singular) noun.

From: Shortliffe, E. H. & Cimino, J. J. (2014). Biomedical Informatics, 4th ed.

O que é um **sistema de informação?**

Sistema

Um conjunto de componentes/partes que interagem para atingir uma finalidade

Um sistema tem uma estrutura interna que transforma inputs em outputs, para um fim específico.

E.g.: diversos sistemas no corpo humano

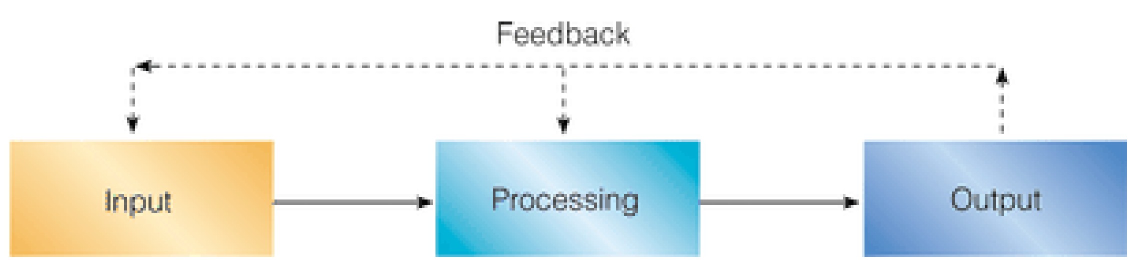
Sistema de informação

Um conjunto de recursos interrelacionados (humanos e tecnológicos) para satisfazer as necessidades de informação de uma organização e dos seus processos de negócio.

FIGURE 1.7

The Components of an Information System

Feedback is critical to the successful operation of a system.



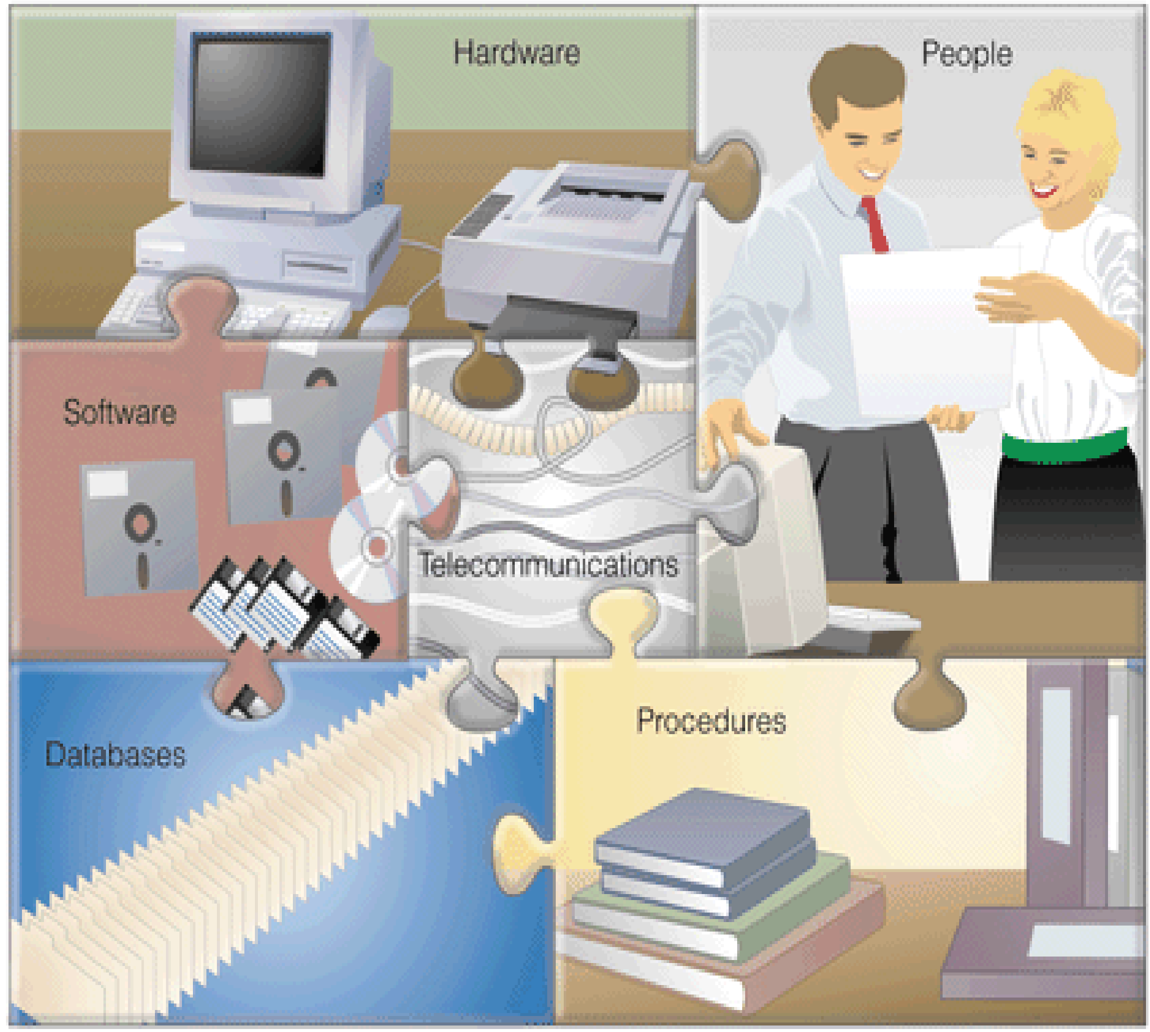
Os sistemas são **funções de transformação complexas**

System	Elements			Goal
	Inputs	Processing elements	Outputs	
Digestive tract	Food	Mouth, stomach, bowl,...	Nutrients ready to use	Absorb nutrients from food
ADT (admission, discharge, transfer)	Patient Records, Contact episodes, Schedules, Resources, etc...	Databases systems, specific software, wristband readers, ...	Priority queue, discharge letters, identification labels, etc...	Manage movement of patients in a hospital

Componentes de um SI computorizado

FIGURE 1.8

The Components of a Computer-Based Information System



ANÁLISE E MODELAÇÃO DE SISTEMAS

O PROCESSO DE ESPECIFICAÇÃO DO SI

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Systems development life cycle (SDLC)

is the process of understanding how an information system (IS) can support business needs by designing a system, building it, and delivering it to users.

Role of the Analyst

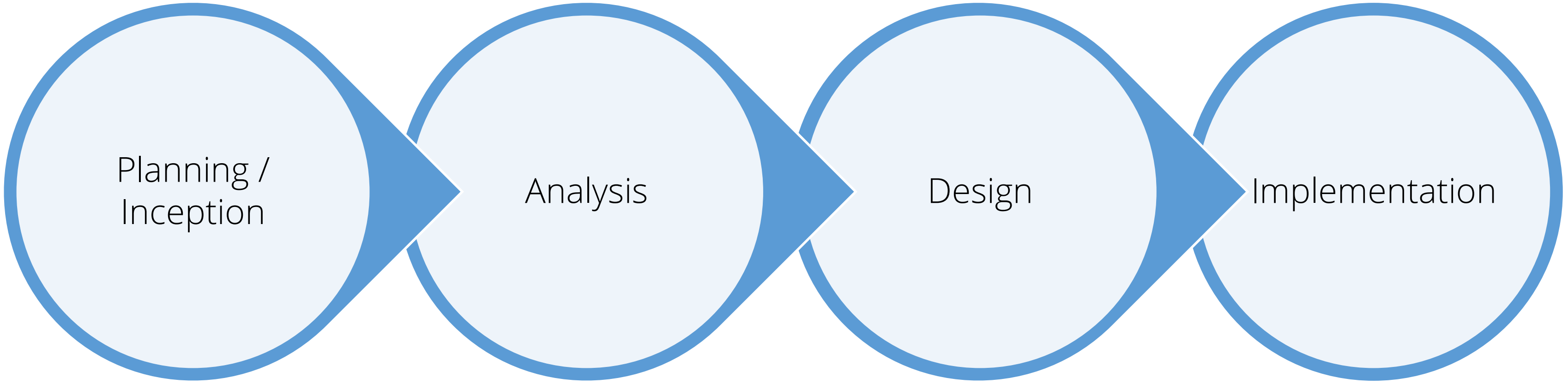
The key person in the SDLC is the systems analyst, who analyzes the business situation, identifies opportunities for improvements, and designs an information system to implement them. Being a systems analyst is one of the most interesting, exciting, and challenging jobs around.

The primary objective of a systems analyst is not to create a wonderful system; instead, it is to create value for the organization.

SDLC phases

Four fundamental phases: planning, analysis, design, and implementation. Different projects might emphasize different parts of the SDLC or approach the SDLC phases in different ways, but all projects have elements of these four phases.

Each phase is itself composed of a series of steps, which rely upon techniques that produce deliverables (specific documents and files that provide understanding about the project).



