



**EESC • USP**

*Escola de Engenharia de São Carlos  
Universidade de São Paulo*

SEP0700 – Métodos para Análise e Solução de  
Problemas em Engenharia de Produção

**QFD – Desdobramento da função qualidade**

Prof. Luiz C. R. Carpinetti

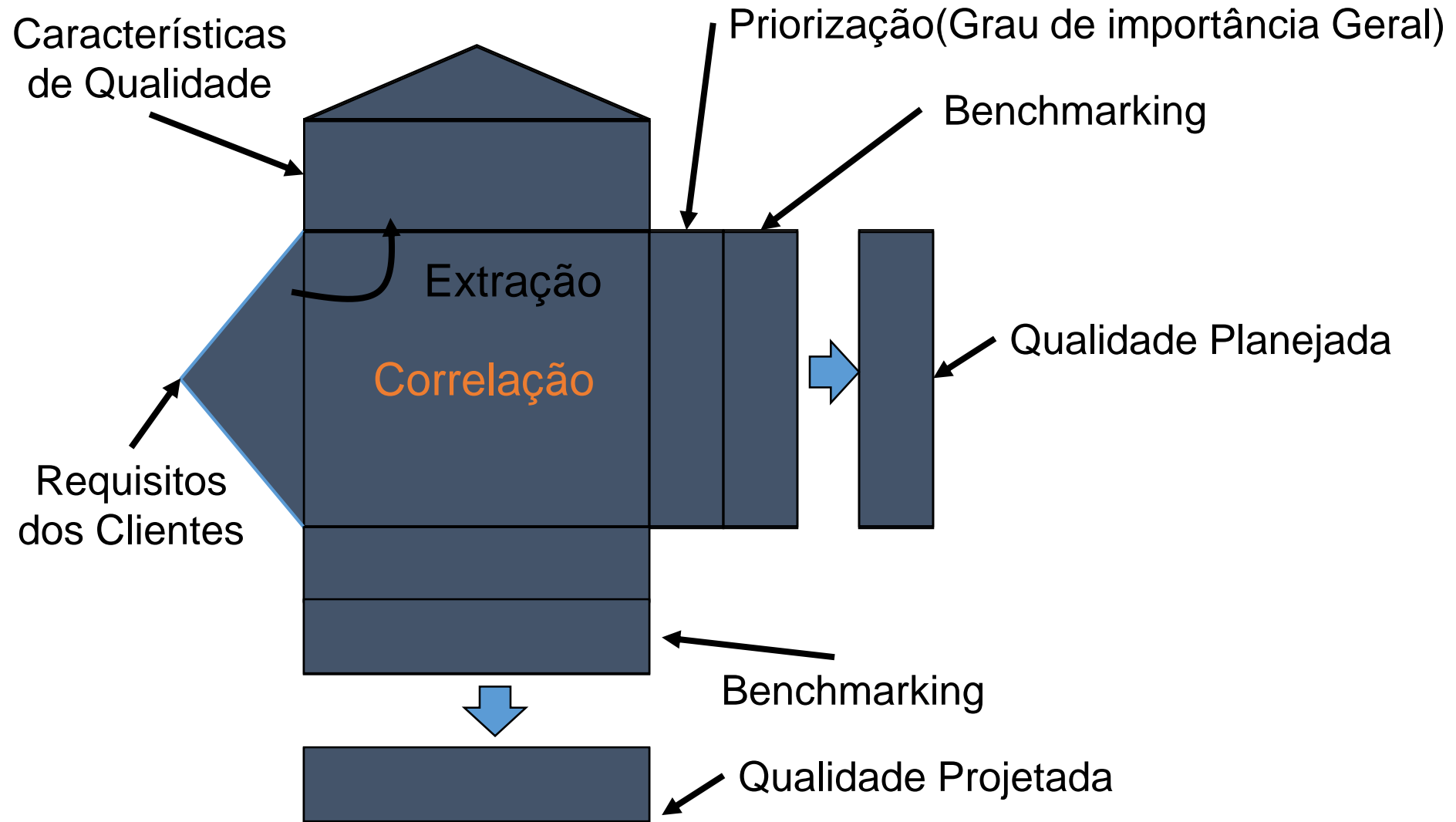
# QFD – quality function deployment

- Método usado no processo de desenvolvimento de produto cujo objetivo principal é transformar requisitos de produto definidos pelo mercado consumidor em características do produto.
- *“QFD é a conversão dos requisitos do consumidor em características de qualidade do produto e o desenvolvimento da qualidade de projeto para o produto acabado através de desdobramentos sistemáticos das relações entre os requisitos do consumidor e as características do produto...” (Akao, 1990, quem propôs o método);*
- Usado na fase de planejamento (ou re-planejamento);
- Originalmente proposto para produtos manufaturados, mas também aplicado para o planejamento de serviços;
- Ajuda a explicitar e construir consenso sobre requisitos x características.

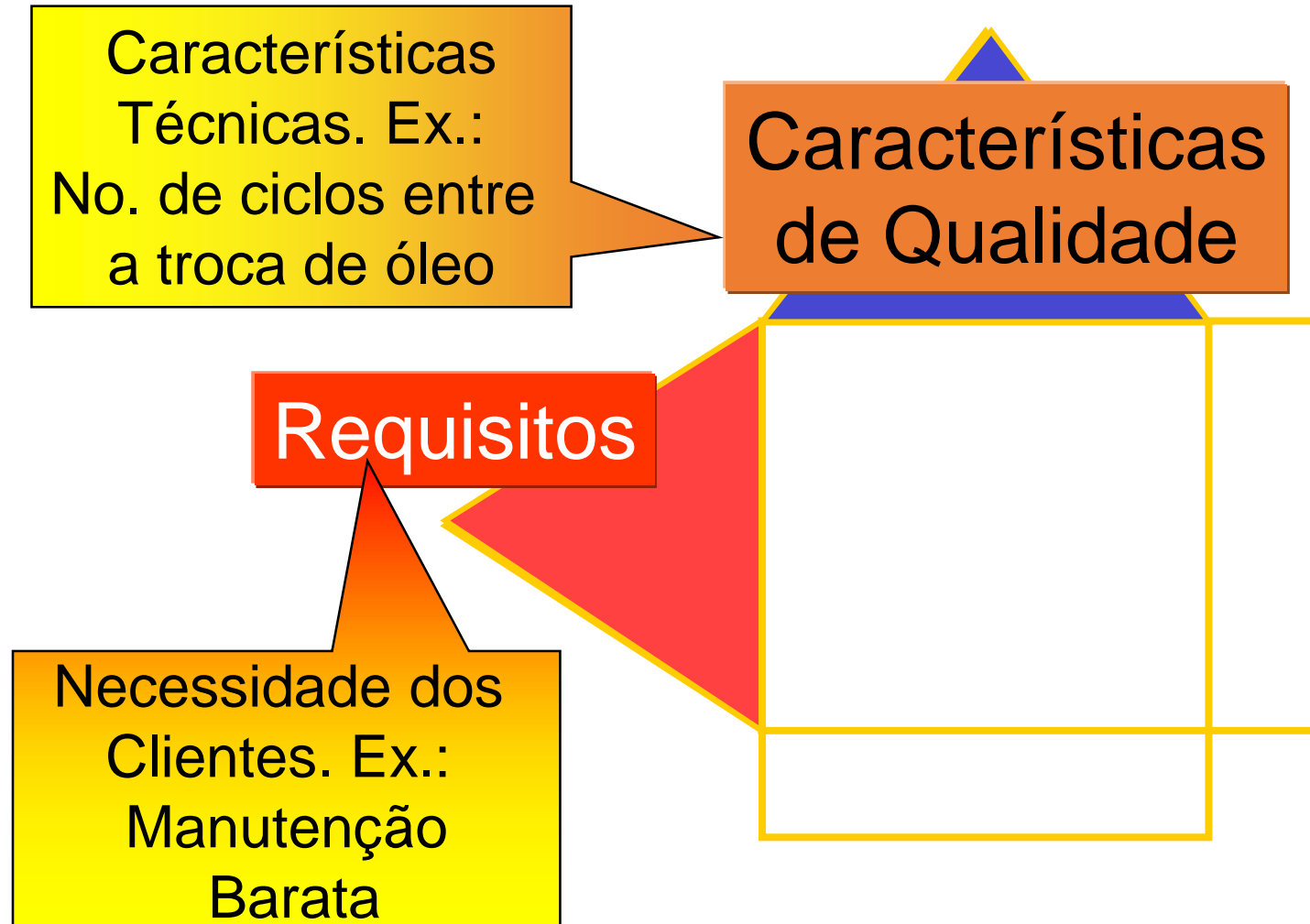
# Casa da qualidade (ou Matriz da qualidade)

- Primeira (muitas vezes única) etapa da QFD;
- Combina várias técnicas, com o objetivo de:
  - desdobramento de requisitos de clientes;
  - Conversão de requisitos em características de produto;
  - Relacionamento entre requisitos e características;
  - Priorização das características de produto.
- Técnicas combinadas:
  - Diagrama em árvore;
  - Matriz de priorização;
  - Matriz de relação.

