

Módulo 7

DESENHAR PARA A USABILIDADE

Exemplo...

The screenshot shows a web-based voting system interface. At the top, there's a navigation bar with links for 'OS MEUS PROCESSOS ELEITORAIS', 'DADOS PESSOAIS', 'MENSAGENS (8)', and 'HISTÓRICO'. Below this, a breadcrumb trail indicates the user is in 'Os meus processos eleitorais > Processo de Eleição para o Conselho Geral ... > Eleição para os Representantes dos Profess... > Consulta das referências de voto'. The main content area is titled 'CONSULTA DAS REFERÊNCIAS DE VOTO'. It contains a text input field with the placeholder 'Insira a sua referência de voto e valide se o seu voto foi contabilizado.' and a blue button labeled 'VALIDAR' with a magnifying glass icon. Below this, a section titled 'Lista de referências de voto' displays a list of vote references, each consisting of a string of characters followed by a superscripted number (e.g., '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e⁷', '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e²³', '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e⁶⁷', '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e⁶⁷').

Exemplo...

The screenshot shows a web-based voting system interface. At the top, there's a navigation bar with links for 'OS MEUS PROCESSOS ELEITORAIS', 'DADOS PESSOAIS', 'MENSAGENS (8)', and 'HISTÓRICO'. The main content area is titled 'CONSULTA DAS REFERÊNCIAS DE VOTO' (Vote Reference Inquiry). It includes a note: 'Insira a sua referência de voto e valide se o seu voto foi contabilizado.' Below this is a search input field containing the reference code '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e76' and a blue 'VALIDAR' (Validate) button with a magnifying glass icon. Below the search area, a section titled 'Lista de referências de voto' (List of vote references) displays four rows of reference codes, each ending with a superscripted character: '23', 'e7', and 'e7'. The reference codes are: '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e76', '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e²³', '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e^{e7}', and '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e^{e7}'.

Exemplo...

The image shows two screenshots of the e-votUM voting system interface. Both screenshots are identical, displaying the 'Consulta das referências de voto' (Reference vote consultation) page.

The top navigation bar includes links for 'OS MEUS PROCESSOS ELEITORAIS', 'DADOS PESSOAIS', 'MENSAGENS (8)', and 'HISTÓRICO'. The user's name 'José Francisco Grela da Freitas Campos' is displayed at the top right.

The main content area has a heading 'CONSULTA DAS REFERÊNCIAS DE VOTO' and a note: 'Insira a sua referência de voto e valide se o seu voto foi contabilizado.' Below this is a text input field containing the reference code '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e76'. To the right of the input field is a blue button labeled 'VALIDAR' with a magnifying glass icon.

A large blue arrow points from the input field in the first screenshot to the same input field in the second screenshot, highlighting the comparison between the two instances.

The bottom section displays a table titled 'Lista de referências de voto' (List of voting references) with one row:

13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e ²³
--

The second screenshot shows the same interface and data, with the blue arrow pointing from the input field to the input field.

Exemplo...

The image shows two screenshots of a web-based voting application. Both screenshots have a dark header bar with the University of Minho logo, the title 'e-votUM', and a user profile picture. The top header also includes tabs for 'OS MEUS PROCESSOS ELEITORAIS', 'DADOS PESSOAIS', 'MENSAGENS (8)', and 'HISTÓRICO'. The user's name 'JOSE Francisco Grela da Freitas Campos' is visible in the top right.

The first screenshot shows the 'CONSULTA DAS REFERÊNCIAS DE VOTO' (Vote Reference Inquiry) page. It features a text input field containing the reference code '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e76' and a blue 'VALIDAR' (Validate) button with a magnifying glass icon. A large blue arrow points from the input field towards the second screenshot.

The second screenshot shows the result of the validation. It displays the same header and navigation menu. The main content area shows the message 'O seu voto foi contabilizado com sucesso!' (Your vote was counted successfully!) in blue text. Below this, it shows the same vote reference code '13d4d4b87661c8e7f2f83d74aced3f93a8ee63e4fb3236b6b96f4021e48a4e76' in a list.

Mestrado Integrado em Engenharia Informática – Universidade do Minho

Designing for maximum usability

Diretrizes=> regras de design

Guidelines

- generic design rules
- lower authority
- more general application

Padrões de design=> cap

Design patterns

- capture and reuse design knowledge

Principles of usability

- general understanding
- low authority
- high generality

Maximum usability

Princípios de usabilidade=> geral co

+ genérico

Standards

- specific design rules
- high authority
- limited application

Padrões/normas=> regras de de

+ específico

Principles for usability

Learnability

Existem três grandes grupos de principios genericos que tem a ver com facilidade de uso:

- the ease with which new users can begin effective interaction and achieve maximal performance

Flexibility

Flexibilidade da interface, fazer coisas de multiplas formas é possivel adaptar ao utilizador.

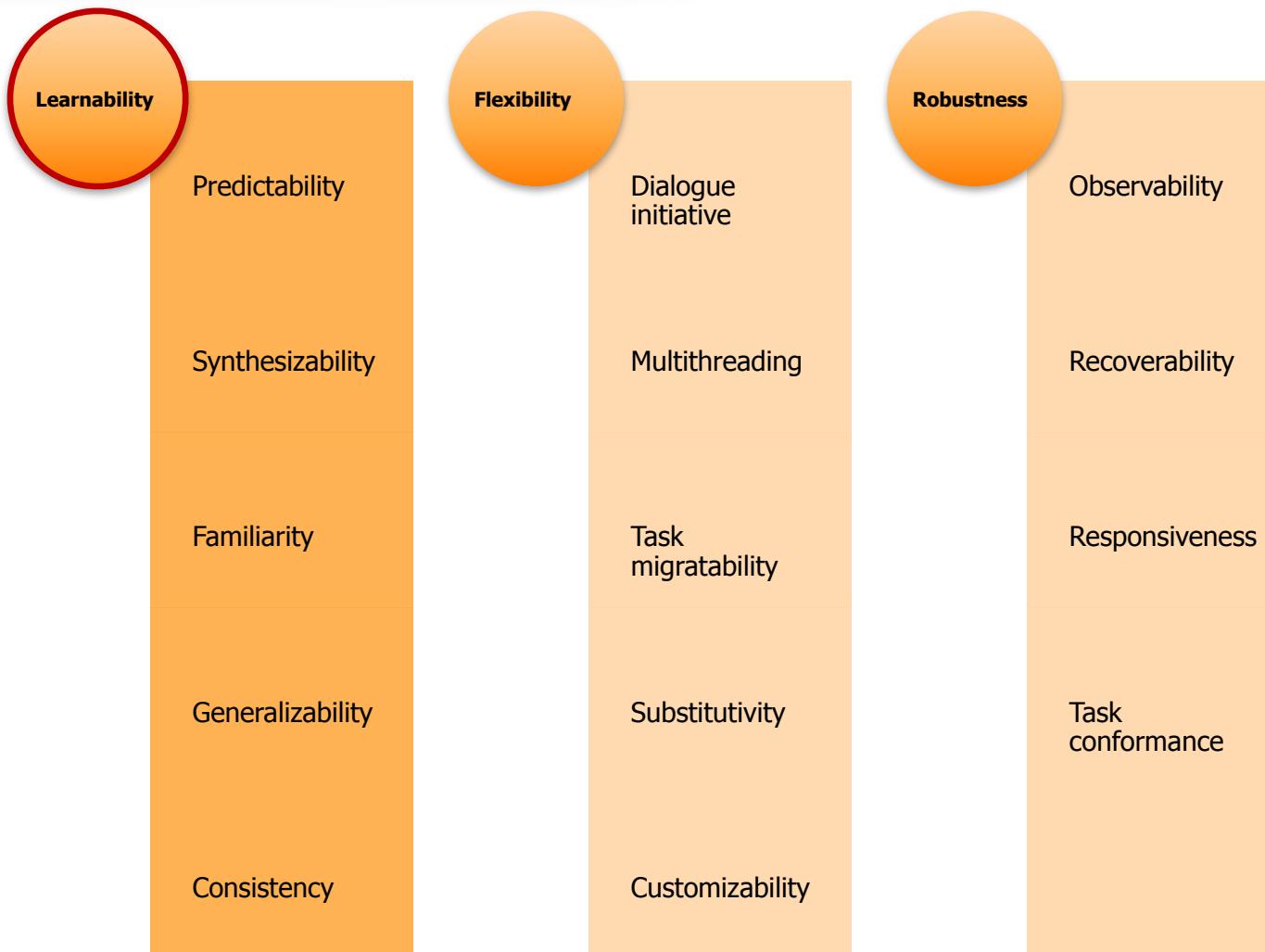
- the multiplicity of ways the user and system exchange information

Robustness

Robustez significa que as pessoas conseguem fazer as coisas que pretendem.