Fundamental phases: **planning**, analysis, design, and implementation

The planning phase is the fundamental process of understanding why an information system should be built and determining how the project team will go about building it. Key steps:

Project initiation

the business value of the system to the organization is identified.

Most ideas for new systems come from outside the IS area (e.g., from the marketing department, accounting department).

A system request presents a brief summary of a business need, and it explains how a system that supports the need will create business value.

The system requests and feasibility analysis are presented to an information systems approval committee (sometimes called a steering committee), which decides whether the project should be undertaken.

Project management

The project manager creates a workplan, staffs the project, and puts techniques in place for the team to control and direct the project through the entire SDLC.

Fundamental phases: planning, **analysis**, design, and implementation

The analysis phase answers the questions of who will use the system, **what the system will do**, and where and when it will be used.

During this phase, the project team investigates any current system(s), identifies opportunities for improvement, and develops a concept for the new system.

Key steps:

analysis of existing systems,
requirements gathering,
solution concept (system proposal)

Fundamental phases: planning, analysis, **design**, and implementation

The design phase decides how the system will operate, in terms of the hardware, software, and network infrastructure; the user interface, forms, and reports; and the specific programs, databases, and files that will be needed.

Key steps:

system architecture design
data model design
program design
selection of frameworks

Fundamental phases: planning, analysis, design, and **implementation**

In the implementation phase, the system is actually built (or purchased, in the case of a packaged software design).

Includes also the transition to the production environment.

Key steps:

construction

installation and transition

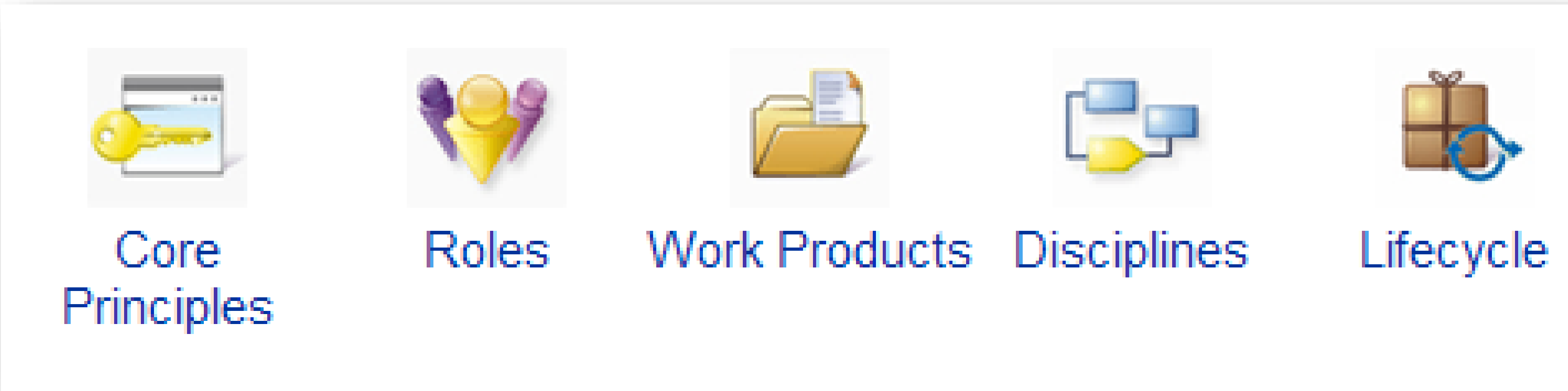
Problemas e soluções na aplicação do SDLC, perspetiva do
Rational Unified Process

Symptoms	Root Causes	Best Practices
Needs not met	Insufficient requirements	Develop Iteratively
Requirements churn	Ambiguous communications	Manage Requirements
Modules don't fit	Brittle architectures	Use Component Architectures
Hard to maintain	Overwhelming complexity	Model Visually (UML)
Late discovery	Undetected inconsistencies	Continuously Verify Quality
Poor quality	Poor testing	Manage Change
Poor performance	Subjective assessment	
Colliding developers	Waterfall development	
Build-and-release	Uncontrolled change	
	Insufficient automation	

O SDLC é concretizado em **processos de desenvolvimento**

Adotar um processo de engenharia testado & (a)provado

O que é que inclui um processo?