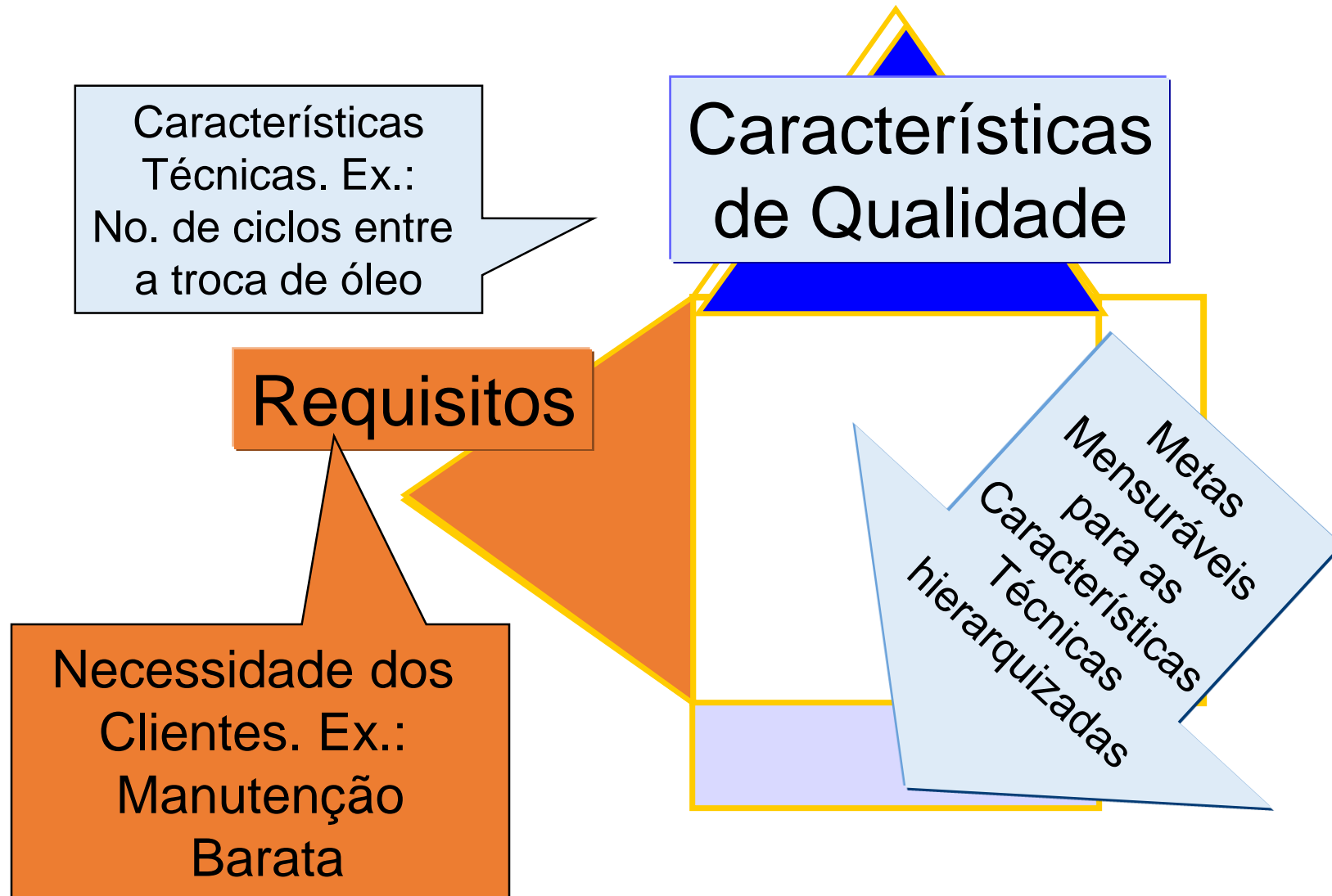
# Casa da Qualidade



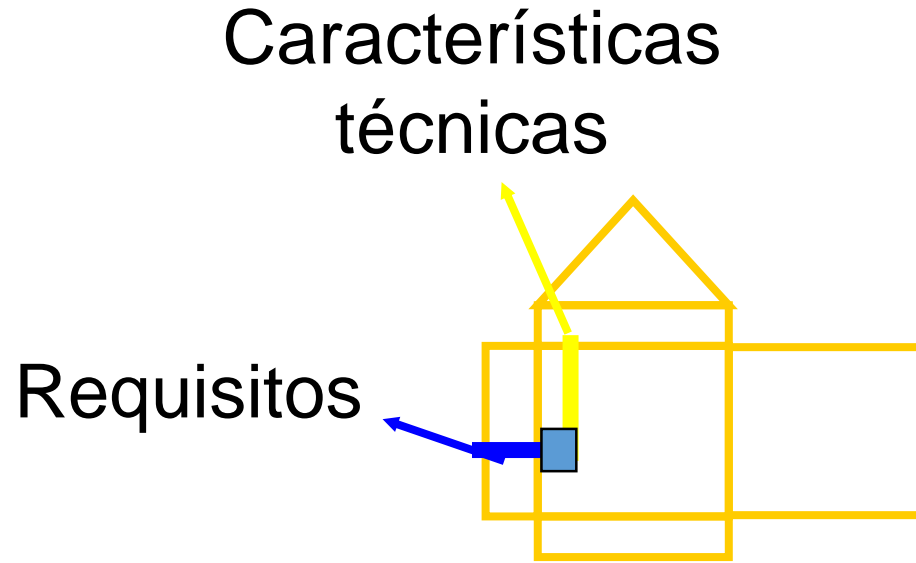
# Relacionamento Requisitos x Características



# Relacionando Requisitos e Características



# Casa da Qualidade



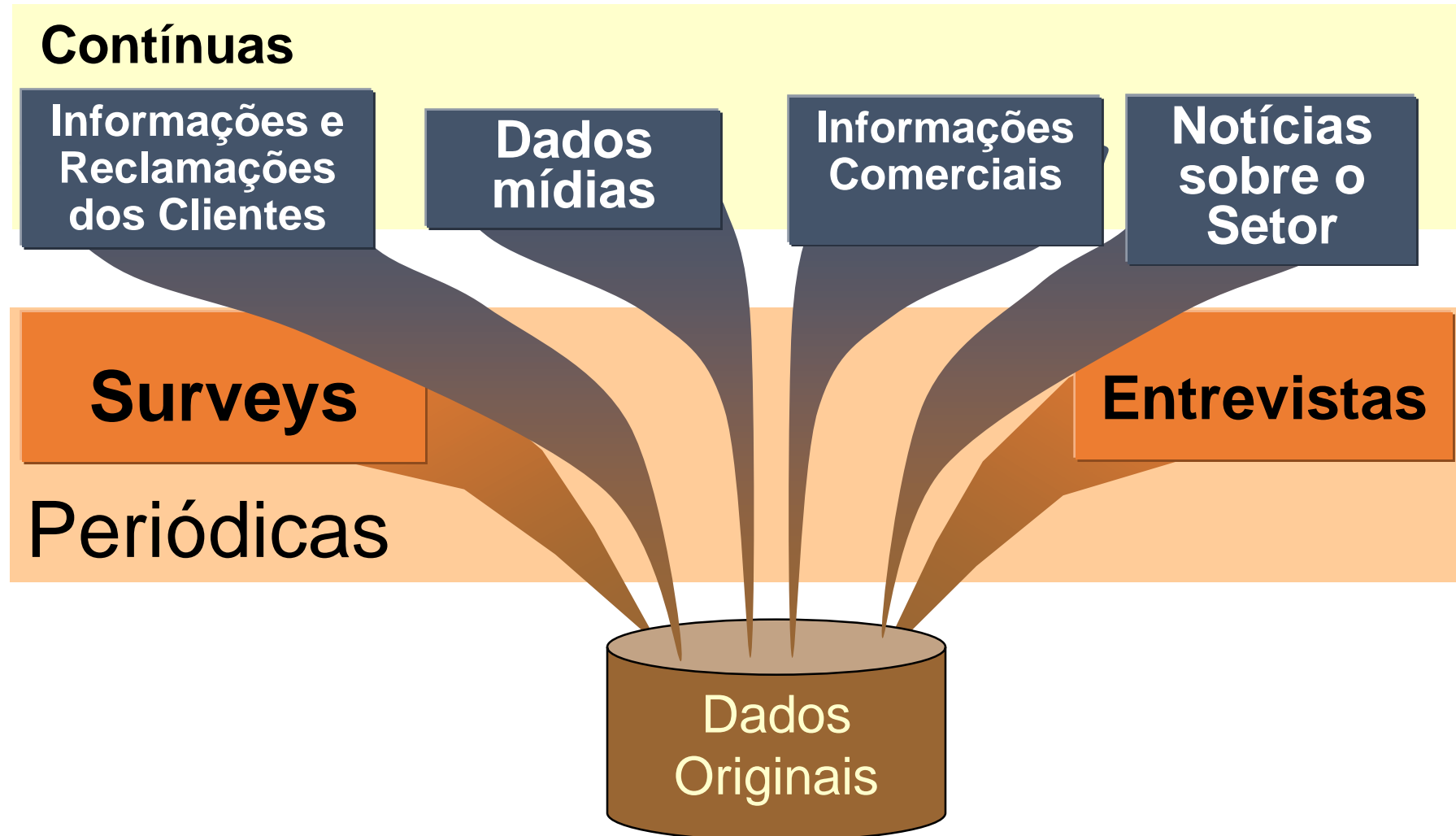
	Via Útil dos Componentes	Frequência de Regulagem	Tamanho do Quadro	Frequência de Vibrações
Baixa Frequência de Manutenção	△	○	○	△
Baixo Custo de Manutenção	○	○		

# Atividades QFD

1	Identificar desejos do consumidor
2	Traduzir desejos do consumidor como requisitos
3	Definir prioridades do consumidor
4	Definir prioridade interna
5	Fazer Benchmarking
6	Definir Plano de Qualidade
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8	Correlação Requisitos – Caracter. da Qualidade
9	Priorizar Caracter. da Qualidade
10	Fazer Benchmarking das Caracter. da Qualidade
11	Definir Qualidade desejada



