

Sistemas de informação para o controle das organizações

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Motivação

Fonte: Prakken (2000, p. 149-196)

- Sistemas de informação organizacionais são usados [ou criados, gerados] para vários propósitos distintos numa organização
- Cada tipo apresenta características, que os tornam mais ou menos adequados a distintas necessidades e propósitos da organização.
- Os colaboradores que atuam nesses sistemas de informação precisam conhecer as potencialidades e limitações de cada um.
- Exemplos
 - Sistemas de informação aptos à geração de ideias não são adequados para suporte a atividades rotineiras.
 - Sistemas de bases de dados são boas fontes de informação interna.
 - Sistemas de decisão estratégica de uma organização dependem de informações externas.
 - Alguns sistemas de informação podem ser vistos como uma agregação de outros sistemas de informação de menor escopo
 - Melhoria de processos, depende de informações internas
 - Alguns tem uso mais geral, outros tem uso mais especializado
 - Alguns sistemas são aptos para uso na alta gestão, outros por colaboradores operacionais

Um modelo conceitual do funcionamento dos sistemas de informação

- Para solucionar um PROBLEMA COM INFORMAÇÃO
- Identificamos uma série de PROCESSOS DE TRANSFORMAÇÃO
 - Compostos por um número de ATIVIDADES que geram informação
 - Resultando ou apoiando DECISÕES
- As atividades são executados por PESSOAS ou MÁQUINAS, empregando TECNOLOGIAS
- As TECNOLOGIAS podem ser INFORMÁTICAS/AUTOMÁTICAS ou MANUAIS

A pedra de toque (touchstone) para um sistema de informação envolve responder às seguintes questões:

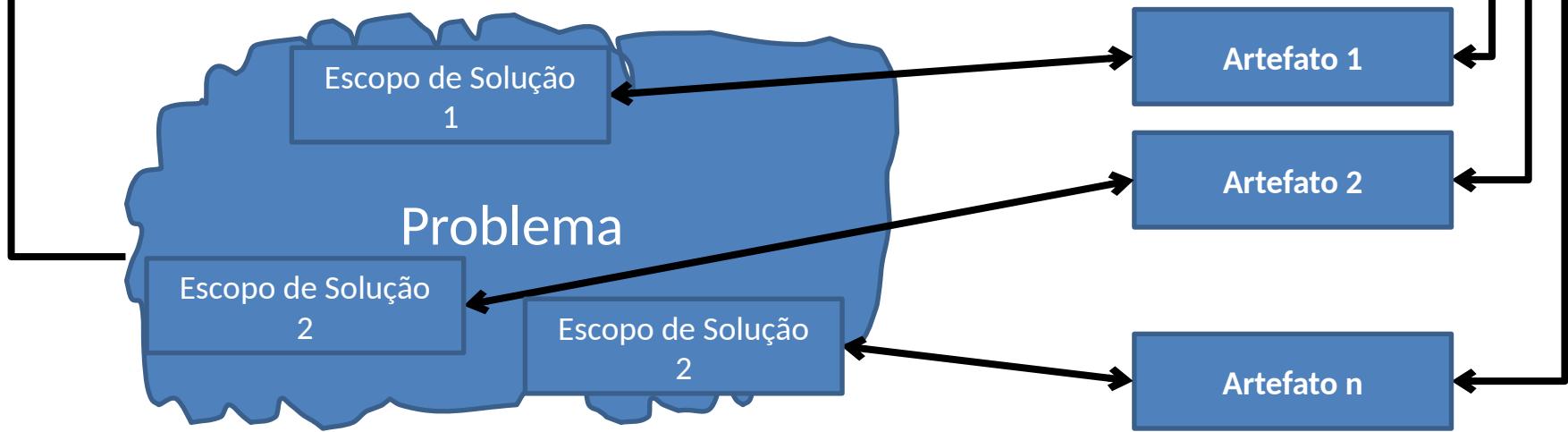
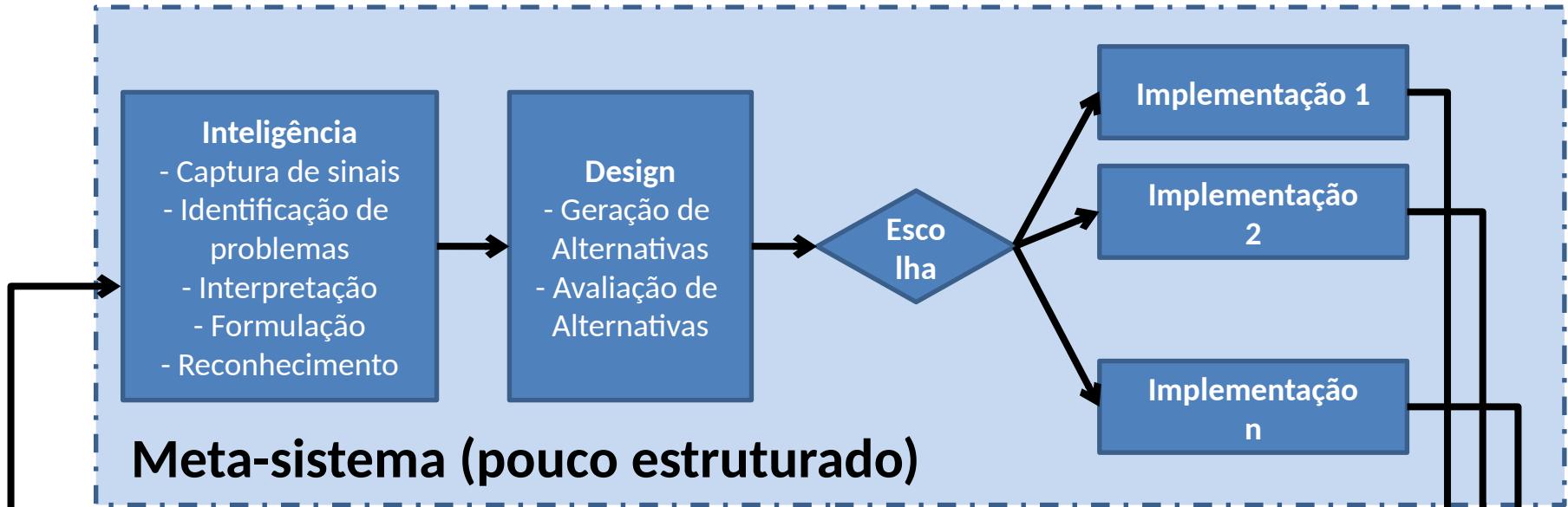
- Qual o PROBLEMA [de informação, de um usuário] ele soluciona?
- Quais são as séries de PROCESSOS DE TRANSFORMAÇÃO?
- Como os processos são decompostos em um número de ATIVIDADES?
- Quais DECISÕES, baseadas em informações geradas no interior do sistema, resultam desses processos?
- Quem são as PESSOAS que executam atividades?
- Quem são as MÁQUINAS que executam atividades?
- Quais TECNOLOGIAS MANUAIS são empregadas pelas pessoas ou máquinas?
- Quais TECNOLOGIAS INFORMÁTICAS/AUTOMÁTICAS são empregadas pelas pessoas ou máquinas?

Problemas e Decisões

Prakken (2000, p. 27-34)

- A problem is:
 - *manifest or latent tensions between what should be and what is*
- In the process of decision making we can identify four phases (Simon, 1959):
 - Intelligence,
 - Design,
 - Choice and
 - Implementation.
- Two of these phases - intelligence and design - can be split up as follows:
 - Intelligence:
 - Observation of problems, i.e. catching signals,
 - Identification of problems/signals,
 - Interpretation of problems/signals,
 - Formulation of problems,
 - Recognition of problems.
 - Design:
 - Generation of alternatives,
 - Evaluation of alternatives.

Problema, meta-sistema e artefato



Há distintos níveis de estruturação de processos e sistemas

- Processos (e sistemas) estruturados
 - A ordem de execução das atividades pode ser pré-definida de forma não ambígua ou determinística.
 - Amenos à substituição das pessoas por máquinas
- Processos (e sistemas) semi-estruturados
 - Apenas uma parte da ordem da execução de atividades pode pré-definida de forma não ambígua ou determinística
- Processos (e sistemas) não estruturados
 - Não é possível definir claramente a ordem de nenhuma atividade.
 - Difíceis de substituição das pessoas por máquinas.
 - As pessoas são apoiadas por sistemas de informação. As máquinas desempenham um modesto papel.

Informática usada na estruturação ou na execução de processos (Prakken, 2000)

- Informática na estruturação de processos
 - Ocorre quando se trabalha especialmente com dados qualitativos
 - Aplicações computacionais oferecem templates ou modelos para a realização de atividades pelo usuário, envolvendo apresentação e coleta de dados
- Informática na execução de processos
 - Ocorre especialmente quando se trabalha com dados quantitativos
 - Aplicações computacionais automatizam algoritmos, que realizam cálculos e decisões complexas, eliminando trabalho humano

Tipos de Sistemas de Informação

Fonte: Prakken (2000, p. 149-196) + OUTROS

1. Executive information systems -
Sistemas de Informação executivos
2. Strategic information systems - Sistemas
de Informação Estratégicos
 - Business Intelligence Systems
 - 2 Business Analytics Systems
 - Big Data Analytics Systems
 - Técnicas complementares
 - 3 Sistemas de planejamento estratégico
3. Database systems - Sistemas de bases
de dados
4. Document information systems -
Sistemas de Gerenciamento de
Documentos
5. Idea processing systems - Sistemas de
Processamento de Ideias
6. Group information systems (groupware)
- Sistemas de Informação para Trabalho
em Grupo
7. Knowledge based systems and expert
system
8. Artificial intelligence systems / Sistemas
de Inteligência Artificial
9. Decision support systems / Sistemas de
Suporte à Decisão
10. Structured decision systems / Sistemas
de Decisão Estruturada
11. Electronic Data Interchange / Sistemas
de Intercâmbio de Dados Eletrônicos
12. Transaction Processing Systems -
Sistemas de Processamento de
Transações
13. Workflow Automation Systems /
automação de fluxos de trabalho e
Business Process Management
Systems / sistemas de gestão de
processos de negócio
14. Geographic Information Systems /
Sistemas de Informação Geográficos

Categorizações (não exclusivas) para sistemas de informação

Fonte: Prakken (2000, p. 149-196)

- Conforme o nível de estruturação das atividades
 - Sistemas para atividades estruturadas
 - Sistemas de processamento de transação, Sistemas de decisão estruturada, Sistemas de intercâmbio eletrônico de dados
 - Sistemas para atividades semi-estruturadas
 - Sistemas de processamento de ideias, Sistemas de suporte a decisão, Sistemas de informação gerenciais
 - Sistemas para atividades não estruturadas
 - Sistemas de informação executiva, Sistemas de informação estratégica, Sistemas de processamento de ideias
- Outras categorias não baseadas na estruturação
 - Sistemas de bases de dados, Sistemas de gestão de documentos, Sistemas baseados em conhecimento, Sistemas de informação para grupos

Tipo SI #1

Executive information systems

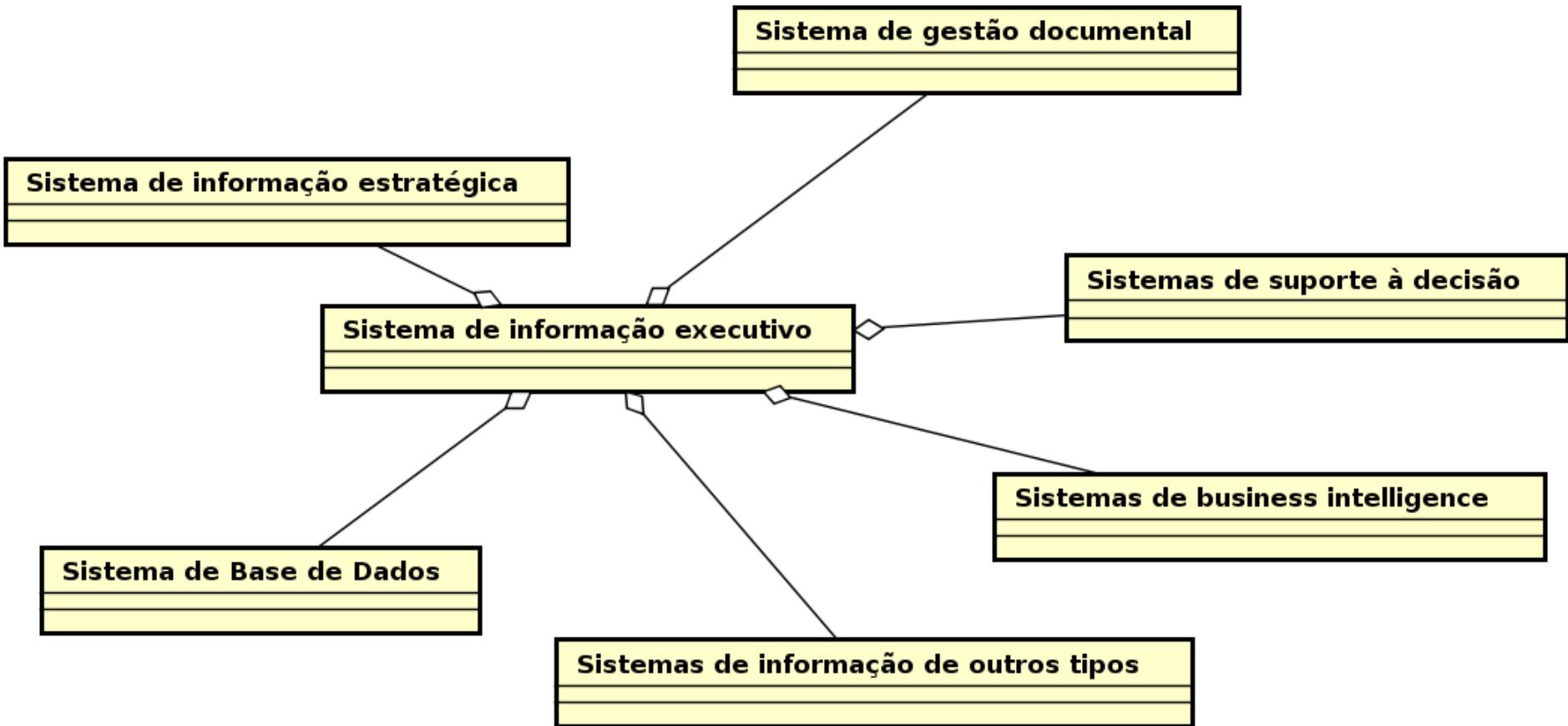
Sistemas de informação
executivos ou de suporte
executivo

Executive information systems

Sistemas de informação executivos ou de suporte executivo

Fonte: Prakken (2000, p. 149-196)

- Executive information systems (also called executive support systems) are information systems at the highest level of the organization's hierarchy (Rockart and Treacy, 1981).
- São sistemas “Closely related to the nature of the activities of executive managers.”
- Formed by a number of other information systems, such as
 - Data base systems,
 - Strategic information systems,
 - Document information systems etc
- Sobre a natureza da atividades de executivos (Mintzberg)
 - A quickly changing need of information during relatively short periods of time
 - A preference for verbal communication
 - Information needs particularly concerning external developments



Funções dos executive information systems

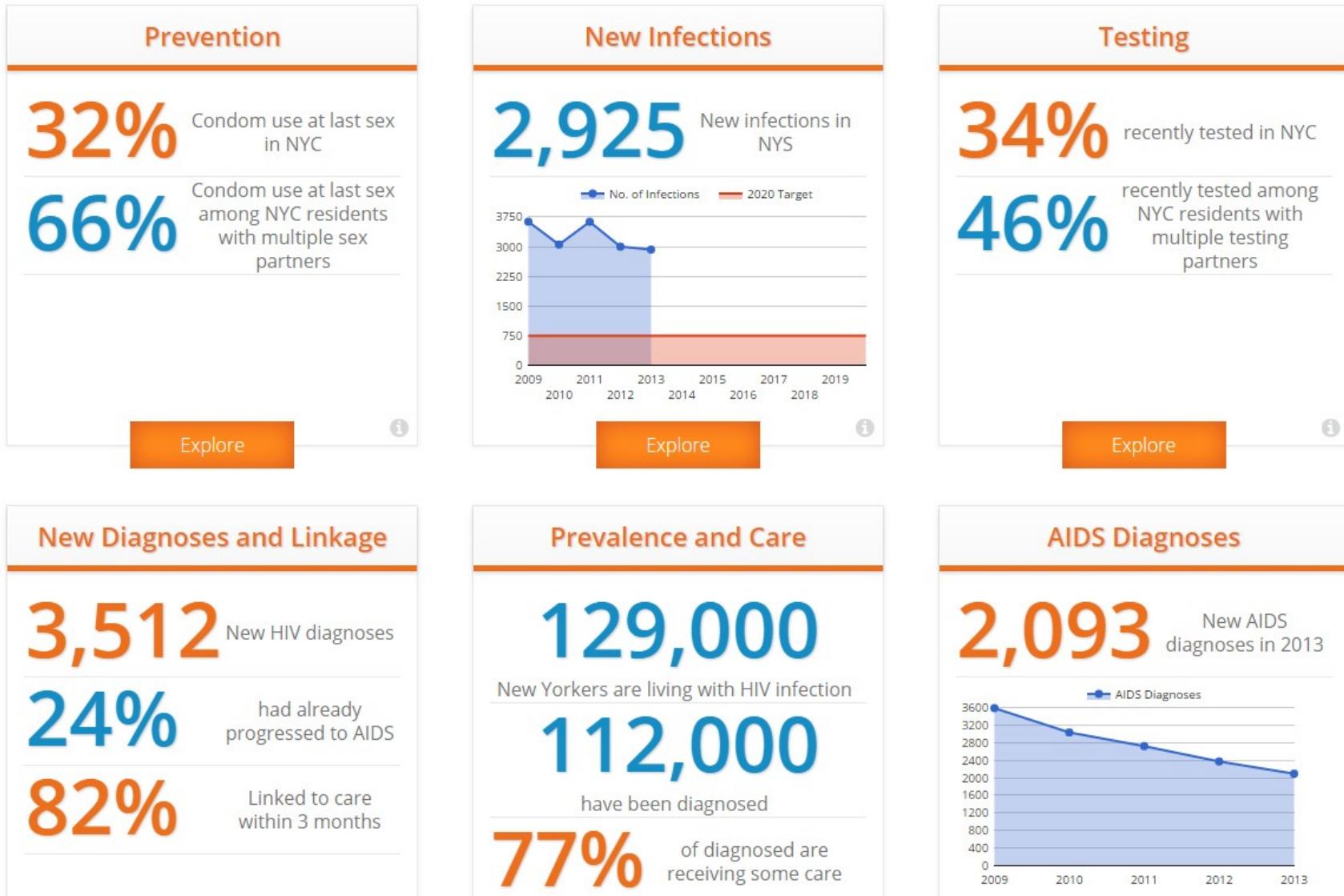
Fonte: Prakken (2000, p. 154-155)

- Executive information systems should have the following functions (Cullen, 1995)
 - Drill down (the possibility to look at data at different levels of aggregation, for instance per division, per department, per product or per district),
 - Exception reporting (developments are reported if tolerance limits, specified for the variables involved, are exceeded),
 - Trend analysis (to get a clear view of relevant development patterns),
 - Status reports (electronically generating standard reports; reports in many organizations part of their management information system).
- Additional possibilities
 - Sensitivity analysis (computing the impact of alternative development patterns of a number of key variables),
 - Issue management (combining data originating from various sources),
 - Business intelligence (possibilities to disclose external data bases, relevant for the organization's long term viability; when discussing strategic information systems we return to this subject),
 - Communication (in daily practice electronic communication, especially electronic mail (abbreviated e-mail) is able to save a lot of time, compared with more traditional media),
 - Office functions (these functions relate to the personal and to the day-to-day support of various activities, such as electronic calendaring of meetings; by the way an activity that is usually done by a secretary and not by top management itself).

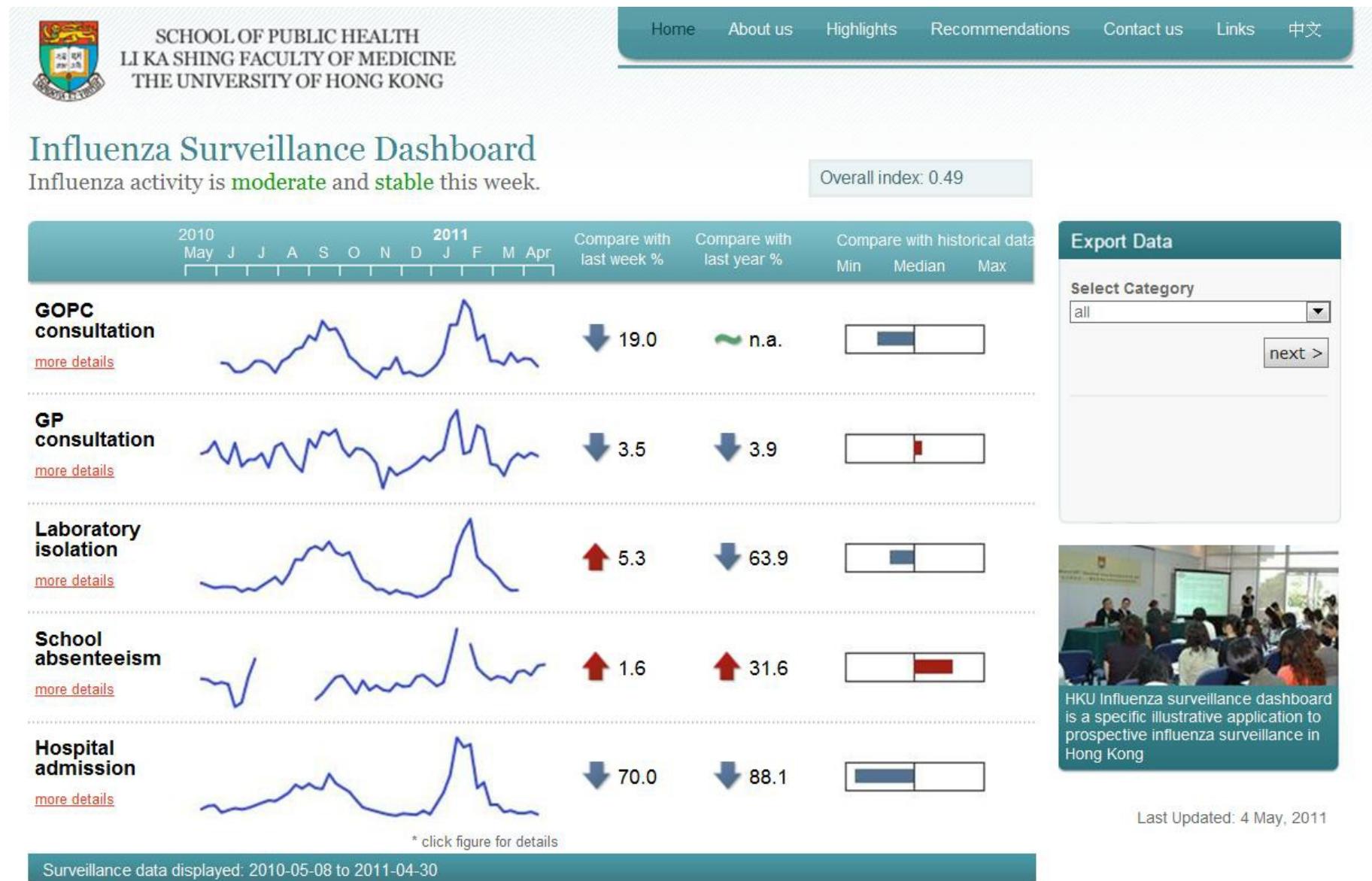
dashboards

Exemplo de informação sobre acontecimentos que se desenvolvem externamente à organização: Information Dashboard sobre HIV em NYC

Fonte: <http://etedashboardny.org/ending-the-epidemic-dashboard-launch/>

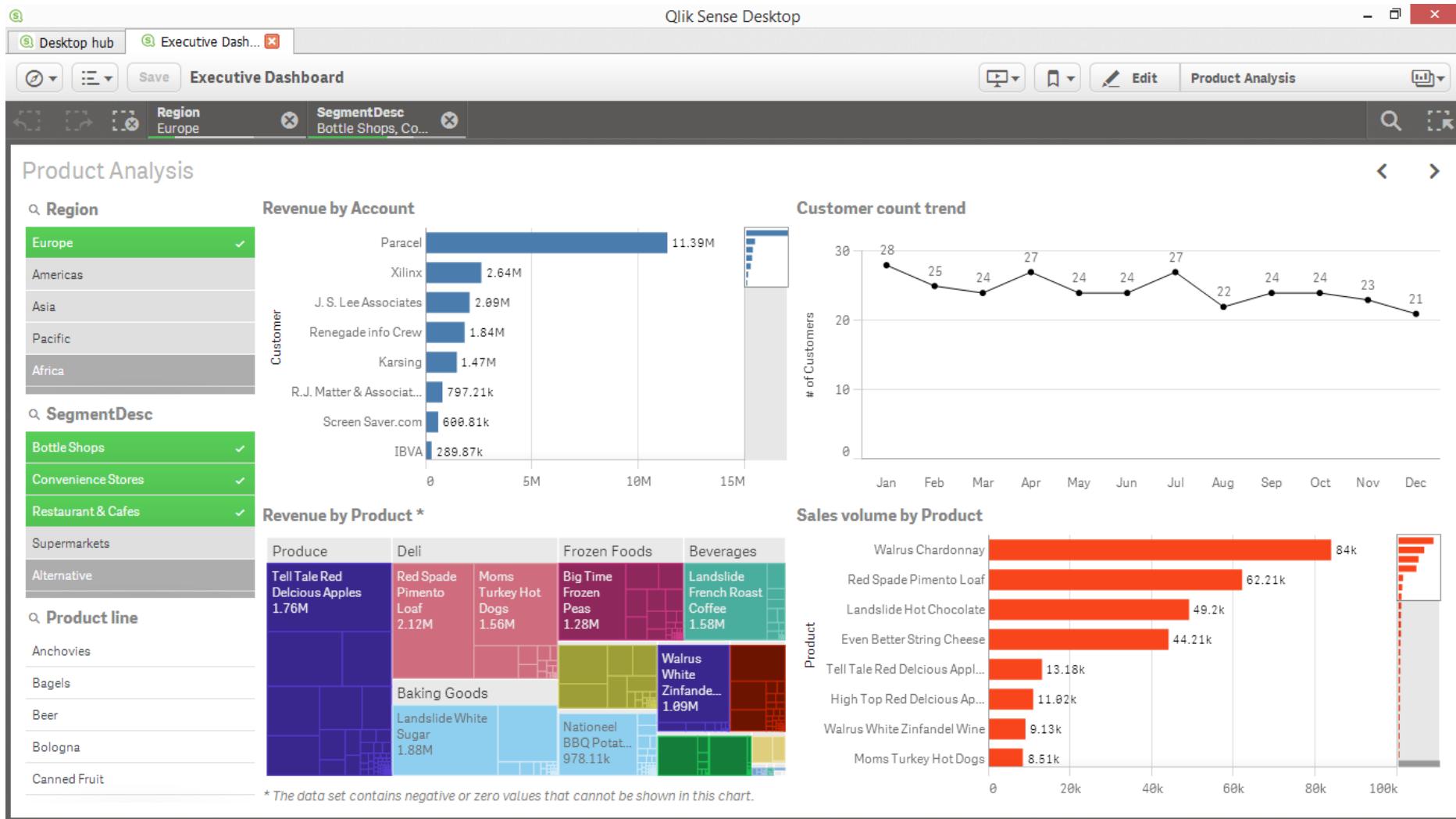


Exemplo de análise de tendências: Monitorando a Gripe em Hong Kong. Fonte: <http://www.jmir.org/2011/4/e85/>



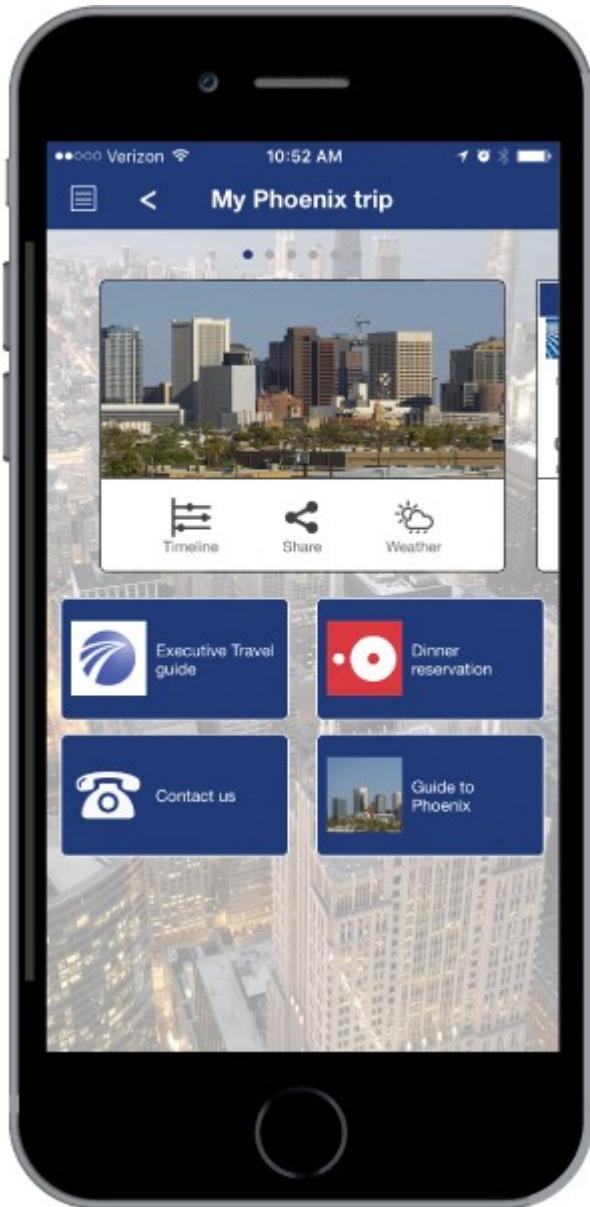
Exemplo de Drill-Down: Dashboard comercial

Fonte: <https://www.freakalytics.com/wp-content/uploads/2014/10/Qlik-Sense-Exec-Dashboard-Freakalytics-201410.png>



Comunicação e funções de suporte de escritório

Exemplo de funções de comunicação e escritório: Mobile Apps para executivos



- Apoio a viagens. Fonte: <http://executivetravel.com/wp-content/uploads/2016/02/on-go-app.png>
- Executive dashboards. Fonte: <https://www.behance.net/gallery/9595857/Executive-Dashboard-Mobile-App>



Tipo SI #2

Strategic Information
systems

Sistemas de informação
estratégicos

Sistemas de Informação Estratégicos

- O que é estratégia?
 - Estratégia é relacionada a ações que podem gerar elevado impacto sobre uma organização no seu longo prazo
- O que é uma decisão estratégica?
 - Decisões sobre quais ações estratégicas realizar
- O executivo-chefe é o principal responsável por tomar decisões estratégicas
- Logo, sistemas de informação estratégicos também são uma parte importante dos sistemas de suporte executivo
- The concept 'strategic information system' can be interpreted in two different ways:
 - Strategic information system are
 - Information systems supporting the strategic policy of organizations and
 - Information systems processing – generating (especially external) strategic flows of information.