http://epf.eclipse.org/wikis/openup/

Rational Unified Process: boas práticas

Desenvolver de forma iterativa

Gestão explícita de requisitos

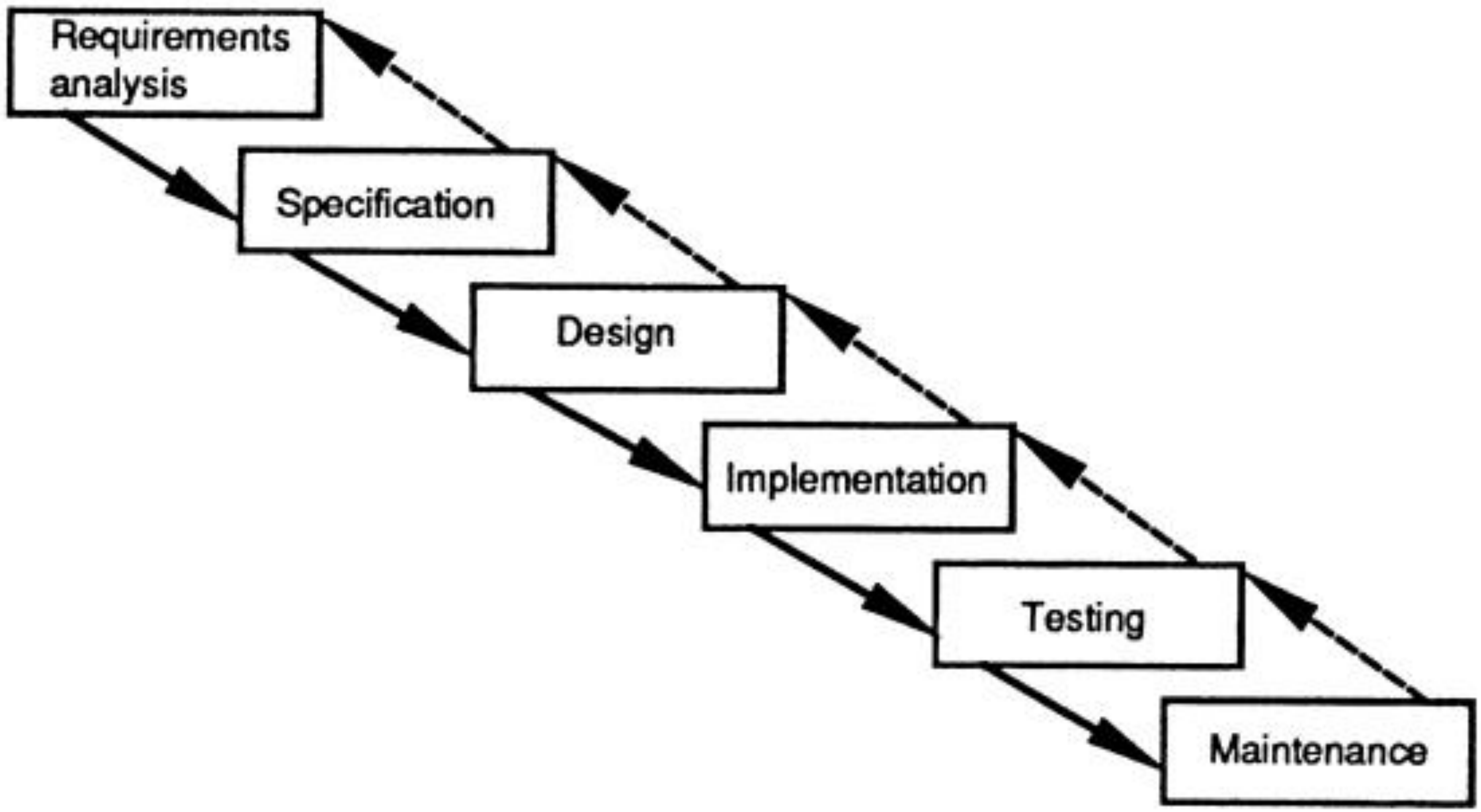
Usar arquiteturas de componentes

Usar modelos visuais

Práticas de verificação contínua da qualidade

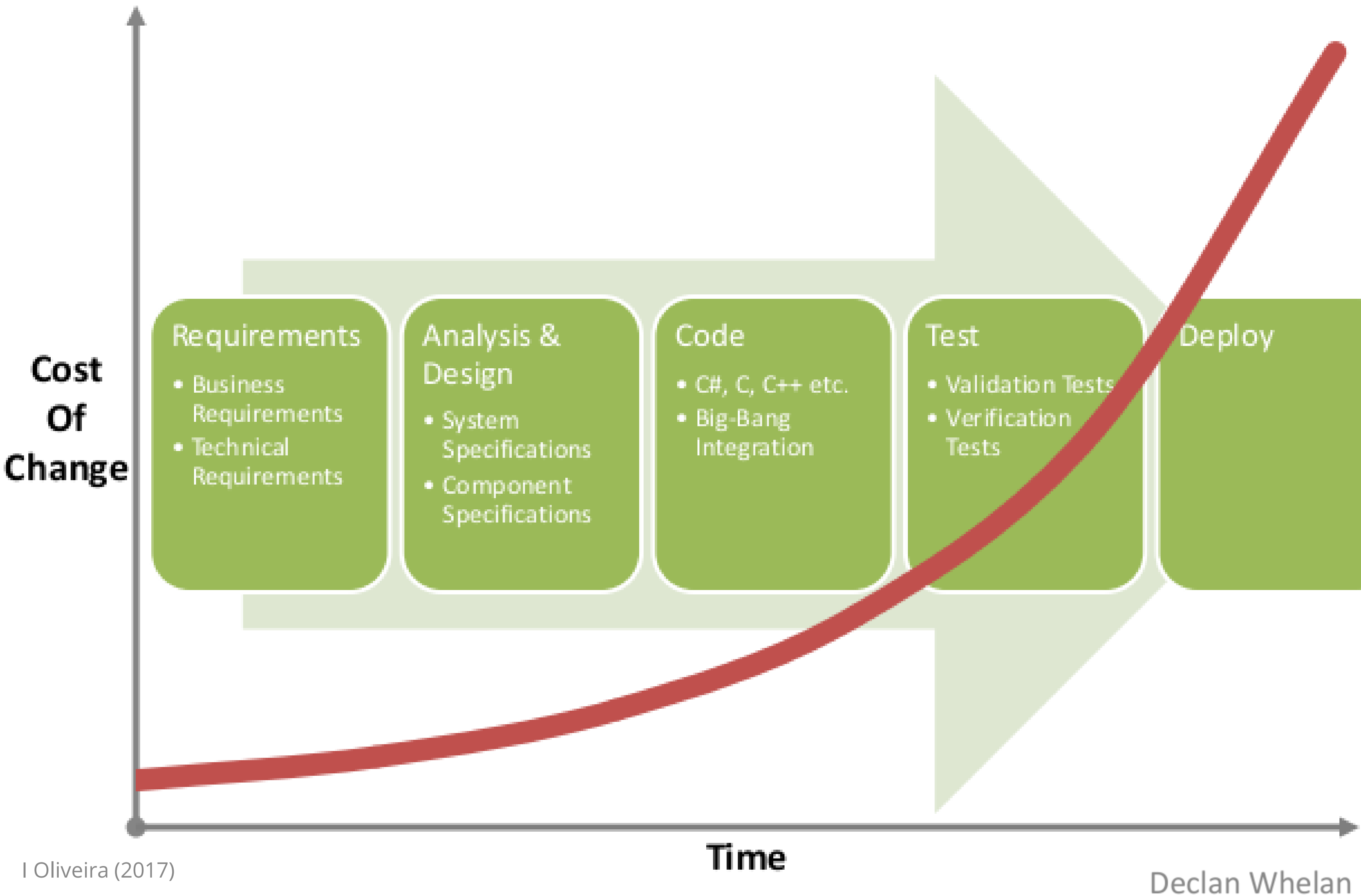
Gestão explícita da mudança

“Classical” engineering approach: **Waterfall**



W. Royce, “Managing the Development of Large Software Systems,” *Proc. Westcon*, IEEE CS Press, 1970, pp. 328-339.

O problema fundamental é **adiar os riscos**



Problemas da abordagem sequencial

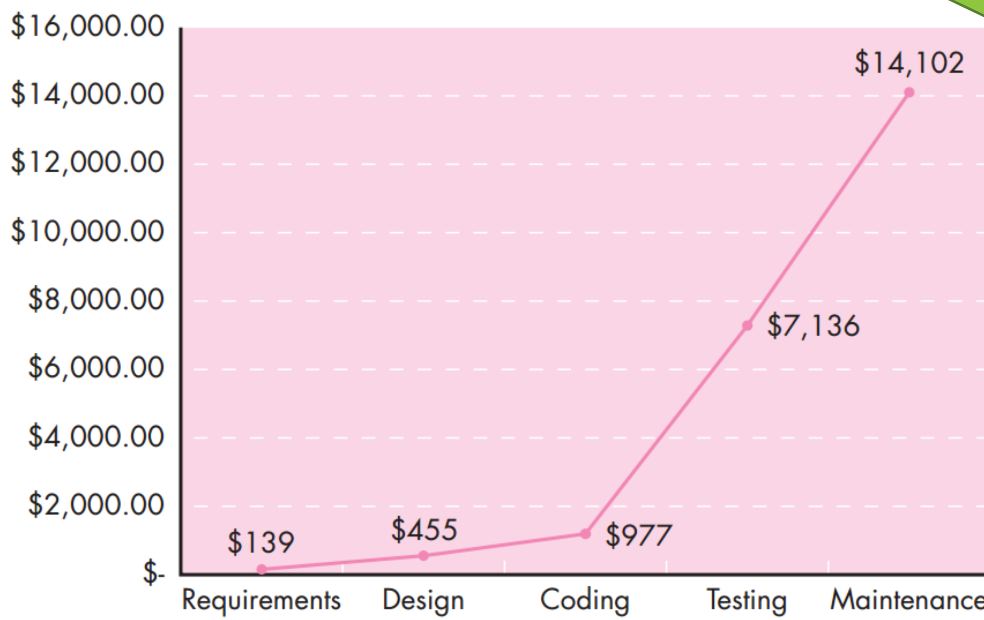
Confirmação tardia de que os riscos críticos estão controlados

Integração (módulos, sub-sistemas) e teste tardios

Longo “black out”

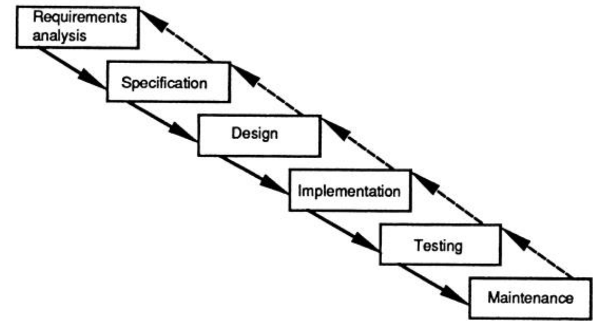
Assunção: os requisitos são (tendencialmente) estáveis.

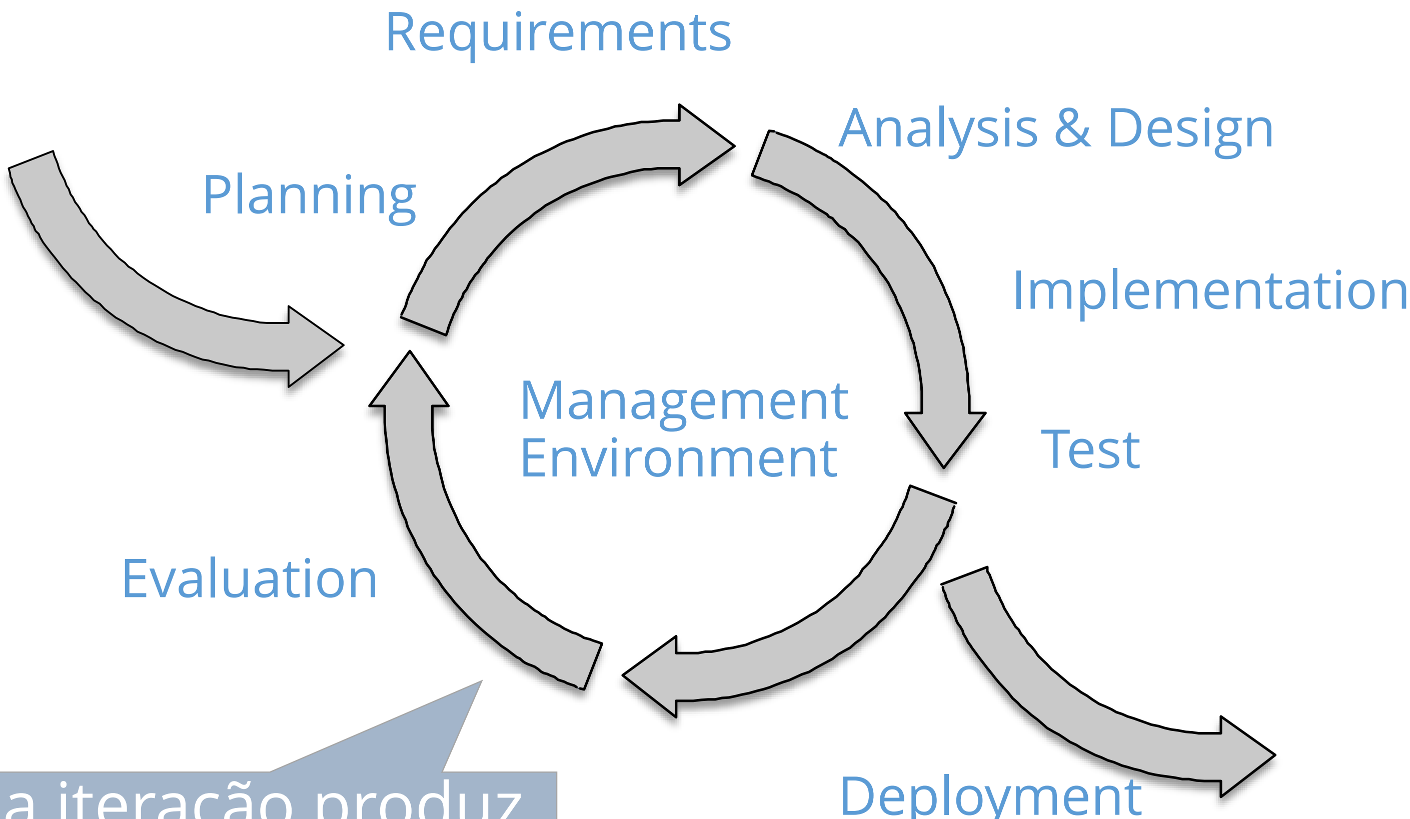
Quanto mais tarde um problema é revelado, mais difícil e caro é de resolver.