- the level of support provided to the user in determining successful achievement and assessment of goal-directed behaviour

Principles of usability



Principles of learnability 1/5

Predictability

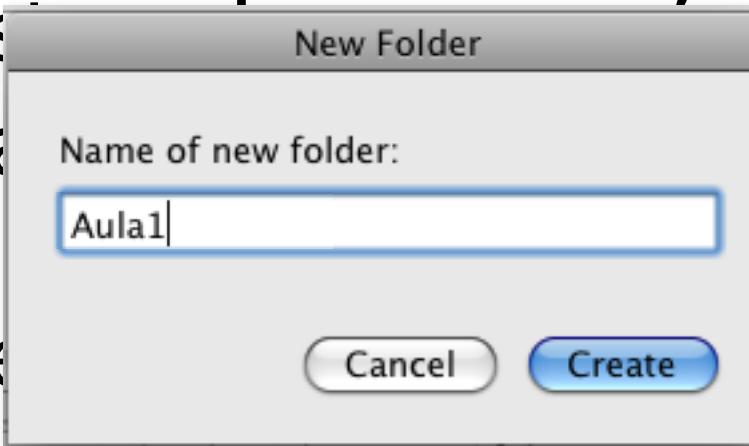
Ser previsível é mais fácil de aprender, é ser capaz de prever qual o

- Ability to determine the effect of actions on the system
- Non-determinism:
 - System view vs. user's view
 - Available information enough?
 - Ex.: Criar uma nova pasta no diálogo 'Save As...' (Mac)

Principles of learnability 1/5

Predictability

- Ability to determine the effect of actions on the system
- Non-determinism:

- Systematic approach
 - Available options
 - Examples
- 'Save' dialog box example:
- 
- view
ough?
no diálogo

Principles of learnability 1/5

Predictability

- Ability to determine the effect of actions on the system
- Non-determinism:

- System provides feedback
 - Available options
 - Examples
- 'Save' button
-
- New Folder
- Name of new folder:
Aula1
- Cancel Create
- New Folder
- Name of new folder:
Aula1
- This name is already taken.
- Cancel Create

Principles of learnability 1/5

Predictability

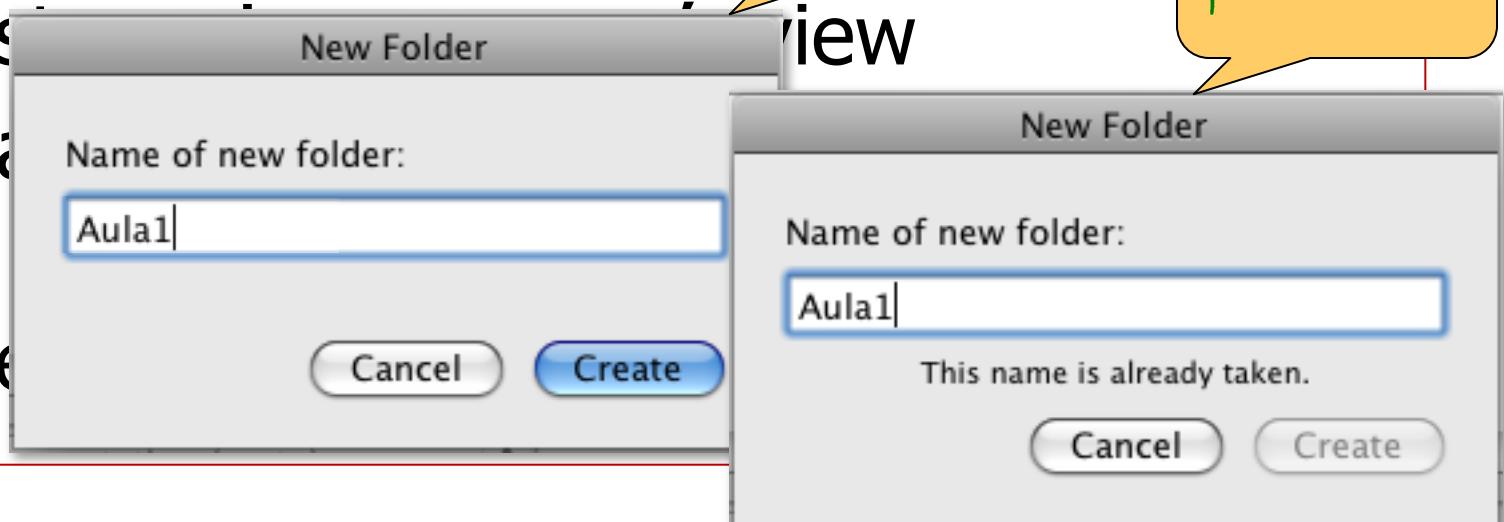
- Ability to determine the effect of actions on the system
- Non-determinism:

- System provides feedback

- Available options

- Ex.: 'Save' dialog

- 'Save' dialog



Principles of learnability 2/5

Synthesizability (of mental model)

- Assessing the effect of past actions on current state
- Honesty: ability of user interface to provide information about state changes
 - Immediate vs. Eventual honesty
- Ex.: Notificação de envio de SMS num telemóvel.

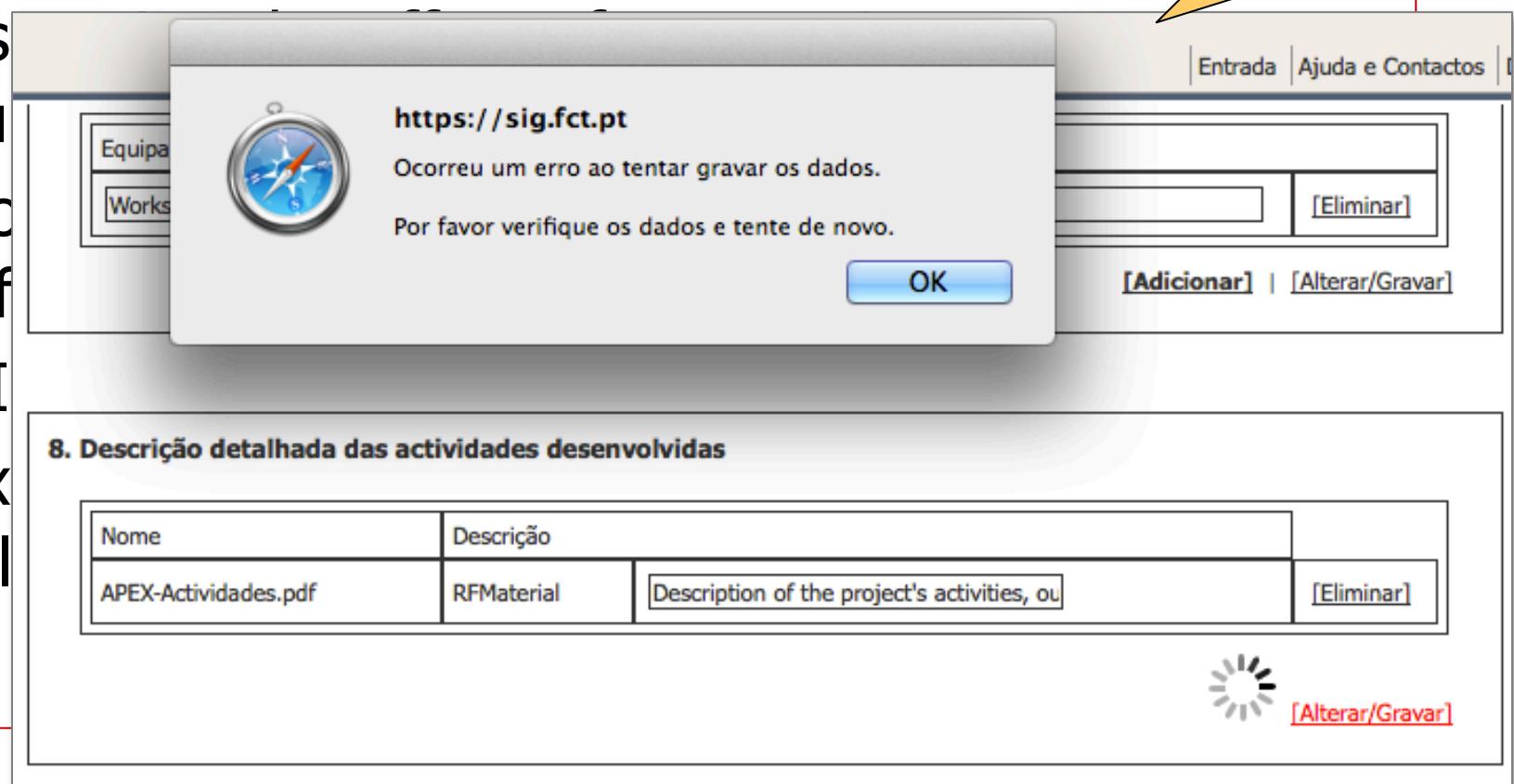
Ser possível sintetizar um modelo mental da interface, o que a aplicação faz; É p

Principles of learnability 2/5

Synthesizability (of mental mode)

negative example!

- Asks questions that can be answered by the user
- Has clear feedback information
- Is consistent with the user's mental model
- Extends the user's knowledge



Principles of learnability 2/5

Synthesizability (of mental mode)

negative example!

- Assessing the effect of past actions on current state
- How to infer information
- Implementation
- Example: telephone system

The screenshot shows a software interface with two main sections. The top section is a table for equipment management:

Equipamento	Nº Recibo	Data	Observações
Workstation Base Valor € 250.00 €	ID-005/2011	09-06-2011	[Empty]

Buttons at the bottom right of this section are [Adicionar] and [Alterar/Gravar].

The bottom section is a table for detailed activity descriptions:

8. Descrição detalhada das actividades desenvolvidas	
Nome	Descrição
APEX-Actividades.pdf	RFMaterial Description of the activities, outputs and

Buttons at the bottom right of this section are [Alterar/Gravar] and [Eliminar]. A red message at the bottom right says "Dados Gravados com sucesso!".

Principles of

Apresentar as coisas de uma maneira que as pessoas conheçam; Conseguir

Familiarity

- How prior knowledge applies to a new system
 - about the world
 - about other systems
- Use of **metaphors** can help
- Examples:
 - Timetables
 - Lack of adoption of Open Source software?