Strategic Information systems

Fonte: Prakken (2000, p. 155)

- We focus on **information systems helpful in generating strategic information.**
 - their main task is tracing external developments.
 - have an important role in the 'signalling' phase of the decision making process.
 - This sort of activities is called environmental scanning or intelligence surveillance
 - Usually the input data of strategic information systems will not be gathered by the system itself, because strategic relevant developments cannot always be identified in advance and programmed, but by parts of the organization which have contacts with the world outside; particularly the organization's management and the selling department.
- In fact, **a strategic information system is no more than a data base, consisting of a specific kind of data, supplemented with some grouping and computing facilities and filled by humans.**
- Because of the strategic meaning of these information systems it is important for the organization's executive management to be directly responsible here.
- In order to have an effective policy, organizations not only need information about their environment and external developments but also information about the organization's position as well. Not until information from these two resources is mutually confronted, are organizations able to diagnose their position and have a platform to shape their strategic policy properly

Subtipo #2.1

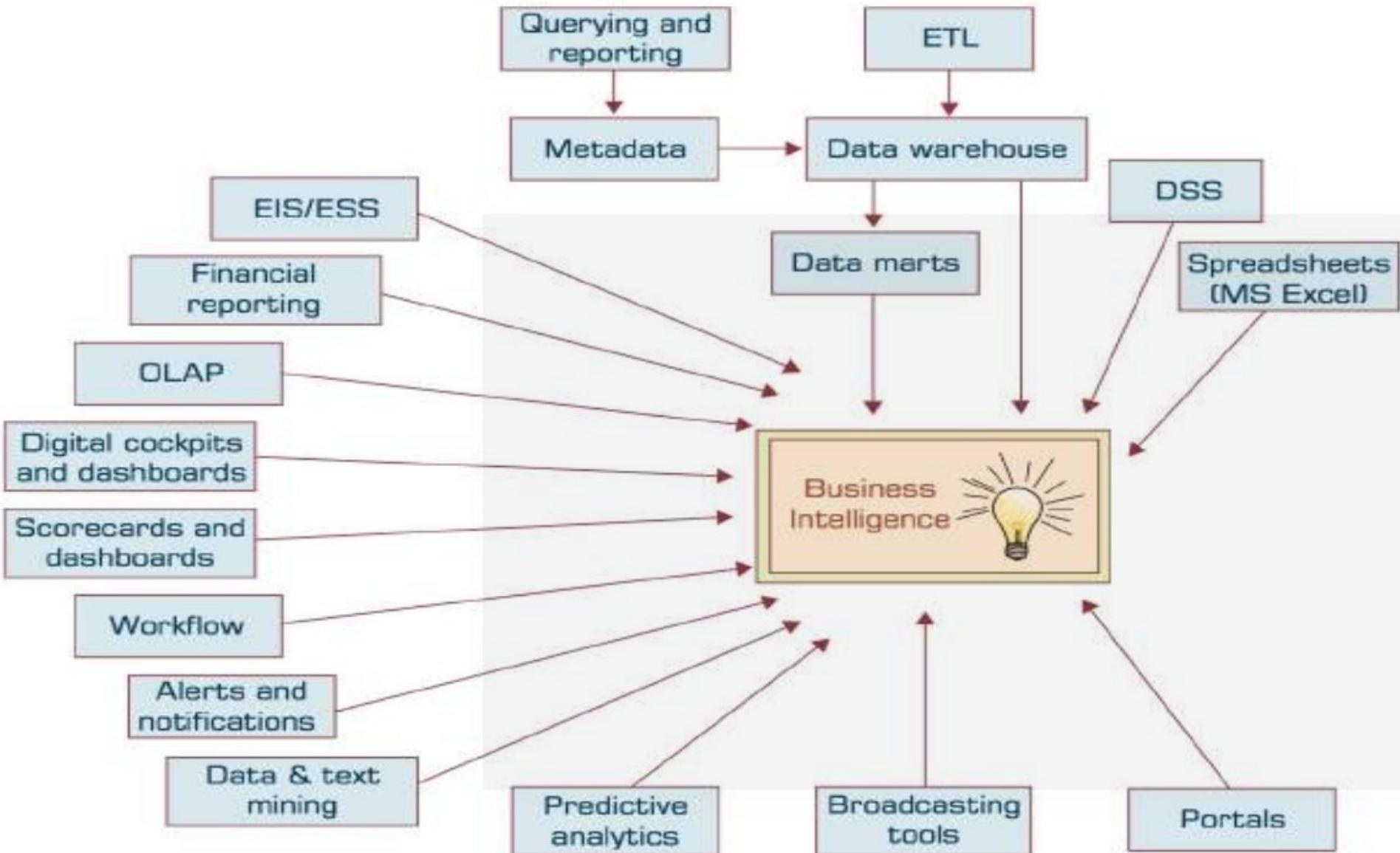
Business intelligence (BI) systems

Sistemas de business intelligence

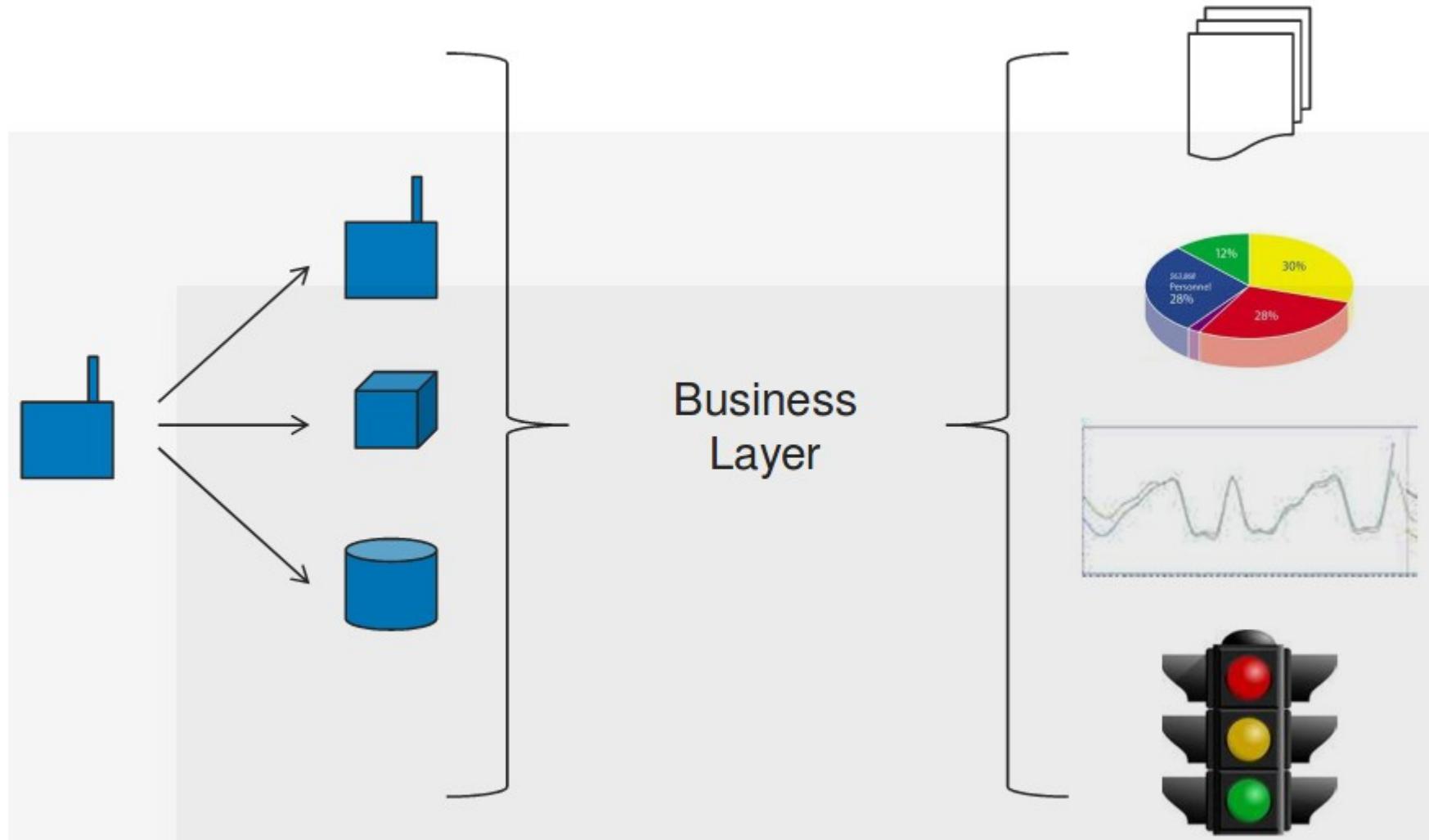
- Business Intelligence
 - “applications and technologies for collecting, storing, analyzing and providing access to information for improving businesses process modeling quality” (Hancock, 2005)
 - “an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance” (Gartner, 2006)
- Common functions of business intelligence technologies include
(https://en.wikipedia.org/wiki/Business_intelligence)
 - Reporting,
 - Online analytical processing,
 - Analytics,
 - Data mining,
 - Process mining,
 - Complex event processing,
 - Business performance management,
 - benchmarking, text mining, predictive analytics and prescriptive analytics. (Wikipedia)

Termos relacionados com business intelligence.

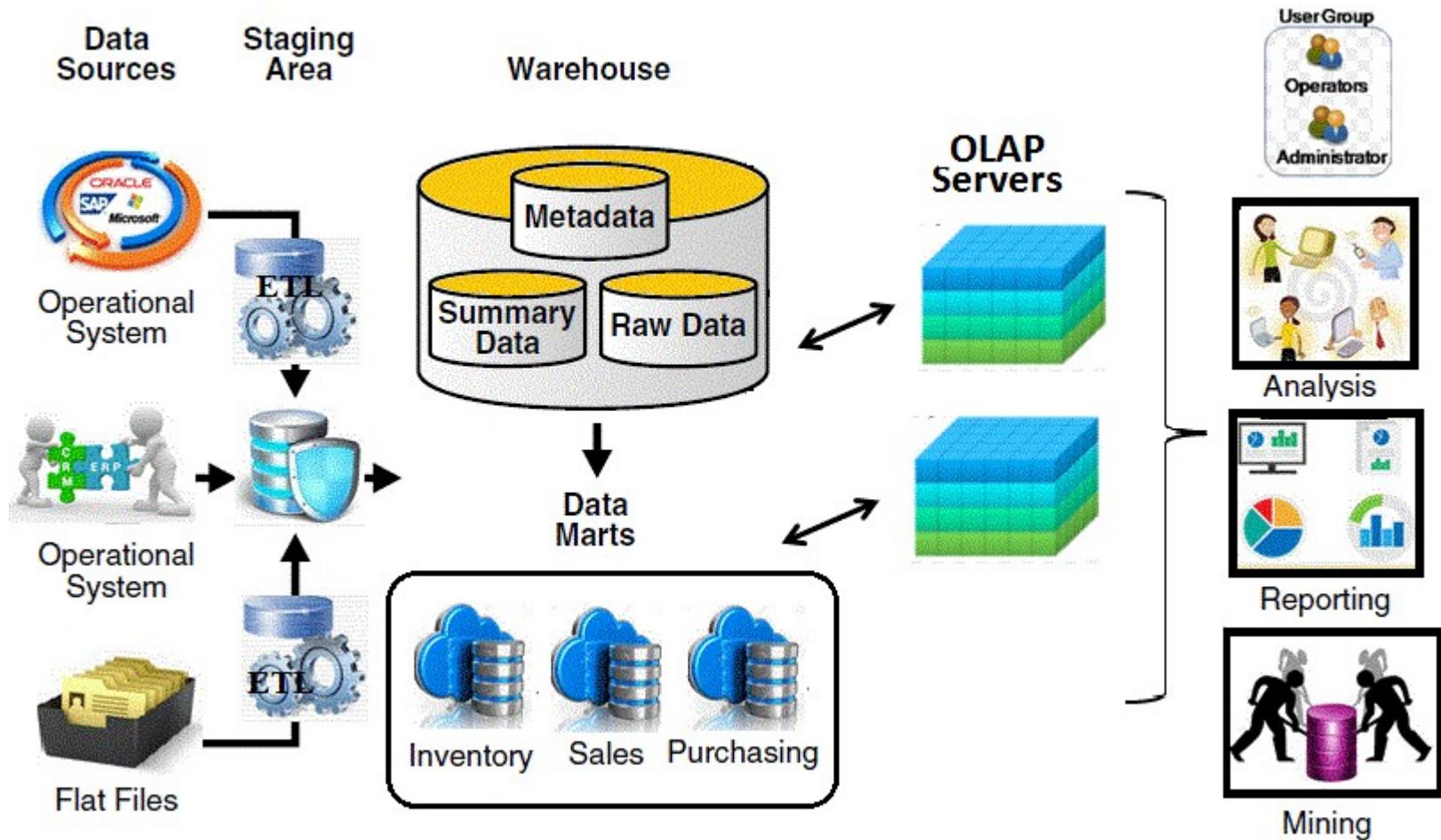
Fonte: Sharda et all (2017)



BI = Data integration + Dashboards
+ Relatórios. Fonte: Waite (2011)



Elementos da arquitetura de Business Intelligence Systems com foco nos elementos datawarehouse e OLAP

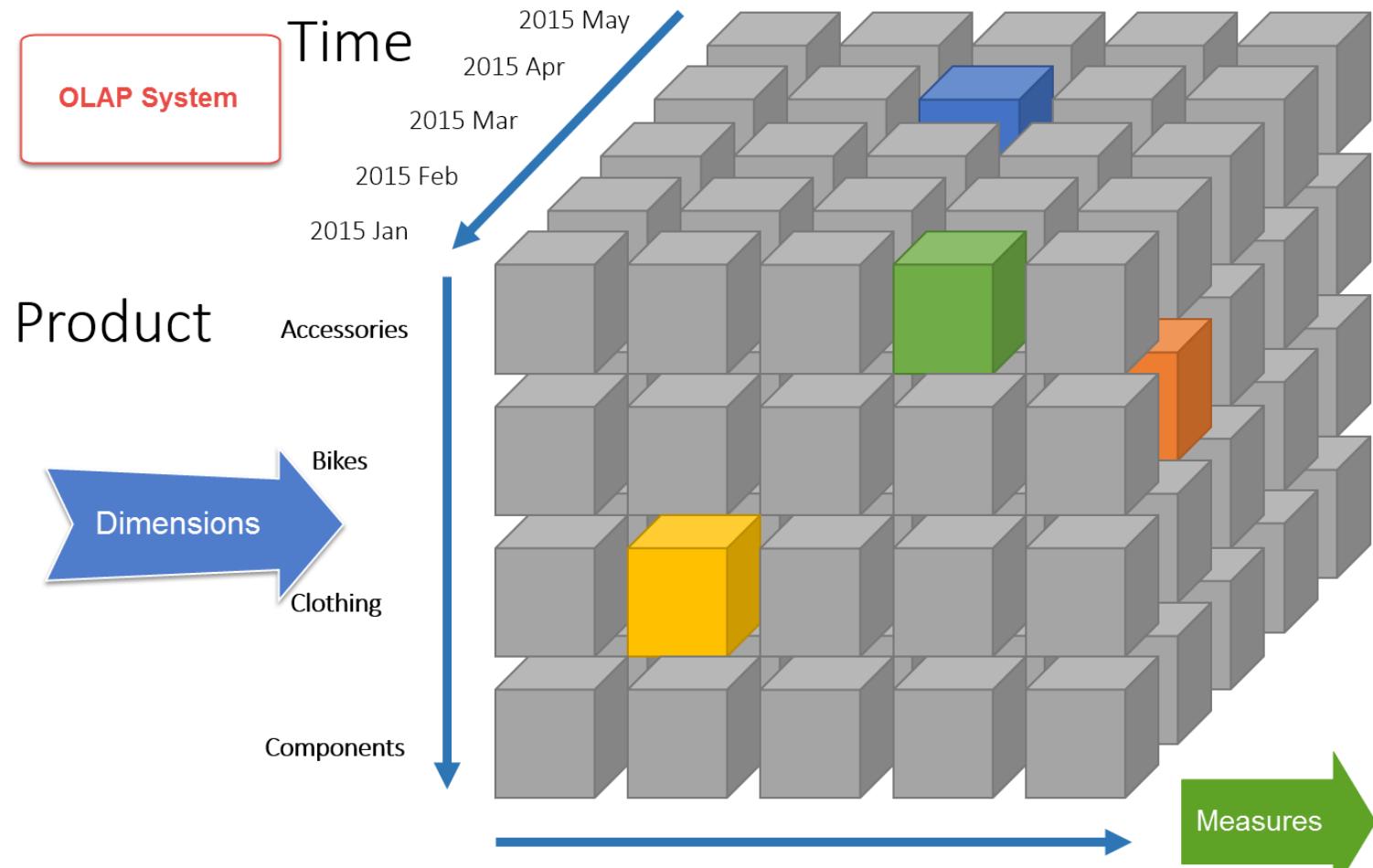


Fonte: <http://www.sql-datatools.com/2015/09/sql-datawarehouse-olap-servers.html>

Modelagem multidimensional e montagem de cubos para ferramentas OLAP

Exemplo de Drill-Down com OLAP Cubes – Online Analytical Processing Systems

Fonte: <http://datacompute.in/what-are-the-differences-between-oltp-and-olap-systems/>



Exemplificando a questão da montagem de cubos. Fonte: Maria Luiza Campos, Data warehousing. ERBD, 2007. Campos (2007)

Suponha a existência de uma estrutura de dados relacional, de um banco transacional. Responda rápido.. o que vende mais, vermelho ou branco?

Fonte: Campos (2007)

Um exemplo de relatório de volume de vendas para a concessionária CLYDE

| MODEL | COLOR | SALES VOLUME |
|--------------|-------|--------------|
| MINI VAN | BLUE | 6 |
| MINI VAN | RED | 5 |
| MINI VAN | WHITE | 4 |
| SPORTS COUPE | BLUE | 3 |
| SPORTS COUPE | RED | 5 |
| SPORTS COUPE | WHITE | 5 |
| SEDAN | BLUE | 4 |
| SEDAN | RED | 3 |
| SEDAN | WHITE | 2 |

Agora suponha a existência de uma estrutura de dados multidimensional, obtida pela transformação de registros de um banco transacional. Responda rápido.. o que vende mais, vermelho ou branco?

Fonte: Campos (2007)

Volume de Vendas

The diagram illustrates a 3D array structure. On the left, a vertical column labeled "MODEL" lists three categories: Mini Van, Coupe, and Sedan. To the right, a horizontal row labeled "COLOR" lists three colors: Blue, Red, and White. A 3x3 grid of numbers represents the sales volume for each combination of model and color. The values are: Mini Van (Blue: 6, Red: 5, White: 4), Coupe (Blue: 3, Red: 5, White: 5), and Sedan (Blue: 4, Red: 3, White: 2).

| | | | |
|----------|---|---|---|
| | | | |
| Mini Van | 6 | 5 | 4 |
| Coupe | 3 | 5 | 5 |
| Sedan | 4 | 3 | 2 |

Blue Red White

COLOR

- ✓ Um array multidimensional tem um número fixo de dimensões e os valores são armazenados nas células
- ✓ Cada dimensão consiste de um número de elementos

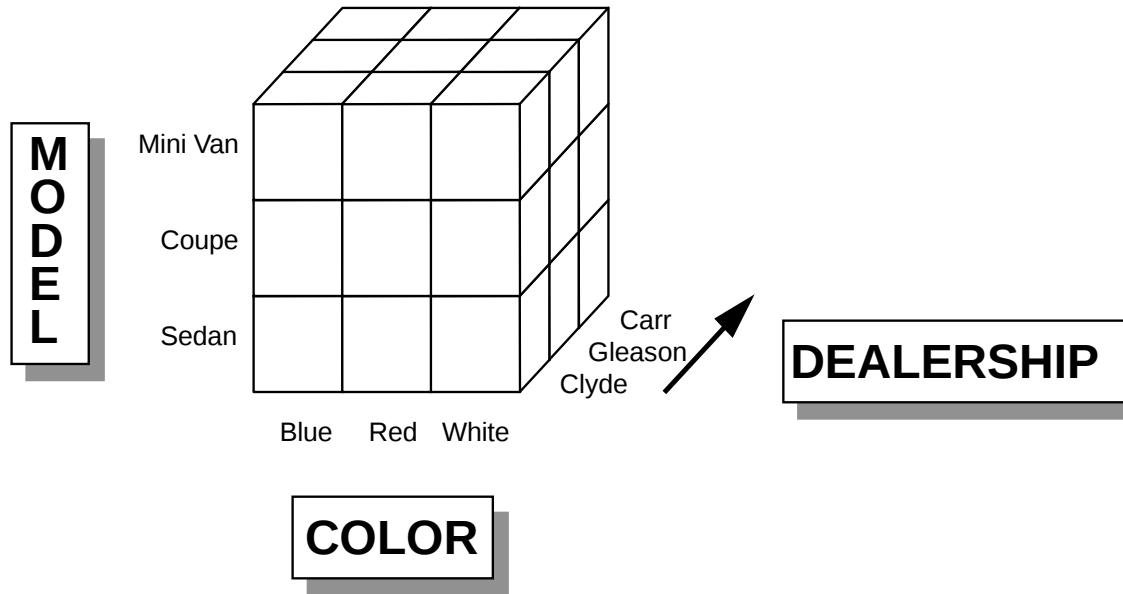
Acrescentando mais concessionárias, e mais uma coluna...
 responda rápido: Como as cores influenciam as vendas? Fonte:
 Campos (2007)

Volume de
 Vendas para
 todos os
 concessionários

| MODEL | COLOR | DEALERSHIP | VOLUME |
|--------------|-------|------------|--------|
| MINI VAN | BLUE | CLYDE | 6 |
| MINI VAN | BLUE | GLEASON | 6 |
| MINI VAN | BLUE | CARR | 2 |
| MINI VAN | RED | CLYDE | 3 |
| MINI VAN | RED | GLEASON | 5 |
| MINI VAN | RED | CARR | 5 |
| MINI VAN | WHITE | CLYDE | 2 |
| MINI VAN | WHITE | GLEASON | 4 |
| MINI VAN | WHITE | CARR | 3 |
| SPORTS COUPE | BLUE | CLYDE | 2 |
| SPORTS COUPE | BLUE | GLEASON | 3 |
| SPORTS COUPE | BLUE | CARR | 2 |
| SPORTS COUPE | RED | CLYDE | 7 |
| SPORTS COUPE | RED | GLEASON | 5 |
| SPORTS COUPE | RED | CARR | 2 |
| SPORTS COUPE | WHITE | CLYDE | 4 |
| SPORTS COUPE | WHITE | GLEASON | 5 |
| SPORTS COUPE | WHITE | CARR | 1 |
| SEDAN | BLUE | CLYDE | 6 |
| SEDAN | BLUE | GLEASON | 4 |
| SEDAN | BLUE | CARR | 2 |
| SEDAN | RED | CLYDE | 1 |
| SEDAN | RED | GLEASON | 3 |
| SEDAN | RED | CARR | 4 |
| SEDAN | WHITE | CLYDE | 2 |
| SEDAN | WHITE | GLEASON | 2 |
| SEDAN | WHITE | CARR | 3 |

Nova transformação de registros transacionais para visão multidimensional

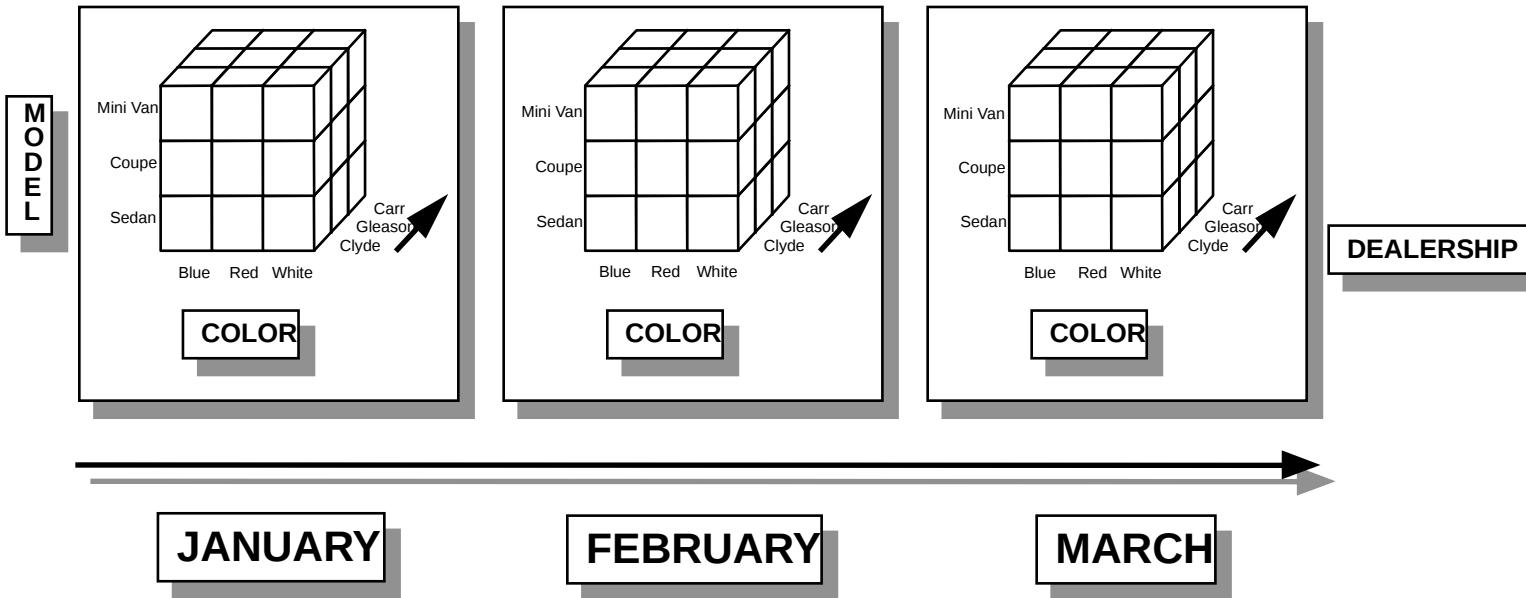
Volume de Vendas



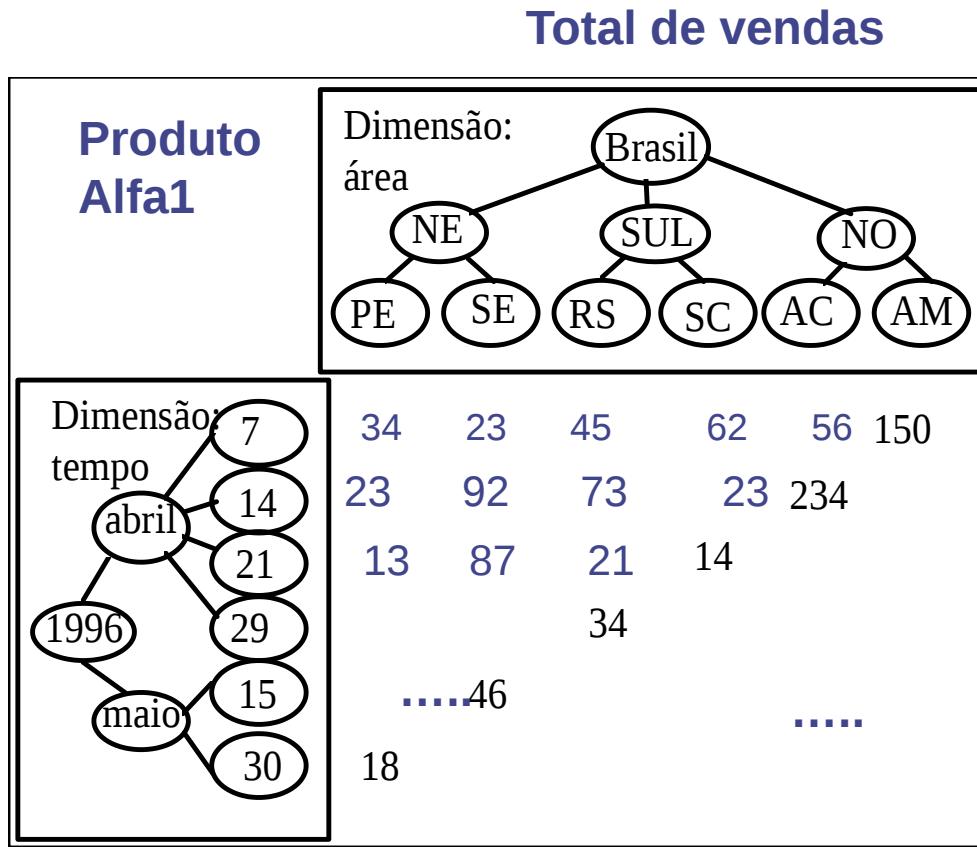
- O cubo é, de fato, apenas uma metáfora visual.
- É uma representação intuitiva do evento porque todas as dimensões coexistem para todo ponto no cubo e são independentes umas das outras.