Boehm, B., and V. Basili, “Software Defect Reduction Top 10 List,” IEEE Computer,
vol. 34, no. 1, January 2001, pp. 135–137.
http://doi.ieeecomputersociety.org/10.1109/2.962984

O desenvo\lvimento iterativo foca-se na produção de incrementos, em pequenos ciclos





Cada iteração produz um incremento funcional

Rational Unified Process: boas práticas

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Gestão explícita de requisitos

Usar arquiteturas de componentes

Usar modelos visuais

Práticas de verificação contínua da qualidade

Gestão explícita da mudança

Os requisitos são estáveis? Exemplos do projeto SISO

Novos requisitos em várias fases do projeto

Grupos da população alvo:

- Inicial: crianças no 1º ciclo, grávidas, idosos carenciados
- Em fase de produção: adolescentes

Acrescentar os processos de auditoria

Requisitos evolutivos

Limitar os pagamentos (dias 1 a 8, em grupos)

Reorganização dos Cuidados Primários

Requisitos "temporários"

Admitir coortes de certas idades por períodos temporários...

SISO
Sistema de Informação para a Saúde Oral

Rational Unified Process: boas práticas

Desenvolver de forma iterativa

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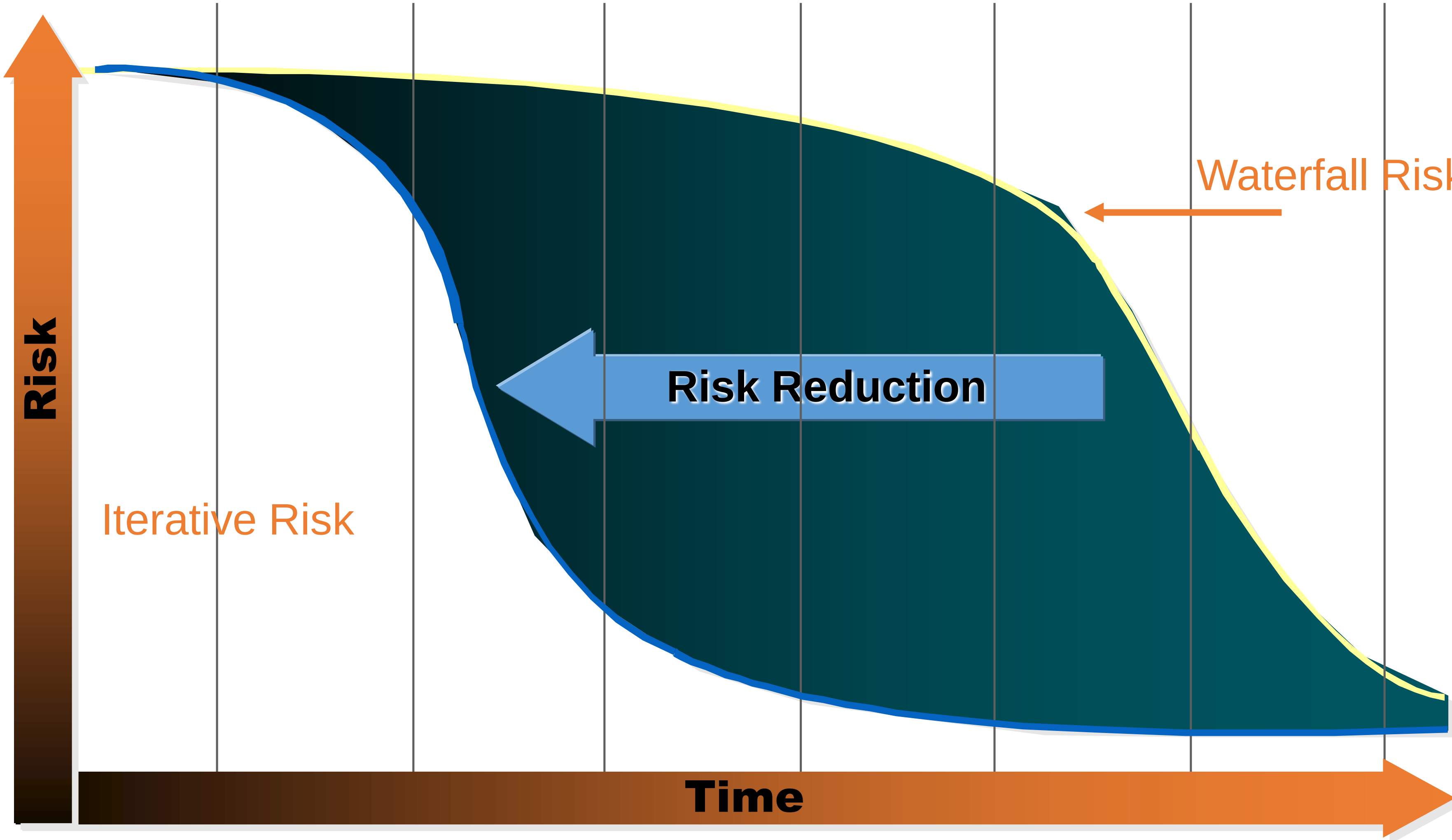
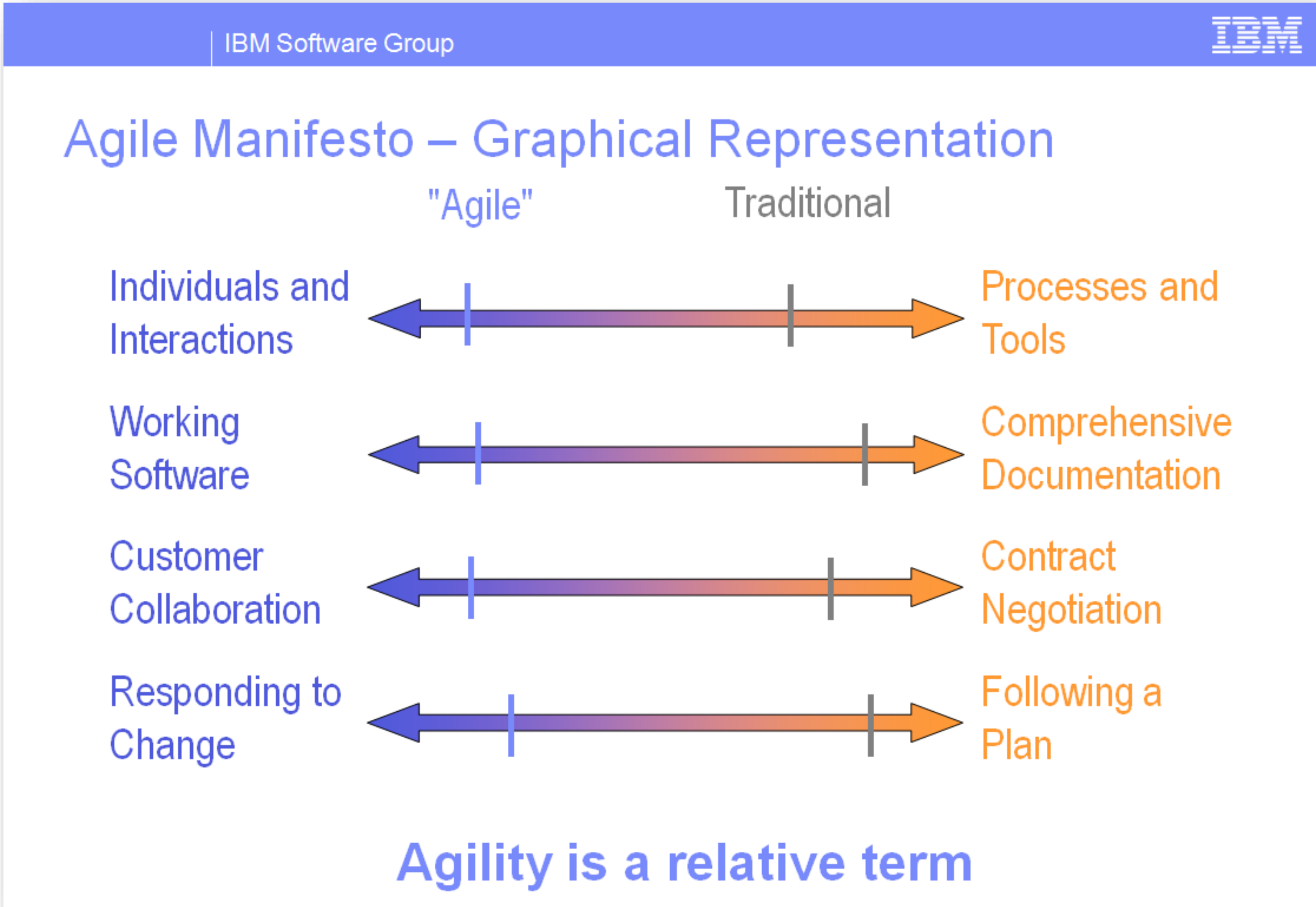
Entregas frequentes, integração em contínuo