Como o conhecimento prévio se apli

Principles of learnability 3/5

Familiarity

[imprimir](#)

Nome: José Francisco Creissac Freitas Campos 1076

30/03/2015 - 02/04/2015

	segunda-feira	terça-feira
14:00	Programação Orientada aos Objetos [EEUM_G - DI-1.04]	Sistemas Interactivos [EEUM_G - DI-0.05]
15:00	PL2	Sistemas Interactivos [EEUM_G - DI-0.05]
16:00		TP1
17:00		
18:00	Programação Orientada aos Objetos [EEUM_G - DI-0.11]	Programação Orientada aos Objetos [EEUM_G - DI-0.11]
19:00	PL6	PL5

more familiar

new system

less familiar

O meu Horário					
Disciplina	Dia da Semana	Ano Lectivo	Horas	Tipo aula	
530807 - Desenvolvimento de Sistemas Informação	ter	02/03	11h-13h	teórica	
530807 - Desenvolvimento de Sistemas Informação	ter	02/03	18h-20h	teórica-prática	
7008N8 - Desenvolvimento de Sistemas Informação	ter	02/03	11h-13h	teórica	
530405 - Paradigmas da Programação IV	qua	02/03	09h-11h	teórica-prática	
530405 - Paradigmas da Programação IV	qui	02/03	09h-11h	teórica-prática	
530405 - Paradigmas da Programação IV	qui	02/03	15h-17h	teórica-prática	
001011 - Interacção Humano-Computador	sab	02/03	11h-13h	teórica	

[imprimir](#)

Principles of learnability 4/5

Generalizability

Uma coisa que se possa fazer num

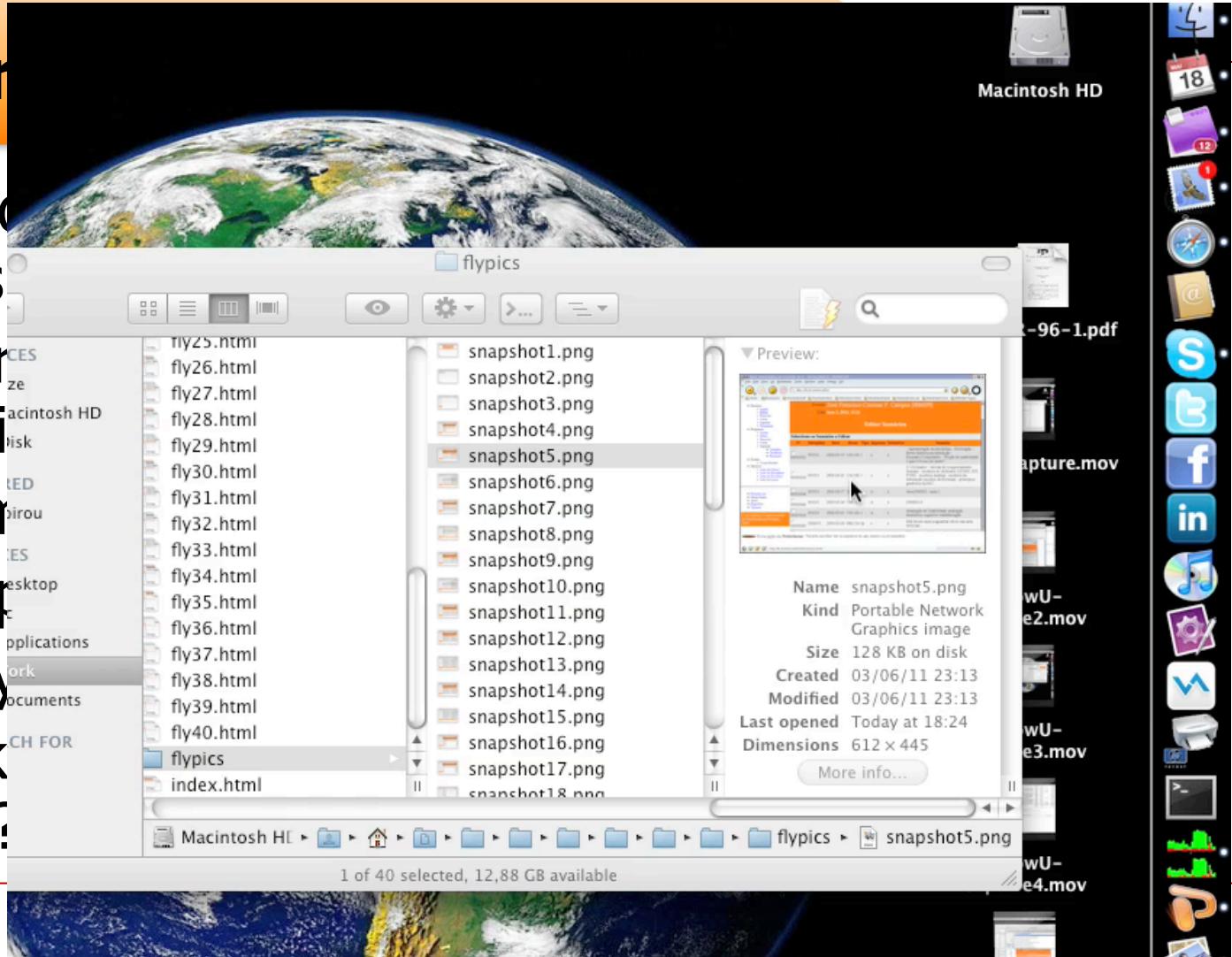
- Extending specific interaction knowledge to new situations
- Explores users' ability to compare similar situations
- A form of **consistency**
- Examples:
 - Copy&Paste services
 - Lack of Drag&Drop to Apps on some Mac OSs?

Estendendo conhecimento de interação específico

Principles of learnability 4/5

General

- Extended knowledge through new situations
- Exploration of situations
- A form of trial and error
- Examples
- Copying
- Lack of OS support for OSs:



Principles of learnability 5/5

Consistency

O principio mais importante e mencionada; O comportamento

- Probably the **most mentioned principle!**
- Likeness in input/output behaviour in similar situations or task objectives
- Internal consistency
 - Inside the application
 - Example: Toyota AC
- External consistency
 - Between one application and the rest of the system
 - Example: Mac apps menu

Provavelmente o princípio mais mencionado! Se

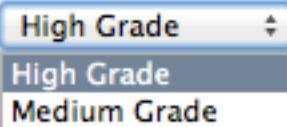
Principles of learnability 5/5

Consistency

- Probably the **most mentioned principle!**
- Likeness in input/output behaviour in similar situations or task objectives
- Internal consistency

*Lack of
internal consistency!*

A seguinte caixa permite selecionar a força criptográfica da sua chave. Aconselhamos que selecione 1024 por ser a mais segura e, simultaneamente, não comprometer a compatibilidade com sistemas de correio dos destinatários com quem se vai corresponder.



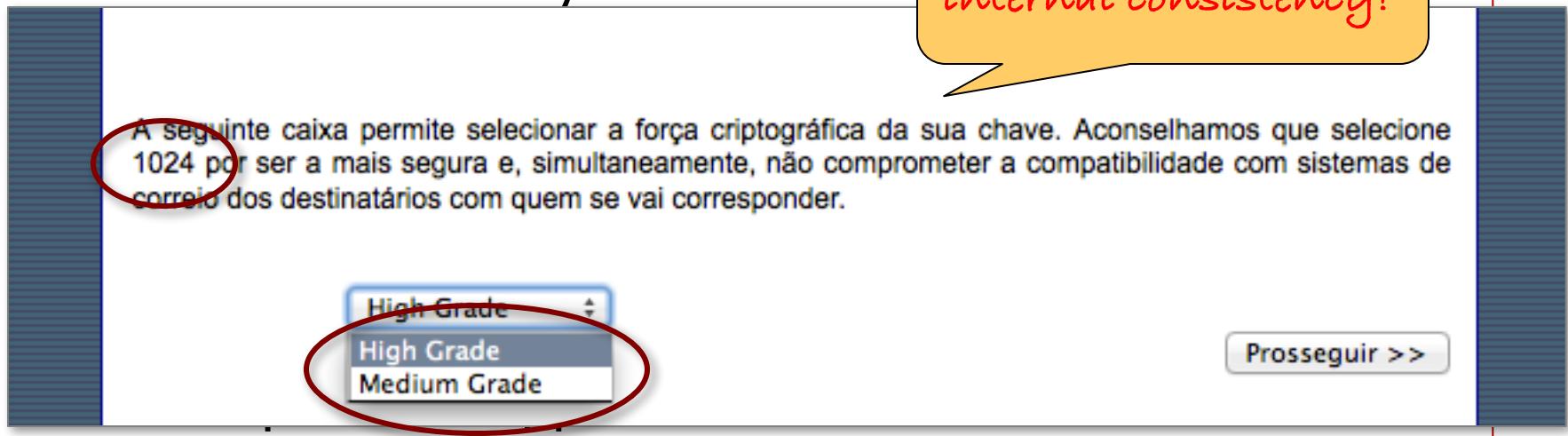
[Prosseguir >>](#)

Principles of learnability 5/5

Consistency

- Probably the **most mentioned principle!**
- Likeness in input/output behaviour in similar situations or task objectives
- Internal consistency

*Lack of
internal consistency!*



Principles of learnability 5/5

Consistency

- Probably the **most mentioned principle!**
- Likeness in input/output behaviour in similar situations or task objectives
- Internal consistency
 - Inside the application
 - Example: Toyota AC
- External consistency
 - Between one application and the rest of the system
 - Example: Mac apps menu