Acrescentando Dimensões - Hipercubos

Volume de Vendas

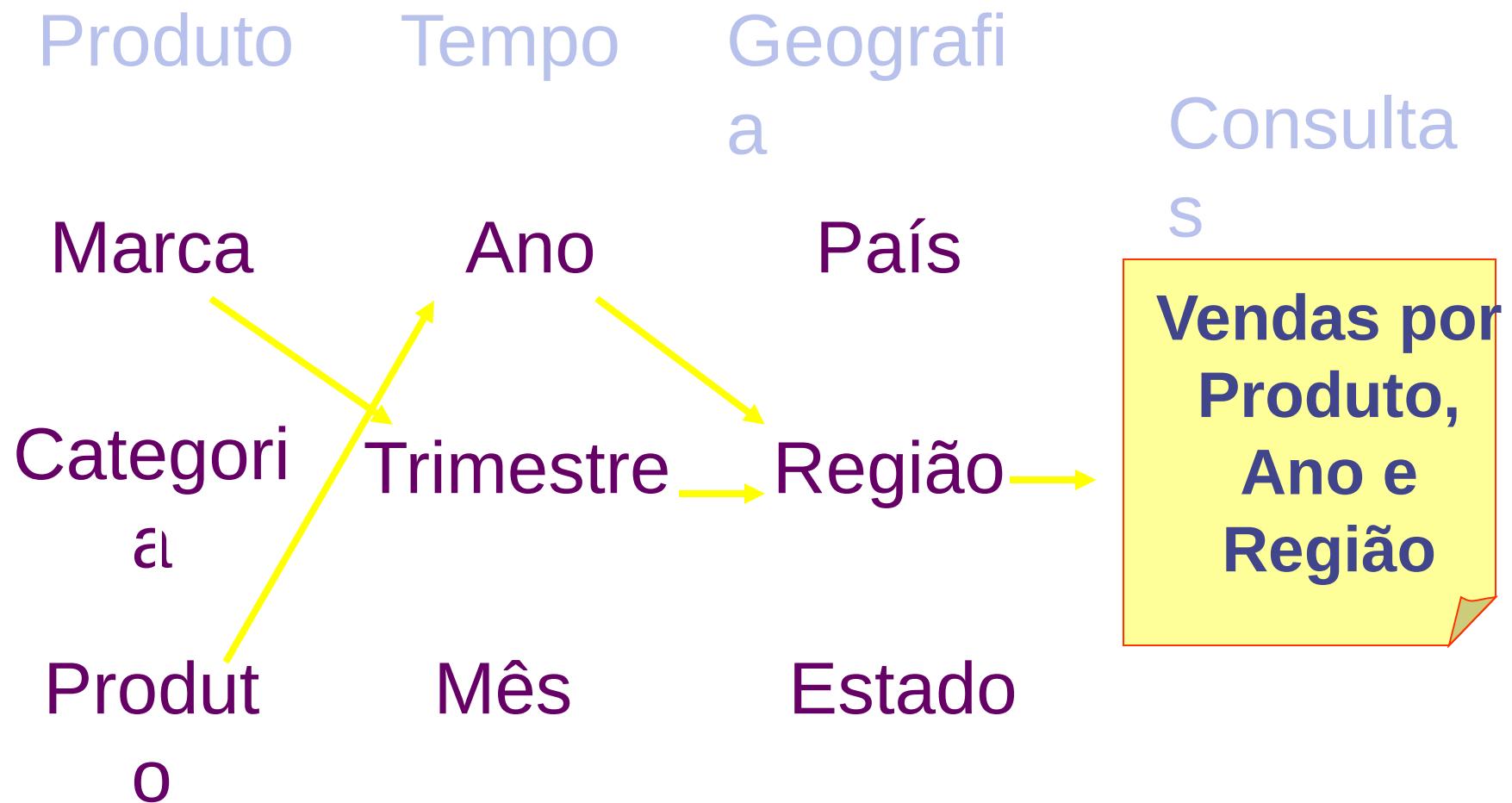


Níveis nas dimensões ou Hierarquias

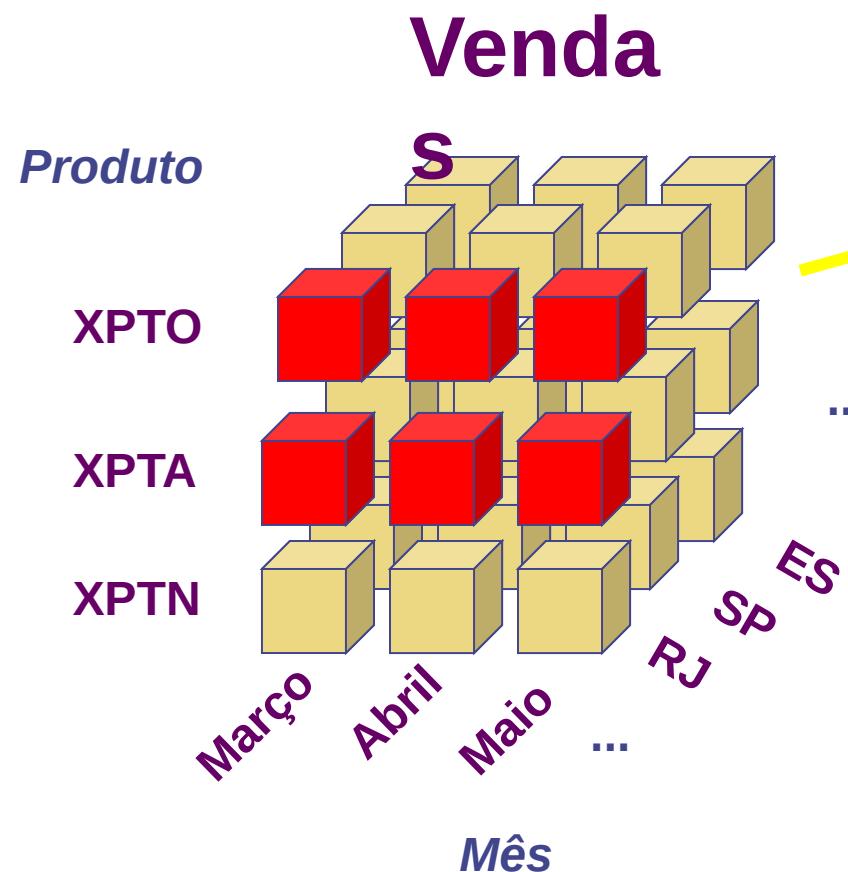


- Hierarquias são a base das agregações

Hierarquias e Agregados



Agregados

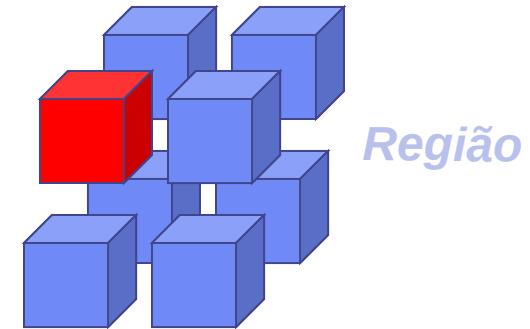


Categoria

Região

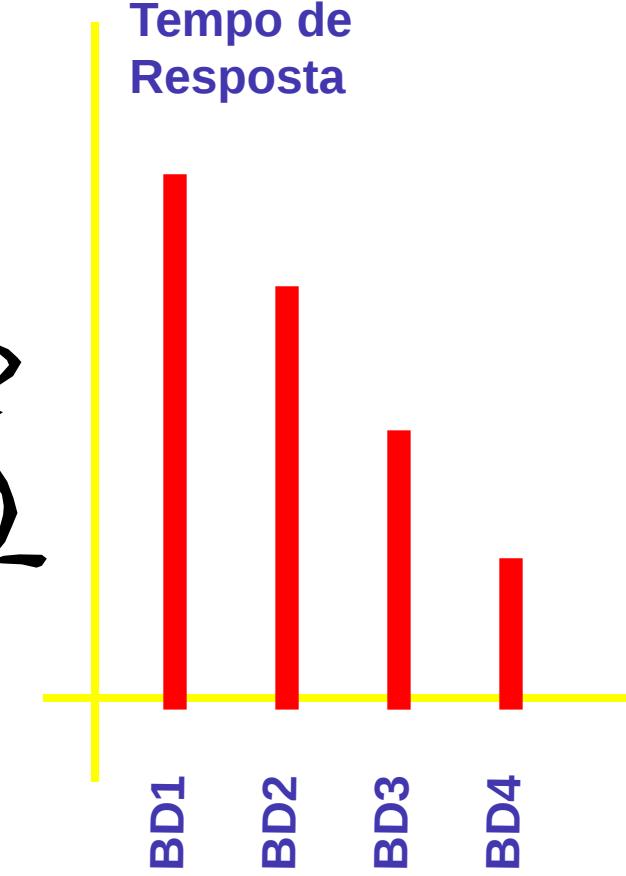
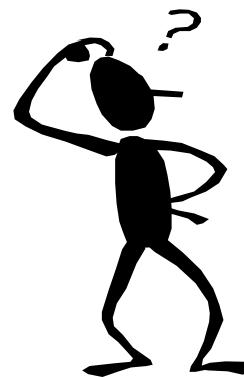
Trimestre

Estado

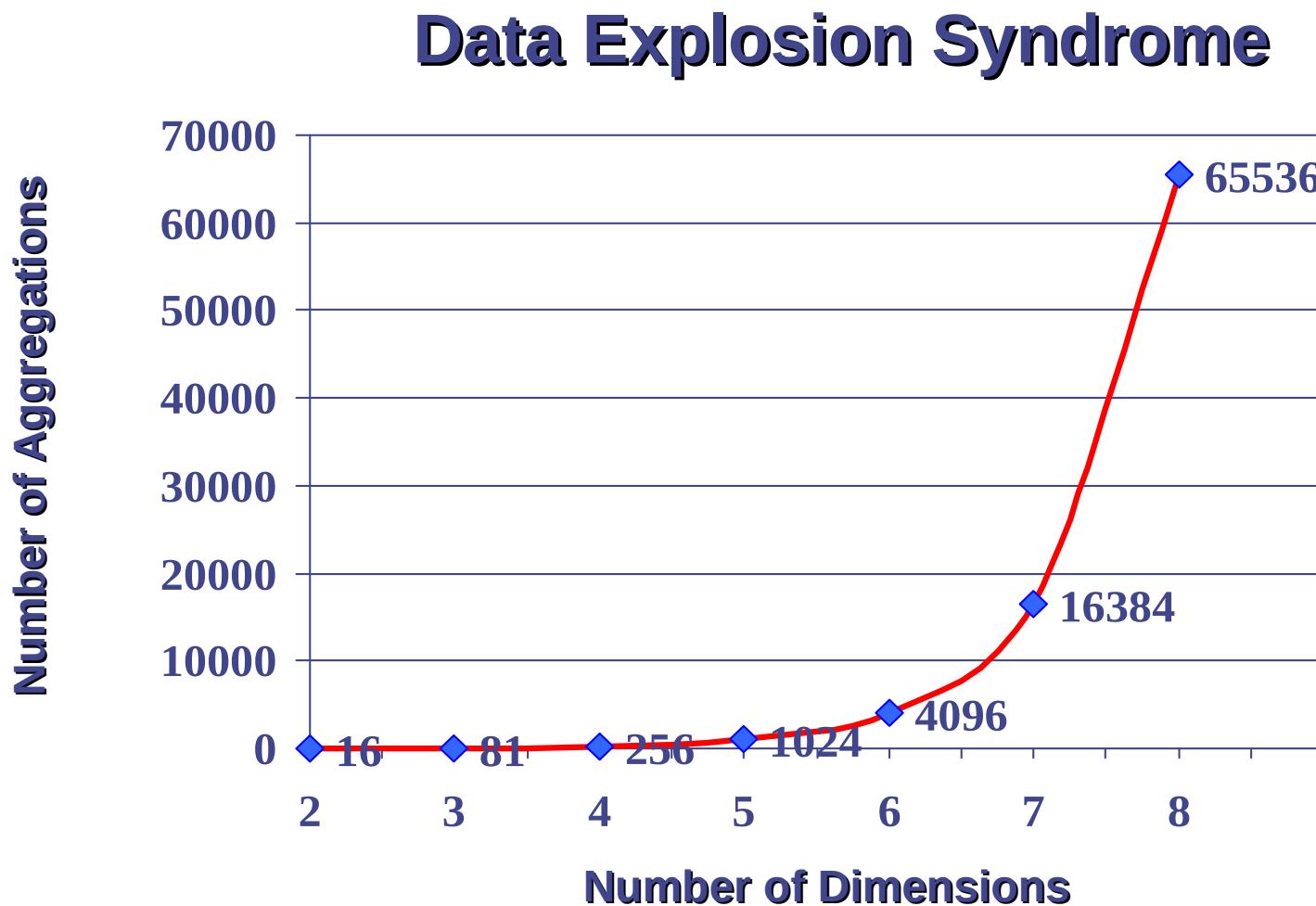


Problemas na construção dos cubos...

*Calcular os agregados no momento
da recuperação ou armazená-los?*



A Síndrome da Explosão no Volume de Dados. Fonte: Campos (2007)



(4 levels in each dimension)

Subtipo #2.1.1

Data / Businesss

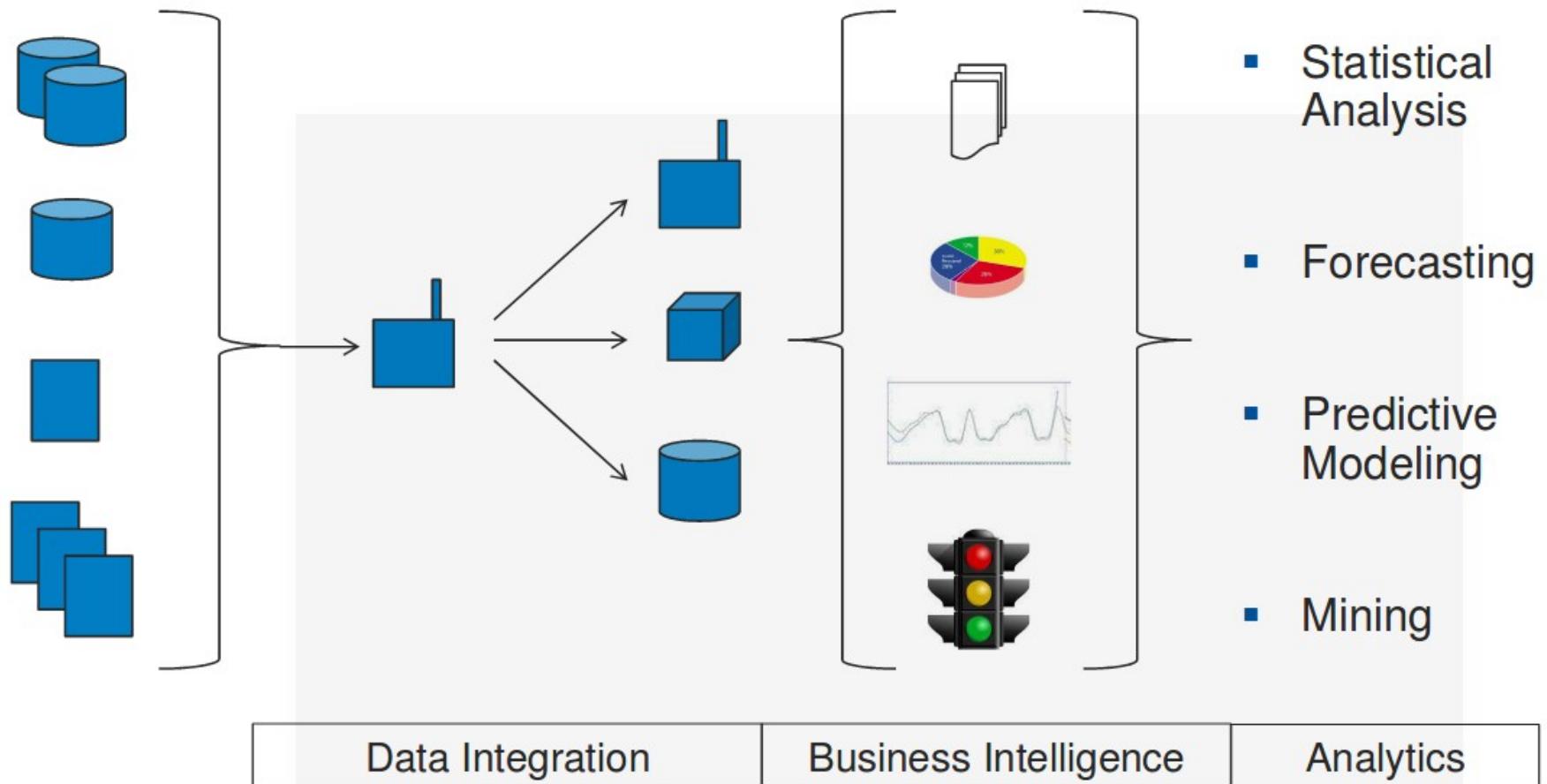
Analytics e Data

Science

Data Analytics ou Business Analytics

- Segundo Sharda et al (2018, p. 20):
 - Analytics é o processo de desenvolver decisões ou recomendações acionáveis baseadas em insights gerados a partir de dados históricos.
 - Esse processo é baseado em tecnologias informáticas, técnicas de ciências administrativas e estatística, para a solução de problemas reais.
 - O termo BI está sendo substituído por Analytics, pois BI está sendo expandido pela Analytics, com o uso de Data Science.
- Data Science
 - Conjunto de habilidades e técnicas que conjugam programação, estatística e ciências da complexidade avançadas, para trabalhar em análises descritivas, diagnósticas, preditivas e prescritivas, com vários tipos de dados distintos, não apenas na área de negócios, mas também na área científica.

Analytics = BI + Data science aplicada (análises estatísticas + previsões + predictive analytics + Mineração de dados).



Fonte: Waite (2011)

Tipos de Analytics.

Fonte: (Sharda et al, 2018, p. 20)

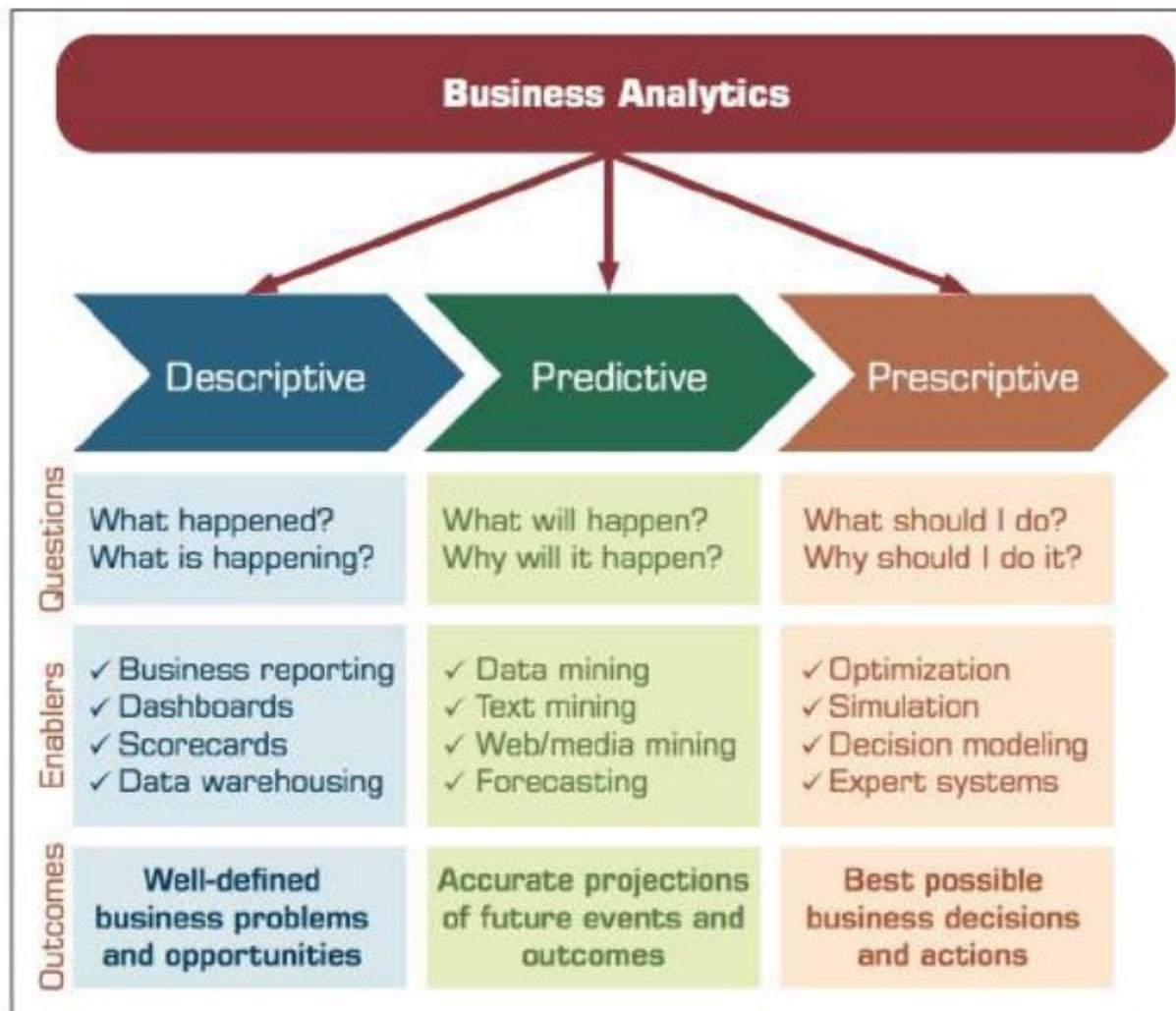


FIGURE I.11 Three Types of Analytics.

8 níveis de data analytics (1/2).

Fonte: Waite (2011)

1



| Number | Report Date | Expenditures |
|-------------|-------------|--------------|
| 1 | 10-Oct-05 | \$739.55 |
| 2 | 10-Oct-05 | \$449.55 |
| 3 | 29-Sep-05 | \$1,021.95 |
| 4 | 29-Sep-05 | \$441.00 |
| 5 | 13-Sep-05 | \$170.88 |
| 6 | 23-Aug-05 | \$1,029.03 |
| 7 | 23-Aug-05 | \$1,029.00 |
| 8 | 17-Aug-05 | \$812.91 |
| 9 | 27-Jun-05 | \$510.76 |
| 10 | 14-Jun-05 | \$293.14 |
| 11 | 22-May-05 | \$291.20 |
| 12 | 3-May-05 | \$264.25 |
| 13 | 23-Apr-05 | \$379.00 |
| 14 | 24-Jan-05 | \$375.00 |
| 15 | 19-Dec-05 | \$84.00 |
| 16 | 24-Nov-05 | \$54.00 |
| 17 | 22-Nov-05 | \$1,319.94 |
| 18 | 18-Nov-05 | \$209.10 |
| 19 | 13-Nov-05 | \$5.00 |
| 20 | 13-Nov-05 | \$486.00 |
| grand Total | | \$11,302.09 |

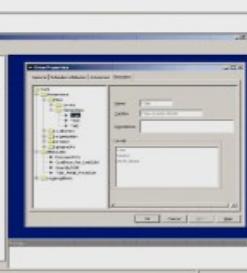
STANDARD REPORTS

Answer the questions: What happened? When did it happen?

Example: Monthly or quarterly financial reports.

We all know about these. They're generated on a regular basis and describe just "what happened" in a particular area. They're useful to some extent, but not for making long-term decisions.

2



AD HOC REPORTS

Answer the questions: How many? How often? Where?

Example: Custom reports that describe the number of hospital patients for every diagnosis code for each day of the week.

At their best, ad hoc reports let you ask the questions and request a couple of custom reports to find the answers

3



QUERY DRILLDOWN (OR OLAP)

Answer the questions: Where exactly is the problem? How do I find the answers?

Example: Sort and explore data about different types of cell phone users and their calling behaviors.

Query drilldown allows for a little bit of discovery. OLAP lets you manipulate the data yourself to find out how many, what color and where.

ALERTS

Answer the questions: When should I react? What actions are needed now?

Example: Sales executives receive alerts when sales targets are falling behind.

With alerts, you can learn when you have a problem and be notified when something similar happens again in the future. Alerts can appear via e-mail, RSS feeds or as red dials on a scorecard or dashboard.

8 níveis de data analytics (2/2).

Fonte: Waite (2011)

5



STATISTICAL ANALYSIS

Diagnostic Analytics

Answer the questions: Why is it happening? What opportunities am I missing?

Example: Banks can discover why an increasing number of customers are refinancing their homes.

Here we can begin to run some complex analytics, like frequency models and regression analysis. We can begin to look at why things are happening using the stored data and then begin to answer questions based on the data.

6



FORECASTING

Forecasting Analytics

Answer the questions: What if these trends continue? How much is needed? When will it be needed?

Example: Retailers can predict how demand for individual products will vary from store to store. Forecasting is one of the hottest markets – and hottest analytical applications – right now. It applies everywhere. In particular, forecasting demand helps supply just enough inventory, so you don't run out or have too much.

7



PREDICTIVE MODELING

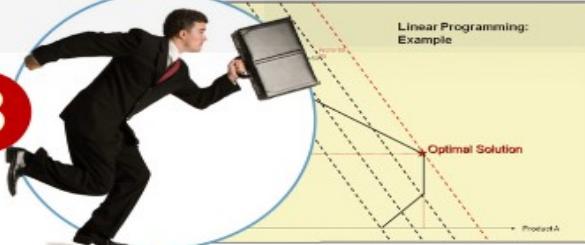
Predictive Analytics

Answer the questions: What will happen next? How will it affect my business?

Example: Hotels and casinos can predict which VIP customers will be more interested in particular vacation packages.

If you have 10 million customers and want to do a marketing campaign, who's most likely to respond? How do you segment that group? And how do you determine who's most likely to leave your organization? Predictive modeling provides the answers.

8



OPTIMIZATION

Prescriptive Analytics

Answer the questions: How do we do things better? What is the best decision for a complex problem?

Example: Given business priorities, resource constraints and available technology, determine the best way to optimize your IT platform to satisfy the needs of every user.

Optimization supports innovation. It takes your resources and needs into consideration and helps you find the best possible way to accomplish your goals.

Subtipo #2.1.1.1

Sistemas e Tecnologias de

Big Data Analytics: Obtendo Informações Externas

para uso em SI Estratégicos

Obtendo Informações Externas para uso em SI Estratégicos com uso de BIG Data

Fonte: SAS: https://www.sas.com/pt_br/insights/big-data/what-is-big-data.html

- Motivação para entender o Big data
 - “A quantidade de dados criados e armazenados globalmente é quase inimaginável, e apenas continua crescendo. Isso significa que há ainda mais potencial para extrair insights importantes dessas informações — embora apenas uma pequena porcentagem dos dados seja realmente analisada. O que isso significa para as empresas? Como elas podem fazer um uso melhor dessas informações brutas que fluem para dentro de suas paredes todos os dias?”
- Big data
 - Refere-se ao “grande volume de dados — tanto estruturados quanto não-estruturados — que sobrecarrega as empresas diariamente”
- Características do big data
 - **Volume.** Organizações coletam dados de fontes variadas, incluindo transações financeiras, mídias sociais e informações de sensores ou dados transmitidos de máquina para máquina. No passado, armazená-los teria sido um problema — mas novas tecnologias (como o Hadoop) aliviaram esse fardo.
 - **Velocidade.** Os dados são transmitidos numa velocidade sem precedentes e devem ser tratados em tempo hábil. Etiquetas RFID, sensores e medições inteligentes estão impulsionando a necessidade de lidar com torrentes de dados praticamente em tempo real.
 - **Variedade.** Dados são gerados em inúmeros formatos — desde estruturados (numéricos, em databases tradicionais) a não-estruturados (documentos de texto, e-mail, vídeo, áudio, cotações da bolsa e transações financeiras).
 - **Variabilidade.** Além das crescentes velocidade e variedade dos dados, seus fluxos podem ser altamente inconsistentes com picos periódicos. Qual a última tendência nas redes sociais? Todos os dias, picos de dados sazonais ou gerados por eventos particulares podem ser difíceis de gerenciar, ainda mais com dados não-estruturados.
 - **Complexidade.** Os dados de hoje vêm de múltiplas fontes, o que torna difícil ligá-los, combiná-los, limpá-los e transformá-los entre sistemas. No entanto, é necessário conectar e correlacionar relações, hierarquias e ligações múltiplas, ou você pode rapidamente perder o controle sobre seus dados.