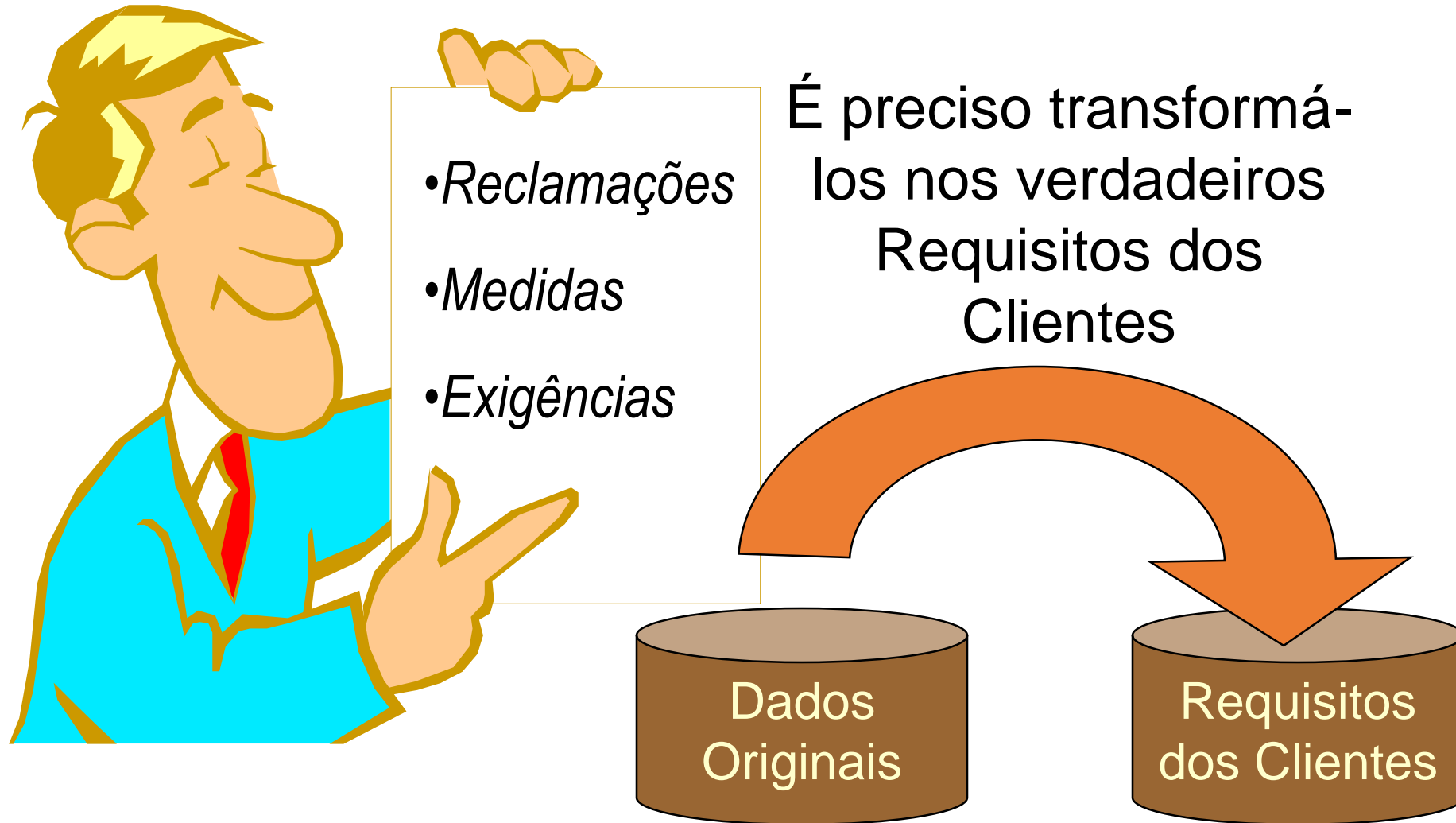
# Formas de ouvir o cliente



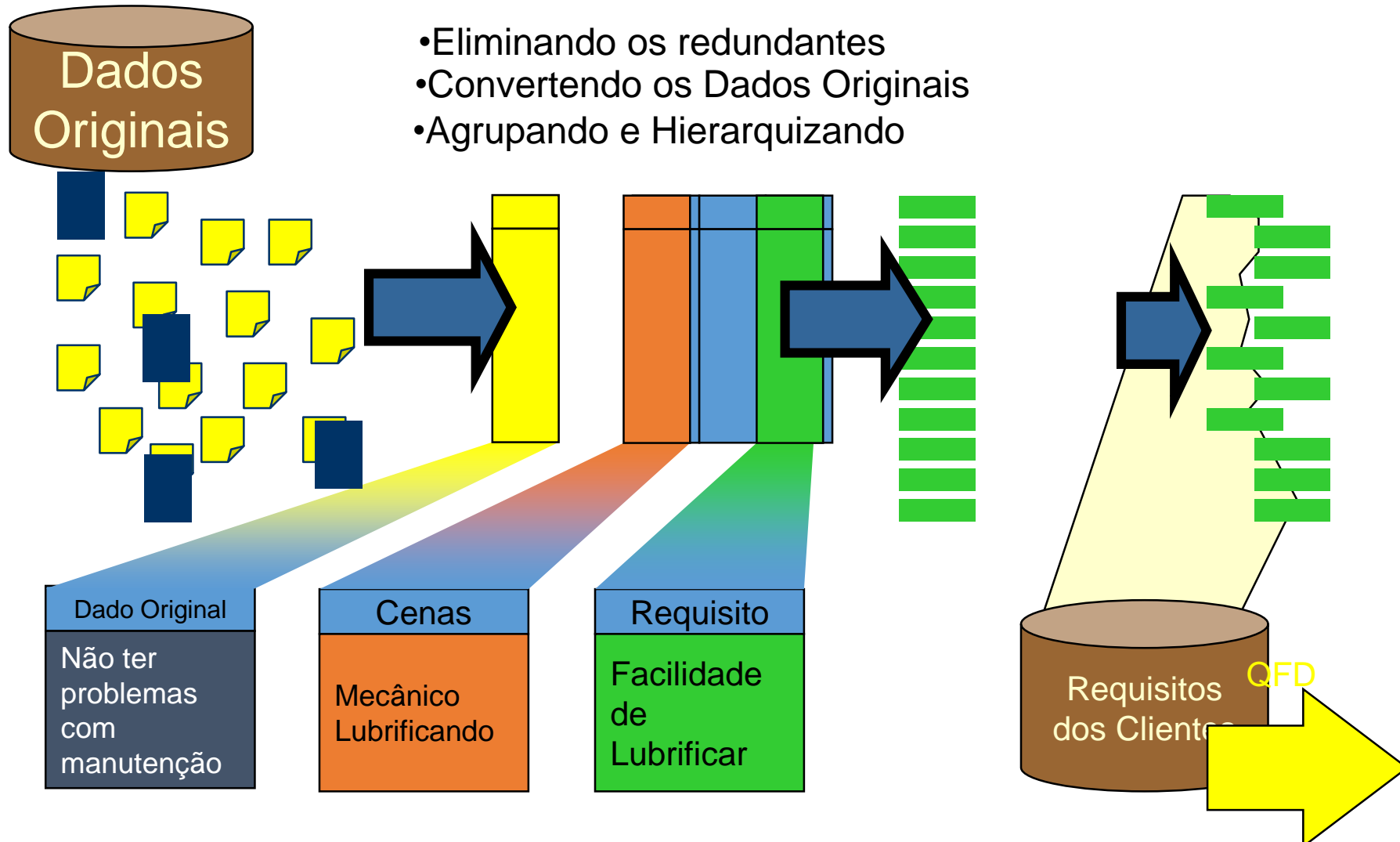
# Atividades QFD

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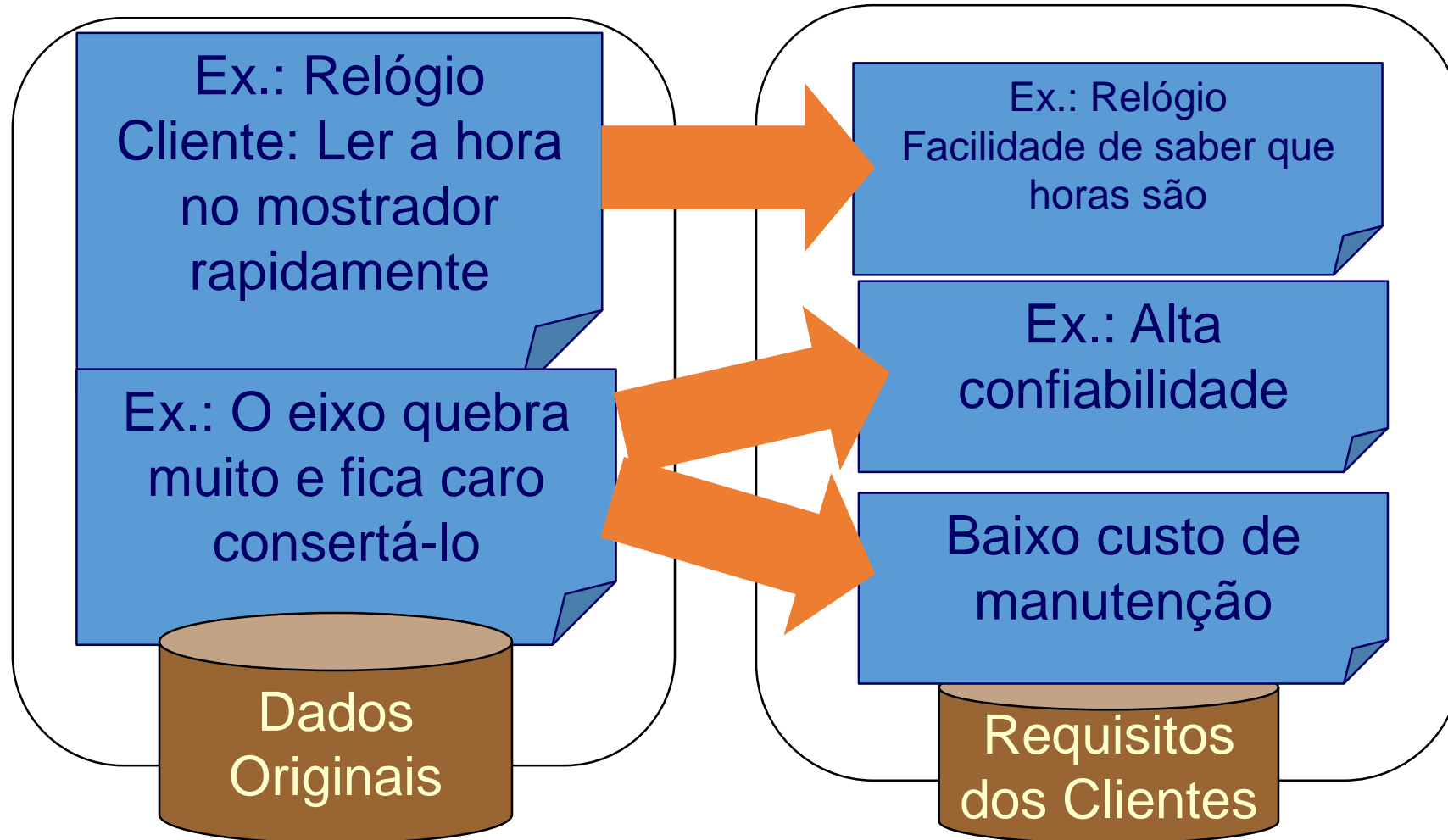
# Dados originais: Traduzir desejos do consumidor