Lack of
internal consistency!
(five identical buttons, five
different behaviours)



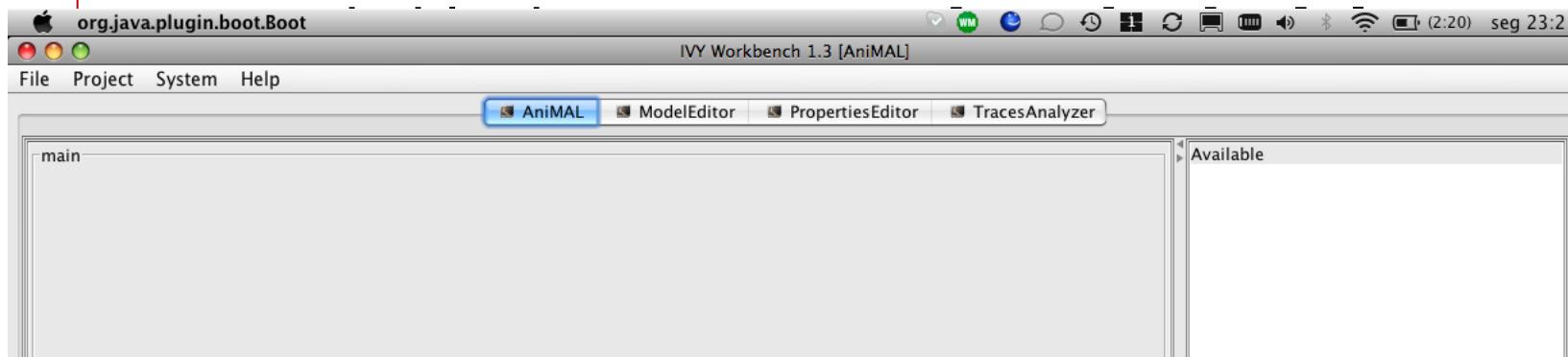
Principles of learnability 5/5

Consistency

- Probably the **most mentioned principle!**
- Likeness in input/output behaviour in similar situations or task objectives
- Internal consistency
 - Inside the application
 - Example: Toyota AC
- External consistency
 - Between one application and the rest of the system
 - Example: Mac apps menu

Principles of learnability 5/5

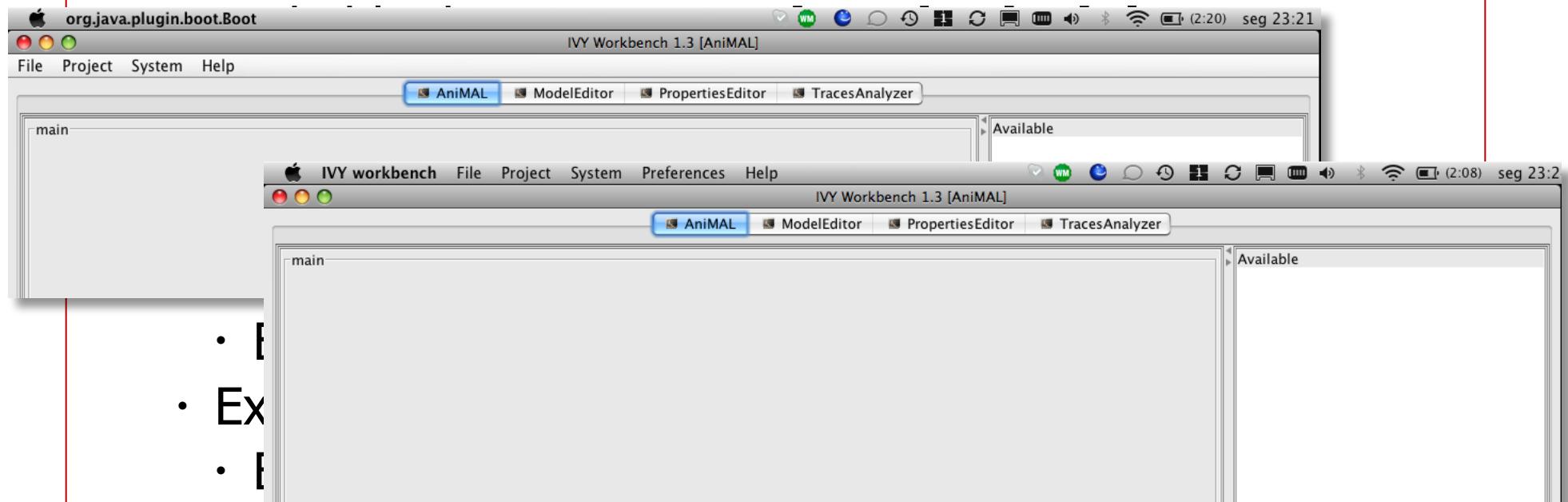
Consistency



- Example: Toyota AC
- External consistency
 - Between one application and the rest of the system
 - Example: Mac apps menu

Principles of learnability 5/5

Consistency



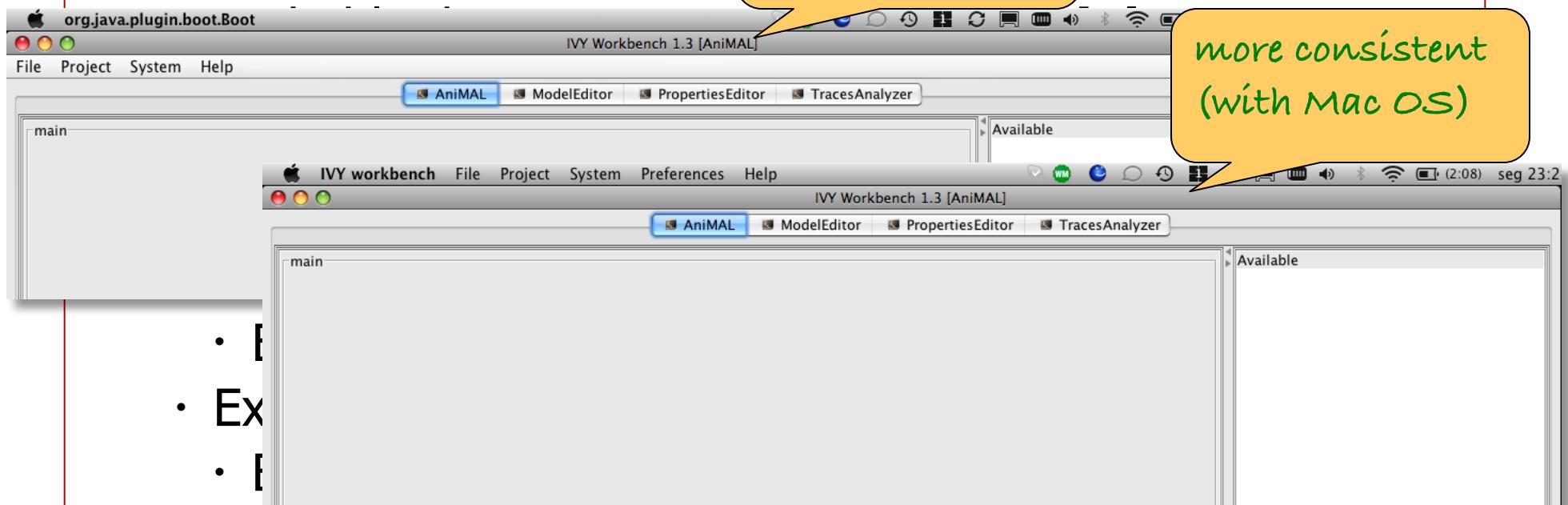
- [
- Example
- [
- system
- Example: Mac apps menu