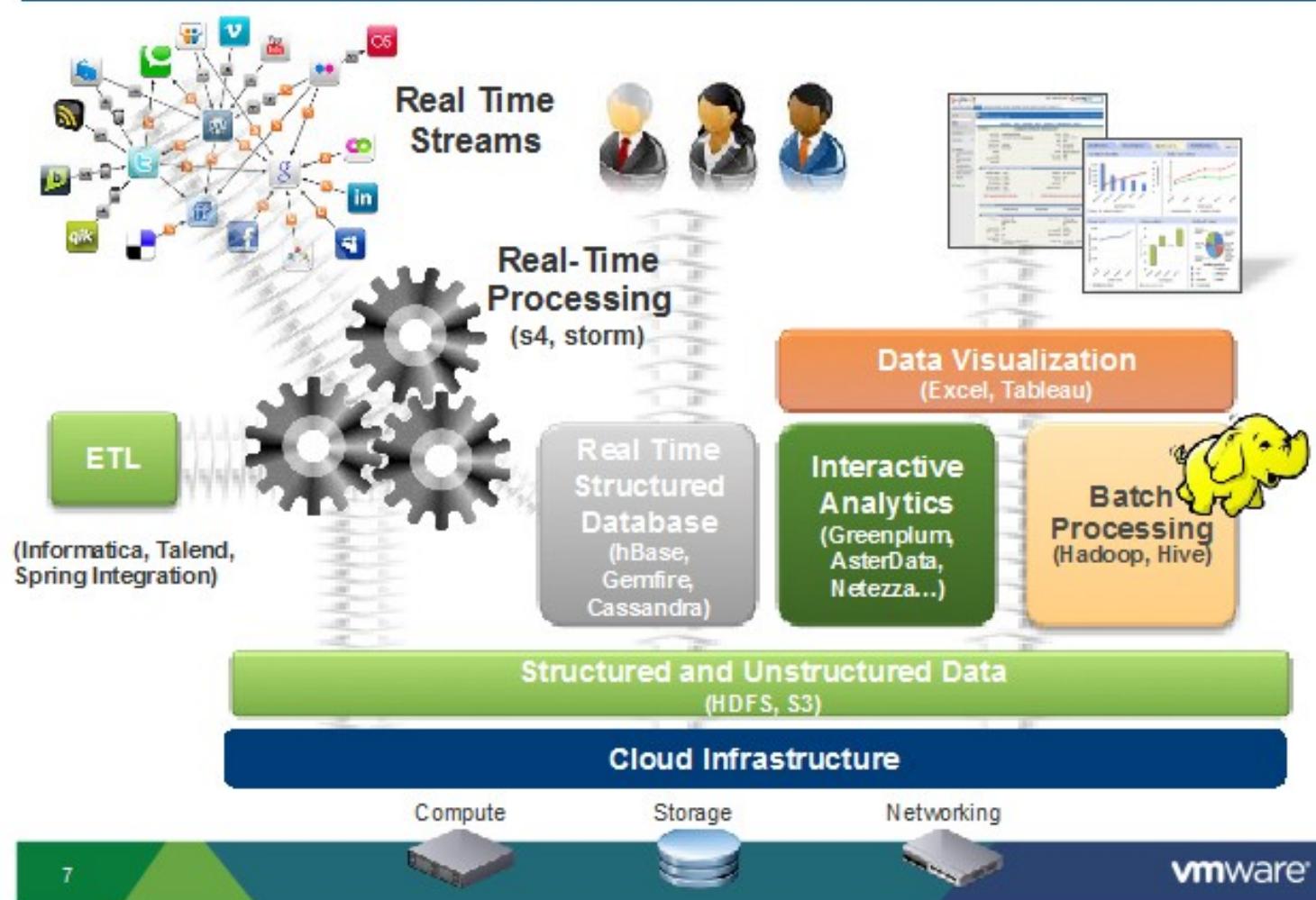
Big Data Analytics

- “Market-leading enterprises are defined by their ability to make smart, fast decisions based on the vast sea of data that they manage. Hidden in that sea are transformative insights about your business and your customers that can help you identify new revenue streams, improve customer experiences, and reduce costs. IBM offers a portfolio of physical and software-defined infrastructure and software applications to simplify your transition to an analytics-driven enterprise.”
 - Fonte: <https://www.ibm.com/it-infrastructure/solutions/big-data>
-

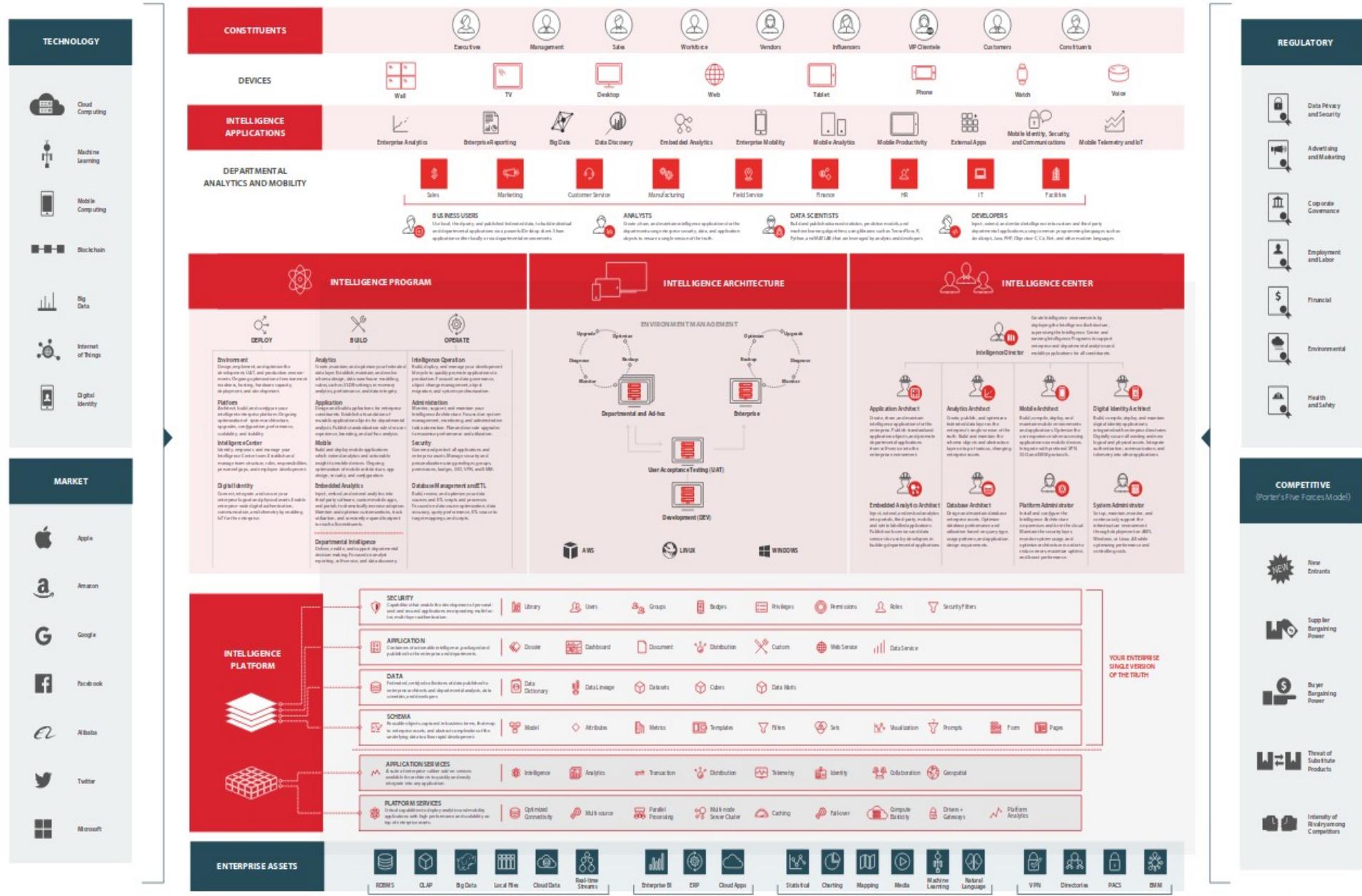
Exemplo: Coleta de dados externos com Big Data Analytics

Fonte: <http://blogs.vmware.com/vfabric/files/2012/08/holistic-view-big-data-framework.jpg>

A Holistic View of a Big Data System



MAP OF THE INTELLIGENT ENTERPRISE™



Subtipo #2.2

Artefatos e técnicas complementares para desenvolvimento de sistemas de informação estratégicos

Técnicas de análise de futuros também podem gerar insumos para sistemas de informação estratégicos

Algumas técnicas de análise, que podem gerar dados para SI estratégicos (1/4)

Fonte: <http://www.forwiki.ro/wiki/Category:Practices>

- Agent Modelling
 - [Simulating](#) the actions and interactions of autonomous agents (both individual or collective entities such as organizations or groups) with a view to assessing their effects on the system as a whole. (https://en.wikipedia.org/wiki/Agent-based_model)
- Backcasting
 - Develop normative scenarios and explore their feasibility and implications.
Brainstorming and Scenario Building can be used.
- Creativity Methods
 - Brainstorming, Mindmapping, Conversational analysis, Utopian writing, Science fiction
- Critical & Key Technology Study
 - Interviews with experts on the technology for which a forecast is being developed
- Cross-Impact Analysis
 - Evaluate changes in the probability of the occurrence of a given set of events consequent on the actual occurrence of one of them
- Delphi survey
 - Collaborative process that is designed to improve group communications about a complex problem or topic

Algumas técnicas de análise, que podem gerar dados para SI estratégicos (2/4)

Fonte: <http://www.forwiki.ro/wiki/Category:Practices>

- Environmental Scanning & Monitoring
 - Gathering, analyzing, and dispensing information for tactical or strategic purposes about the environments in which an organization is operating
- Expert Panels
 - Typically groups of 12-20 individuals are given 3-18 months to deliberate upon the future of a given topic
- Gaming
 - Involve role play, in which people act as if they were someone else
- Modelling & Simulation
 - A simplified representation of a real system is produced to develop understanding on how the actual system works
- Morphological Analysis & Relevance Trees
 - Normative forecasting method which start with future needs or objectives, and then seek to identify the circumstances, actions, technologies, etc. required to meet them.
- Multi-Criteria Analysis
 - Aims to compare different actions or solutions according to a variety of criteria and policies. The method is based on the evaluation of actions by means of a weighted average. Is not a method specific to Foresight exercises.

Algumas técnicas de análise, que podem gerar dados para SI estratégicos (3/4)

Fonte: <http://www.forwiki.ro/wiki/Category:Practices>

- S&T Roadmapping
 - A graphical representations in which "nodes" (past, present or future states of the art in S&T development) are connected by "links" (causal or temporal relations) showing the nature, rate and direction of potential S&T developments from or towards those nodes. These representations can be put into practical use to illuminate the way forward and in informing decisions about possible future options to help planning.
- SWOT Analysis
 - An analytical method is used to identify and categorise significant internal factors (i.e. strengths and weaknesses) and external factors (i.e. opportunities and threats) an organisation faces.
- Scenario Building
 - Is an empirical driven process. The explorative approach means to look how a situation can evolve from the present into different alternative futures. This is often a participatory process, involving many stakeholders and perspectives and encourages speculation. The normative approach takes one specific and desired future as a starting point and looks at different possible paths to achieve this desired future.

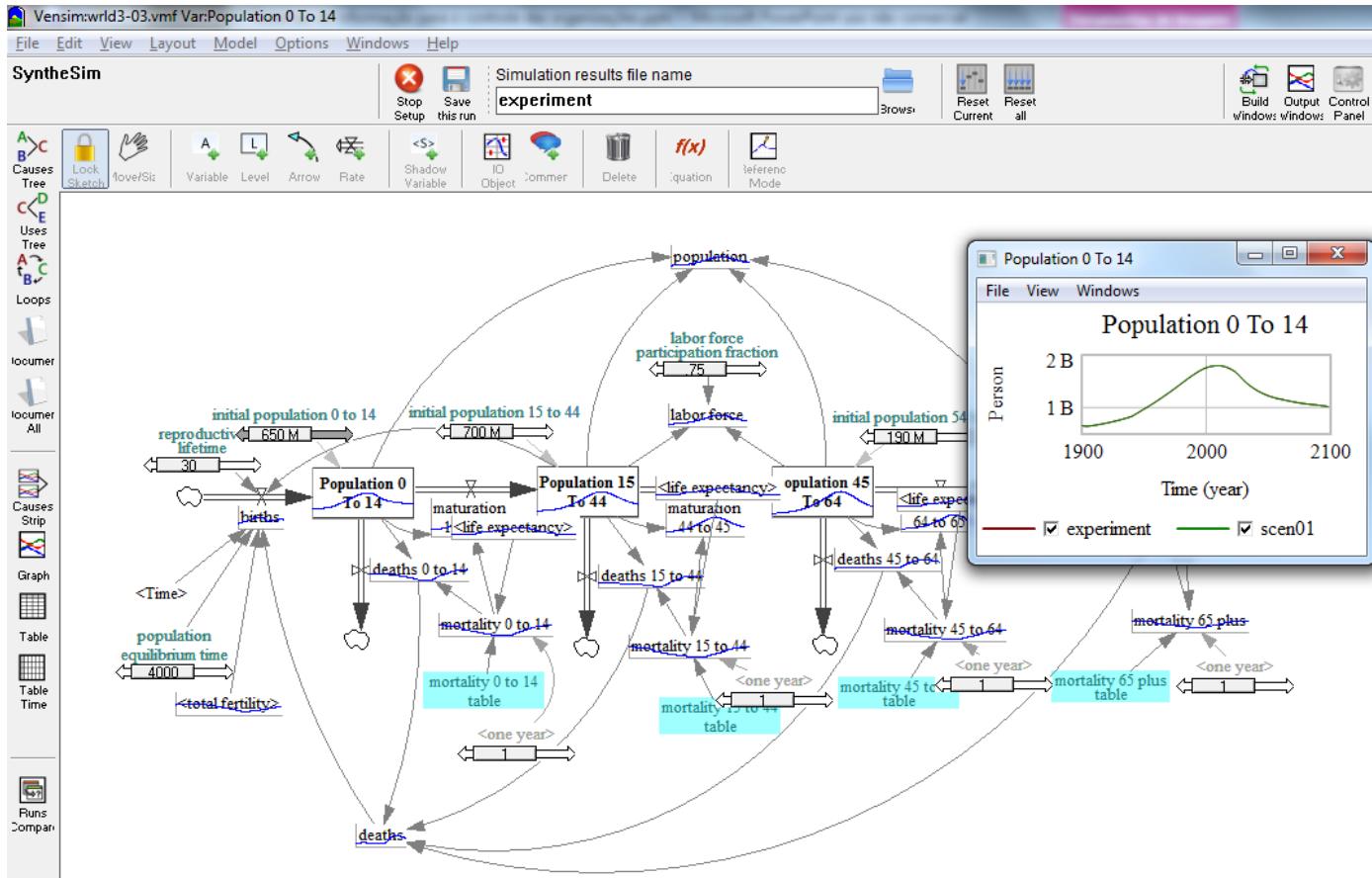
Algumas técnicas de análise, que podem gerar dados para SI estratégicos (4/4)

Fonte: <http://www.forwiki.ro/wiki/Category:Practices>

- Structural Analysis
 - Seeks to represent the 'system' by highlighting key variables, which (potentially) influence the problem under study.
- System Dynamics
 - A modelling technique for framing, understanding and managing the dynamic behaviour of complex systems, which may be found in business, industrial and social systems. Based on the notions of Systems Thinking, including causality, holism, hierarchy and continuity, SD considers the interrelations and interdependencies between system elements by using feedback loops.
- Trend Intra & Extrapolation
 - Locate a trend that is apparent over time, and project it forward based on data concerning the rates of change and the extent of change achieved.

Simulação de um sistema usando system dynamics.

Ex: Modelando a evolução da população mundial



Subtipo #2.3

Sistemas de informação
estratégicos para apoiar a
execução da política estratégica
de uma organização:
Desenvolvimento,
Implementação, Monitoramento
e Controle do Planejamento
Estratégico

| | | | |
|--|---|---|--|
| Resultados para a Sociedade | Reducir a morbimortalidade de causas evitáveis materna e infantil | Reducir a mortalidade prematura por complicações de doenças respiratórias, cardiocirculatórias e diabetes | Melhorar a satisfação dos usuários em relação ao SUS |
| Processo | Reducir a morbimortalidade por causas externas | Propiciar maior longevidade saudável | |
| Perspectiva de Gestão | | | |
| <p>Implementar Redes de Atenção a Saúde Fortalecer a APS como ordenadora do Cuidado Fortalecer o processo de regionalização da saúde Instituir a Política para Atenção Ambulatorial Especializada sob a lógica das RAS Implementar a Política de Atenção Hospitalar, sob a lógica das RAS, definindo o papel dos hospitais no território loco-regional Qualificar a Política de Assistência Farmacêutica Garantir a transversalidade das ações de Vigilância em Saúde na RAS Implementar a Política Estadual de Regulação</p> <ul style="list-style-type: none"> • Organizar os sistemas de apoio às Redes de Atenção à Saúde <ul style="list-style-type: none"> ◦ Qualificar os Sistemas de Informação para análise, disseminação e compartilhamento de dados. ◦ Implementar tecnologias e ferramentas para a gestão da clínica ◦ Investir na infraestrutura da SES para fazer frente às suas competências ◦ Estruturar o sistema de diagnóstico, fortalecer a hemorrede e laboratórios de saúde pública • Promover a mudança de cultura organizacional visando a implantação das Redes de Atenção à Saúde <ul style="list-style-type: none"> ◦ Modernizar o organograma e aperfeiçoar os fluxos e processos de trabalho da SES ◦ Fortalecer a transversalidade, a comunicação e o trabalho coletivo na SES ◦ Implementar a Política de Gestão do Trabalho ◦ Incentivar a intersetorialidade com instituições governamentais e não governamentais ◦ Fortalecer o papel regulador do Estado • Fortalecer a Política Estadual de Formação e Educação Permanente de acordo com as RAS, com ênfase na gestão • Qualificar as atividades de regulação, contratualização, monitoramento e avaliação <ul style="list-style-type: none"> ◦ Incentivar e fortalecer as instâncias de controle e participação social. ◦ Fortalecer a CIR e o planejamento regional e macrorregional ◦ Fortalecer a ouvidoria do SUS como instrumento de gestão e de avaliação da satisfação do usuário. | | | |
| Perspectiva Financeira | | | |

Mapa estratégico da Saúde no RS
 Fonte:
<http://www.saude.rs.gov.br>

- Cumprir os 12% orçamentários, conforme LC 141/2012
- Aprimorar os mecanismos de monitoramento e execução do gasto público
- Alocar os recursos financeiros de acordo com as necessidades de saúde visando reduzir as desigualdades regionais
- Implementar estratégias de captação de recursos nacionais e internacionais.

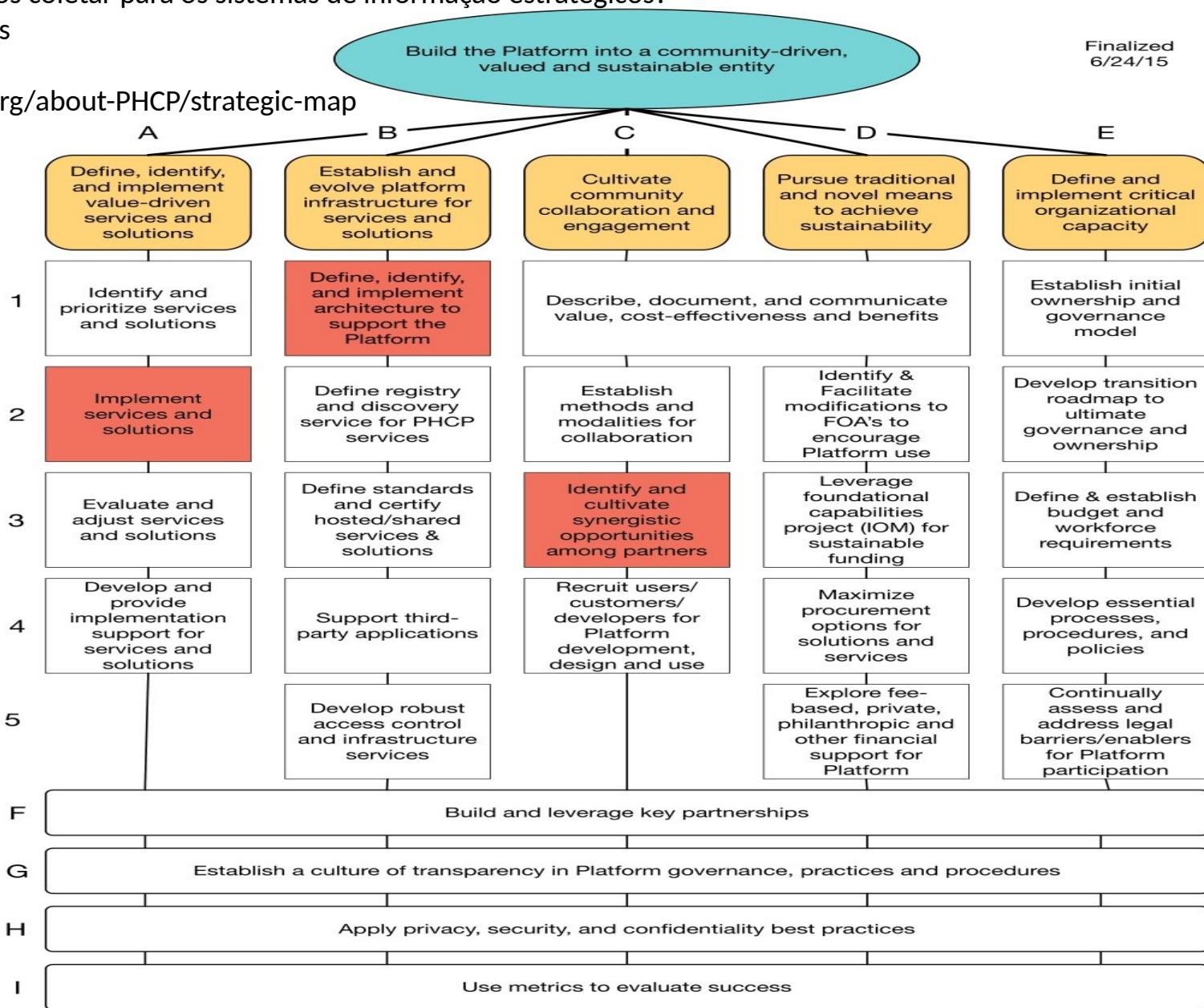
Como saber quais dados coletar para os sistemas de informação estratégicos?

Dos mapas estratégicos

Fonte:

<http://www.thephcp.org/about-PHCP/strategic-map>

Finalized
6/24/15



Tipo #3

Database systems

Sistemas de bases de

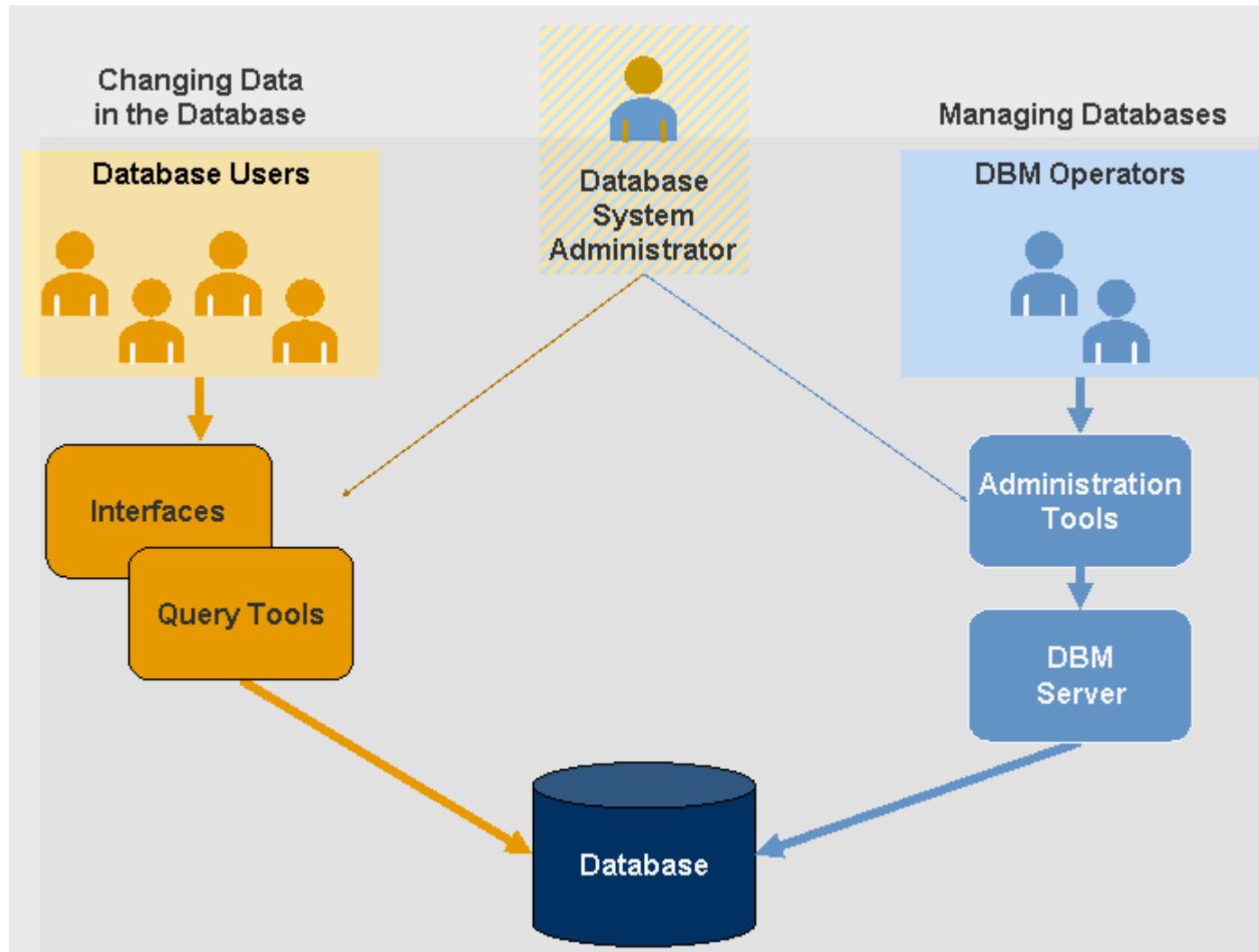
dados

Sistemas de bases de dados e sistemas de gerenciamento de bases de dados

- A database is an organized collection of data, stored and accessed electronically.
- Database designers typically organize the data to model aspects of reality in a way that supports processes requiring information, such as (for example) modeling the availability of rooms in hotels in a way that supports finding a hotel with vacancies. Fonte: wikipedia
- The database management system (DBMS) is the software system that interacts with end users, applications, and the database itself to capture and analyze data.
- O sistema de base de dados é o conjunto formado pelos artefatos (bases de dados, SGBD), pessoas (usuários humanos, administradores, analistas etc), e processos manuais realizados pelas pessoas, juntamente com os processos computacionais (aplicações) que acessam os dados.

Elementos típicos em um sistema de base de dados.

Fonte: http://maxdb.sap.com/doc/7_8/45/01f20034166c32e10000000a114a6b/frameset.htm

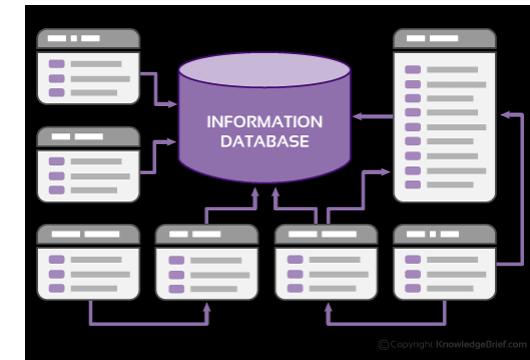
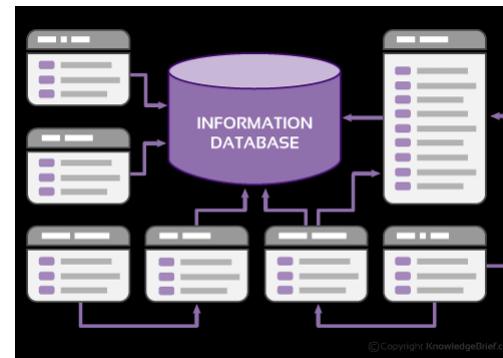
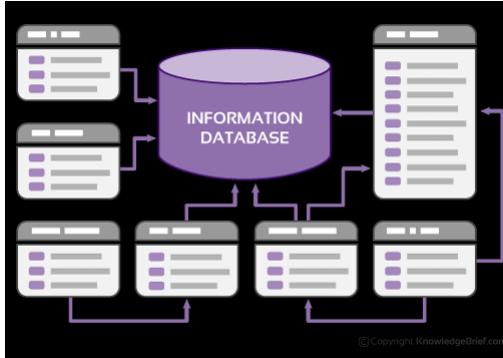
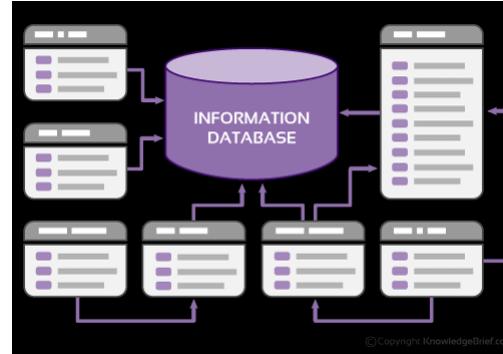
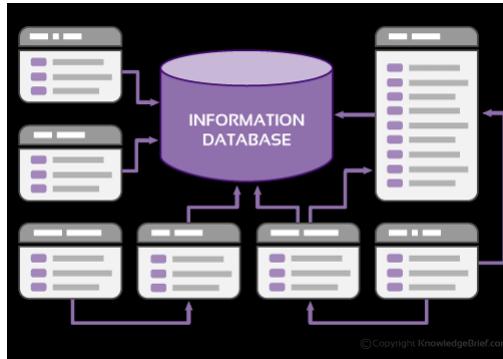


Database Systems (Sistemas de Bases de Dados)

Fonte: Prakken (2000, p. 149-196)

- These systems play, in connection with strategic information systems ... a role especially in the signalling phase of the organization's strategic decision-making process.
- Data base systems are well suited to picture the organization in a number of different ways. For instance, it is very easy to compare the organization's departments from various points of view.
- Also it is possible to show specific developments such as in the field of sales. Using data base systems we are able to get a clear and detailed view of the company's position and its changes in the preceding years.
- The character of the data being stored in data base systems is about alpha numeric quantities; in respect of storing quantitative data (numbers) as well as qualitative data (text). The management of these data collections is called data base management.
 - If it is about the manipulation of quantitative data, i.c. the execution of calculations, then we are confronted with decision support systems.
 - A text processor is a well-known example of the manipulation of qualitative data. And an idea processing system is another one.