# Passos para Transformar Dados Originais em Requisitos



# Exemplos de Transformação dos Dados Originais

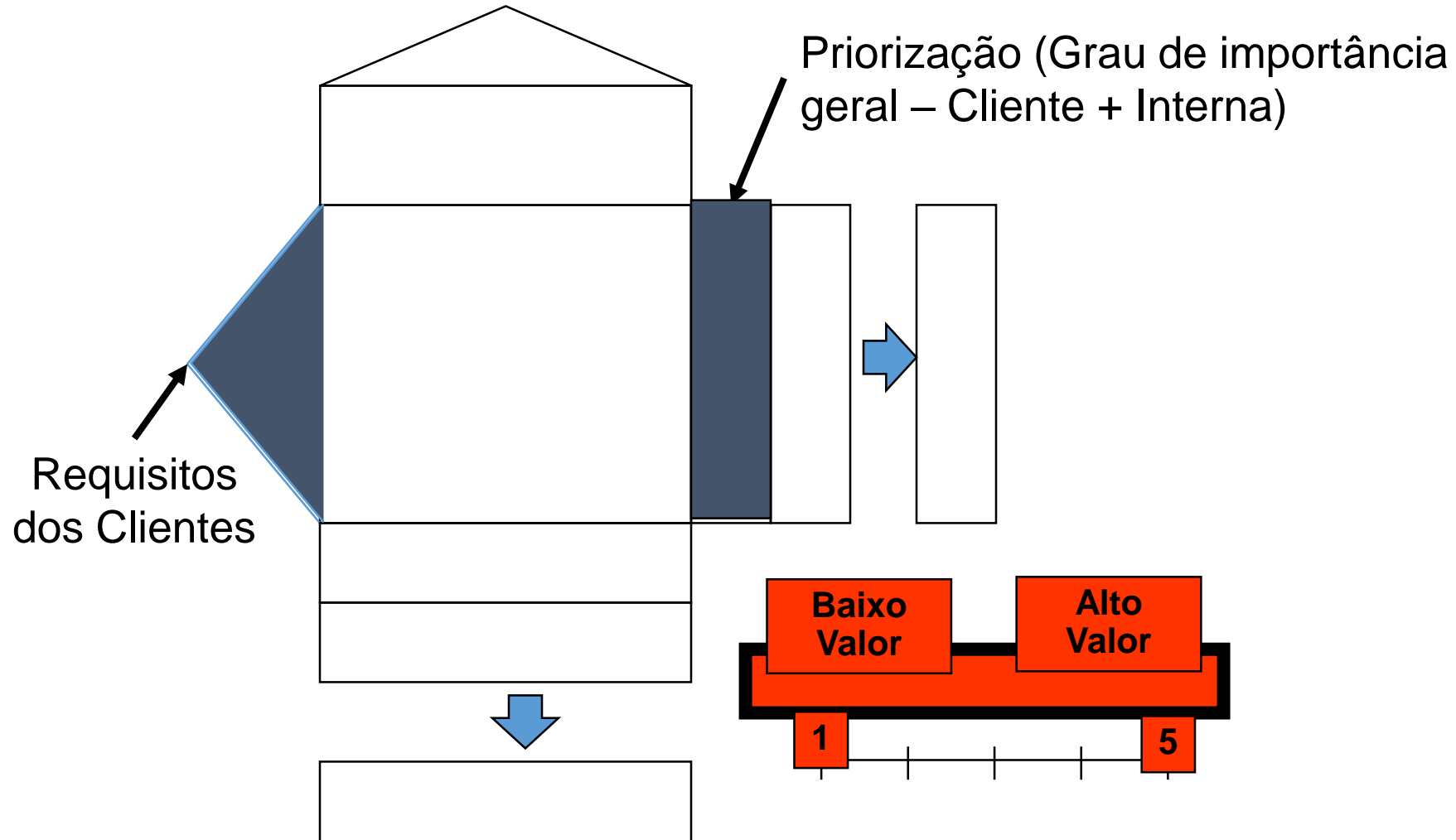




# EESC · USP Atividades QFD

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9	Priorizar Caracter. da Qualidade
10	Fazer Benchmarking das Caracter. da Qualidade
11	Definir Qualidade desejada
12	Próxima Casa da Qualidade...

# Casa da Qualidade

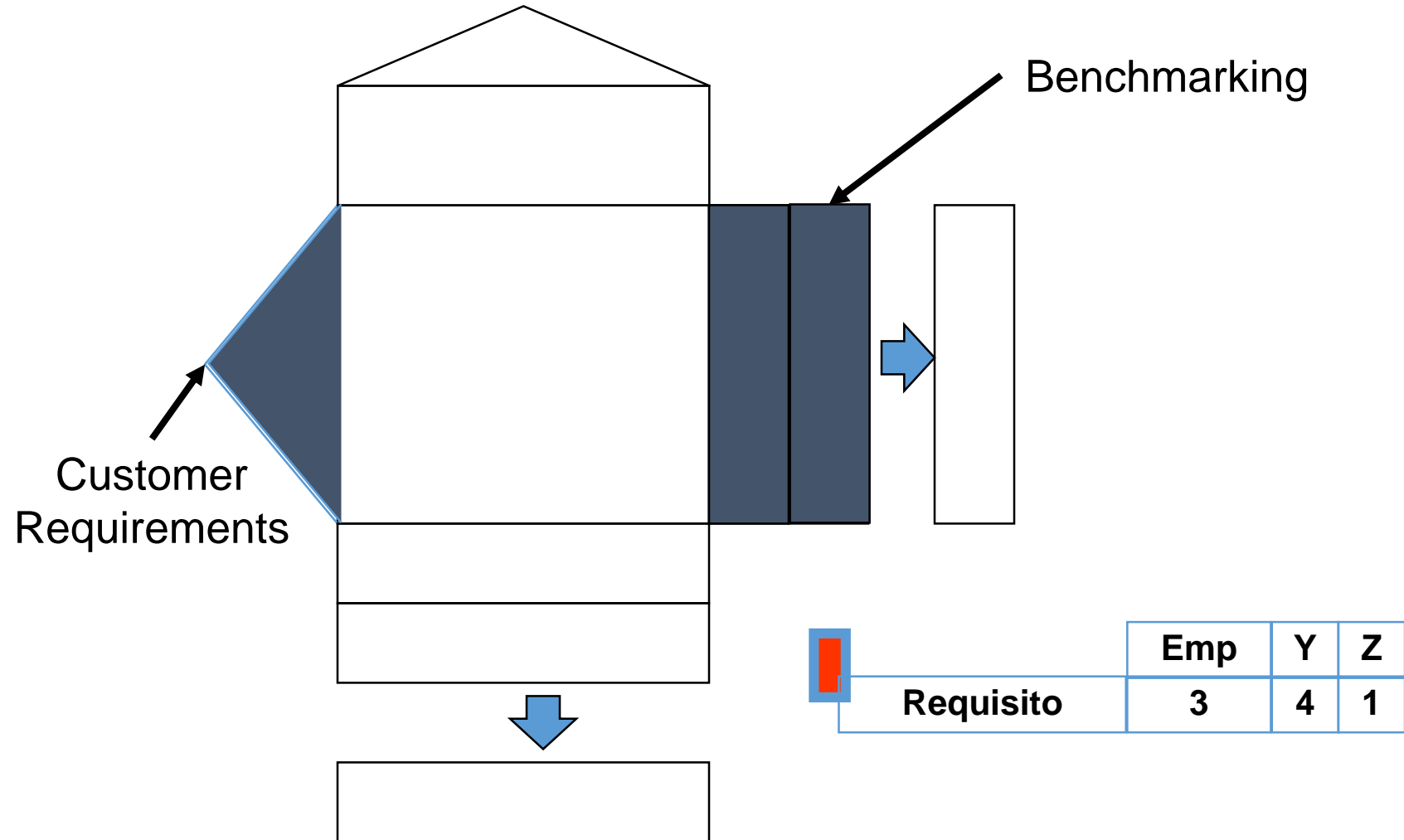


# Atividades QFD

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# Casa da Qualidade



# Benchmarking

Tabela “O que ?”

Fácil de Segurar
...
...
Não desliza

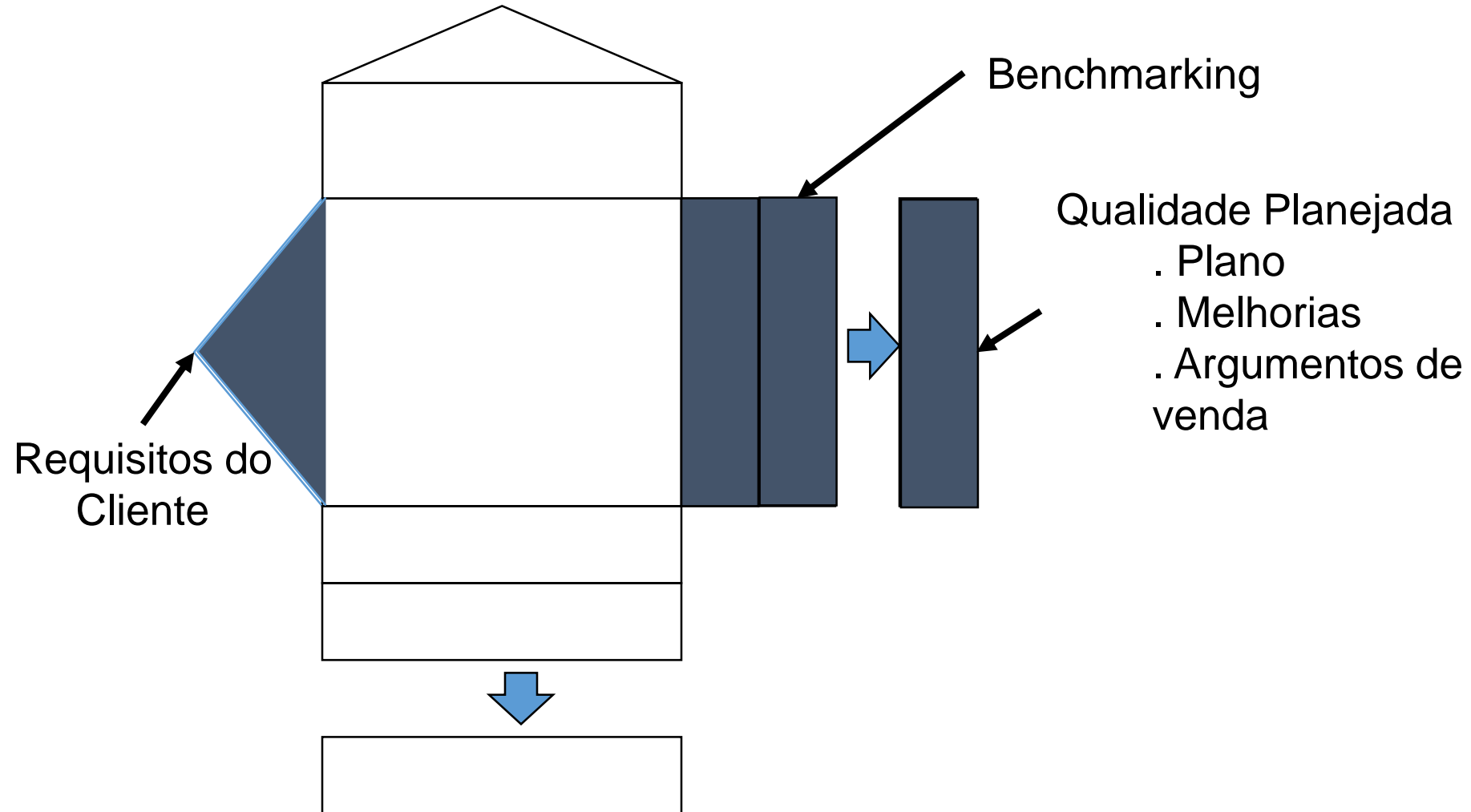
.....