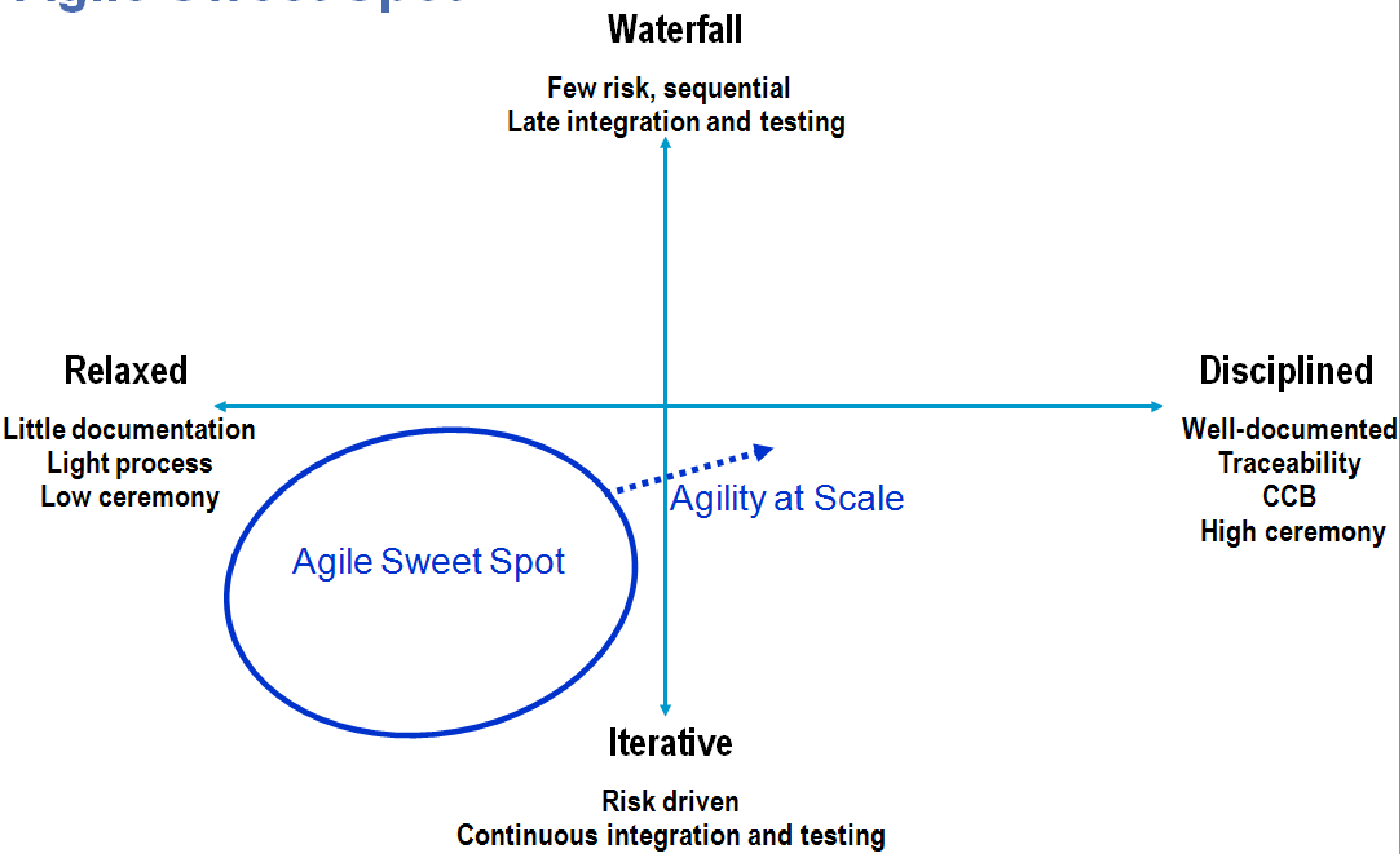


Abordagem evolutiva incluída nos "métodos ágeis"



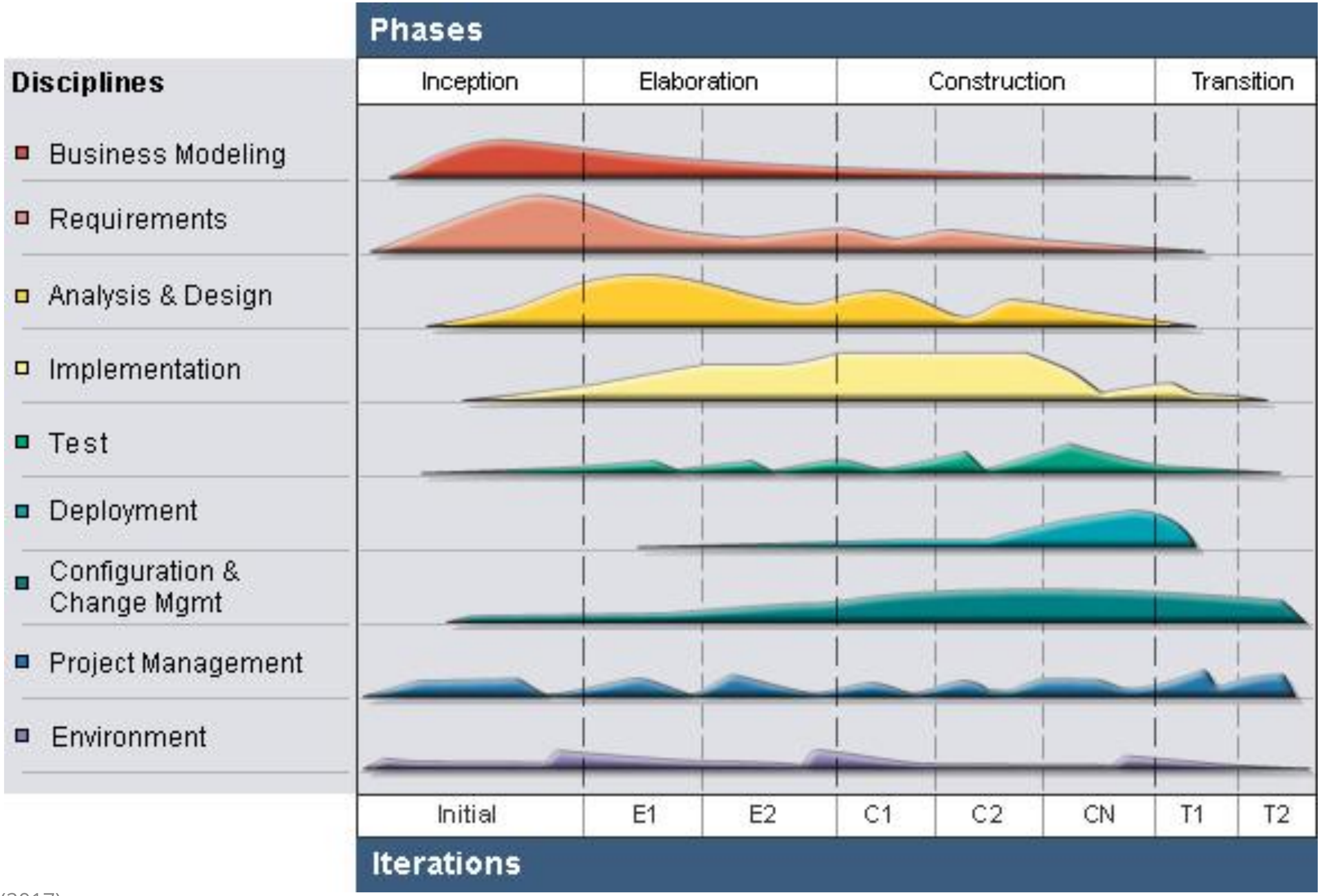
Credit: Per Kroll (IBM)