Principles of learnability 5/5

Consistency

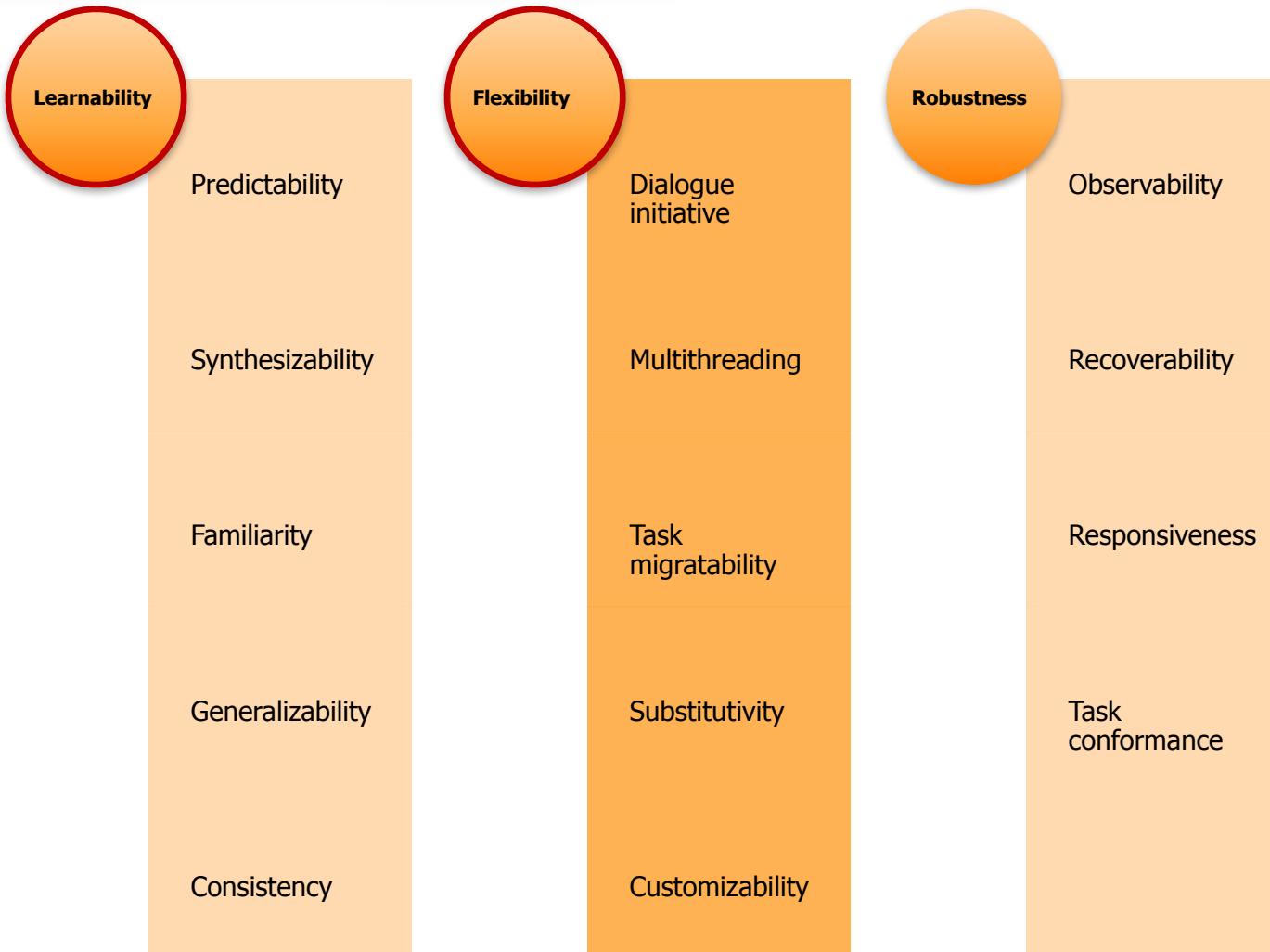
less consistent
(with Mac OS)

more consistent
(with Mac OS)



- []
- Example
- []
- system
- Example: Mac apps menu

Principles of usability



Principles of flexibility 1/5

Dialogue initiative

- System control (less flexibility)
 - Ex.: modal dialogue; wizard; deep menu structures
- User control (more flexibility)
 - Ex.: toolboxes; navigating the web; direct manipulation
- Goal is to maximize user control(?!)
 - Sometimes we want/need to guide users...
 - Good knowledge of tasks will help create feeling of user control
- Ex. : making search available in input fields

Quem toma a iniciativa do dialogo, quem

Principles of flexibility 1/5

D

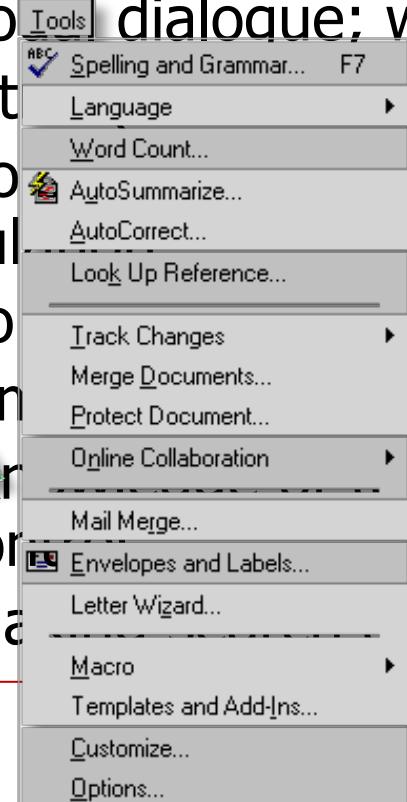
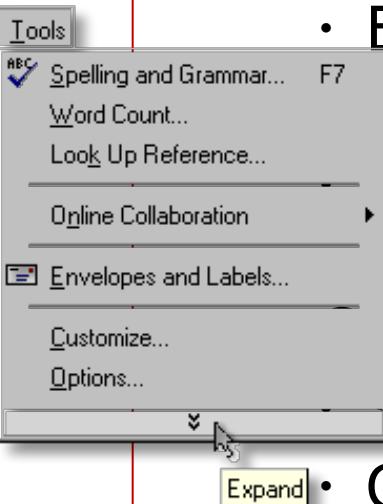
more system control
(too much for most people!)

- Ex.: modal dialogue; wizard
- Ex.: too many controls
- Ex.: too much manipulation
- Ex.: modal dialogues; wizard is too much control
- Ex.: modal dialogues; wizard is too much control
- Good for user control
- Ex. : modal dialogues; wizard is too much control

more user control

(too much for some people?)

```
jfc@flyingmorcego.di.uminho.pt: /home/jfc
jfc@flyingmorcego.di.uminho.pt ~
$ ssh -X morcego.gsim.di.uminho.pt
jfc@morcego.gsim.di.uminho.pt's password:
Last login: Fri Mar  4 03:02:44 2005 from vpnserver.di.uminho.pt
[jfc@flyingmorcego jfc]$ ls
20042005-OpcãoIII-Inscrições.pdf  ivg.ps
Archive/
bin/
cartaD.jpg
ceiareis.jpg
config.xml
Desktop/
Desktop1/
Documents/
ds@
Ensino/
ESI_3.pdf
flier.pdf
Fun/
Gestao/
Investigacao/
Invitation.pdf
[jfc@flyingmorcego jfc]$
```



available in input fields

Principles of flexibility 2/5

Multithreading

- The ability of system to support user interaction for more than one task at a time
- Interleaved multithreading
 - Ex.: windowing system (input)
- Concurrent multithreading
 - Ex. 1: multimodality with fusion ("copy that to there")
 - Ex. 2: windowing system (output)

Pr

The screenshot shows a Google Maps search interface. In the search bar at the top, the word "Braga" is typed. Below the search bar, a dropdown menu lists several locations:

- Bragança Paulista - São Paulo, Brazil
- Braga, Portugal
- Bragaw Street, Anchorage, AK, United States
- Bragadiru, Ilfov, Romania
- Bragança - Para, Brazil

On the left side of the map, there is a sidebar with a red border containing the following text:

Get directions My place
United States
Not your current location
Put your business on Google Maps

Below the sidebar, there is a button labeled "Experience MapsGL" next to a small 3D building icon.

The main area shows a satellite map of North America, specifically the United States and parts of Canada and Mexico. A zoom control is visible on the left side of the map. At the bottom, there is a scale bar indicating 500 miles and 500 km, and a copyright notice: "Imagery ©2013 TerraMetrics, Map data ©2013 Google, INEGI".

Principles of flexibility 3/5

Task migrability

- Passing responsibility for task control between user and system
- A task can be internal to user, internal to system, or shared
 - Ex. 1: Spell checking of a text document
 - Ex. 2: Cruise control
 - Mudança de “modo” cria complicações

Principles of flexibility 4/5

Substitutivity

- Allowing equivalent values to be substituted for each other (typically input)
 - Good alternative to error messages
 - Can minimize user errors and cognitive effort
- Representation multiplicity
 - Substitutivity also at the output
 - Ex.: Different views in a word processor
- Equal opportunity
 - Eliminating distinction between input and output
 - Ex.: input de datas; conversões

Principles of flexibility 4/5

Substitutivity

- Allowing equivalent values to be substituted for each other (typically input)
 - Good alternative to error messages
 - Can minimize user errors and cognitive effort
- Representation multiplicity
 - Substitutivity also at the output
 - Ex.: Different views in a word processor
- Equal opportunity
 - Eliminating distinction between input and output
 - Ex.: input de datas; conversões

Principles of flexibility 4/5

high substitutivity
(in due date)

The image shows five separate windows of a software application, likely a project management tool, demonstrating the concept of high substitutivity in due dates. Each window contains fields for Project, Context, Estimated Time, Start, Due, Completed, Added, and Changed. The 'Due' field is highlighted in each window, showing different values: '2009/05/15 17:00', 'next friday', '1 week', '1w', and '2009/06/01 17:00'. A red box surrounds the third window, and a yellow speech bubble with the text 'high substitutivity (in due date)' points to it.