Desafios na utilização de um sistema de bases de dados: imagine dezenas de bancos de dados, com milhares de tabelas e milhões de registros gerados ao longo de dezenas de anos criados por milhares de pessoas em centenas de locais diferentes, alterados por dezenas de programadores e analistas. Como organizar, compreender e utilizar todos esses dados?



**Tipo #4: Document
Information Systems /
Sistemas de
Gerenciamento de
Documentos**

Document Information Systems

Fonte: Prakken (2000, p. 149-196)

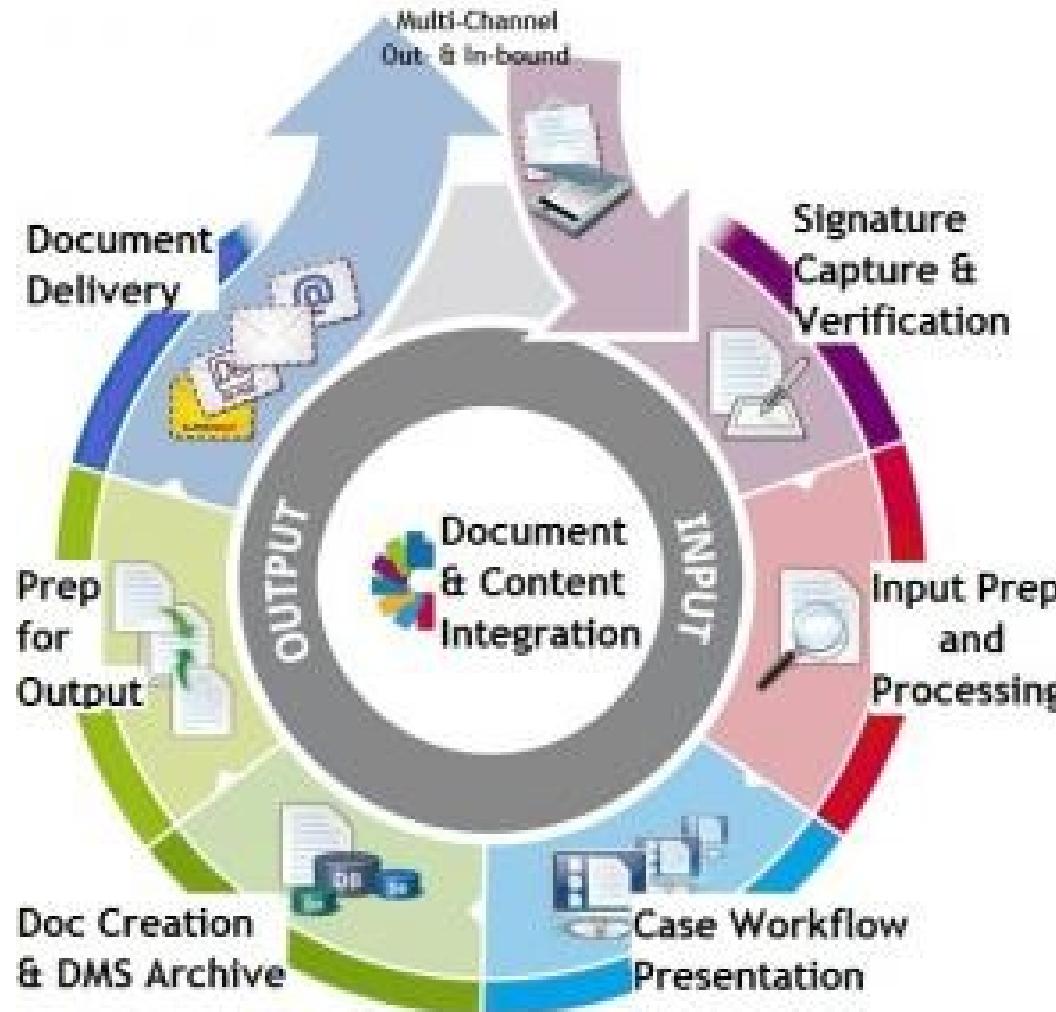
- The miniaturization of ICT caused the birth of mini computers and micro computers (PC's), facilitating the access of users to all sorts of data bases, including digital documents.
- Based on these technical opportunities, the concept 'document', originally closely related to paper as a medium, assumed a broader significance. Nowadays, speaking about documents, we are pointing at all data collections having a specific significance as a whole for the user, and that can be recorded by image and/or tone media.
- Because it is especially about the registering of *images* - texts, diagrams, figures, etc. - here, we call this image processing. The systems involved, therefore, are called document image systems or document information systems.
- These information systems, actually to be called document *data* systems, can be defined as follows:
 - *Systems used to manage - to be split up into inputing, storing, processing, retrieving, reproducing and circulating - data laid down in documents*

O que é um documento?

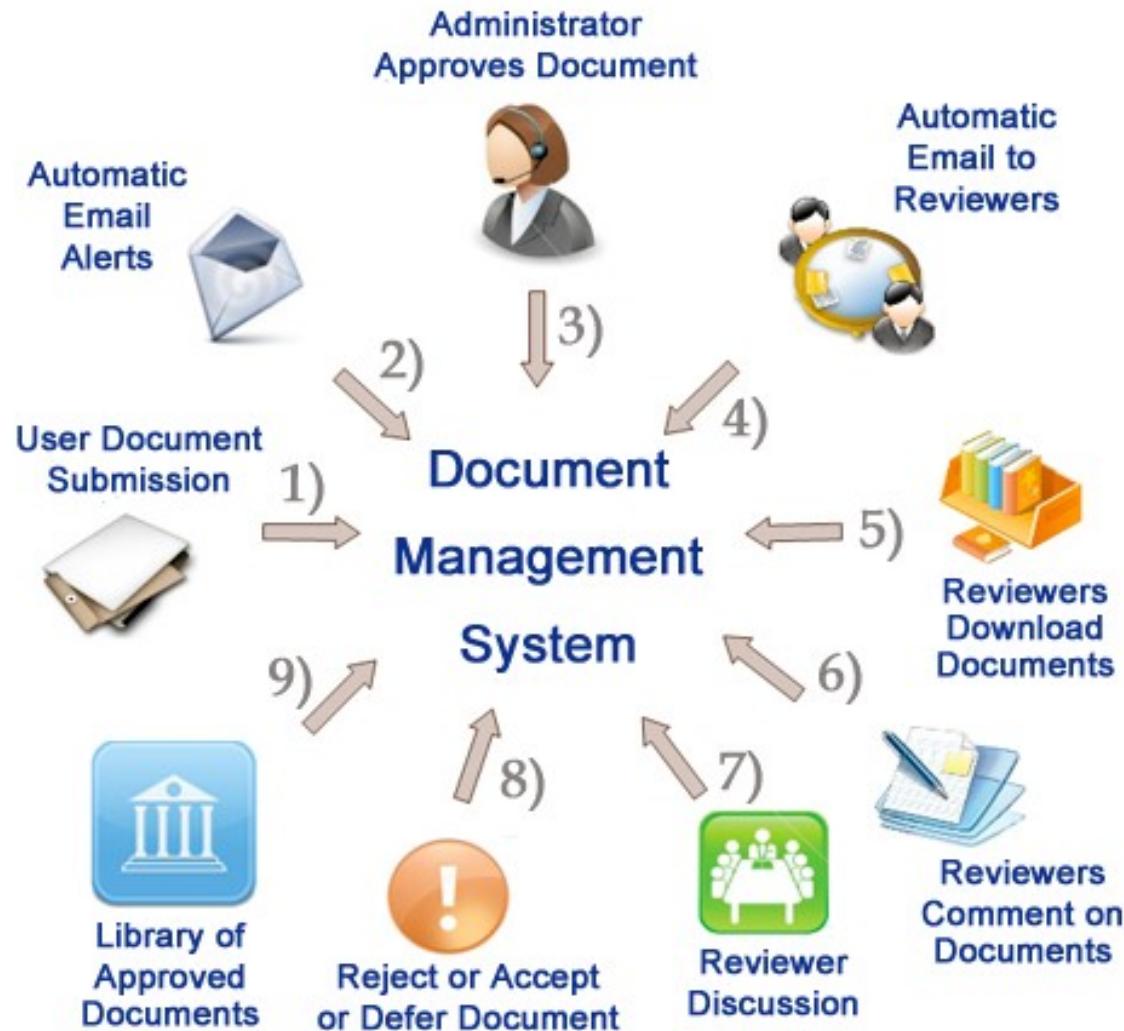
- Uma peça de material escrito, ou impresso, ou eletronicamente registrado, ou mesmo um objeto físico (ex: item museológico), que provê informação ou evidência de que um fato ocorreu em uma organização, e que serve como um registro oficial [da ocorrência do fato]
- Um sistema de gerenciamento de documentos se preocupa com as características de preservação, autenticidade e integridade do documento, enquanto prova ou evidência da ocorrência de um fato. Ou seja, atende a um aspecto de legalidade e de segurança, além da questão puramente informacional.

Funções típicas de um sistema de gerenciamento de documentos

Fonte: https://www.icon-uk.net/Enterprise_Document_Infrastructure_Products.html

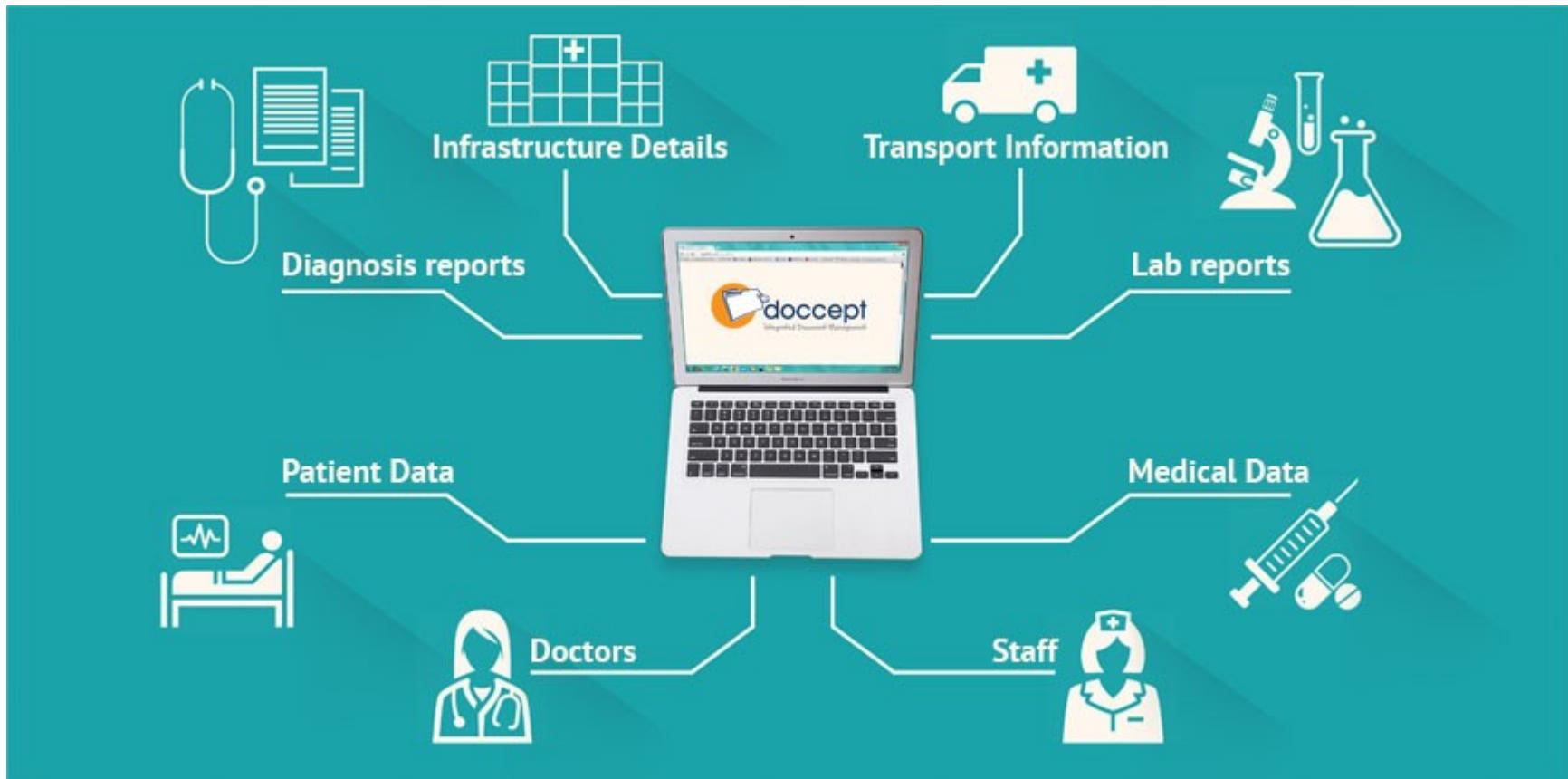


Mais exemplos de funções e papéis típicos de um sistema de gerenciamento de documentos. Fonte:
<https://blotter.com/blotter/document-management-system-roles/>



Exemplo: Escopo típico de uso um sistema de gestão de documentos em saúde

Fonte: <https://www.doccept.com/solutions/healthcare>



**Tipo #5:
Idea Processing
Systems / Sistemas de
processamento de
ideias**

Idea Processing Systems

Fonte: Prakken (2000, p. 149-196)

- This role particularly relates to - supporting - idea generation.
- Ideas we define as (Young, 1989):
 - *elementary mental representations of objects or concepts*
- In the framework of the decision making process this is crucial for the phases 'recognition', 'interpretation' and 'formulation' as a part of the intelligence stage, and for the 'generation of alternatives' within the design stage.
- Ideas are the building blocks of bigger wholes such as plans or problems (meaning 'something' asking for a decision).
- As a consequence, idea processing concerns the process resulting in these plans or in the identification of these problems and helping to find solutions.
- Idea processing can be described as (Young, 1989):
 - *the transformation process with ideas as input and resulting in output laid down in plans or the identification of problems*

Levels of idea processing systems

Fonte: Prakken (2000, p. 149-196)

- A number of levels to be identified in applying idea processing systems:
- *Secretary level*
 - Registering, and as a consequence keeping available for the user, thoughts, ideas, etc., emerging during the (strategy) meeting.
 - Speech recognition - system to be able to record spoken text immediately and reproducing it afterwards in written or spoken form.
- *Framework level*
 - Supports the meeting's participants by structuring their thoughts and ideas. Such a structuring, for example, takes place by combining and grouping the input text elements from various points of view, having been programmed in advance.
 - Watch over the procedures to stimulate the users' creativity by posing critical questions
- *Generative level*
 - On the generative level the role of the user will be (partially) taken over.
 - The application [information system] itself generates new ideas, after the user has taken care of the necessary input
 - Artificial intelligence

Principais origens de ideias, segundo Graham and Bachmann (2004). *Ideation: The Birth and Death of Ideas* (p. 44-51)

- Problem solution
 - trying to solve a particular problem
- Evolutionary idea
 - takes something that already exists and improves it
- Symbiotic idea
 - Combines two or more existing ideas
- Revolutionary idea
 - is one that breaks away from existing thought and provides a completely new perspective
- Serendipitous discovery
 - an unintended result in which the inventor recognizes its value
- Targeted innovation
 - derived from intensive research and development, often with the clear expectation of economic gain.
- Artistic innovation
 - created as an expression of an artistic impulse
- Philosophical idea
 - can never be reduced to practice and live only in the minds of their creators and those with whom they share it
- Computer-assisted discovery
 - using a computer to assist in exploring a vast numbers of possibilities by searching for the desired properties

Exemplo: Ilustrando um espaço de processamento de ideias

Fonte: https://www.123rf.com/clipart-vector/searching_new_idea.html?mediapopup=62637119



Exemplo de conceitos para criação de sistemas de processamento de ideias: The six thinking hats, por Edward de Bono

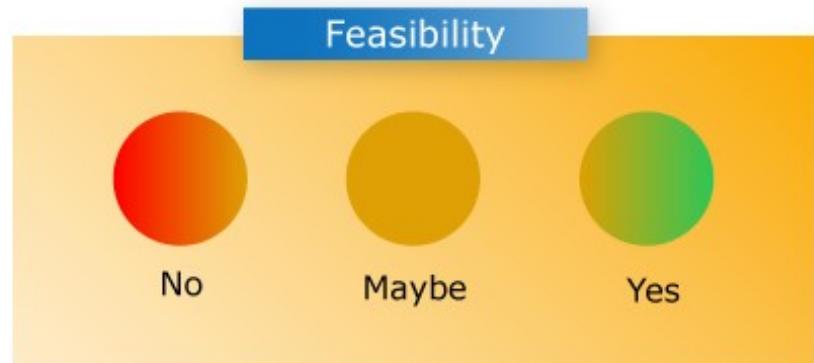
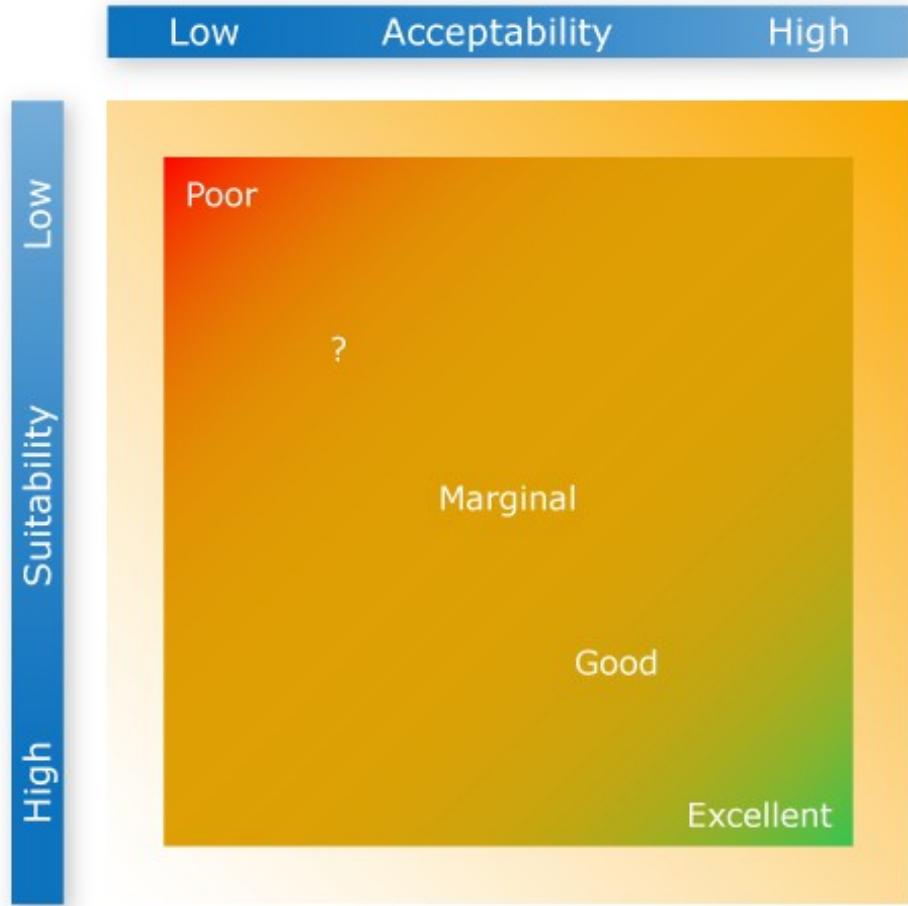
Fonte:

<https://www.alchemyassistant.com/topics/jzAjwnhPinv53YKQ.html>



Exemplo de ferramenta: Idea evaluation matrices

Fonte:
<https://www.alchemyassisstant.com/topics/jzAjwnhPinv53YKQ.html>



Tipo #6

Group Information
Systems / Sistemas de
informação para
trabalho em grupo /
groupware

Group information systems (groupware)

Fonte: Prakken (2000, p. 149-196)

- A *group*, consisting of a number of members closely related to each other during a meeting
- Group information systems can be defined as information systems supporting the activities *of* and *within* groups
- By *group activities* we mean (Bostrom, Anson and Clawson, 1993):
mutual dependent activities executed by a number of people meant to transform the actual problem situation of the group into a desired future situation using a number of actions or steps
 - The concept 'group' therefore, is used here in its task-oriented significance, no matter whether mental or physical tasks have to be executed.
 - In order to accomplish its task, the group must have the necessary information and the instruments to handle this information adequately.
 - If people are working together in groups, this may happen simultaneously (same time) as well as diachronously (different times) and located (same location) as well as dislocated (different locations), at least if the intended group process is not hampered.
 - group information systems offer the opportunity of communication of many people to many people.

Vantagens de trabalhar em grupo

Fonte: Prakken (2000, p. 149-196)

- The advantages of people working in groups, instead of in an isolated manner, can be summarized as follows (Forsyth, 1990; Nunamaker, c.s., 1993), viz.
 - synergy (because of the differences between the group members added value is created),
 - more objective judgement (group judgements are more balanced due to richer inputs of ideas and discussions),
 - encouraging behaviour (belonging to a group is stimulating for the group members),
 - learning (group members learn from each other).

Groups also have some disadvantages, compared with a collection of rather autonomously operating individuals (Forsyth, 1990; Nunamaker, c.s., 1993): Fonte: Prakken (2000, p. 149-196)

- loss of time (if a group is discussing a problem, no more than one member is speaking at a given moment, one after another),
- blocking of results (because the other members have to listen, if one of them is speaking, they have to stop thinking about other opportunities than those revealed by the speaking member),
- adaptive behaviour (if the group has a majority point of view, the members with a deviant opinion are exposed to pressure from the others to adapt),
- groupthink (this phenomenon is closely related to the previous issue and means that group members will try to agree, and therefore run some risk of making mistakes or of neglecting relevant ideas; in fact, for the group, a common opinion is more important than other considerations),
- fear of the group's judgement (some members are afraid that the group will evaluate them negatively or will laugh at them; this issue is especially important if the group consists of people from different hierarchical organizational levels),
- free riding (people hide themselves within the group, meaning that they participate in the group process insufficiently),
- inertia (the group only pays attention to ideas as far as they correspond with the group's current problem, meanwhile neglecting other ideas perhaps also relevant to other - future - problems),
- socialization (part of the communication between the group members has nothing to do with the tasks to be accomplished, but can be qualified as 'social talk'),
- dominance (some group members try to dominate the group by using a number of manipulation devices: speaking very loudly, interrupting others, using rather inaccessible technical terms, etc.),
- information overload (the number of ideas generated by the group exceeds the group's idea processing capacity),
- coordination problems (the group does not have an effective strategy to cope with the ideas generated, and consequently confusion and premature discussions will follow),
- incomplete use of available information (the group does not make good use of all the information the individual group members have access to),
- lacking objective judgement of ideas (because an idea is introduced by a specific member of the group there may be a tendency to evaluate it as positive or negative, depending on the - organizational - position of the member involved).

Desenho de sistemas de groupware

Fonte: Prakken (2000, p. 149-196)

- In designing information systems, it is our intention to equip these systems with a functionality reducing the disadvantages of groups, meanwhile strengthening their advantages.

Exemplo: Whatsapp:
Uma ferramenta
muito usada (e
abusada) para
comunicação em
grupos familiares, do
trabalho, escola,
negócios etc



Exemplo: Trello: Criando e gerenciando Kanbans

The screenshot shows a Trello board titled "RBSIC - Revista Brasileira de Segurança da Informação e Comunicações". The board has three main columns: "To Do", "Doing", and "Done".

- To Do:**
 - Formalizar políticas editoriais (3 comments)
 - Revisar o texto dos tipos de publicações permitidas da Rbsic (2 comments)
 - Revisar seções Rbsic (7 comments, 1/3 completed)
 - Reconvidar editores de seção (1 comment)
 - Dissolver conselho e comitê (1 comment)
- Doing:**
 - Upgrade software ojs v3 (2 comments, 2/6 completed)
 - Estudar e avaliar se vale a pena ir para ojs v3 (3 comments, 1/3 completed)
 - Revisar e organizar hierarquicamente as áreas de foco da revista (2 comments)
 - Definir política de segurança Rbsic (1 comment)
- Done:**
 - Adicionar um cartão...

Left Sidebar (Tipos de Atividades):

- Pessoas
- Infraestrutura
- Processos
- Conteúdo
- Identidade e Estratégia

Bottom Left: Adicionar um cartão...

Right Sidebar (Menu):

- Alterar Tela de Fundo
- Filtrar Cartões
- Stickers
- Power-Ups
- Mais

Bottom Right: Ambiente da revista foi criado. Ainda

Exemplo: Slack: Comunicação em grupo, usando vários canais

Download the Slack Windows app for greater control over your notifications. Easier if you're on multiple teams, too!

The screenshot shows the Slack desktop application interface. On the left is a sidebar with team information ('RBSIC'), user profiles ('jorgehfernandes'), and a list of channels ('All Threads', 'Channels', '# general', '# ojs', '# random', 'Direct Messages'). The main area is a conversation in the '#general' channel. The channel header indicates it's for company-wide announcements and work-based matters. A message from 'raulcsouza' at 7:56 PM suggests discussing an article with risks and opportunities in social engineering. The conversation continues on Tuesday, August 22nd, with messages from 'rodrigo' (@trello) about Trello integration and 'trello' (APP) joining the channel. A message from 'rodrigo' at 1:33 AM uses the '@everyone' tag. At the bottom, there's a message input field with '+ Message #general' and a smiley face icon.

RBSIC
jorgehfernandes

All Threads

Channels

general

ojs

random

Direct Messages

slackbot

jorgehfernandes (...)

alcimar_rangel68

andreadacrla

jb_ribas

marcelo.karam

raulcsouza

rbsam

rodrigo

+ Invite People

#general

joined #general

raulcsouza 7:56 PM

raulcsouza 8:56 PM

penso que seria interessante discutir no #artigo alguns riscos e oportunidades dos estudos em engenharia social, desenhando um paralelo com os aspectos éticos vs. riscos à privacidade dos participantes em estudos dessa natureza.