Benchmarking		
Nossa Empresa	Y	Z
2	3	4
4	3	4
2	2	2
3	3	5

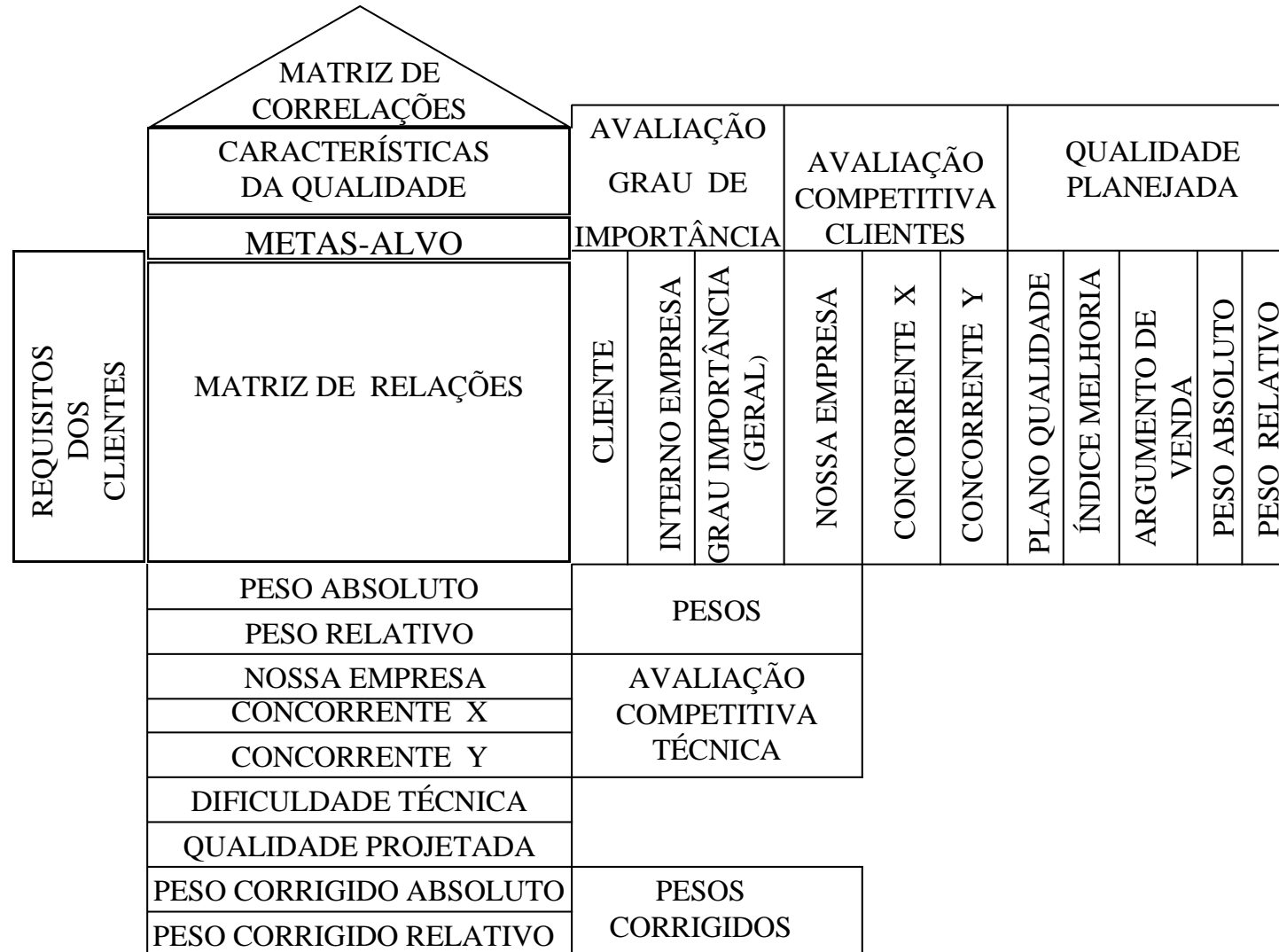
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# Casa da Qualidade



# Casa da Qualidade





# Qualidade Planejada

- **Índice de melhoria:** *quantificação do plano de melhoria, através da relação entre “notas” do plano e do desempenho atual, para cada requisito;*
- **Argumento de Vendas:** *benefícios -chave que o produto deve oferecer aos clientes para o atendimento das necessidades. Pesos diferenciados (e.g. 1,5 - especial; 1,2 - comum);*
- **Peso dos requisitos:** *importância relativa dos requisitos. Determinado por:*

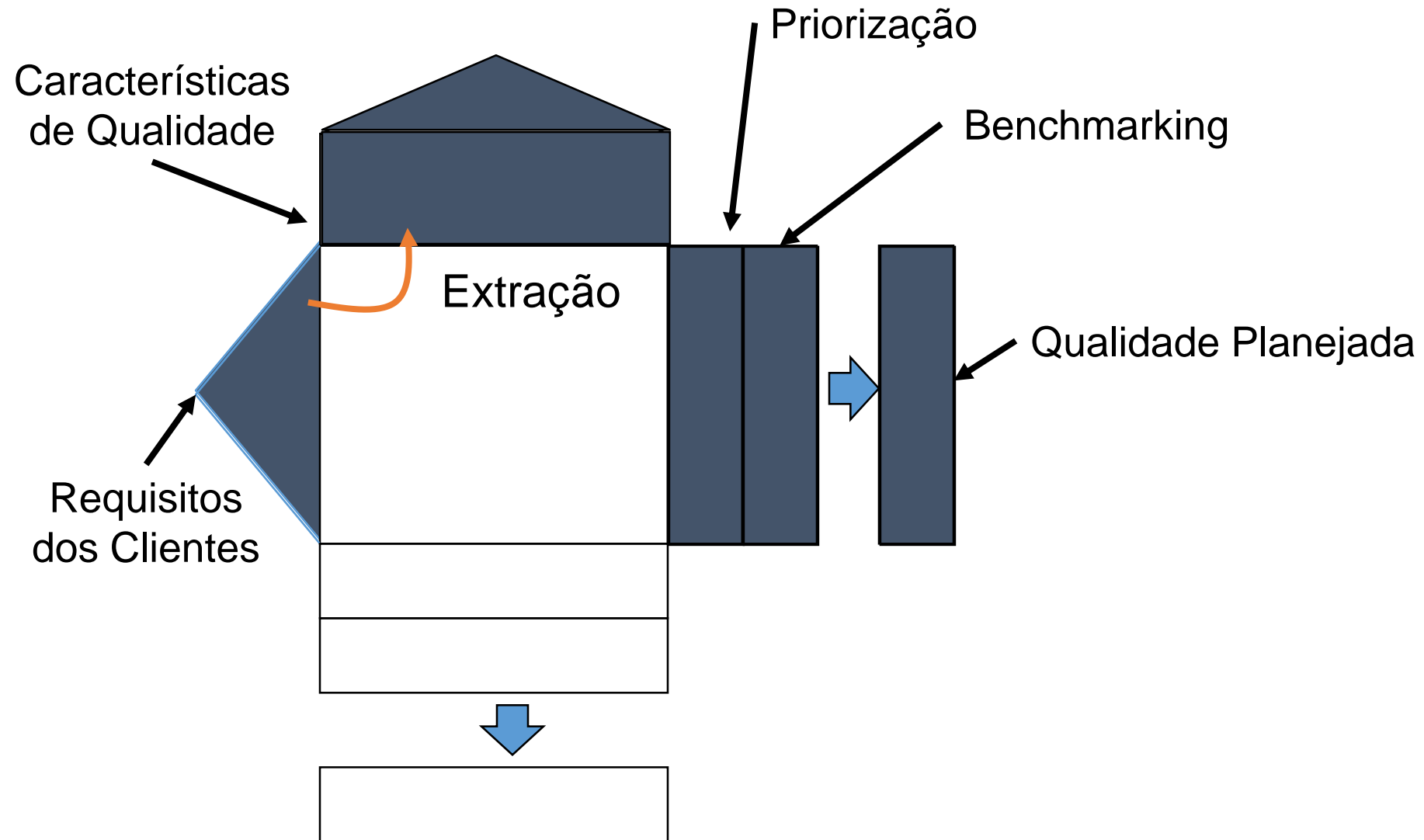
**$\text{Peso} = \text{Grau de Importância} \times \text{Índice de Melhoria} \times \text{Argumento de Vendas}$**