- Ex.: input de datas; conver

Principles of flexibility 4/5

Substitutivity

- Allowing equivalent values to be substituted for each other (typically input)
 - Good alternative to error messages
 - Can minimize user errors and cognitive effort
- Representation multiplicity
 - Substitutivity also at the output
 - Ex.: Different views in a word processor
- Equal opportunity
 - Eliminating distinction between input and output
 - Ex.: input de datas; conversões

Principles of flexibility 4/5

Substitutivity

- Allowing equivalent values to be substituted for each other (typically input)
 - Good alternative to error messages
 - Can minimize user errors and cognitive effort
- Representation multiplicity
 - Substitutivity also at the output



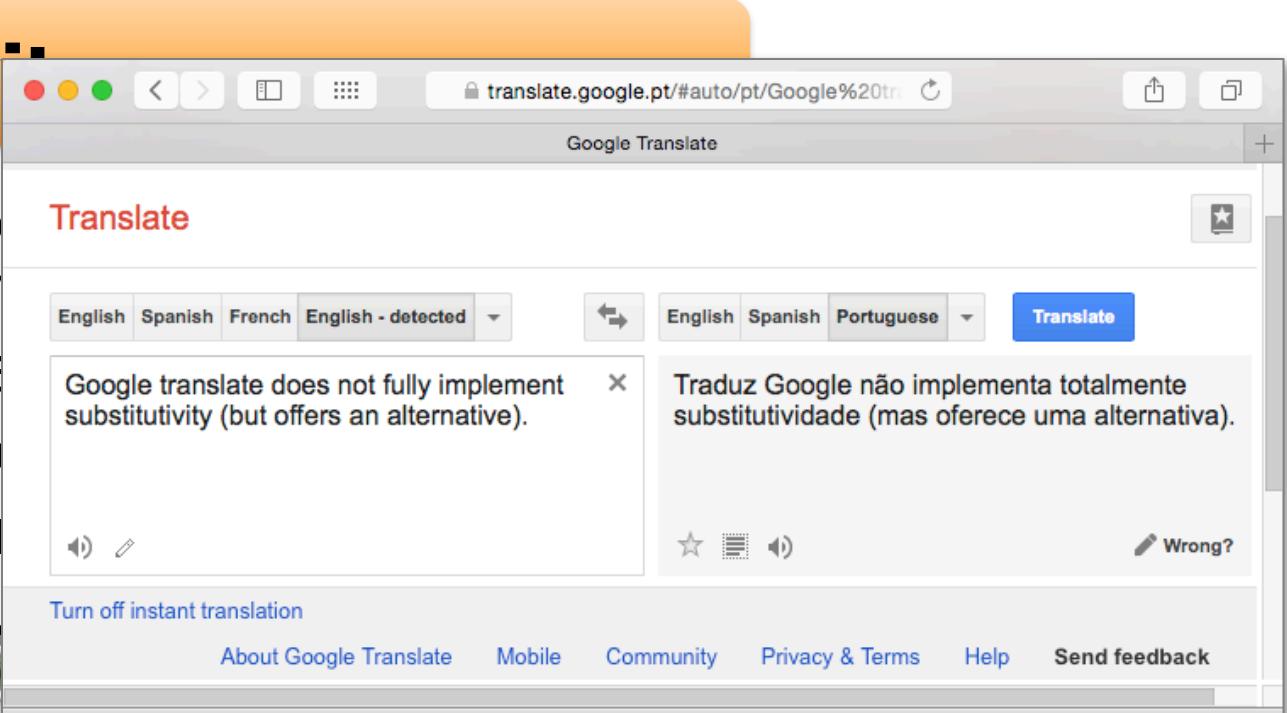
a word processor

between input and output
conversões

Principles of flexibility 4/5

Substitutivity

- Allowing equivalent representations to each other (typical of AI)
- Good alternative to equivalence
- Can minimize search space
- Representation independence
- Substitutivity



between input and output
conversões

Principles of flexibility 4/5

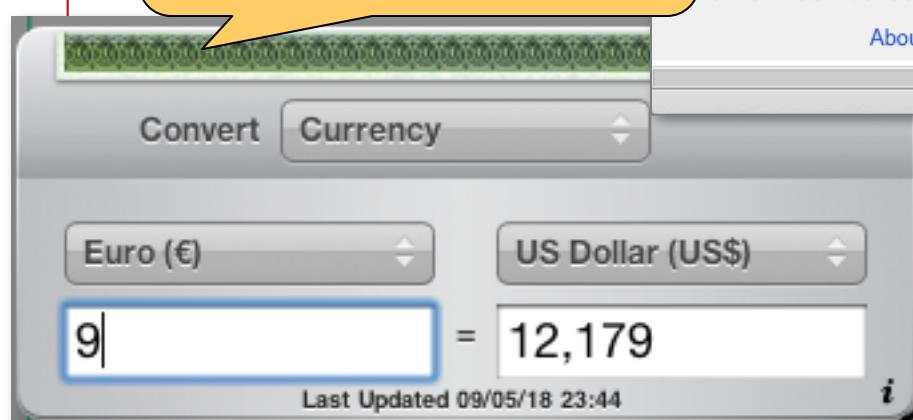
less substitutivity
(no equal opportunity;
alternative implemented)

Substitutivity

- Allowing equivalent each other (typical)
- Good alternative

Can minimize

more substitutivity
(equal opportunity)



between input and output
conversões

Principles of flexibility 5/5

Customizability

- Modifiability of the user interface
- Adaptability (Adaptabilidade)
 - Modified by the user
 - Ex.: toolbars; user interface scripting
 - Adaptivity (Adaptação)
 - Automatically modified by the system
 - Based on knowledge about the user – tricky!
 - Ex.: MS Windows™ adaptive menus
 - Based on knowledge about the device
 - Ex.: Responsive Web Design

Principles of flexibility 5/5

Adaptability
(user changes the system)

Customizability

- Modifiability of the system
- Adaptability (Adaptability)

Modifiability

Ex.: tools

daptability

Automati

• Based

on user

needs

• Based

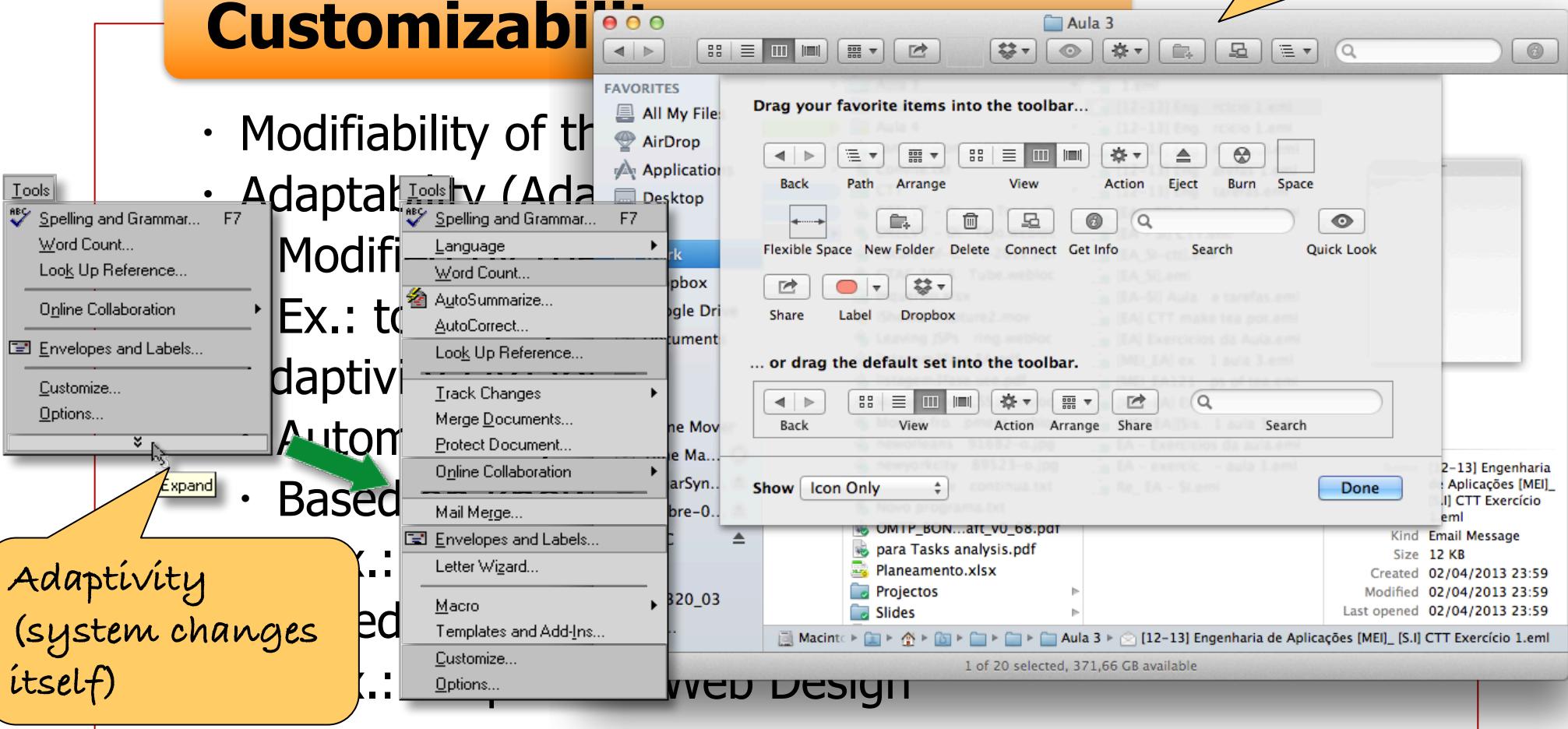
on user

needs

Adaptivity

(system changes

itself)



The screenshot shows the homepage of the Portuguese news website Público.pt. At the top, there's a navigation bar with links like 'EDIÇÃO IMPRESSA', 'LOJA', 'IMOBILIÁRIO', 'SERVIÇOS', 'CLASSIFICADOS', 'Iniciar sessão', and 'Registar'. A search bar is also present. Below the header, there's a main news article titled 'Julgamento de activistas angolanos chega ao fim com nova acusação' with a photo of people holding portraits. To the right, there's an advertisement for Comboios de Portugal (CP) featuring a green train ticket for a trip from Lisbon to Porto.

adaptivity
(to the device)

interface
(e)

Modified by the user

- Ex.: toolbars; user interface scripting
- Adaptivity (Adaptação)
 - Automatically modified by the system
 - Based on knowledge about the user – tricky!
 - Ex.: MS Windows™ adaptive menus
 - Based on knowledge about the device
 - Ex.: Responsive Web Design

Julgamento de activistas angolanos chega ao fim com nova acusação

Feriados voltam para mostrar que "há valores permanentes acima das conveniências conjunturais"

MARIA JOÃO LOPEZ

Costa repõe feriados não por populismo: há datas que não podem ser perdidas

Julgamento de activistas angolanos chega ao fim com nova acusação

ANA DIAS CORDEIRO Luaty Beirão

Luaty Beirão e outros 16 activistas saberão nesta segunda-feira se ficam presos ou em liberdade.