Agile Sweet Spot



Credit: Per Kroll (IBM)

Ciclo de vida do Unified Process



I Oliveira (2017)

Rational Unified Process: boas práticas

Desenvolver de forma iterativa

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MODELAÇÃO

LINGUAGEM VISUAL DE ESPECIFICAÇÃO

universidade de aveiro
departamento de eletrónica, telecomunicações e informática
deti

Usamos **modelos visuais para captar partes do mundo/realidade**

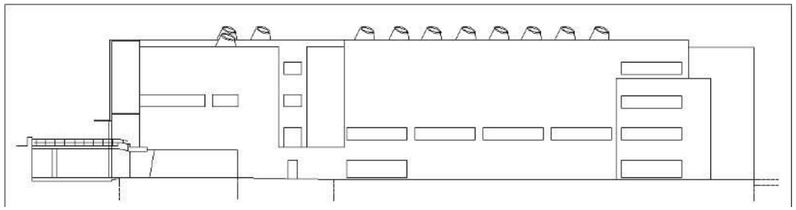
Uma linguagem comum (escrever, ler)

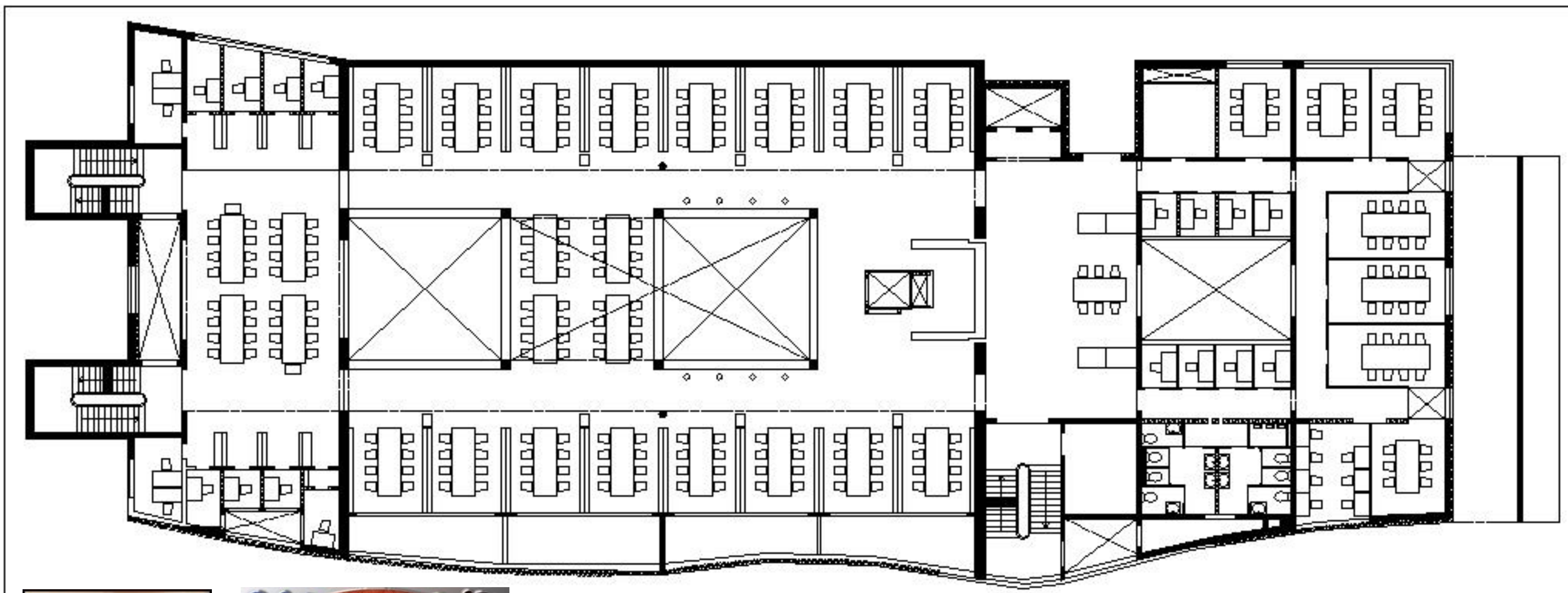
Especificações visuais são mais intelegíveis

Compor: aplicar talento e disciplinas técnicas

Orquestra: a prova que os modelos funcionam!

Um modelo é uma simplificação da realidade





Os modelos ajudam a **gerir a complexidade**

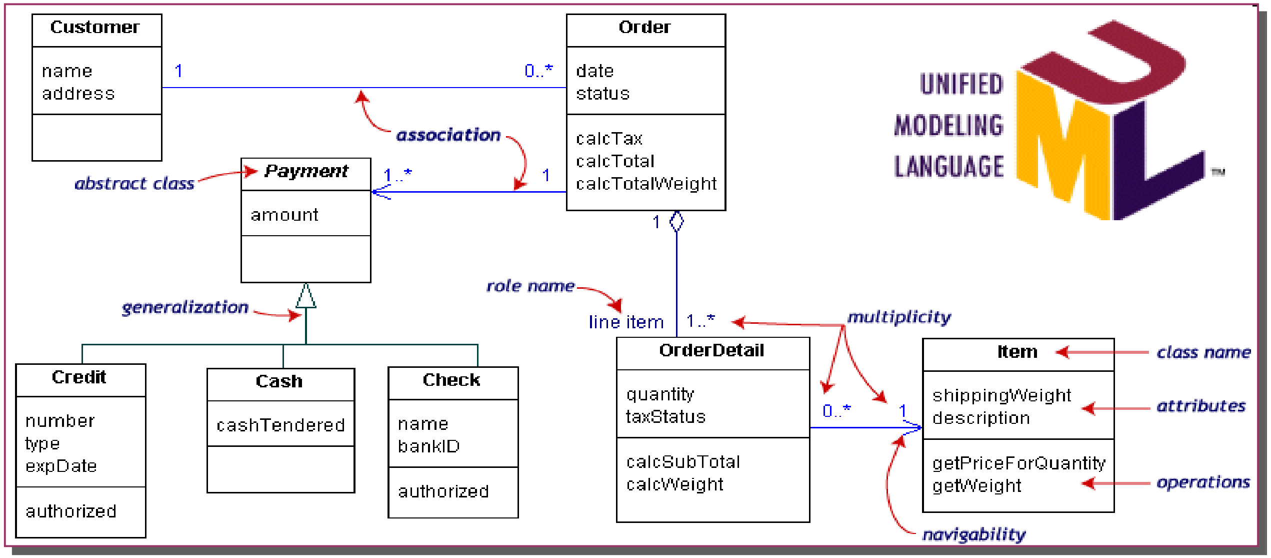
G. Booch apresenta 4 razões para usar modelos:

Ajudar a **visualizar um sistema**, como se pretende que venha a ser

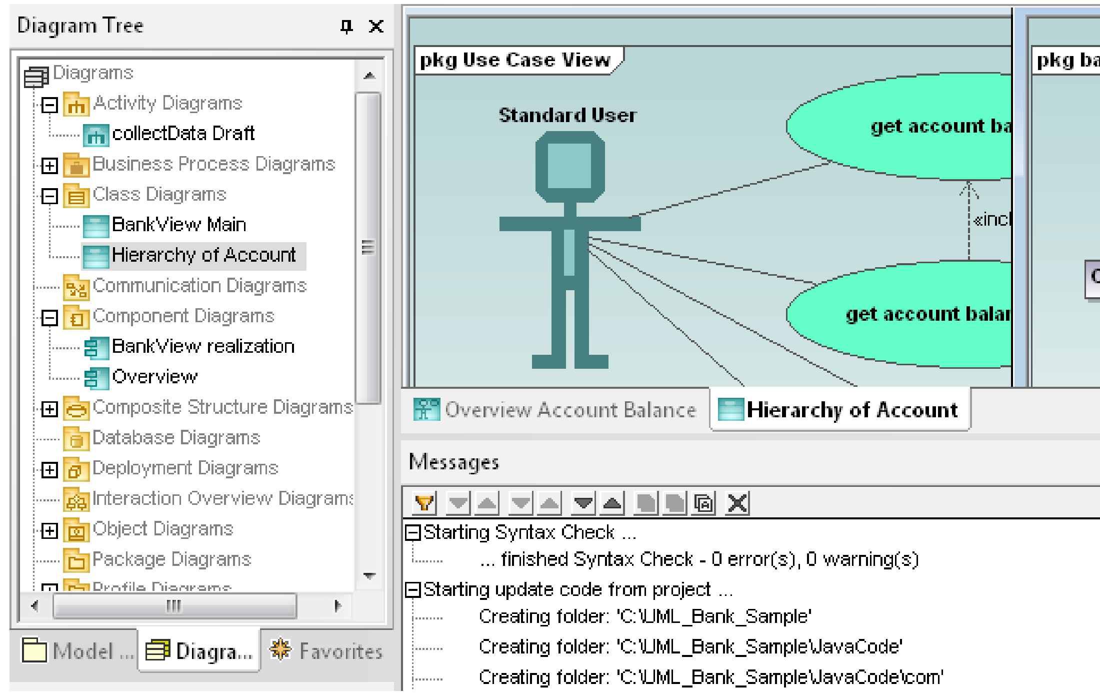
Especificar a **estrutura e o comportamento** do sistema (antes de implementar)