# Atividades QFD

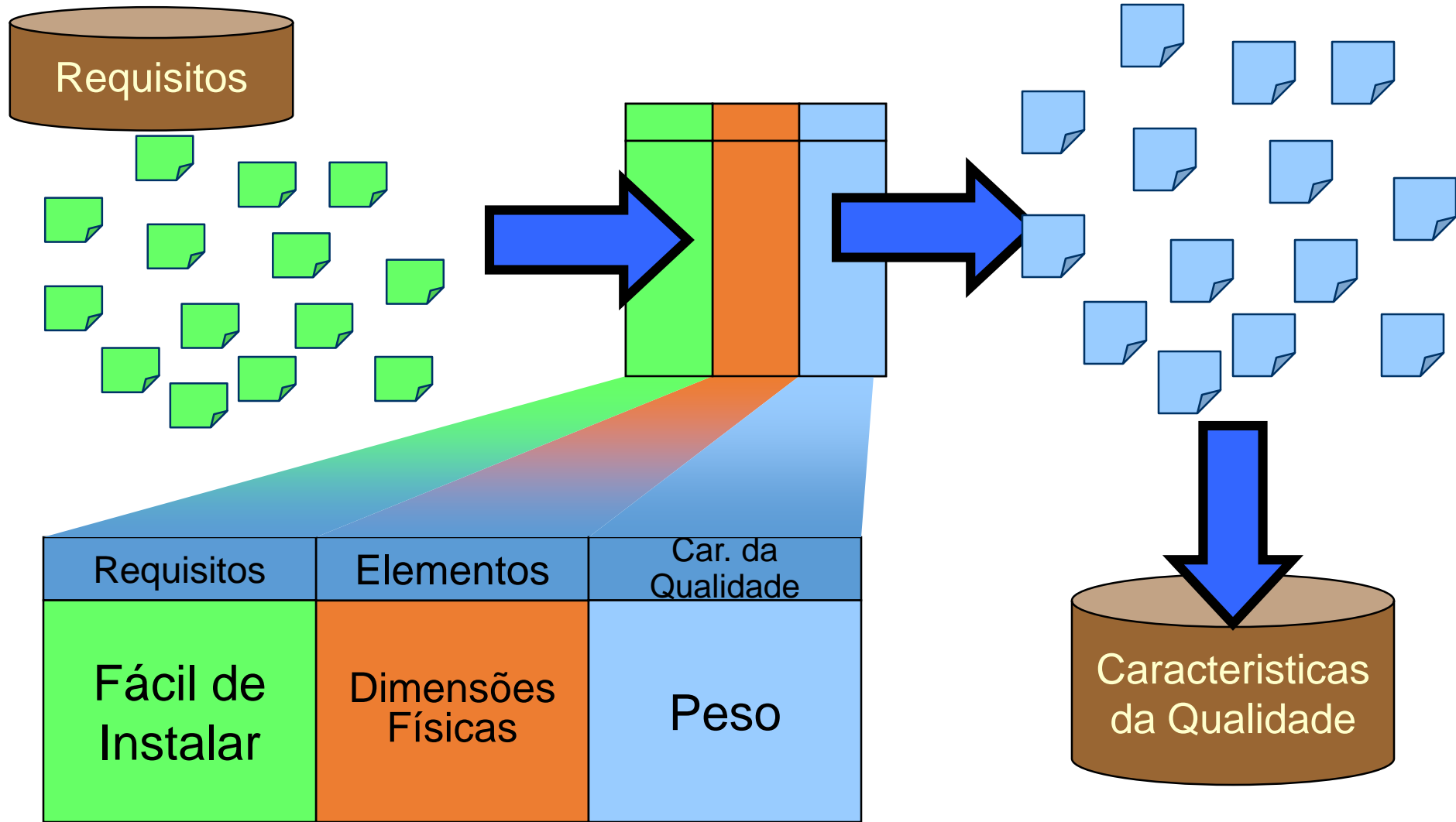
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# Casa da Qualidade



# Traduzir Requisitos em Características da Qualidade

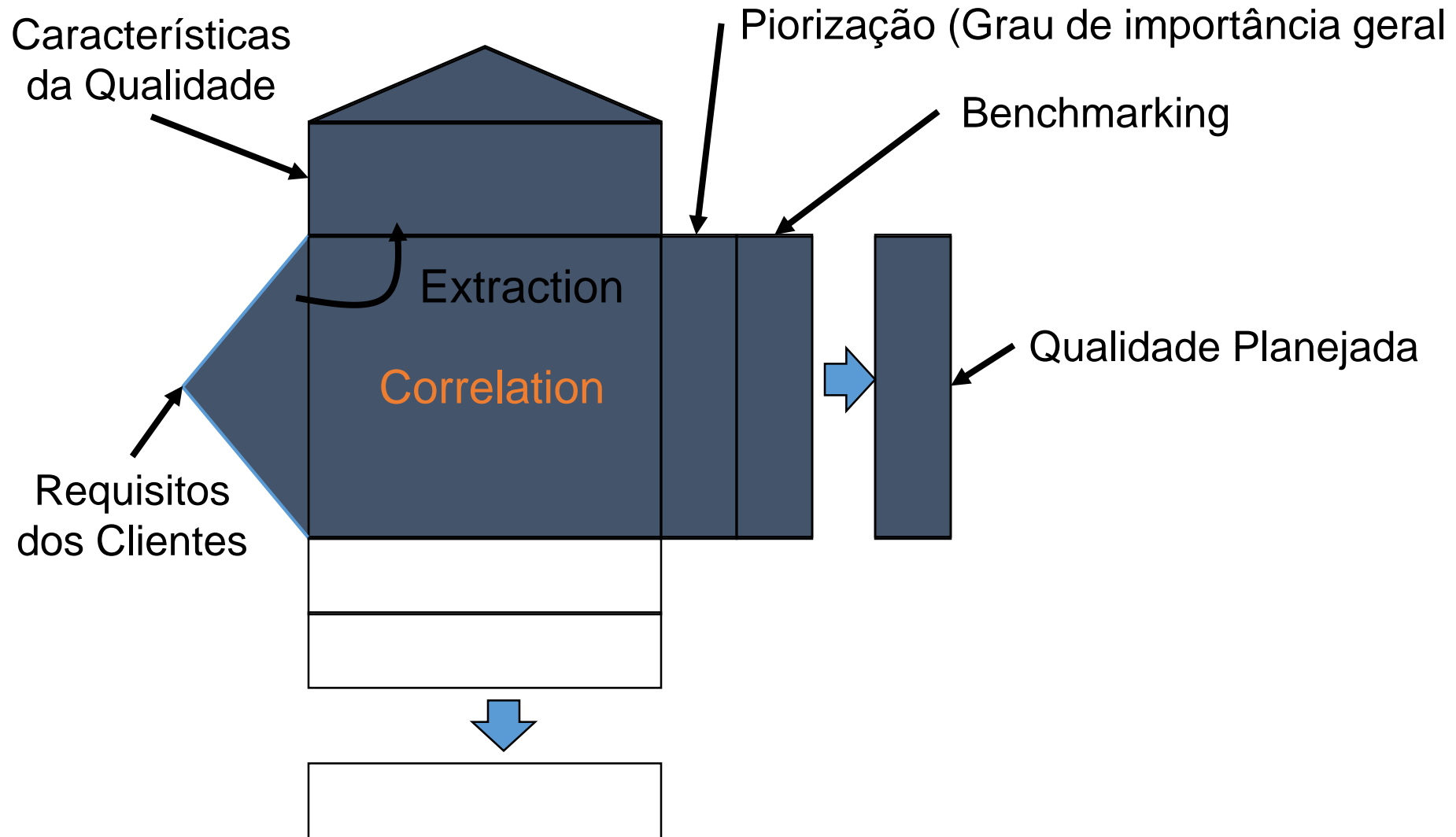




# EESC · USP Atividades QFD




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# Casa da Qualidade












# Correlação entre Requisitos e Características de Qualidade

## Tabela “Como”

-  Forte Correlação
-  Correlação moderada
-  Correlação fraca

## Tabela “O que”

	Comprimento	...	Quan. Tinta da carga	Hexagonalidade
Fácil de segurar				
Durabilidade				
...				
Não desliza				






# EESC · USP Atividades QFD










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# Conversão

Tabela “Como ?”

Tabela “O que ?”




-  = 9
-  = 3
-  = 1

	Comprimento			Hesagonalidade	Peso dos Requisitos
Fácil de Segurar					14
...					23
...					44
Não desliza					19

# Conversão

Tabela “Como ?”

Tabela “O que ?”

-  = 9
-  = 3
-  = 1

	Comprimento	...	...	Hexagonalizada	Peso Requisitos
Fácil de segurar	3			3	14
...		3			
...	1	9	3		44
Não desliza	1		9		19

Multiplicar



# Conversão

Tabela “Como”




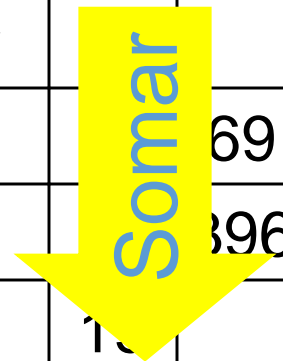
-  = 9
-  = 3
-  = 1

Tabela “O que”

	Comprimento	...	...	Hexagonalidade
Fácil de segurar				42
...		69	207	
...		396	132	
Não desliza	105		171	
	105	465	339	219