- Basicamente
- Ex.: Responsive Web
- Basicamente
- Ex.: Responsive Web

adaptivity
(to the device)

interface
(to the device)

adapting

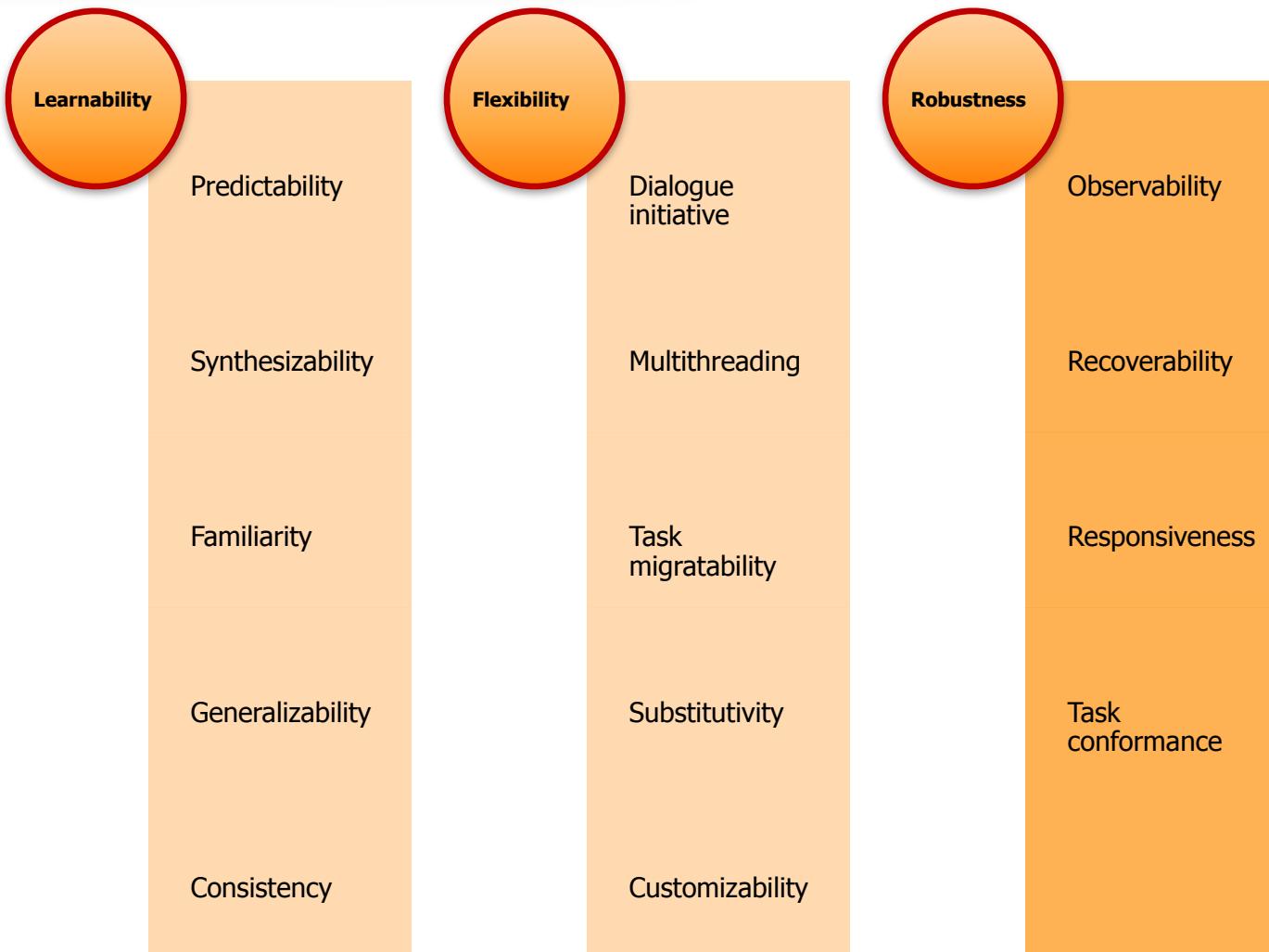
Particulares fogem do risco dos fundos e apostam em certificados e depósitos

PEDRO CRISÓSTOMO

O montante investido em unidades de participação era, há dois anos, o dobro do dinheiro aplicado em produtos de poupança públicos.

Particulares fogem do risco dos fundos e apostam em certificados e depósitos

Principles of usability



Principles of robustness 1/4

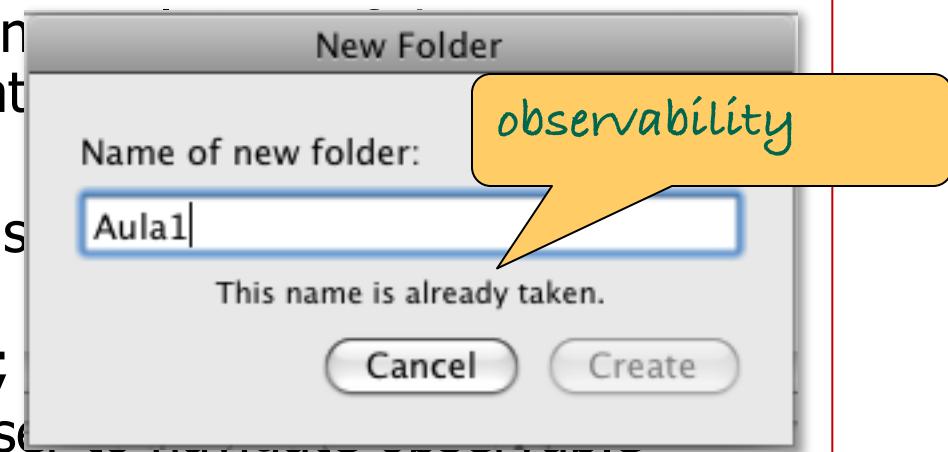
Observability

- Ability of user to evaluate the internal state of the system from its perceivable representation – c.f. Predictability
- Five aspects
 - browsability – possibility of user to explore current state (limited screen real-estate)
 - defaults – static vs. dynamic; passive recall
 - reachability – possibility of user to navigate observable states
 - persistence – sound vs. icon for notifications
 - operation visibility – what can be done is clear
- Ex.: Showing available slots on a Timetabling system

Principles of robustness 1/4

Observability

- Ability of user to evaluate the information from its perceivable representation
- Five aspects
 - browsability – possibility of users navigating through the system (limited screen real-estate)
 - defaults – static vs. dynamic;
 - reachability – possibility of users interacting with the system states
 - persistence – sound vs. icon for notifications
 - operation visibility – what can be done is clear
- Ex.: Showing available slots on a Timetabling system



Principles of robustness 1/4

Observability

- Ability of users to understand what is happening from its perspective
- Five aspects of observability:
 - browsability – how easy it is to find information (limited screen space)
 - defaults – what is the system's state when it starts up
 - reachability – what states can be reached from what states
 - persistence – sound vs. icon for each item
 - operation visibility – what can be done to each item
- Ex.: Showing available slots on a timetabling system

	Prototipagem	Soares Dias .		2016
Trabalho	Aula 4 - Análise de Tarefas	Ana Luisa da Cruz Pinheiro Coutinho .	15 de Março de 2016 17:04:01 ATRASADO	11 de Março de 2016
Trabalho	Aula 5 - Prototipagem	João Paulo Rodrigues Mano da Silva .	15 de Março de 2016 17:05:56	15 de Março de 2016
Trabalho	Aula 5 - Prototipagem	Jose Luis enes Ribeiro .	15 de Março de 2016 20:48:33 ATRASADO	
Trabalho	Aula 5 - Prototipagem	Sérgio Manuel Pereira Simões .	15 de Março de 2016 21:23:30 ATRASADO	2016

browsability

observability

flexibility/
customizability

Principles of robustness 1/4

Obs:

- Ability to recover from errors
- Five levels of robustness
- breaking (links)
- defining
- reading state
- persistency
- operation
- Example: ...

The screenshot shows a web interface for managing student grades. At the top, there's a navigation bar with links for Pesquisar Contactos, Braga, weather forecasts for Hoje (8-16), Amanhã (10-14), and Sábado (12-13), and menu items like ÁREA PESSOAL, ÁREA DE TRABALHO, QUALIDADE, RELATÓRIOS, and SAIR. Below the navigation is the UMinho logo and the text 'INTRANET - UMINHO'. The main content area is titled 'AS MINHAS PAUTAS' and includes tabs for 1º CICLO/MI, 2º CICLO, and 3º CICLO. A green success message says 'O ficheiro foi importado com sucesso' and 'Para gravar as classificações importadas, por favor, clique no botão "gravar pauta".' Below this is a table of student data:

UNIVERSIDADE DO MINHO	Ano lectivo 2013/2014	Época de Janeiro/Fevereiro	Pauta Normal
Curso: Licenciatura em Engenharia Informática			
Unidade Curricular: Desenvolvimento de Sistemas de Software			
Número	Aluno	Reg	Classificaç
60988	Agostinho Abilio Cardoso Fernandes	ORD	R
38620	Alexandre Filipe Vilaça Fernandes	ORD	F
64307	André David Gomes Monteiro oliveira	ORD	13
64322	André Diogo Ribeiro Assunção Pereira	ORD	12
57758	André Fafe Fernandes Ferreira de Melo	ORD	F
61018	André Sá Silva	ORD	13
42949	António Carlos de Almeida Brandão Capelo	T-E	18
19671	António César Monteiro da Silva	ORD	F

A yellow callout bubble on the right contains the text 'how to save marks? lack of operation visibility'.