Serve como **referência / orientação** para a construção (“planta”)

Documentar as decisões (de desenho) que foram feitas



Modelação visual no desenvolvimento



UML 2: Unified Modeling Language

Linguagem de modelação normalizada

Benefícios

Promover a comunicação mais clara e sucinta

Manter o desenho (planeamento) e a implementação (construção) coerentes

Mostrar ou esconder diferentes níveis de detalhe, conforme apropriado

Pode suportar, em parte, processos de construção automática (gerar a solução a partir do modelo)

Evolução histórica UML (*timeline*)

UML 2.x

UML 1.3

OMG Acceptance, Nov 1997

Final submission to OMG, Sep '97

UML 1.1

First submission to OMG, Jan ´97

public feedback

UML partners

UML 1.0

Web - June ´96

UML 0.9

OOPSLA ´95

Unified Method 0.8

Other methods

Booch method

OMT

OOSE

UML é uma especificação do OMG

OBJECT MANAGEMENT GROUP®

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Unified Modeling Language™ (UML®) Resource Page

| Introduction to UML | UML Success Stories | UML Certification Program | Vendor Directory |

Getting Started With UML:

UNIFIED MODELING LANGUAGE™

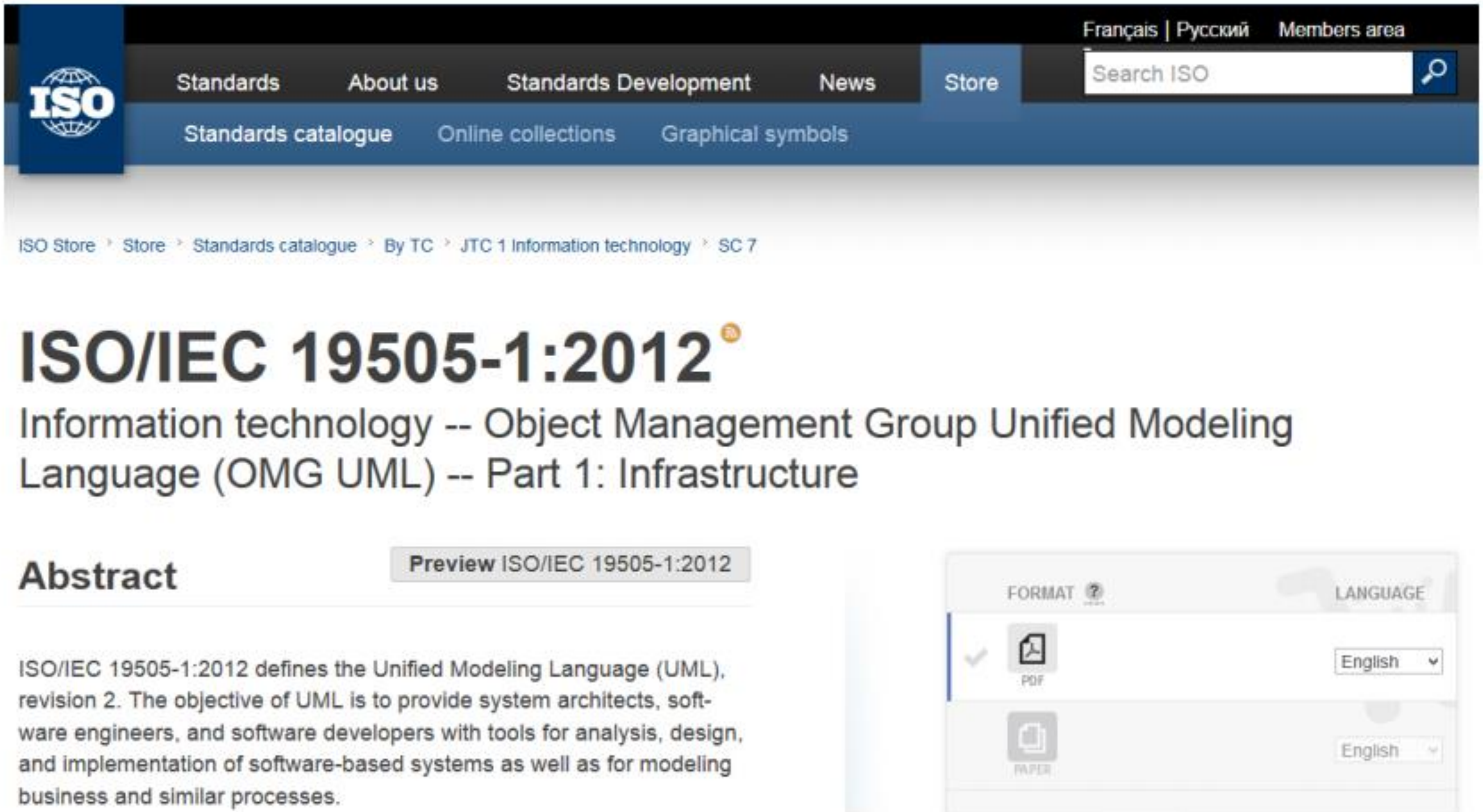
The Unified Modeling Language™ - UML - is OMG's most-used specification, and the way the world models not only application structure, behavior, and architecture, but also business process and data structure.

UML, along with the Meta Object Facility (MOF™), also provides a key foundation for OMG's Model-Driven Architecture®, which unifies every step of development and integration from business modeling, through architectural and application modeling, to development, deployment, maintenance, and evolution.

OMG is a not-for-profit technology standards consortium; our members define and maintain the UML specification which we publish in the series of documents linked on this page for your free download. Software providers of every kind build tools that conform to these specifications. To model in UML, you'll have to obtain a compliant modeling tool from one of these providers and learn how to use it. The links at the bottom of this page will help you do that.

If you're new to modeling and UML, start with our own Introduction to UML, here, and possibly this piece on the benefits of modeling to your application

Também reconhecida como um standard internacional ISO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ISO/IEC 19505-1:2012

Information technology -- Object Management Group Unified Modeling Language (OMG UML) -- Part 1: Infrastructure

Abstract

Preview ISO/IEC 19505-1:2012

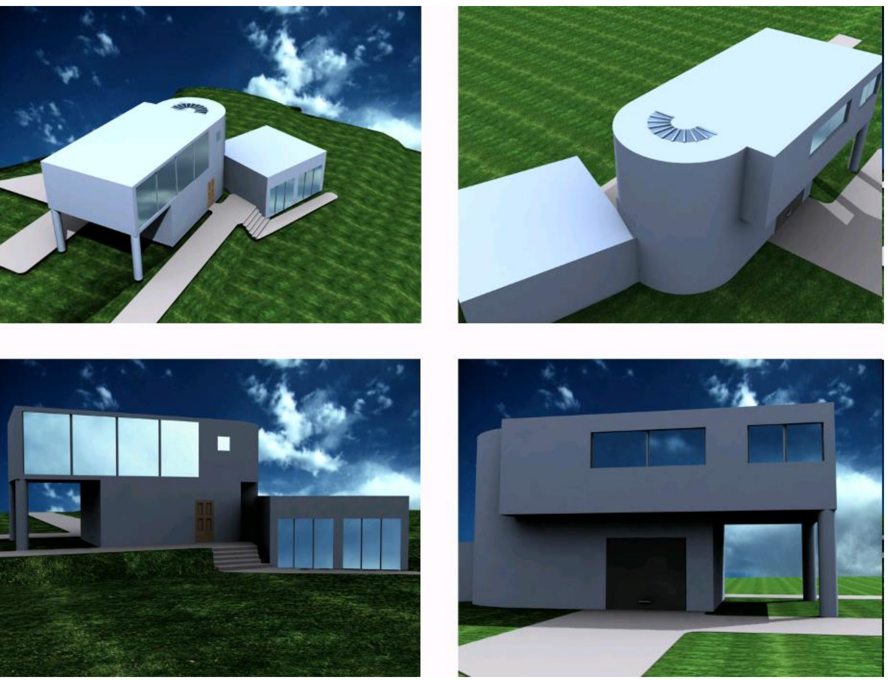
ISO/IEC 19505-1:2012 defines the Unified Modeling Language (UML), revision 2. The objective of UML is to provide system architects, software engineers, and software developers with tools for analysis, design, and implementation of software-based systems as well as for modeling business and similar processes.