Monday, August 21st

Tuesday, August 22nd

new messages

rodrigo 12:29 AM

@trello

rodrigo 12:35 AM

disabled an integration in this channel: Trello - RBSIC

rodrigo 12:38 AM

removed an integration from this channel: Trello - RBSIC

trello APP 1:03 AM

joined #general by invitation from @rodrigo

rodrigo 1:24 AM

/invite @trello (edited)

rodrigo 1:33 AM

@everyone Pessoal,

+ Message #general

Tipo #7

Artificial Intelligence

Systems /

Sistemas de

Inteligência Artificial

Artificial Intelligence Systems

Fonte: Prakken (2000, p. 149-196)

- Artificial intelligence (Minsky, 1967) is the science concerning the design of machines able to take actions that require intelligence if executed by man.
- Abilities of intelligent beings (Hofstadter, 1979):
 - they react flexibly to circumstances,
 - they take advantage of circumstances as much as possible,
 - they give a clear interpretation of ambiguity and inconsistencies,
 - they are able to balance the relative importance of various factors,
 - they determine similarities and differences between various phenomena,
 - they form new concepts based on old ones,
 - they formulate new ideas.
- Ainda não existem sistemas com plena inteligência artificial, sendo portanto, os mesmos restritos a domínios de aplicação bem específicos

Tipo #8

Knowledge-based systems /

Expert systems

Sistemas Baseados em
Conhecimento e Sistemas

Especialistas

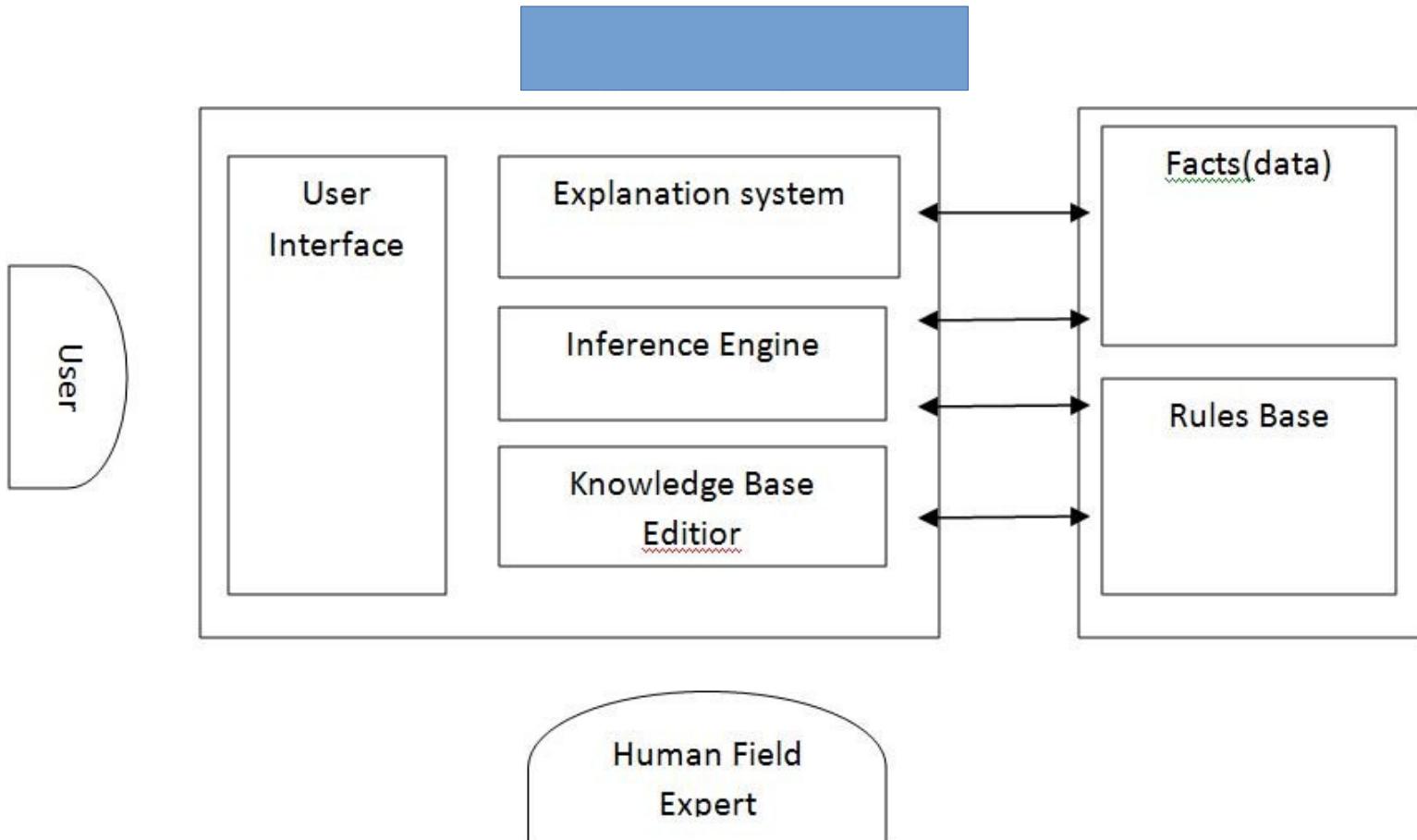
Sistemas Baseados em Conhecimento e Sistemas Especialistas

Fonte: Prakken (2000, p. 149-196)

- Knowledge-based systems
 - Sistemas de informação formados pelas seguintes partes:
 - inference engine,
 - knowledge base,
 - database,
 - explanation facility.
 - Com o objetivo de responder a questões e dúvidas de um usuário, a partir da destilação de conhecimento sistematizado
- Expert systems
 - A subset of knowledge-based systems containing the professional knowledge of (top) experts.

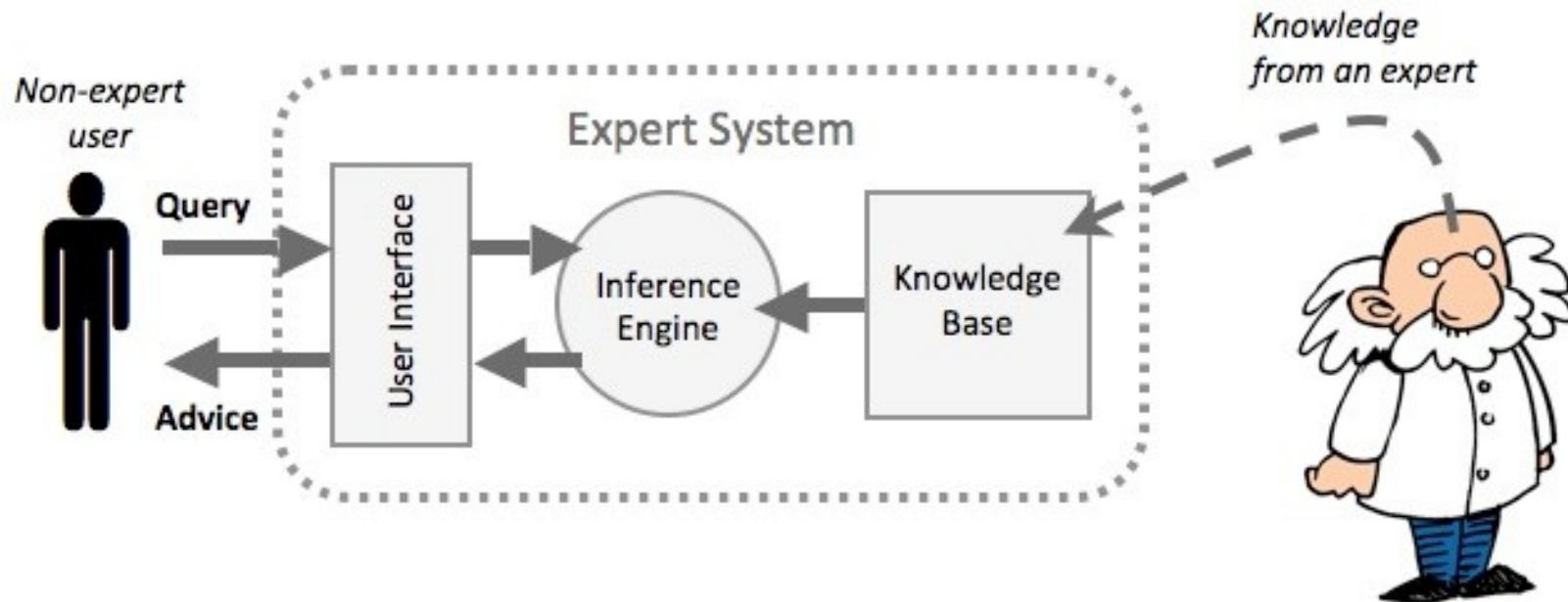
Arquitetura de sistemas baseados em conhecimento

Fonte: <https://www.proprofs.com/quiz-school/story.php?title=expert-systems-level-aict>



Esquema de um sistema especialista

Fonte: https://www.igcseict.info/theory/7_2/expert/



Tipo #9

Decision Support Systems /

Sistemas de Suporte à Decisão

Decision Support Systems

Fonte: Prakken (2000, p. 149-196)

- A decision support system (DSS) relaxes cognitive, temporal, spatial and/or economic limits on the decision maker. The support furnished by the system allows a decision episode to unfold
 - in more-productive ways (e. g., faster, less expensively, with less effort),
 - with greater agility (e.g., alertness to the unexpected, higher ability to respond),
 - innovatively (e.g., with greater insight, creativity, novelty, surprise),
 - reputably (e.g., with higher accuracy, ethics, quality, trust), and/or
 - with higher satisfaction by decisional stakeholders (e.g., decision participants, decision sponsors, decision consumers, decision implementers)versus what would be achieved if no computer-based decision support were used.
- Fonte: DSS Architecture and Types | Request PDF. Available from:
https://www.researchgate.net/publication/226283106_DSS_Architecture_and_Types

Papel de um sistema de suporte a decisão no processo de tomada de decisão. Fonte: Holsapple (2008)

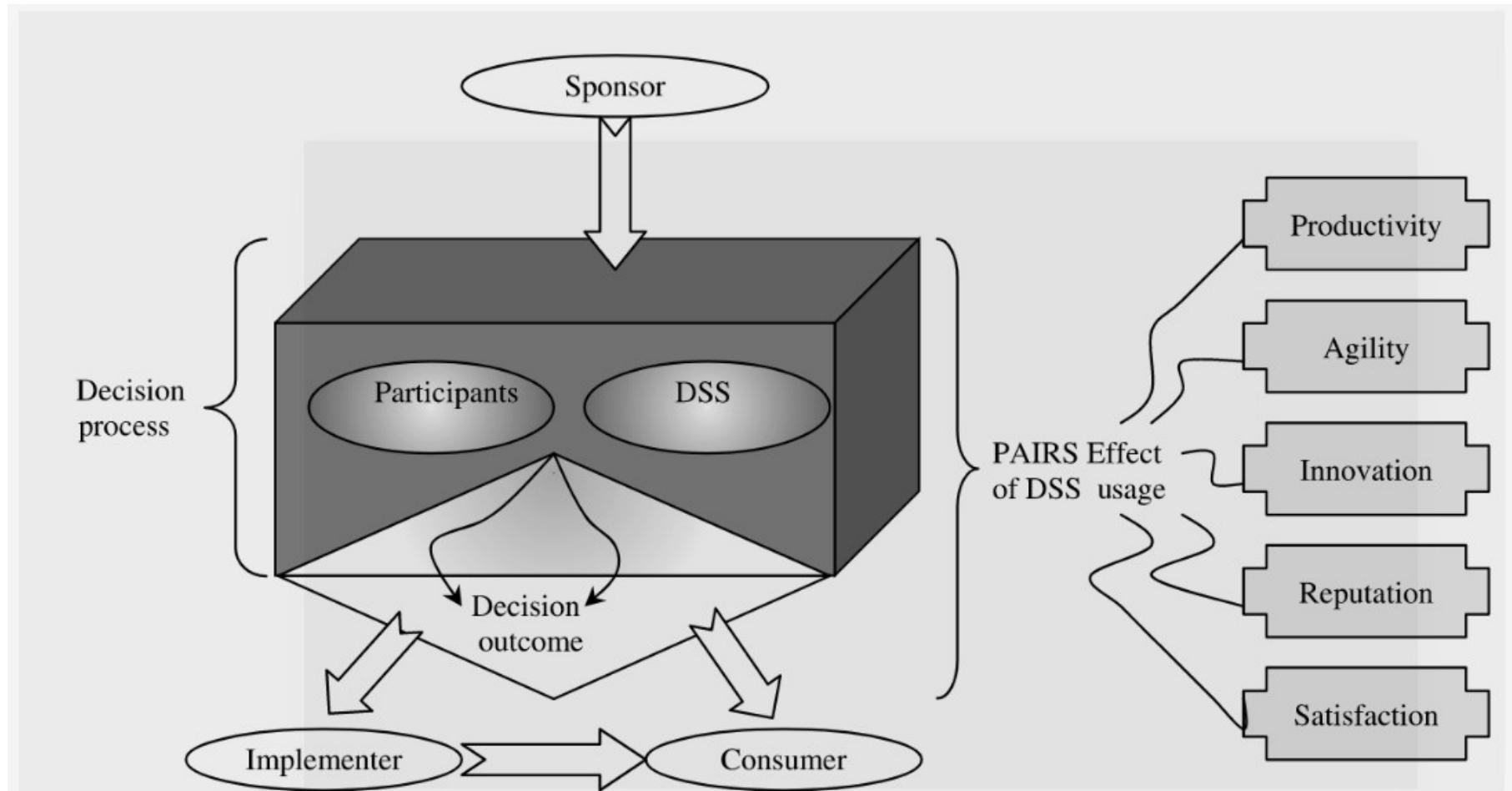


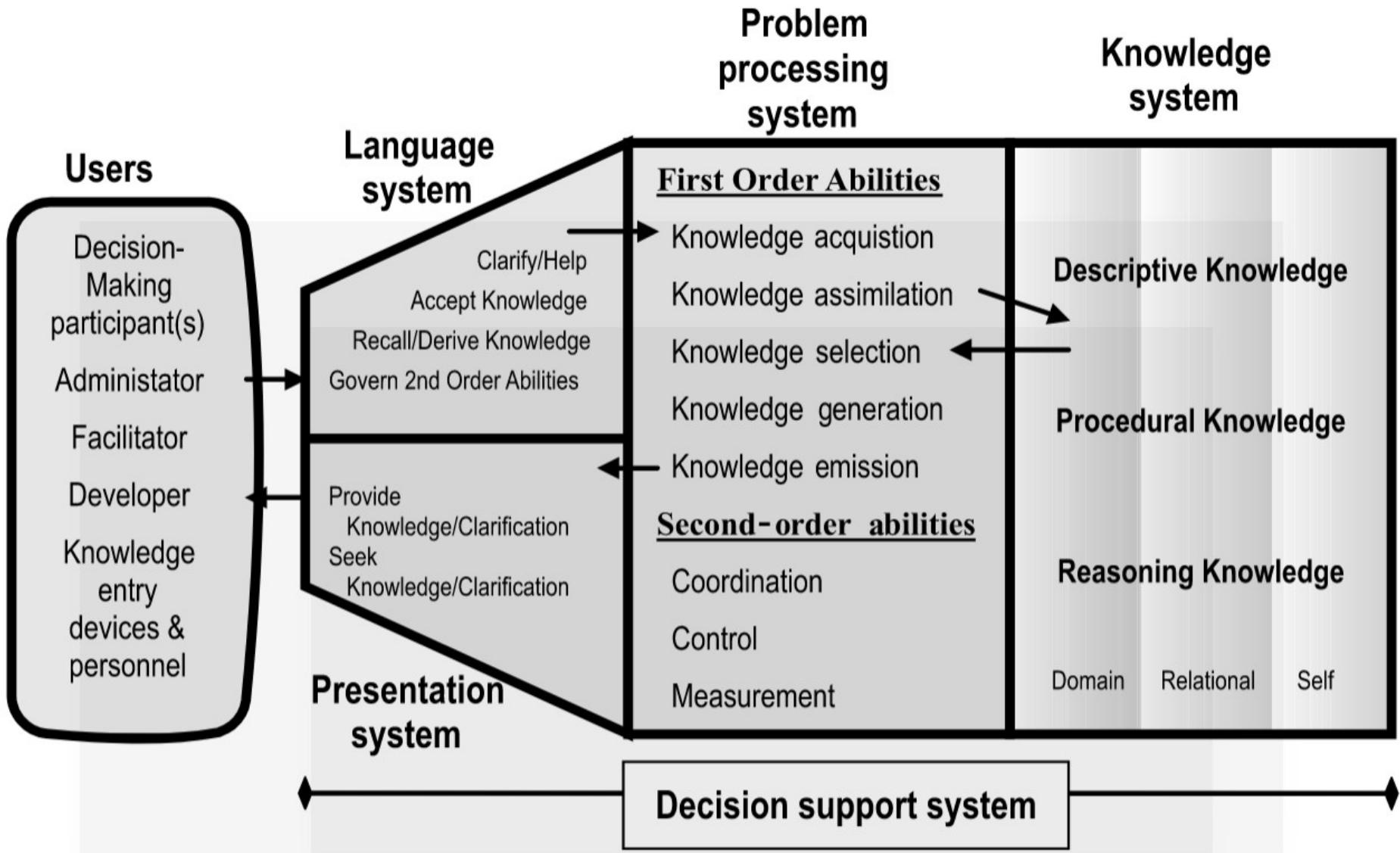
Figure 1. The role of a decision support system in decision making

Variações em sistemas de suporte a decisão

Fonte: Holsapple (2008)

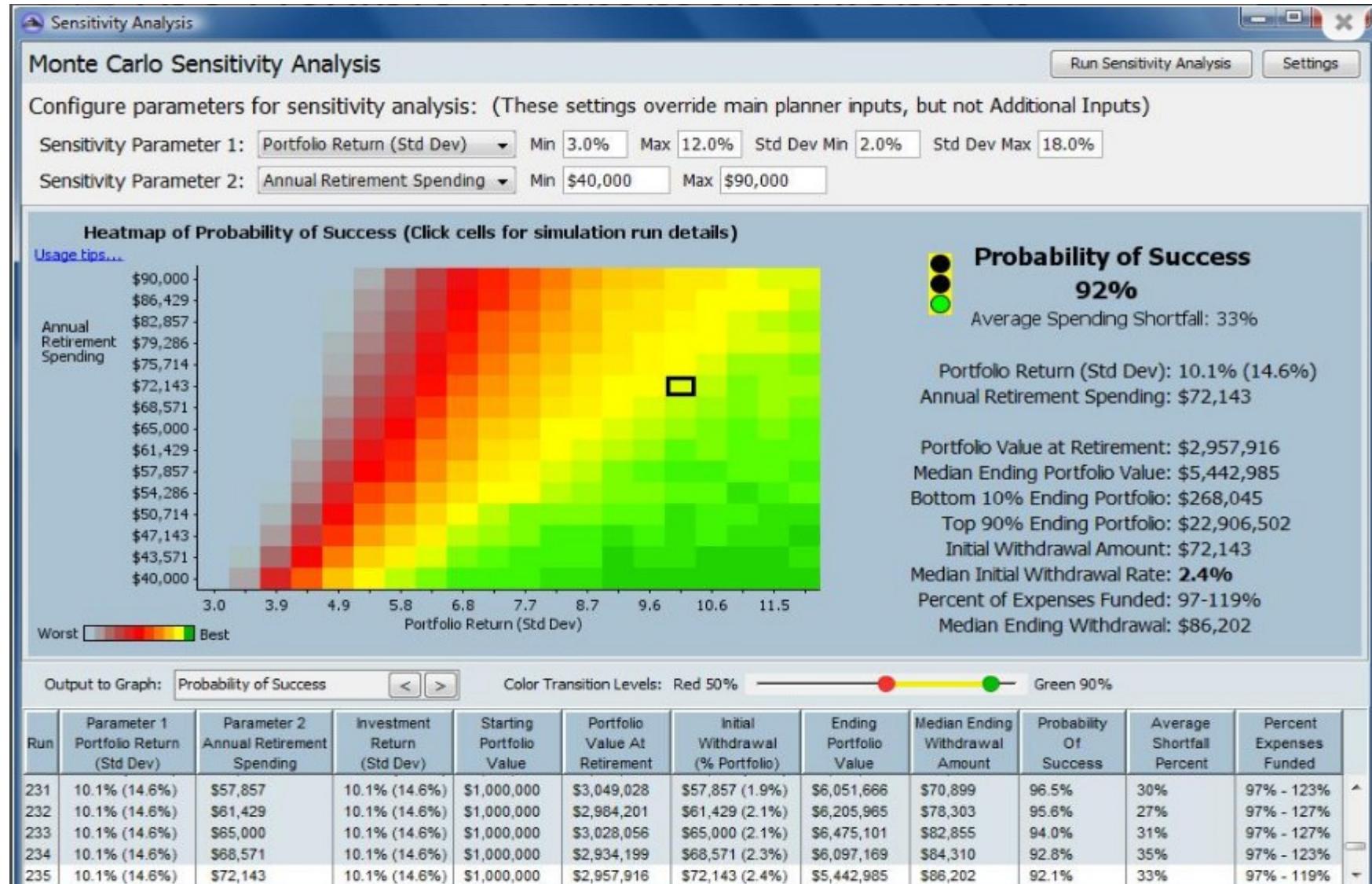
- Text-Oriented Decision Support Systems
- Hypertext-Oriented Decision Support Systems
- Database-Oriented Decision Support Systems
- Spreadsheet-Oriented Decision Support Systems
 - Prakken: Decision support systems (in the narrow sense) can be defined as follows (Keen and Scott Morton, 1978; Freyenfeld, 1984; Mallach, 1994):
 - Interactive information systems, based on quantitative data, used to support middle management, executing complex (ill structured) decision making processes, in respect of the tactical policy of organizations to improve the quality (effectiveness) of those processes
 - Uma característica distintiva dos DSS, no sentido estrito, é a capacidade de apoiar a Sensitivity analysis (exemplo: what-if analysis) na escolha da decisão.
 - Qual o efeito futuro provável, de cada uma das decisões que posso tomar? Ver exemplo bem simples no vídeo <https://www.youtube.com/watch?v=ptePTW4-NuE>
- Solver-Oriented Decision Support Systems
- Rule-Oriented Decision Support Systems
- Compound Decision Support Systems
- Multiparticipant Decision Support Systems

Arquitetura geral de um sistema de suporte à decisão. Fonte: Holsapple (2008)



Exemplo: Análise de Sensibilidade sobre o impacto da contribuição sobre a aposentadoria

Fonte: <http://www.flexibleretirementplanner.com/wp/wp-content/uploads/2012/05/Sensitivity-Analysis-Screenshot.jpg>



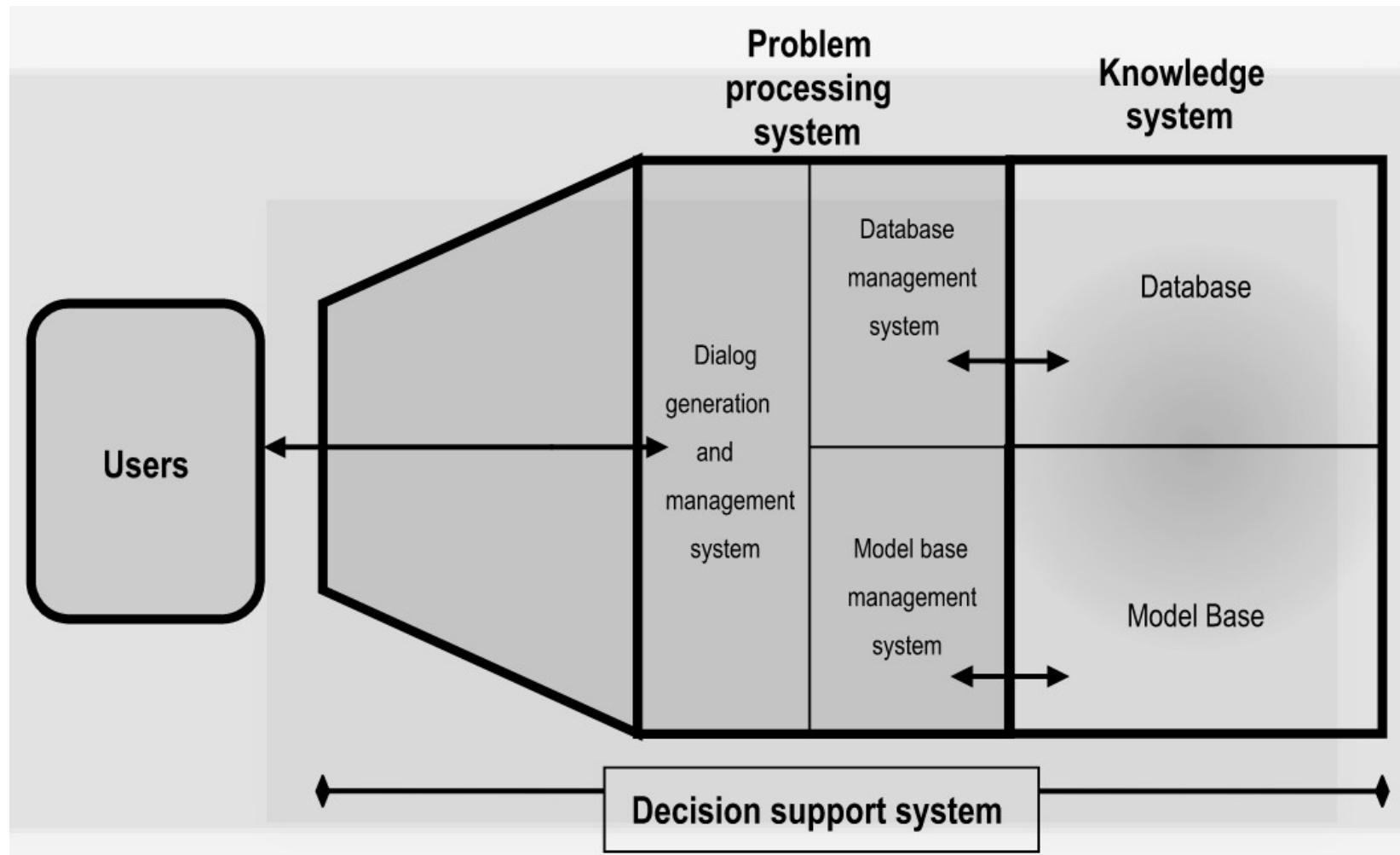
Aprendizagem de Máquina

- Pode ser usada para calibrar os modelos presentes no interior de sistemas de suporte à decisão
 - What is Machine Learning?
 -

Aprendizagem de máquina e sistemas de suporte à decisão

- Machine learning decision support systems (ML-DSS) have been touted as a key driver of major changes in the way medicine is practiced. Fonte: <https://jamanetwork.com/journals/jama/article-abstract/2666494>
- MERKERT, Johannes; MUELLER, Marcus; HUBL, Marvin. A Survey of the Application of Machine Learning in Decision Support Systems. In: ECIS 2015 Proceedings. [s.l.: s.n., s.d.]. Disponível em: <<https://pdfs.semanticscholar.org/cad2/54dee5b045f5e47cf228c5858f3df185dd6e.pdf>>.

A base de modelos pode ser atualizada por meio de algoritmos de aprendizagem de máquina



Tipo #10

**Structured Decision
Systems / Sistemas de
Decisão Estruturada**

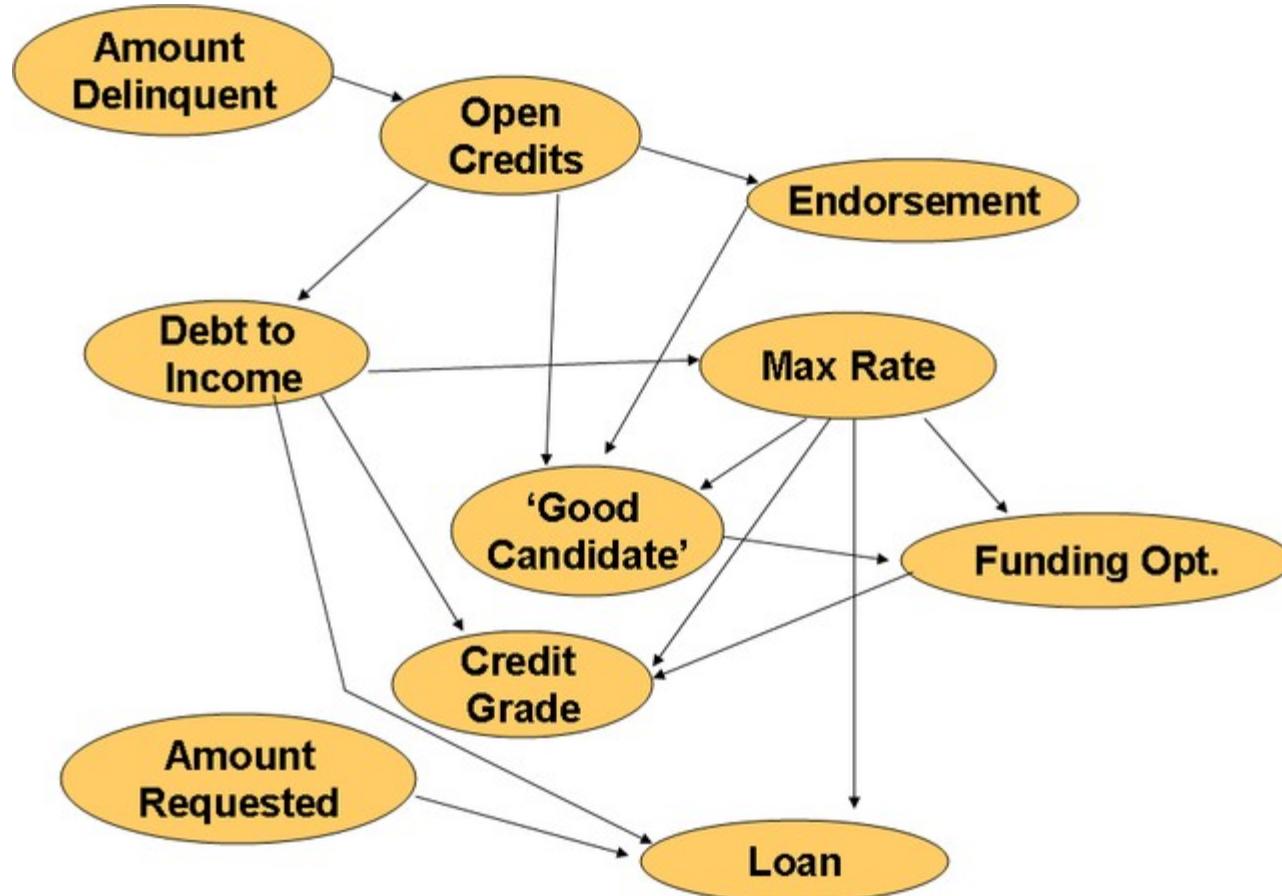
Structured Decision Systems

Fonte: Prakken (2000, p. 149-196)

- Structured decision systems can be defined as follows:
 - *Applications of ICT used to replace people taking (structured) decisions*
- Illustrating the use of structured decision systems we discuss two real world examples in more detail;
 - The decision process about determining a personal loan.
 - Electronic inventory control systems.