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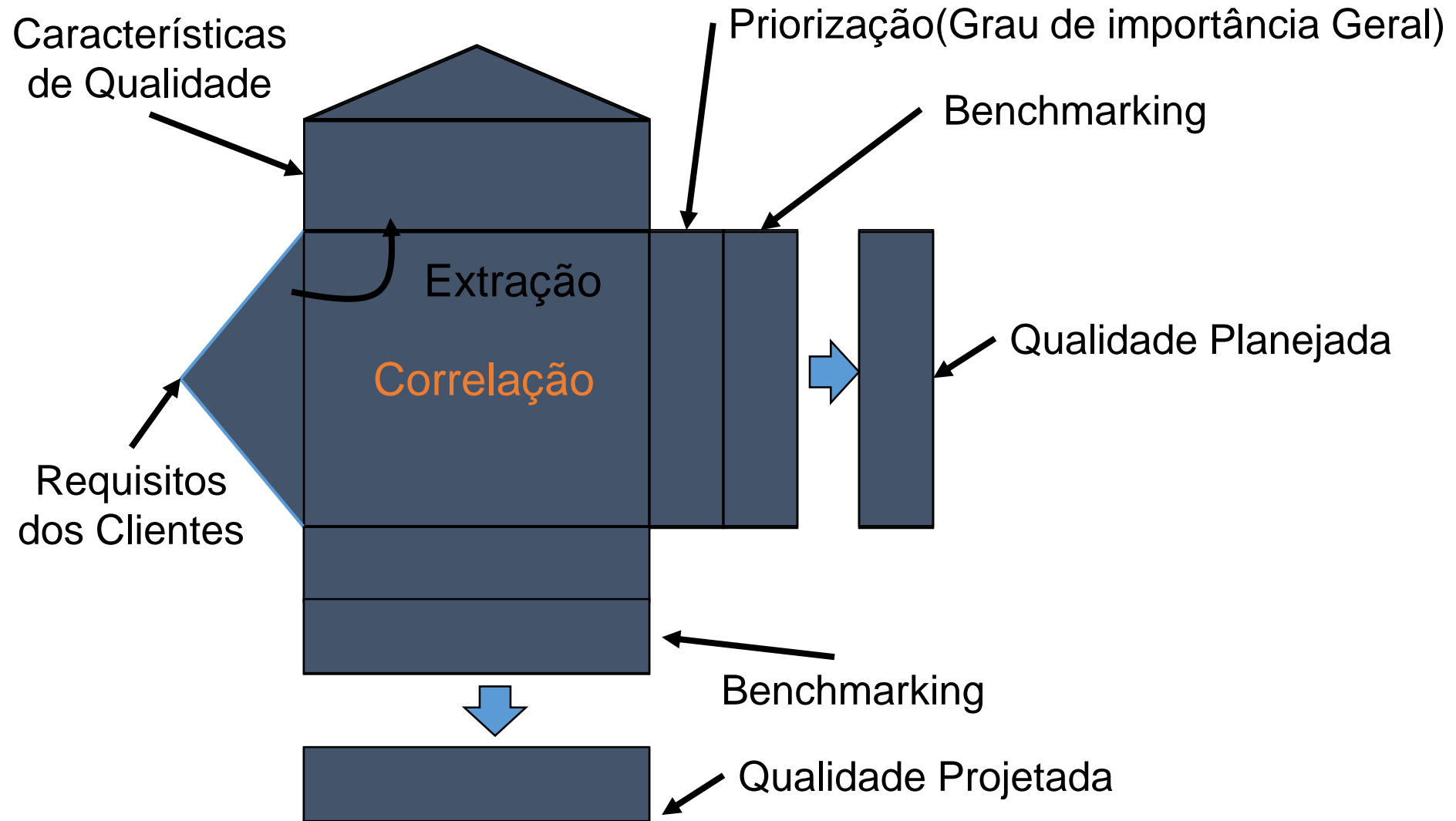
Peso
Requisitos
14
23
44
19



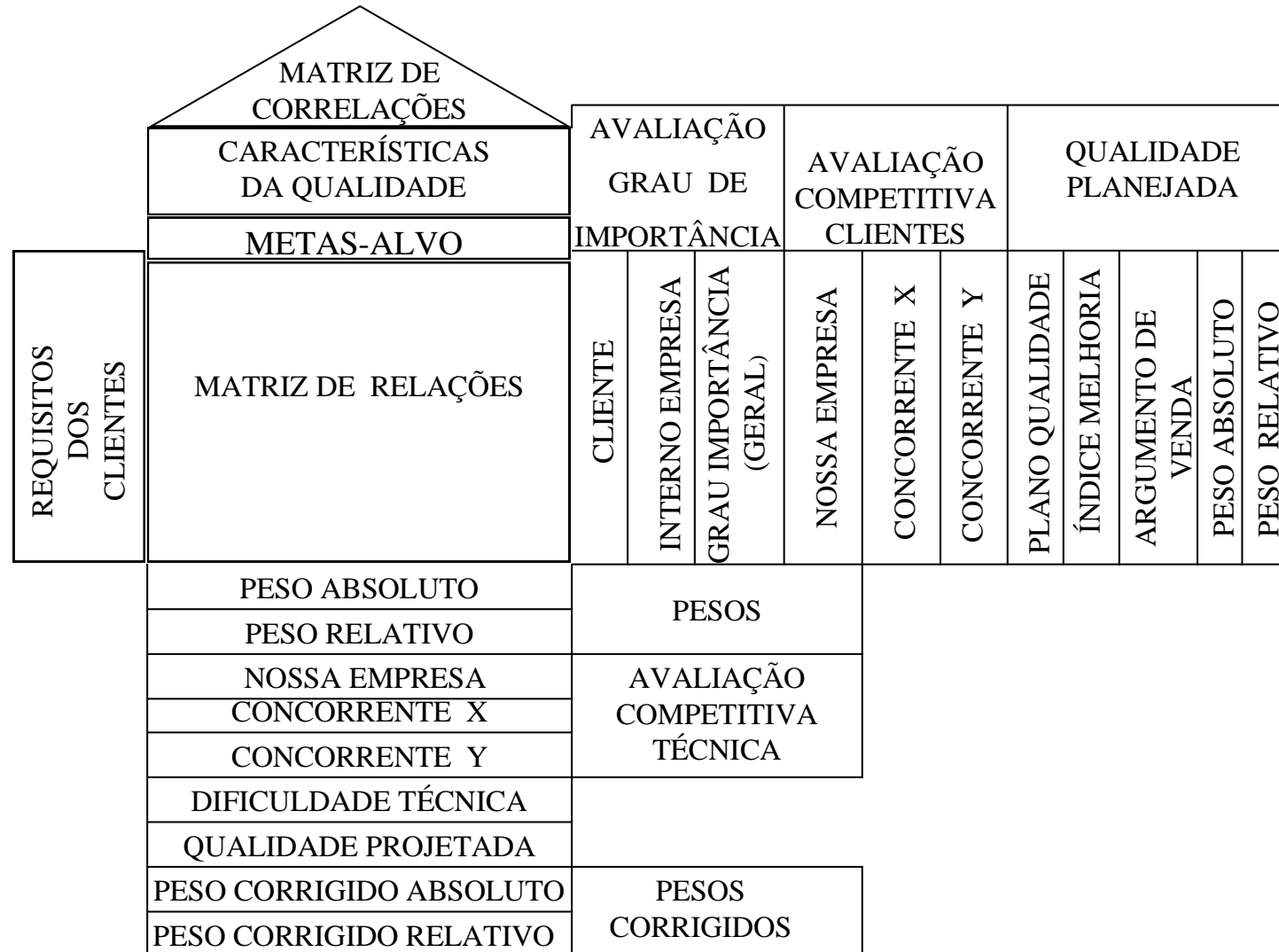
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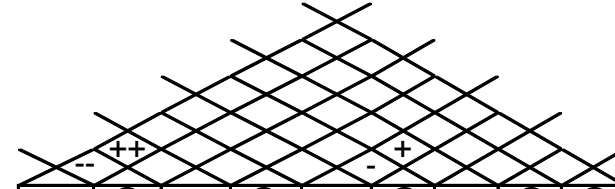
# Casa da Qualidade



# Casa da Qualidade



# Casa da qualidade

Requisito do Cliente Primário	Requisito do Cliente Secundário										Avaliação								
		Resistência da sola	Conforto do solado		Palmeira	Acabamento do couro			Forração interna		Grau de importância	Nossa Empresa	Empresa X	Empresa Y	Plano da Qualidade	Índice de melhoria	Argumento de Venda	Peso Absoluto	Peso Relativo
		no. Ciclos até a ruptura	Densidade	Absorção de impacto	curvatura	resistência à abrasão	brilho	No. Ciclos até o vinco	Espessura da espuma	Elasticidade									
Ser confortável	Leve		9								3	3	5	2	3	1,0	1,2	3,6	12,7
	Macio		3	3					9	9	4	3	5	3	5	1,7	1,5	10,0	35,2
	Anatômico			3	9						4	4	4	2	4	1,0	1,2	4,8	16,9
Ser durável	Resistente	9		1		3		9		3	4	4	5	5	5	1,3	1	5,0	17,6
	Mantém aparência de novo					9	9			3	5	5	1	3	5	1,0	1	5,0	17,6
	Peso absoluto	158	220	174	152	211	158	158	317	423							<b>Total</b>	28,4	100,0
	Peso relativo	8,04	11,1	8,82	7,71	10,7	8	8	16	21									
	Nossa empresa	Avaliação comparativa técnica																	
	Empresa X																		
	Empresa Y																		
	Dificuldade técnica																		
	Peso corrigido																		
	Qualidade projetada																		

# Aplicações - QFD em serviço

## Case studies

### A QFD/*hoshin* approach for service quality deployment: a case study

*K.F. Pun*

*K.S. Chin and*

*Henry Lau*

#### The authors

**K.F. Pun** is a Lecturer and **K.S. Chin** is an Associate Professor, both in the Department of Manufacturing Engineering and Engineering Management, City University of Hong Kong, Hong Kong.

**Henry Lau** is currently Honorary Research Fellow of the Manufacturing Information Systems Research Project, Department of Manufacturing Engineering, Hong Kong.

#### Keywords

Customer orientation, Hoshin kanri, House of quality, Quality function deployment

#### Abstract

Discusses the quality strategy deployment (QSD) processes, and addresses how service organizations identify customers' needs in relation to the development of viable strategies and deployment of quality services using the quality function deployment (QFD) and the *hoshin kanri* techniques. An integrated QFD/*hoshin* approach is proposed to help develop viable strategies and attain service quality deployment. An implementation case of the approach is presented based on a recent QSD study in a typical engineering service organization – the Manufacturing Engineering Laboratory (MEL) of City University of Hong Kong. Incorporating the findings of the study, this paper sets forth the identification of the voice of customers (VOC), the building of a house of quality (HOQ), and the deployment of organizational strategies. Besides, a generic 13-step guideline of QSD process is elaborated for assisting service organizations to attain

## 1. Introduction

A consistent feature noticeable in successful organizations tends to be that short-term decisions are taken in the context of consistent, carefully thought out long-term corporate strategies. Formulation of viable quality strategies can help sustain competitive advantage and respond to the challenge of economic, technological and social changes. Many researchers and practitioners also advocate that deployment of quality strategies could help organizations deliver their quality products/services and attain their performance objectives and goals (Black *et al.*, 1988; Donald and Ronald, 1993; Porter, 1998; Pun and Ma, 1999). This paper begins with a review on the processes of strategy development and deployment. It then discusses the identification of users'/customers' needs and the deployment of service quality in line with corporate/business/functional strategies. A pioneer study of quality strategy deployment (QSD), based on a typical engineering service organization, is described. The study integrated the quality function deployment (QFD) technique and the *hoshin kanri* method to generalize a feasible approach to service quality deployment. Incorporating the findings of the QSD study, a generic 13-step QFD/*hoshin* guideline is proposed to help service organizations develop viable strategies and deploy service quality to attain performance improvement.