FORMAT LANGUAGE

PDF English

PAPER English

Não há uma vista única, mas várias e complementares



Para que serve o sistema?

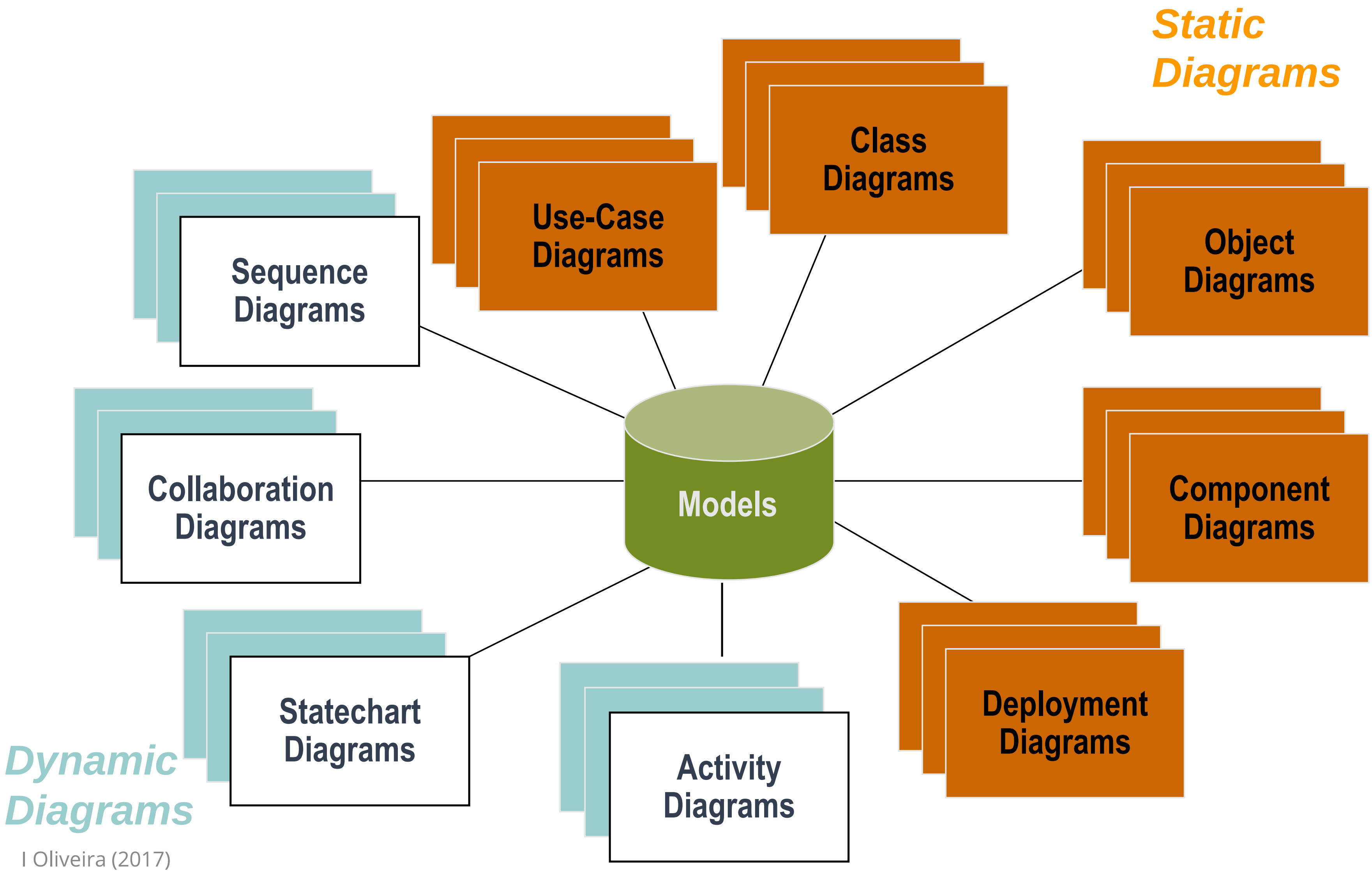
Quais são as estruturas de informação?

Decomposição funcional de atividades complexas

Visualizar a organização do software em partes e as suas interações

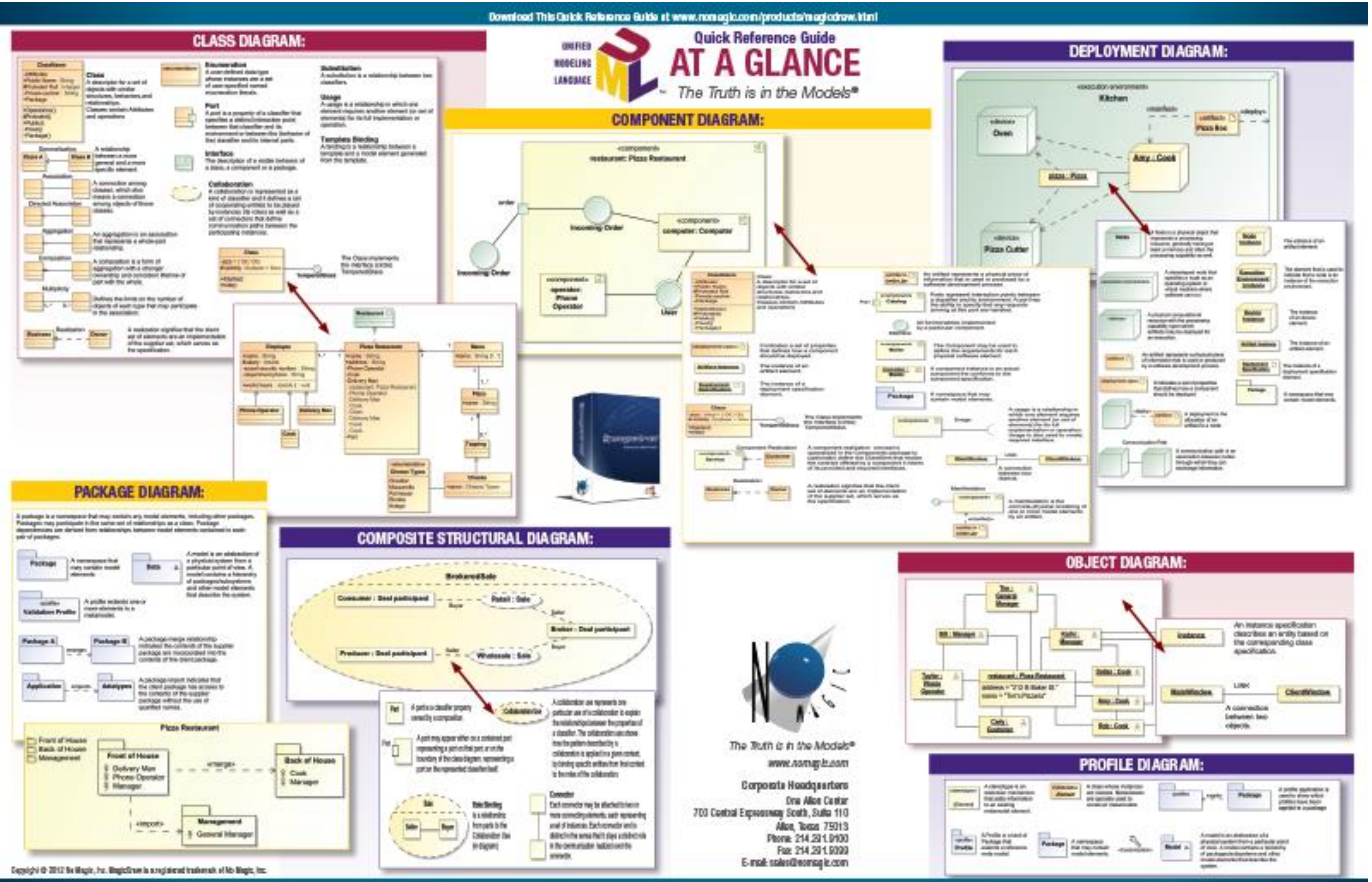
Etc.

A UML fornece a sintaxe e a semântica para modelar diferentes aspetos de um SI



I Oliveira (2017)

UML Reference Card



Ferramentas CASE

Referências de consulta rápida: UML

UML Diagrams.org

MSDN, "Developing models for software design"

M. Fowler, "UML Distilled" (3rd ed)

NoMagic's UML Reference card

Referências

Fowler, Martin. *UML Distilled: A Brief Guide to the Standard Object Modeling Language*. Addison-Wesley, 2003.

Pressman, Roger. *Software Engineering: A Practitioner's Approach*. 7th ed. McGraw-Hill, 2009.

Silva, Alberto, and Carlos Videira. *UML - Metodologias E Ferramentas CASE (vol. I E II)*. 2a ed. Centro Atlântico, 2008.