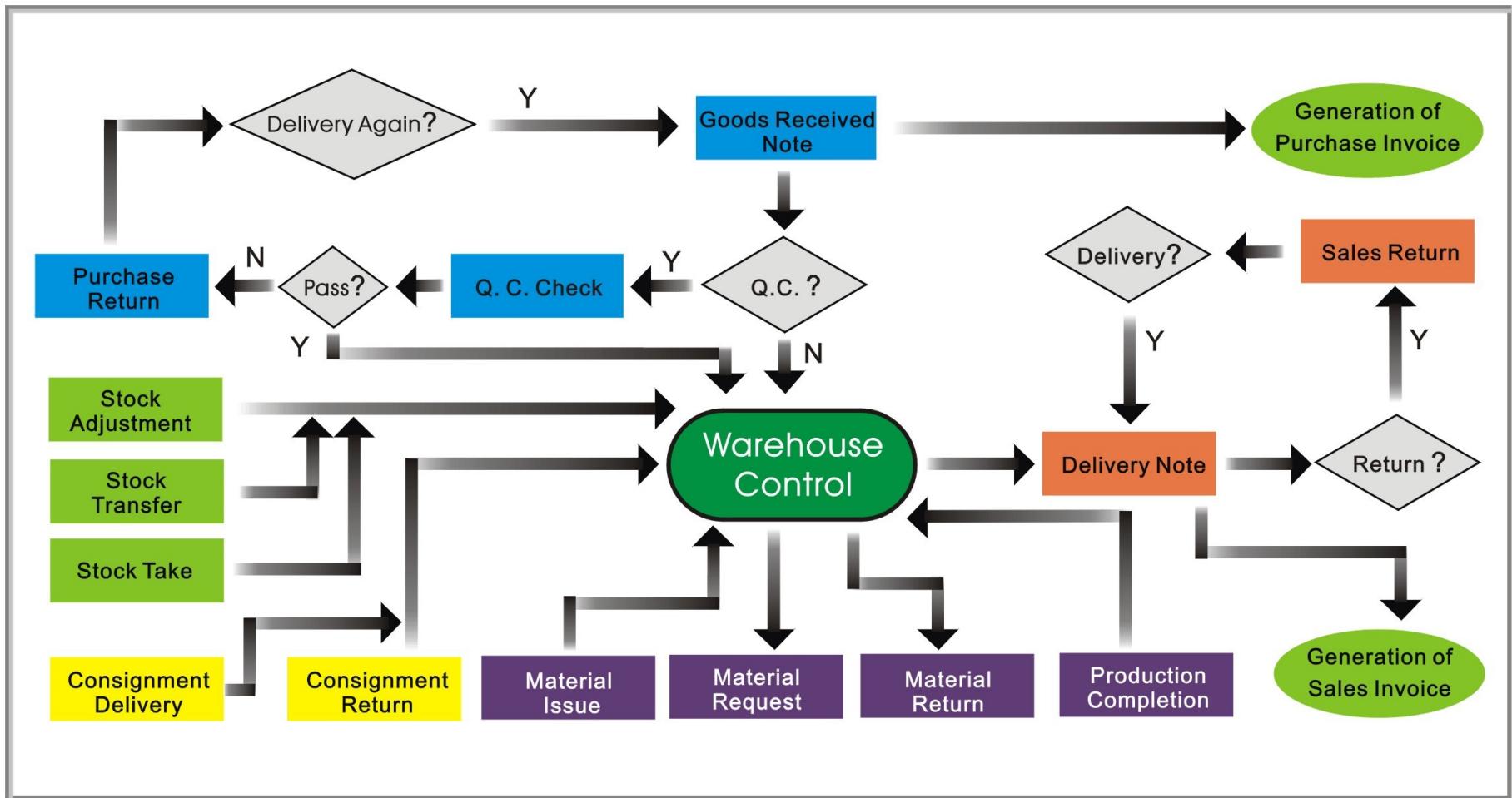
Exemplo: Uma rede bayesiana para estimar risco de um empréstimo

Fonte: http://courses.media.mit.edu/2008fall/mas622j/Projects/CharlieCocoErnestoMatt/graphical_models/



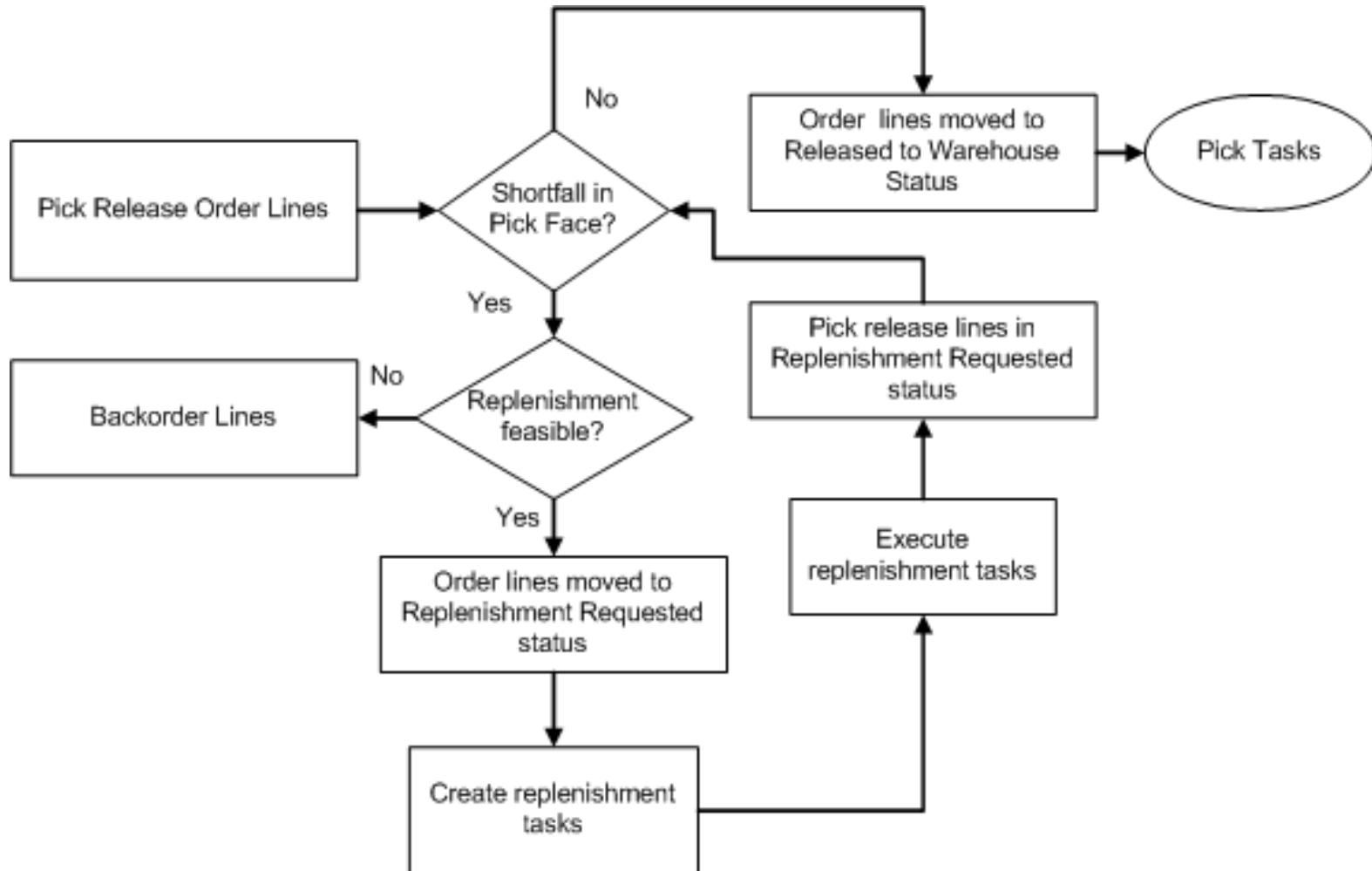
Sistema Transacional: Fluxo de gerenciamento de estoque de produtos em uma loja

Fonte: <http://www.method.hk/en/images/stock.gif>



Exemplo: Manutenção automatizada de níveis de estoque

Fonte: https://docs.oracle.com/cd/E18727_01/doc.121/e13433/img/wmsug_pullreplen.gif



Tipo #11

Electronic Data

Interchange / Sistemas de
Intercâmbio Eletrônico de

Dados

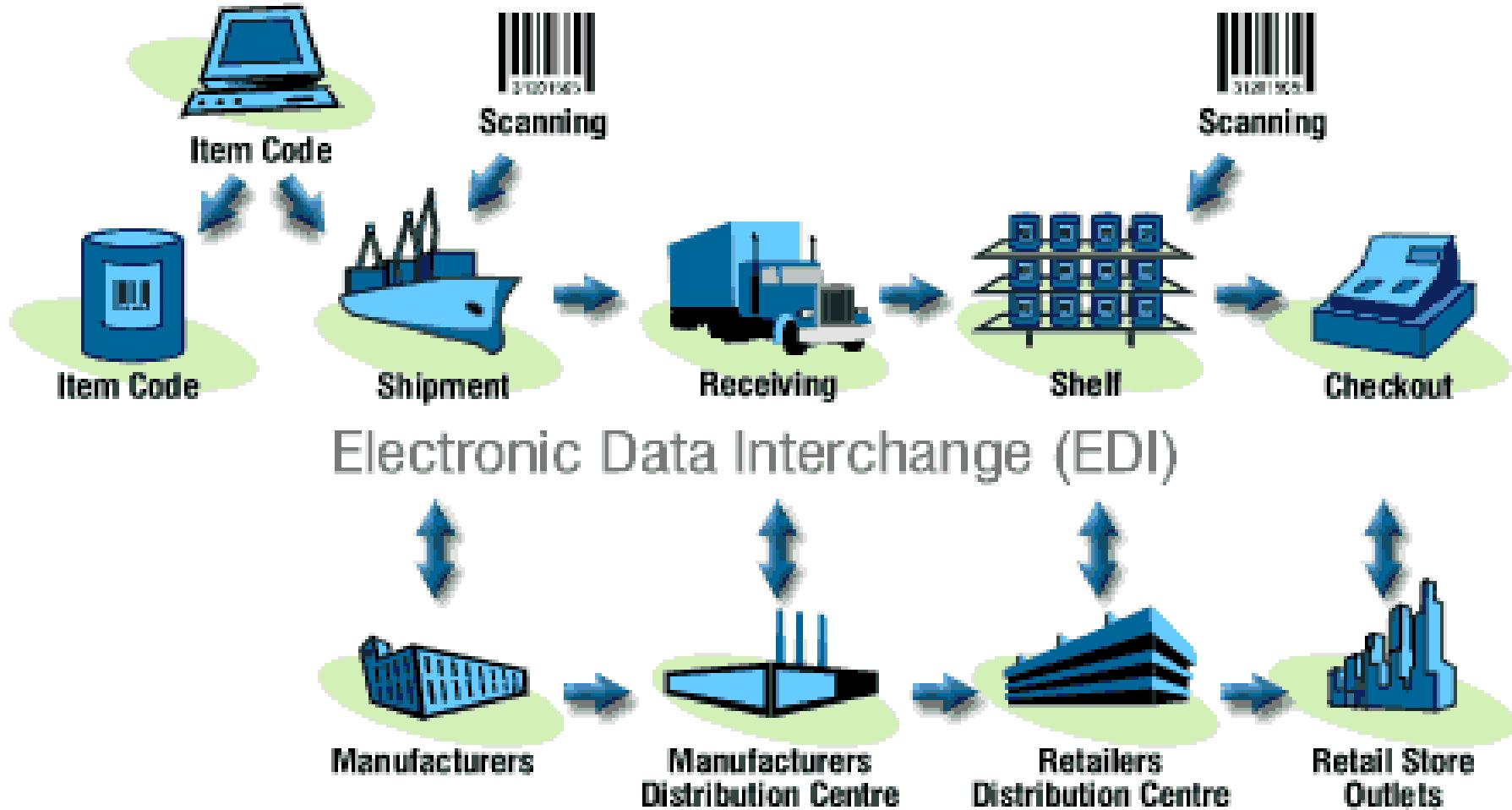
Electronic Data Interchange

Fonte: Prakken (2000, p. 149-196)

- Electronic data interchange we define as:
 - *the electronic data traffic between two or more organizations*
- Extranet we define as:
 - *a communication network between an organization and a number of its clients based on internet technology*

Exemplo: Cenários de intercâmbio de documentos eletrônicos

Fonte: http://globalscorecard.gs1.org/gsclive/guide_to_ECR/E02.asp



Tipo #12

Transaction Processing Systems / Sistemas de Processamento de Transações

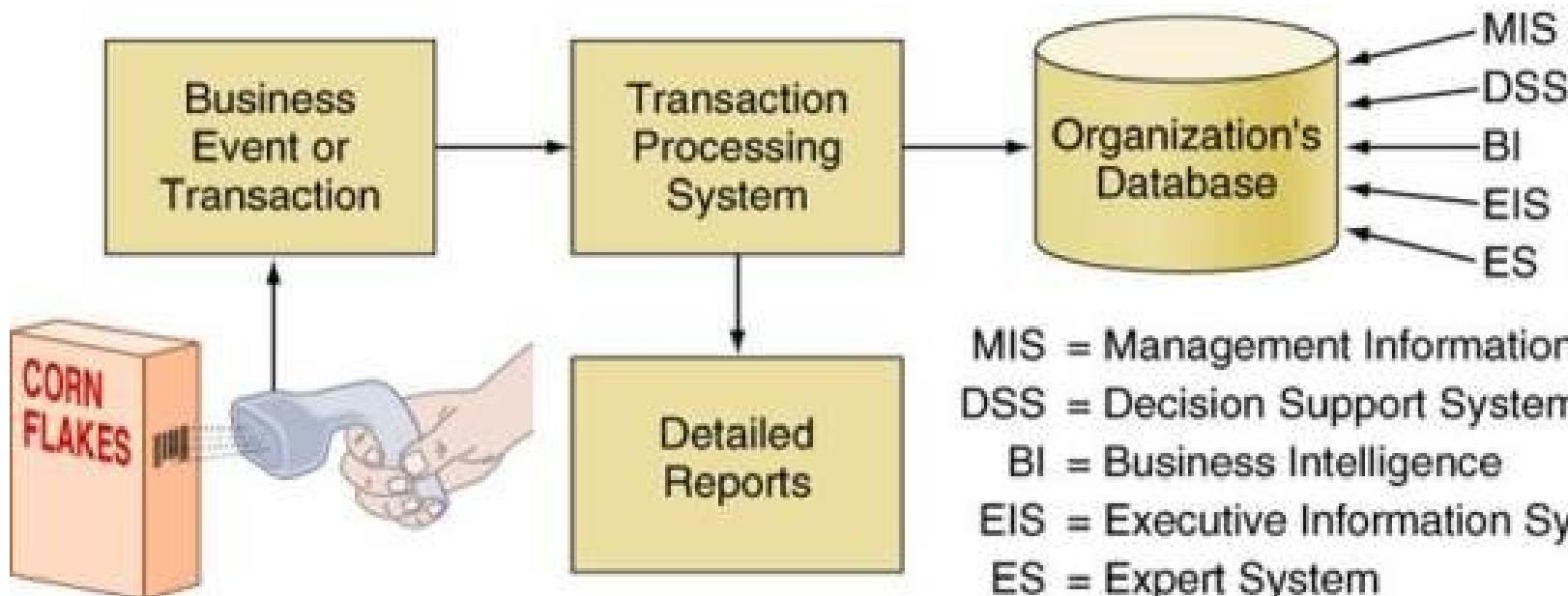
Transaction Processing Systems

Fonte: Prakken (2000, p. 149-196)

- transaction processing systems, also called 'data processing systems' or 'transaction information systems', concern transactions of organizations.
- In this context a *transaction* can be defined as (O'Leary and Williams, 1985):
 - *any business like event occurring within an organization and leading to mutations*
- we can think about operational activities to execute the organization's primary process, such as buying raw materials, paying salaries, receiving payments from clients, etc.
- about transaction processing systems we mean:
 - *the whole of all (sub) systems used for administrative processing transactions within organizations*
- The processing of transactions can be divided into four different activities (O'Leary and Williams, 1985):
 - input of data,
 - processing of data,
 - storing of data and
 - output of data.

Um sistema de processamento de transações em sua relação com outros tipos de sistemas de informação

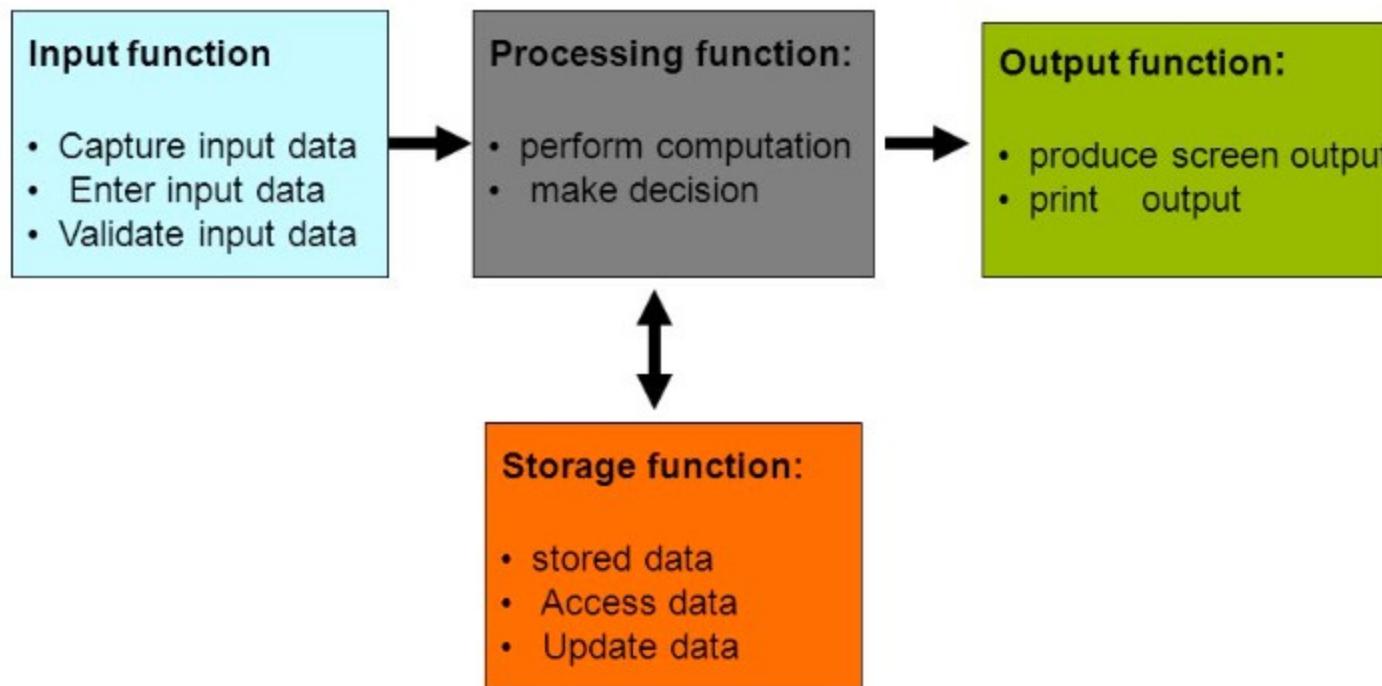
Fonte: <http://csbapp.uncw.edu/mis213/10/images/10-1-1.jpg>



Funções típicas de um sistema de processamento de transações

Fonte: <http://slideplayer.com/slide/6047527/>

Transaction Processing System Functions



Tipo #13

Workflow Automation
Systems / automação de
fluxos de trabalho e
Business Process
Management Systems /
sistemas de gestão de
processos de negócio

Sistemas de automação de fluxos de trabalho (workflow automation systems) ou gestão de processos de negócio (business process management)

- Automação de fluxos de trabalho (workflow automation systems)
 - A system that completely defines, manages and executes “workflows” through the execution of software whose order of execution is driven by a computer representation of the workflow logic.
- Gestão de processos de negócios (Wikipedia)
 - Business process management (BPM) is a discipline in operations management in which people use various methods to discover, model, analyze, measure, improve, optimize, and automate business processes.[1]
 - BPM focuses on improving corporate performance by managing business processes.[2]

Anatomia de um processo de negócio.

Fonte: Dumas et al (2018)

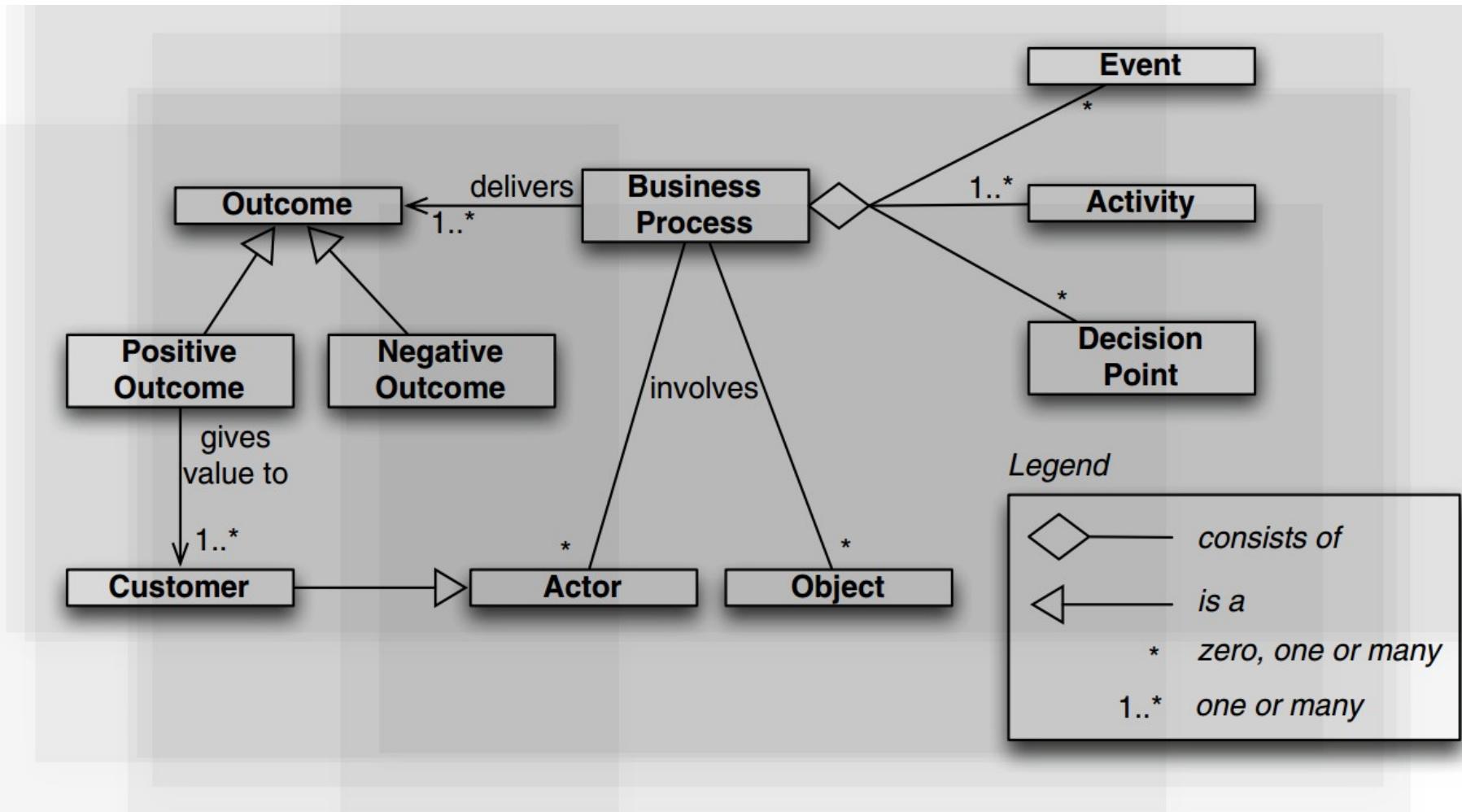


Fig. 1.1 Ingredients of a business process

Ciclo de vida da gestão de processos de negócio. Fonte: Dumas et al (2018)

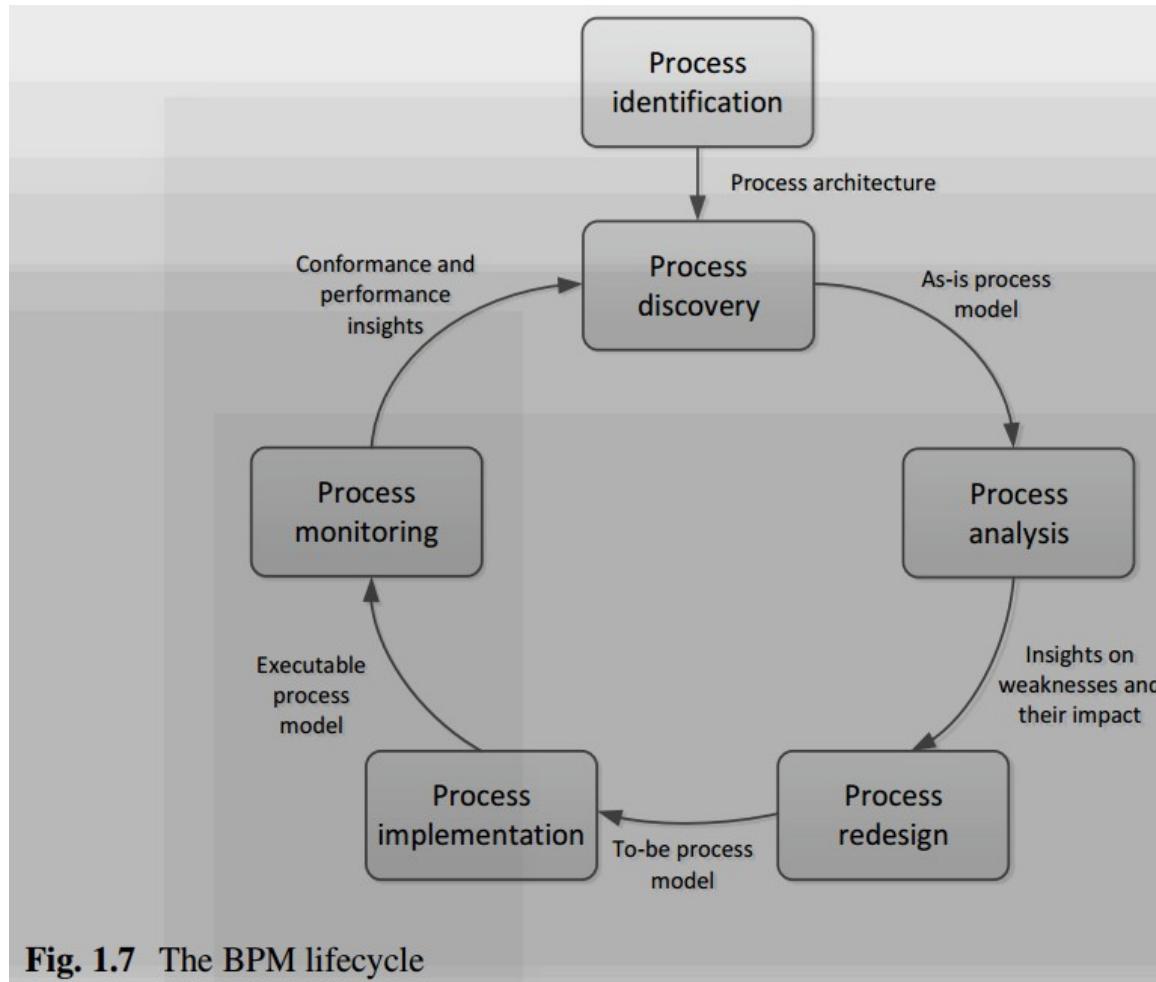
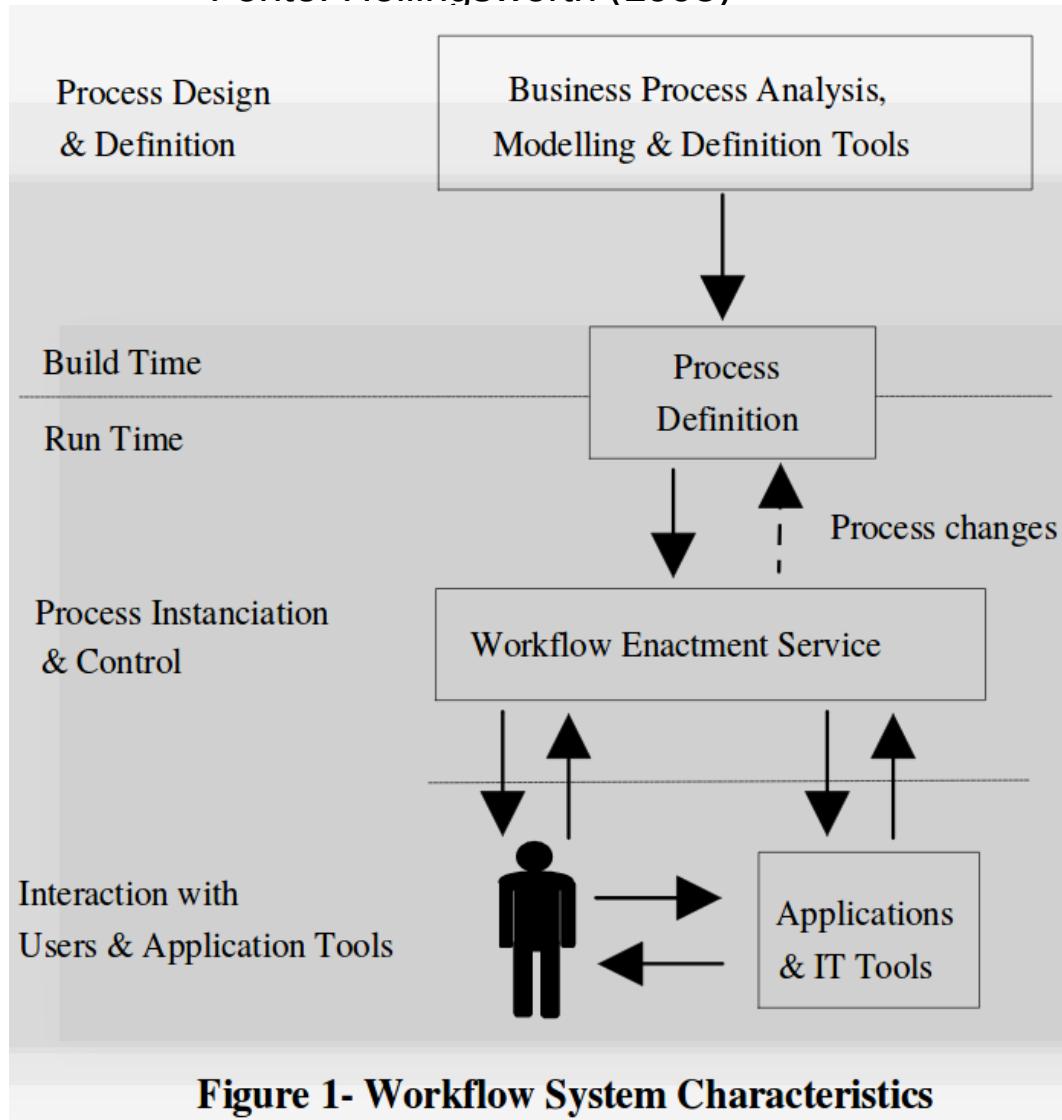