## 2. Strategy development and service quality deployment

The literature of strategic management is

# Outras aplicações de QFD

## Strategic planning using QFD

Catherine P. Killen

*Centre for Management Innovation and Technology,  
Management Policy and Practice Group, University of Technology,  
Sydney, Australia*

Mike Walker

*Customer-Driven Strategies Pty Ltd, Brisbane, Australia, and*

Robert A. Hunt

*Centre for Management Innovation and Technology,  
Graduate School of Management, Macquarie University,  
Sydney, Australia*

Strategic  
planning using  
QFD

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### Abstract

**Purpose** – This paper outlines the use of quality function deployment (QFD) for strategic planning. QFD provides a comprehensive process for defining the issues facing an organisation in terms of customer and stakeholder outcomes, natural segments and key strategic opportunities.

**Design/methodology/approach** – An explanation and overview of the two core stages of strategic planning using QFD are followed by three case examples.

**Findings** – Strategic QFD avoids complex matrix analysis and instead moves directly to concept generation and evaluation. One of the main benefits of strategic QFD is the level of commitment and support for the resulting strategy throughout the organisation. This paper also shows how strategic QFD can be used to identify and optimise internal capabilities and to find and address specific customer opportunities.

**Practical implications** – Strategic planners will find that QFD-based philosophy and methods are useful tools for the creation of a customer-driven strategy.

**Originality/value** – This paper provides insight for practitioners and academics into how strategic QFD systematically translates vision into action, targeting opportunities and creating innovative strategies that are stable even in fast-changing environments.

**Keywords** Quality function deployment, Strategic planning, Innovation, Quality concepts

**Paper type** General review

# Outras aplicações de QFD

JQME  
12,2

150

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METHODOLOGY AND THEORY

## Integrating TPM and QFD for improving quality in maintenance engineering

V.R. Pramod

*Department of Mechanical Engineering, N.S.S. College of Engineering,  
Palakkad, Kerala State, India*

S.R. Devadasan

*Department of Production Engineering, P.S.G. College of Technology,  
Coimbatore, Tamilnadu State, India*

S. Muthu

*Dr Mahalingam College of Engineering and Technology, Pollachi,  
Tamilnadu, India*

V.P. Jagathyraj

*School of Management Studies, Cochin University of Science and Technology,  
Cochin University, Kochi, Kerala State, India, and*

G. Dhakshina Moorthy

*Government Automobile Workshop, Goundam Palayam, Coimbatore, India*

### Abstract

**Purpose** – To provide maintenance engineering community with a model named “Maintenance quality function deployment” (MQFD) for nourishing the synergy of quality function deployment (QFD) and total productive maintenance (TPM) and enhancing maintenance quality of products and equipment.

**Design/methodology/approach** – The principles of QFD and TPM were studied. MQFD model was designed by coupling these two principles. The practical implementation feasibility of MQFD model was checked in an automobile service station.

**Findings** – Both QFD and TPM are popular approaches and several benefits of implementing them have been reported worldwide. Yet the world has not nourished the synergic power of integrating them. The MQFD implementation study reported in this paper has revealed its practical validity.

**Research limitations/implications** – Since MQFD requires strategic decision making, the management commitment and support are required to test implement it. Since the case study was conducted in a public sector service station, this could not be achieved due to the requirement of following complex administrative procedures. However, the feasibility of obtaining customer voices





# Outras aplicações de QFD

## Using QFD and ANP to analyze the environmental production requirements in linguistic preferences

YuanHsu Lin<sup>a</sup>, Hui-Ping Cheng<sup>b</sup>, Ming-Lang Tseng<sup>b,\*</sup>, Jim C.C. Tsai<sup>b</sup>

<sup>a</sup> Department of Finance MingDao University, Taiwan

<sup>b</sup> Department of Business Innovation and Development MingDao University, Taiwan

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### ARTICLE INFO

#### Keywords:

Fuzzy quality function deployment  
Analytical network process  
Sustainable production indicators  
Environmental production requirements

### ABSTRACT

This study is to apply fuzzy quality function deployment (QFD) model with interdependence relations of environmental production requirements (EPRs) aspects and sustainable production indicators (SPIs) criteria for original equipment manufacturing (OEM) firm in Taiwan. At first, to facilitate the main issue of the QFD problem, however, the "Whats" question of EPRs and "Hows" problem of the SPIs have to be made, which are two major components and be emphasized on the house of quality matrices. In conjunction with fuzzy sets theory and analytical network process, the systematic analytical procedures are proposed. Subsequently, a case study demonstrated the evaluation process for identifying "Whats" and "Hows". The results of empirical study show that (1) five aspects of EPRs are deemed to have priority to improve the environmental practice; and (2) twenty-two feasible SPIs criteria are practical indicated. In addition, it is suggested that case firm should aware attentively the SPIs and emphasize on exploiting these EPRs effectively. And develop the "Hows" issues, which should continuously strengthen of the EPRs, respectively.

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# Outras aplicações de QFD

IJQRM  
29,3

284

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## Supplier selection using QFD: a consumer products case study

Angela Tidwell

*Howard University, Washington, DC, USA, and*

J. Scott Sutterfield

*School of Business & Industry, Florida A&M University, Tallahassee,  
Florida, USA*

### Abstract

**Purpose** – During the past decade the role of purchasing in global competitiveness has been steadily increasing in importance. Similarly, the role of packaging continues to increase in importance because of its dual function in advertising and shipping. The purpose of this paper is to employ the Quality Function Deployment (QFD) methodology to analyze the common purchasing problem of supplier selection for toothpaste packaging. Thus, a technique well known in quality management is adapted for use in the entirely new context of supplier selection in purchasing.

**Design/methodology/approach** – The paper begins by stipulating the properties necessary for suitable packaging. It then examines the type(s) of packaging necessary to satisfy these properties. Finally, it moves to the selection of a supplier having the necessary properties to provide packaging. The analysis is performed with a QFD construct.

**Findings** – The QFD process led to a rapid identification of those suppliers most capable of providing the product characteristics that met the corporate total value goal at the time of study.

**Practical implications** – The paper presents a structured management approach to deal with the common problem of supplier selection. In doing so, it provides an approach that may be generalized to solve many types of decision problems confronting operations and supply chain managers.

**Originality/value** – This paper presents a management approach to the very important area of supplier selection. In doing so, it employs a technique well known in the product design area, but not used in the area of supplier selection, that of Quality Function Deployment (QFD). It extends beyond the dyad in that it brings to bear a powerful technique from the Quality Management discipline to a problem in another discipline, Purchasing.

**Keywords** Sourcing, Supplier evaluation, Supply chain management, Marketing, Purchasing techniques, Packaging, Quality function deployment, Supplier selection, Production process

**Paper type** Case study

# Associações de QFD



Training

Calendar

FAQs

Resources

## QFD: Quality Function Deployment

1. Seeks out spoken and unspoken customer needs from fuzzy Voice of the Customer verbatim;
2. Uncovers "positive" quality that wows the customer;
3. Translates these into designs characteristics and deliverable actions; and
4. Builds and delivers a quality product or service by focusing the various business functions toward achieving a common goal—customer satisfaction. Read more...

Here you will find a comprehensive list of resources and opportunities to:

### Learn QFD :

- Public QFD Courses
- In-house Training
- QFD Certificate Program
- Free QFD Newsletter
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# Softwares de QFD



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## QFD Builder (Online Software)

QFD Online is pleased to announce the beta release of our new online QFD Builder. This browser-based software allows users to build, store, and share their Houses of Quality online!



Features include:

- ▣ Unlimited rows, columns and HOQs
- ▣ In-place sorting of requirements by weight, name, and/or custom ordering
- ▣ Access from any machine with a current web browser
- ▣ Simultaneous editing & sharing with remote users (i.e. multi-user collaboration)
- ▣ And much, much more!

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# Softwares de QFD



The screenshot shows the SigmaZone website for SnapSheets XL. The page features a navigation menu with links for Home, Products, Customers, Training and Consulting, Company, and Articles. A search bar is located on the right. The main banner includes a man meditating with a laptop, a screenshot of the SnapSheets XL software interface, and the text "Enhancing Excel Simple. Easy. Proven." along with a "Buy Now" button. Below the banner, the product page for SnapSheets XL is displayed, including a sidebar with "Next Steps" (Download Free Trial, Getting Started, Obtain Pricing, Buy Now), "Download" (Free Trial Version, Example Models, Version Updates), "Watch" (Video tutorials), and "Read" (Aa). The main content area features the title "SnapSheets XL Software for Microsoft® Excel®" and a description of the software's capabilities. A screenshot of the Microsoft Excel ribbon shows the SnapSheets XL ribbon with various tools for QFD and FMEA.

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**Download**

- Free Trial Version
- Example Models
- Version Updates

**Watch**

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**Read**

## SnapSheets XL Software for Microsoft® Excel®

SnapSheets XL is a cost effective easy to use software package that integrates into Excel for Quality Function Deployment (QFD), Failure Mode Effects Analysis (FMEA), and Pugh Concept Selection. Whether your needs are for Six Sigma, Design for Six Sigma (DFSS), ISO 9000, or general use, SnapSheets XL is the solution for your Failure Mode Effects Analysis (FMEA), Quality Function Deployment(QFD), and Pugh Concept Generation and Selection needs.

### SnapSheets XL Integrates into Microsoft Excel



# Benefícios do QFD

- Foco (cliente e mercado, ou outro objeto de análise)
- O esforço de análise comparativa,
- O registro de informações em tabelas e matrizes.
- Formato visual ajuda a dar foco para a discussão do time de projeto, organizando a discussão.
- O processo de elaboração das matrizes leva a uma melhor compreensão da situação e a um maior comprometimento com as decisões tomadas.

# Dificuldades do QFD

- Depende de comprometimento e integração de time multifuncional;
- Definição de graus de importância e relacionamentos podem gerar dúvidas quanto à importância relativa;
- Definição de notas para julgamentos qualitativos (importância, relacionamento) pode gerar dúvidas;
- Excesso de formalismo no uso da ferramenta pode desmotivar o uso da ferramenta.