Fig. 1.7 The BPM lifecycle

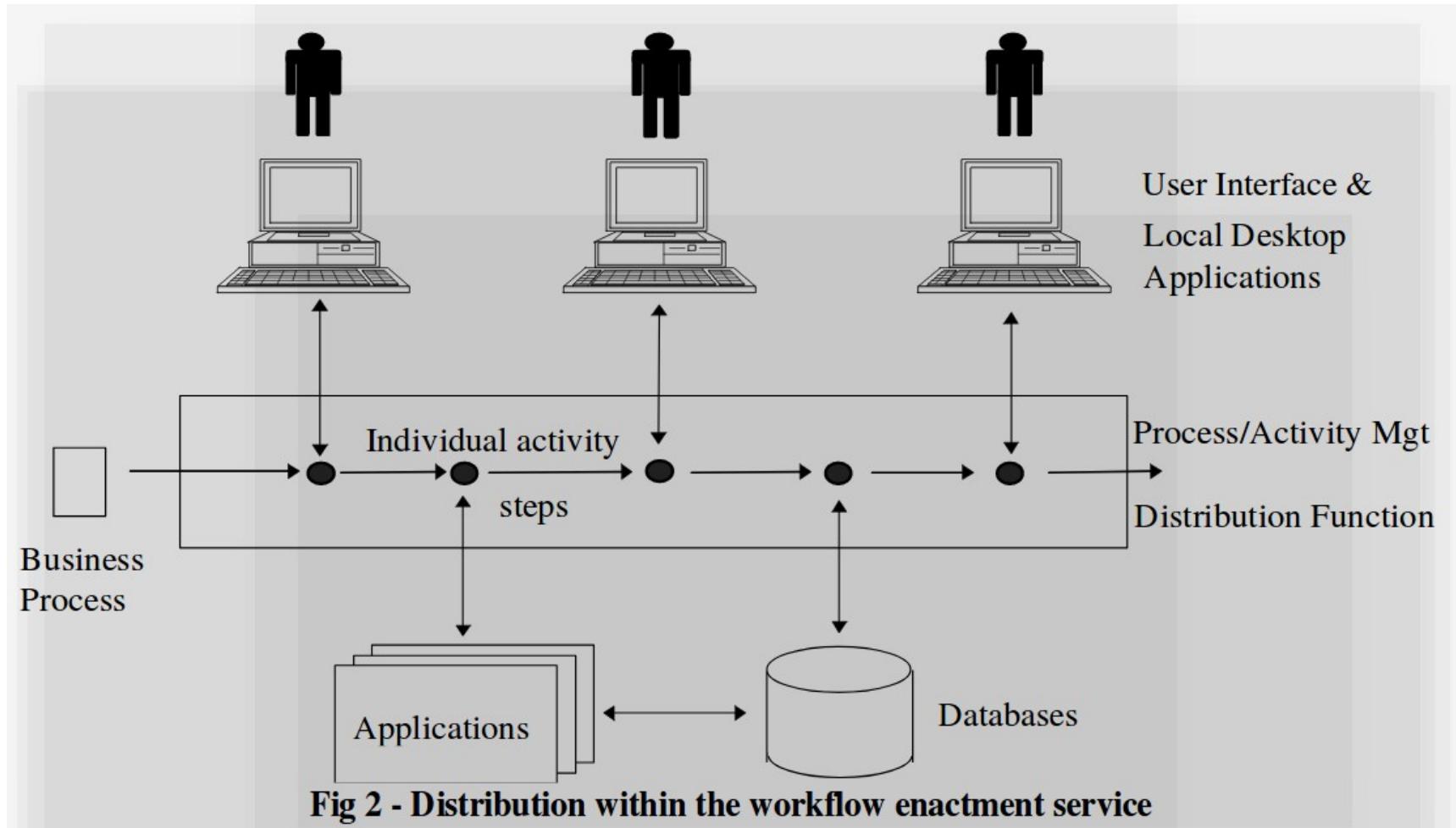
Arquitetura de referência de um sistema de automação de workflow.

Fonte: Hollingsworth (1995)



Um workflow habilitado para execução.

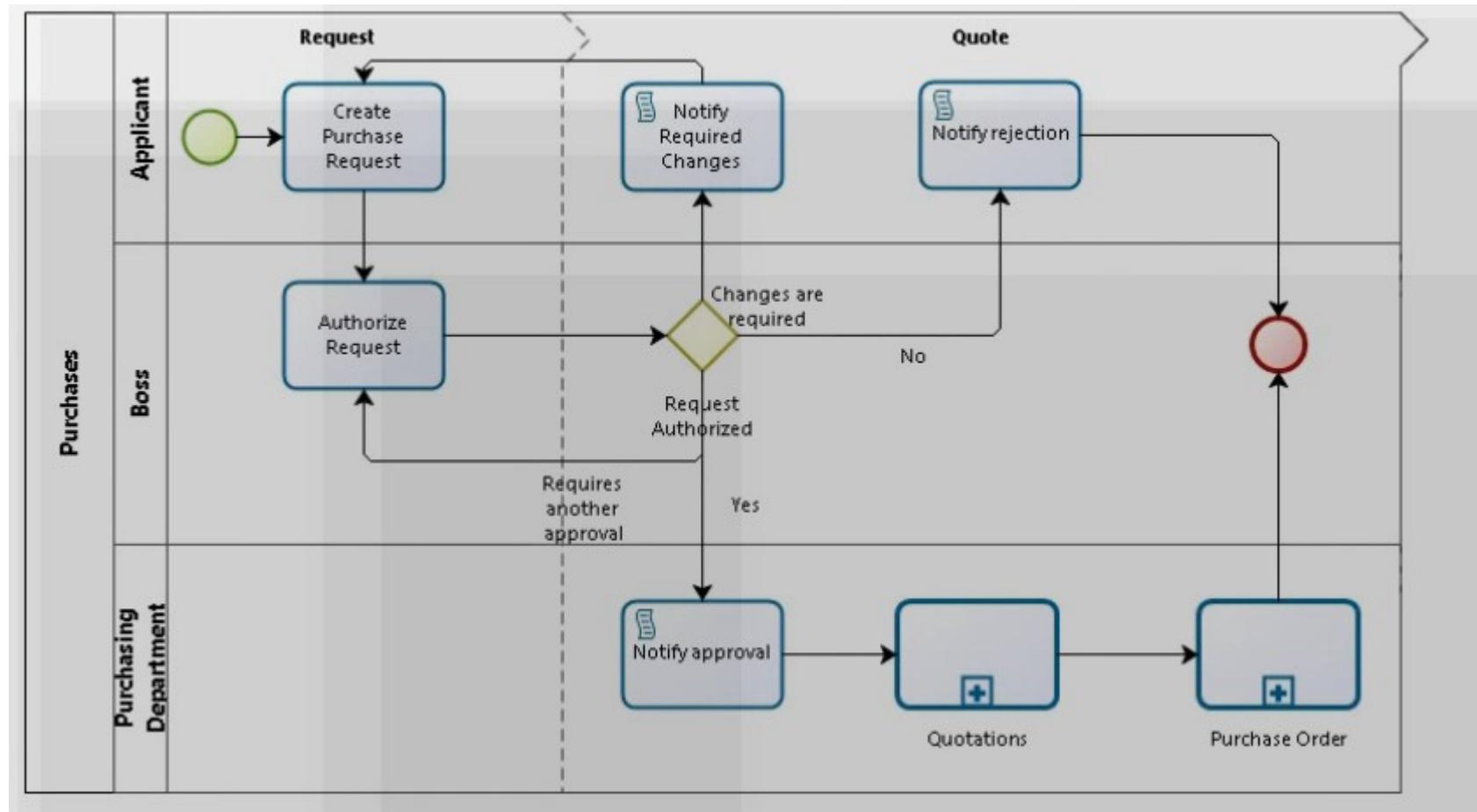
Fonte: Hollingsworth (1995)



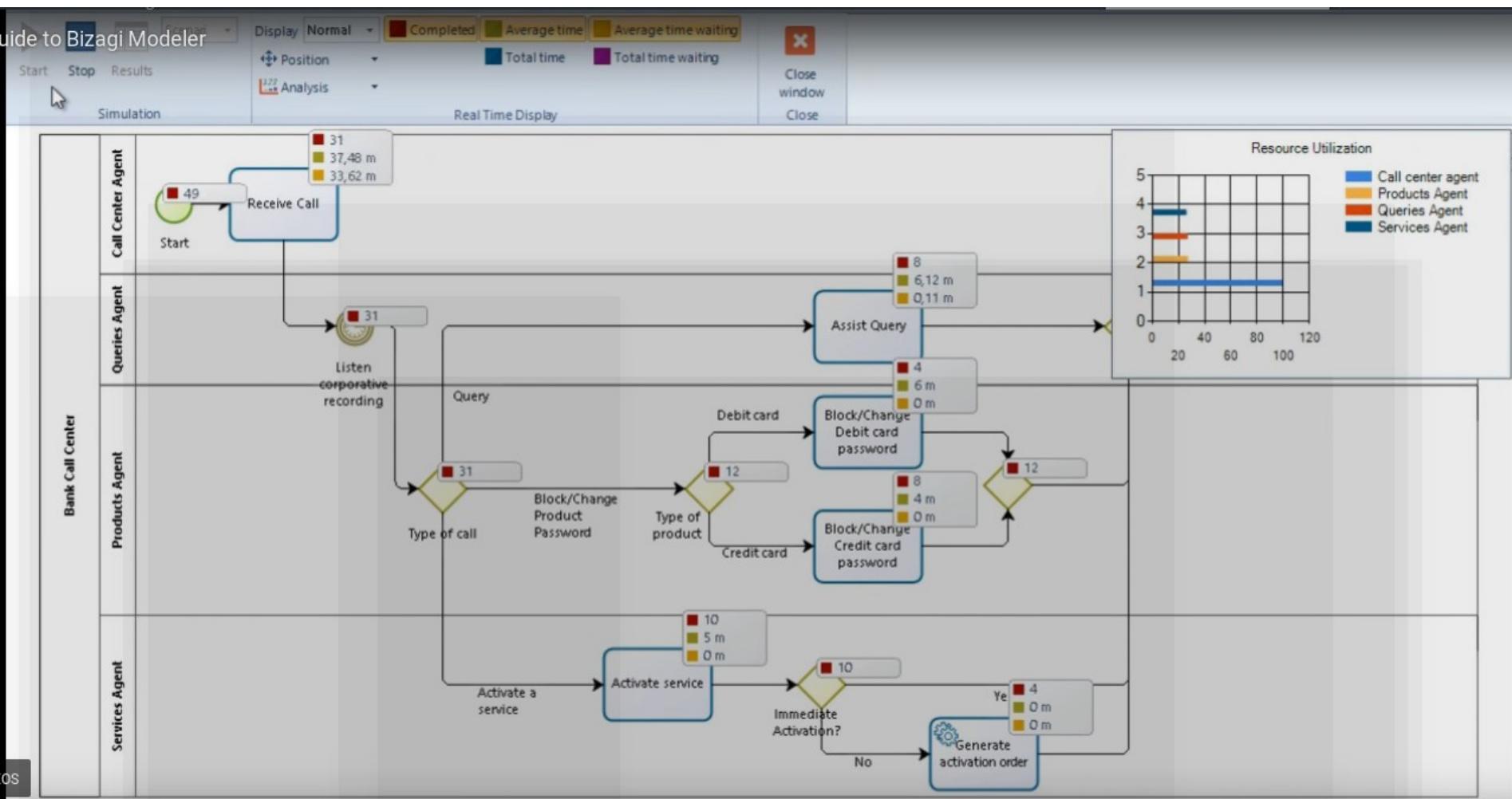
Exemplos de sistemas de automação de workflow. Fonte: (https://en.wikipedia.org/wiki/Workflow_management_system)

- Activiti
- Apache ODE (The Orchestration Director Engine executes business processes written following the WS-BPEL standard.)
- Apache Taverna
- Bizagi
- Bonita BPM
- CEITON
- Collective Knowledge
- Cuneiform (programming language)
- IBM BPM
- Imixs-Workflow
- Intuit QuickBase[6]
- jBPM
- PRPC
- Pyrus
- RedBooth Workflow Management
- Salesforce.com Process Workflow
- ServiceNow Platform
- SAP Business Workflow
- Signavio Workflow Accelerator
- TACTIC (web framework)
- Windows Workflow Foundation
- WorkflowGen
- Workfront
- YAWL

Bizagi Suite: Modelo gráfico de um processo de negócio na notação BPMN

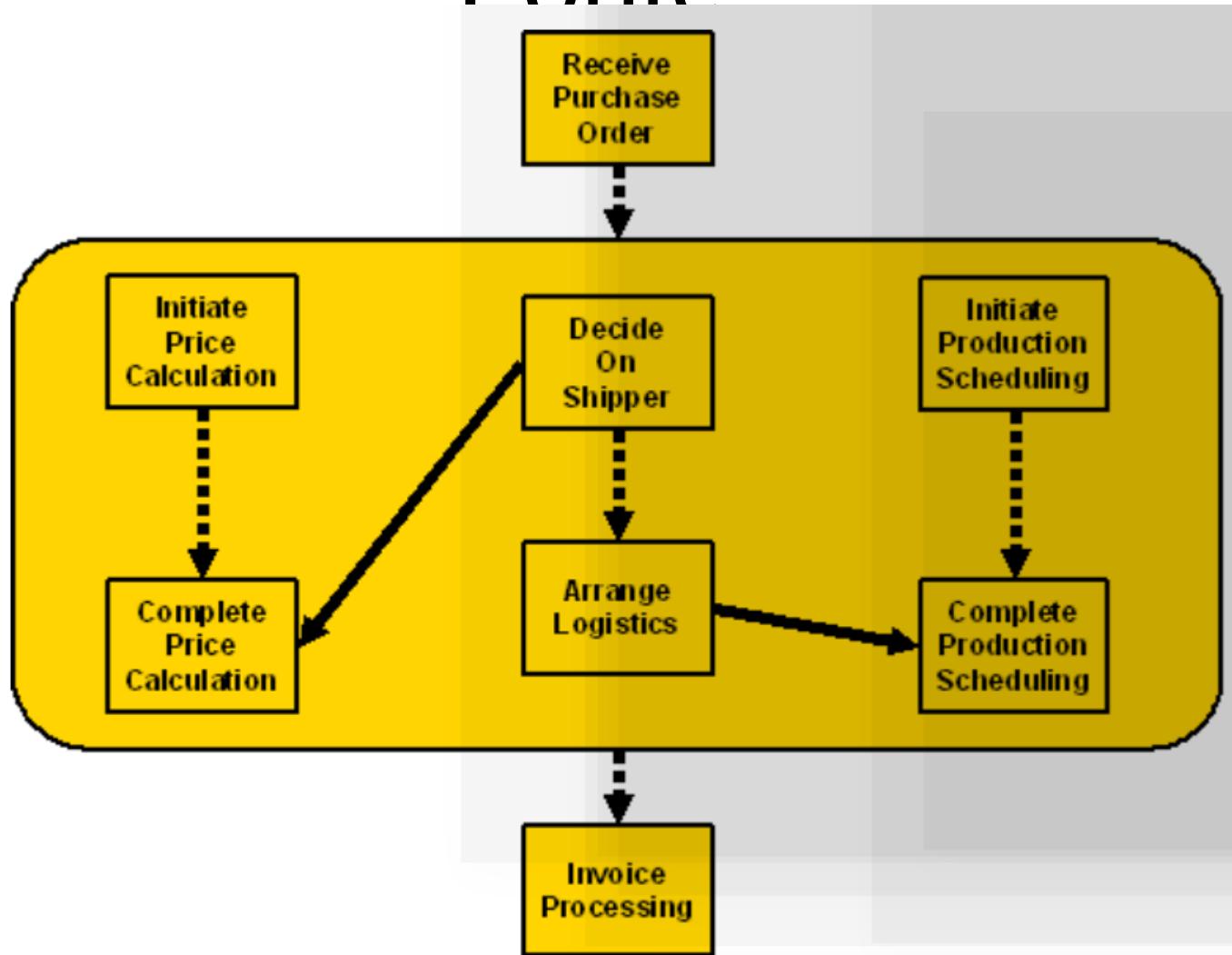


Simulação de um modelo de processos usando Bizagi Modeler



Visualização gráfica de um modelo de processo em BPEL.

Fonte:



Tipo #14

Geographic Information
Systems / sistemas de
informação geográficos

Sistema de Informação Geográficos

- Um Sistema de Informação Geográfica (SIG ou GIS - Geographic Information System, do acrônimo/acrônimo inglês) é um sistema de hardware, software, informação espacial, procedimentos computacionais e recursos humanos que permite e facilita a análise, gestão ou representação do espaço e dos fenômenos que nele ocorrem.

Fonte: https://pt.wikipedia.org/wiki/Sistema_de_inform%C3%A7%C3%A3o_geogr%C3%A1fica

- Modern GIS is about participation, sharing, and collaboration. Discover how the technology is strengthening relationships, driving efficiencies, and opening communications channels in your community.
 - Fonte: <https://www.esri.com/en-us/what-is-gis/overview#image1>

Funções de um GIS

- Geographic Information Systems really comes down to just 4 simple ideas (<https://gisgeography.com/what-gis-geographic-information-systems/>):
 - Create geographic data
 - Manage it.
 - Analyze it and...
 - Display it on a map.

Áreas de aplicação de GIS.

Fonte: <https://www.esri.com/en-us/what-is-gis/overview>

Education

Health

Insurance

Manufacturing

Petroleum

Public Safety

Real Estate

Retail

Sustainability

Telecommunications

Transportation

Electric and
Gas Utilities

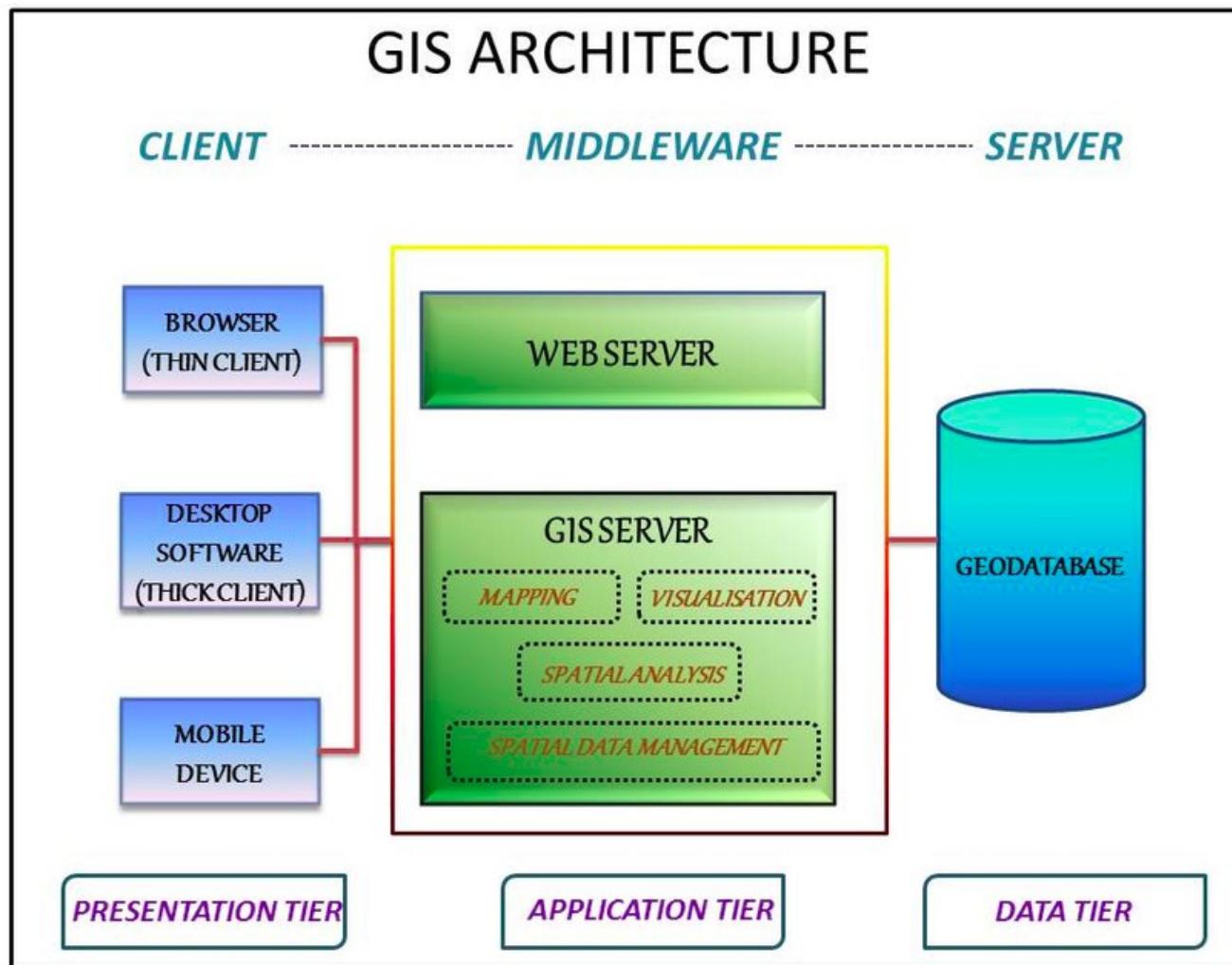
Natural
Resources

Government

Water

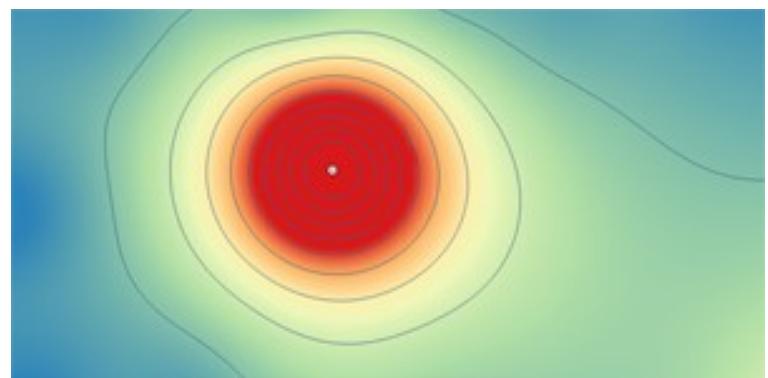
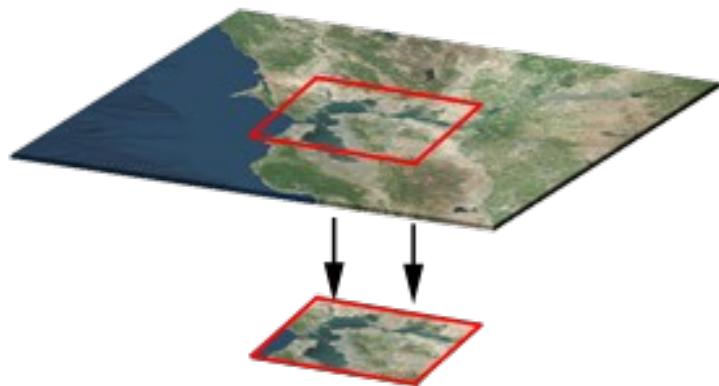
Arquitetura de GIS/SIGs.

Fonte: https://www.researchgate.net/publication/268489288_Spatio-Temporal_Analysis_of_the_Effects_of_Air_Pollution_Hazards_on_Cardiovascular_Health_Outcomes_in_Bangalore_India/figures?lo=1



Exemplos de análises espaciais

- Q: How much forest is in a city boundary or study area?
 - A: Run a clip on land cover classification. Sum the area of forest grid cells.
- Q: How many endangered species are within a 1 mile proximity of a proposed mine?
 - A: Run a buffer. Calculate the number of species in the buffer.



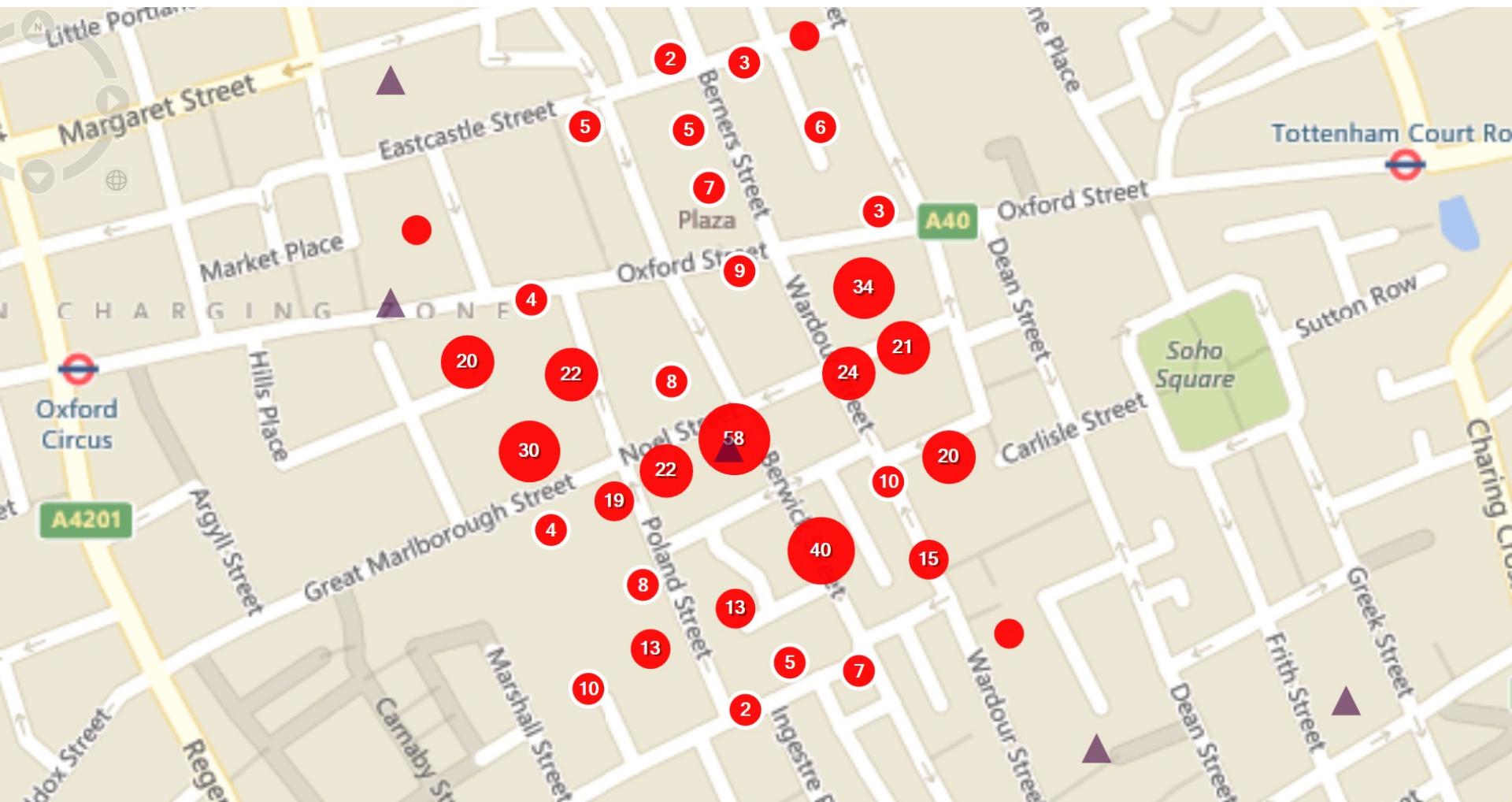
Exemplos de questões geoespaciais (https://pt.wikipedia.org/wiki/Sistema_de_informação_geográfica)

- Localização: Inquirir características de um lugar concreto
- Condição: Cumprimento ou não de condições impostas aos objetos.
- Tendência: Comparação entre situações temporais ou espaciais distintas de alguma característica.
- Rotas: Cálculo de caminhos ótimos entre dois ou mais pontos.
- Modelos: Geração de modelos explicativos a partir do comportamento observado de fenómenos/fenômenos espaciais.
- Material jornalístico. O Jornalismo online pode usar SIGs para aprofundar coberturas jornalísticas onde a espacialização é importante.

Exemplo de interface do EPI INFO.

Fonte:

<https://www.cdc.gov/epiinfo/pc.html>



Tecnologias e sistemas mais comuns

- Open Source Geospatial Foundation
 - https://en.wikipedia.org/wiki/Open_Source_Geospatial_Foundation
- OpenStreetMap
 - <https://www.openstreetmap.org/#map=4/-15.13/-53.19>
- GoogleEarth
- QGIS
 - <https://gisgeography.com/qgis-3/>

Referências

Sistemas de informação para o controle das organizações

Jorge Fernandes
Revisado em set/2018