Principles of robustness 1/4

Obs:

- Ability to recover from errors
- Five levels of robustness
- breaking (links)
- defining
- reading state
- persistency
- operation
- Example: ...

The screenshot shows a web interface for managing student grades. At the top, there's a navigation bar with links for Pesquisar Contactos, Braga, weather forecasts for Hoje (8-16), Amanhã (10-14), and Sábado (12-13), and menu items like ÁREA PESSOAL, ÁREA DE TRABALHO, QUALIDADE, RELATÓRIOS, and SAIR. Below the navigation is the INTRANET - UMINHO logo and a menu with ENSINO & ID, INFORMAÇÃO PROFISSIONAL, VIDA NOS CAMPUS, COMUNICAÇÃO, and SUGESTÕES & RECLAMAÇÕES.

The main content area is titled "AS MINHAS PAUTAS". It shows a message: "O ficheiro foi importado com sucesso. Para gravar as classificações importadas, por favor, clique no botão "gravar pauta".

Below this, a table lists student grades:

Número	Aluno	Reg	Classificação
60988	Agostinho Abilio Cardoso Fernandes	ORD	R
38620	Alexandre Filipe Vilaça Fernandes	ORD	F
64307	André David Gomes Monteiro oliveira	ORD	13
64322	André Diogo Ribeiro Assunção Pereira	ORD	12
57758	André Fafe Fernandes Ferreira de Melo	ORD	F
61018	André Sá Silva	ORD	13
42949	António Carlos de Almeida Brandão Capelo	T-E	18
19671	António César Monteiro da Silva	ORD	F

A yellow callout bubble with red text contains the following text: "how to save marks? lack of operation visibility". A large orange arrow points downwards from this bubble towards the right side of the table.

Principles of robustness 1/4

Obs

- Ability to handle missing values from the database
- Five ways to handle missing values
- breaking ties (linear order)
- dealing with outliers
- readability of results
- stability of results
- performance
- options
- Examples

57779	Sérgio Manuel Rodrigues Caldas	T-E	11
57799	Tarcísio Júnio Lima Malheiro	ORD	10
60030	Tiago Alexandre Rocha Gomes Miranda da Silva	MEL	14
64352	Tiago Fernando dos Santos Braga Fernandes	ORD	13
54713	Tiago Filipe Alves Fonseca da Silva Augusto	T-E	R
55171	Tiago João Ferreira da Conceição	ORD	15
64346	Tiago Luís Santos Loureiro	ORD	14
64381	Tiago Manuel da Silva Santos	ORD	12
61083	Tiago Manuel Monteiro Ferreira de oliveira	ORD	R

how to save marks?

PREENCHIMENTO AUTOMÁTICO
PREENCHER AS CLASSIFICAÇÕES RESTANTES COM O VALOR SELECIONADO

classificação

EXPORTAÇÃO E IMPORTAÇÃO
PARA A IMPORTAÇÃO DO FICHEIRO, TERÁ QUE MANTER A EXTENSÃO .CSV

O ficheiro foi importado com sucesso

ficheiro no file selected

LEGENDA

10 a 20 valores

D Desistiu

F Faltou

NA Não Admitido

R Reprovado

SF Sem Frequência

Principles of robustness 1/4

Obs

- Ability to handle missing values from user input
- Five ways to handle missing values
- breaking down the logic (linear)
- defining the rules
- reading the data and starting again
- performing validation
- open ended
- Example:

57779	Sérgio Manuel Rodrigues Caldas	T-E	11
57799	Tarcísio Júnio Lima Malheiro	ORD	10
60030	Tiago Alexandre Rocha Gomes Miranda da Silva	MEL	14
64352	Tiago Fernando dos Santos Braga Fernandes	ORD	13
54713	Tiago Filipe Alves Fonseca da Silva Augusto	T-E	R
55171	Tiago João Ferreira da Conceição	ORD	15
64346	Tiago Luís Santos Loureiro	ORD	14
64381	Tiago Manuel da Silva Santos	ORD	12
61083	Tiago Manuel Monteiro Ferreira de oliveira	ORD	R

how to save marks?

PREENCHIMENTO AUTOMÁTICO
PREENCHER AS CLASSIFICAÇÕES RESTANTES COM O VALOR SELECIONADO

classificação

EXPORTAÇÃO E IMPORTAÇÃO
PARA A IMPORTAÇÃO DO FICHEIRO, TERÁ QUE MANTER A EXTENSÃO .CSV

O ficheiro foi importado com sucesso

ficheiro no file selected

LEGENDA

10 a 20 valores

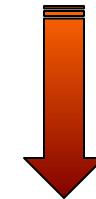
D Desistiu

F Faltou

NA Não Admitido

R Reprovado

SF Sem Frequência



Principles of robustness 1/4

Observability

- Ability to observe what's happening from outside the system
- Five types of observability:
 - breaking down (line by line)
 - defining what's important
 - reading state
 - reading status
 - performance
 - operations
- Ex.: System status

The screenshot shows a software application window with several functional areas:

- PREENCHIMENTO AUTOMÁTICO:** A section for automatically filling remaining fields based on selected values. It includes a dropdown menu labeled "classificação" with the placeholder "escolha uma opção" and a "PREENCHER" button.
- EXPORTAÇÃO E IMPORTAÇÃO:** A section for exporting and importing data. It shows a green success message "O ficheiro foi importado com sucesso", a "ficheiro" input field with "Choose File" and "no file selected", and "EXPORTAR" and "IMPORTAR" buttons.
- LEGENDA:** A legend table mapping codes to descriptions:

Código	Descrição
10 a 20 valores	
D Desistiu	
F Faltou	
NA Não Admitido	
R Reprovado	
SF Sem Frequência	
- GRAVAR:** A "GRAVAR" button located at the bottom right of the main area.

A large orange speech bubble on the right side contains the text: "Lack of observability (operation visibility)".

At the bottom of the screen, there are logos for COMPETE, QREN, and the European Union, along with the text "COPRIGHT 2013 UNIVERSIDADE DO MINHO".

Principles of robustness 2/4

Recoverability

- The ability of users to take corrective action
- Forward recovery (e.g. when error cannot be undone)
 - accepting error state and working from there
 - Ex.: input validation
- Backward recovery
 - **undo** to return to previous state
 - Commensurate effort
 - Hard to undo effects should be hard to do
 - Easy to undo effect should be easy to do
 - Ex.: Trash can
 - easier to undo delete means no delete confirmation needed
 - emptying the trash can cannot be undone so confirmation should be requested

Principles of robustness 2/4

Recoverability

- The ability of users to take corrective action
- Forward recovery
- actions
- Examples
- Backward recovery
- URLs
- Comments
- History
- Error handling
- Ease of use
- Examples

The screenshot shows a web application interface with a modal dialog and a table.

Modal Dialog (Forward Recovery):

- Icon: Safari compass icon.
- URL: <https://sig.fct.pt>
- Message:

Ocorreu um erro ao tentar gravar os dados.
Por favor verifique os dados e tente de novo.
- Buttons: OK, [Adicionar], [Alterar/Gravar]

Table (Backward Recovery):

8. Descrição detalhada das actividades desenvolvidas

Nome	Descrição
Material	Description of the project's activities, ou

[Eliminar] [Alterar/Gravar]

Annotations:

- A yellow callout bubble points to the "OK" button in the modal with the text "forward recovery".
- A yellow callout bubble points to the "Description of the project's activities" table with the text "backward recovery".

Date updated UNDO HIDE

Principles of robustness 3/4

Responsiveness

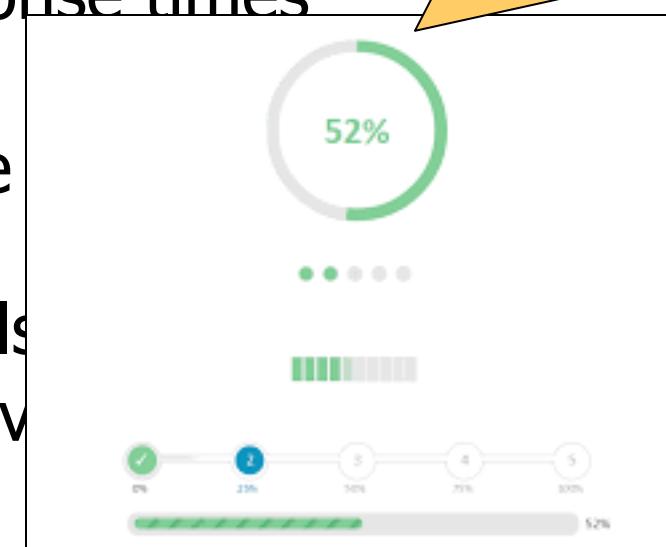
- How users perceive rate of communication with the system
- Short or instantaneous response times
 - From the user perspective
 - When not possible, provide indication of activity
- Stability of response times also relevant
 - Ex. Menus response times vs motor skills

Principles of robustness 3/4

Responsiveness

- How users perceive rate of communication with the system
- Short or instantaneous response times
 - From the user perspective
 - When not possible, provide activity
- Stability of response times also
 - Ex. Menus response times vs

compensating for poor responsiveness



Principles of robustness 4/4

Task conformance

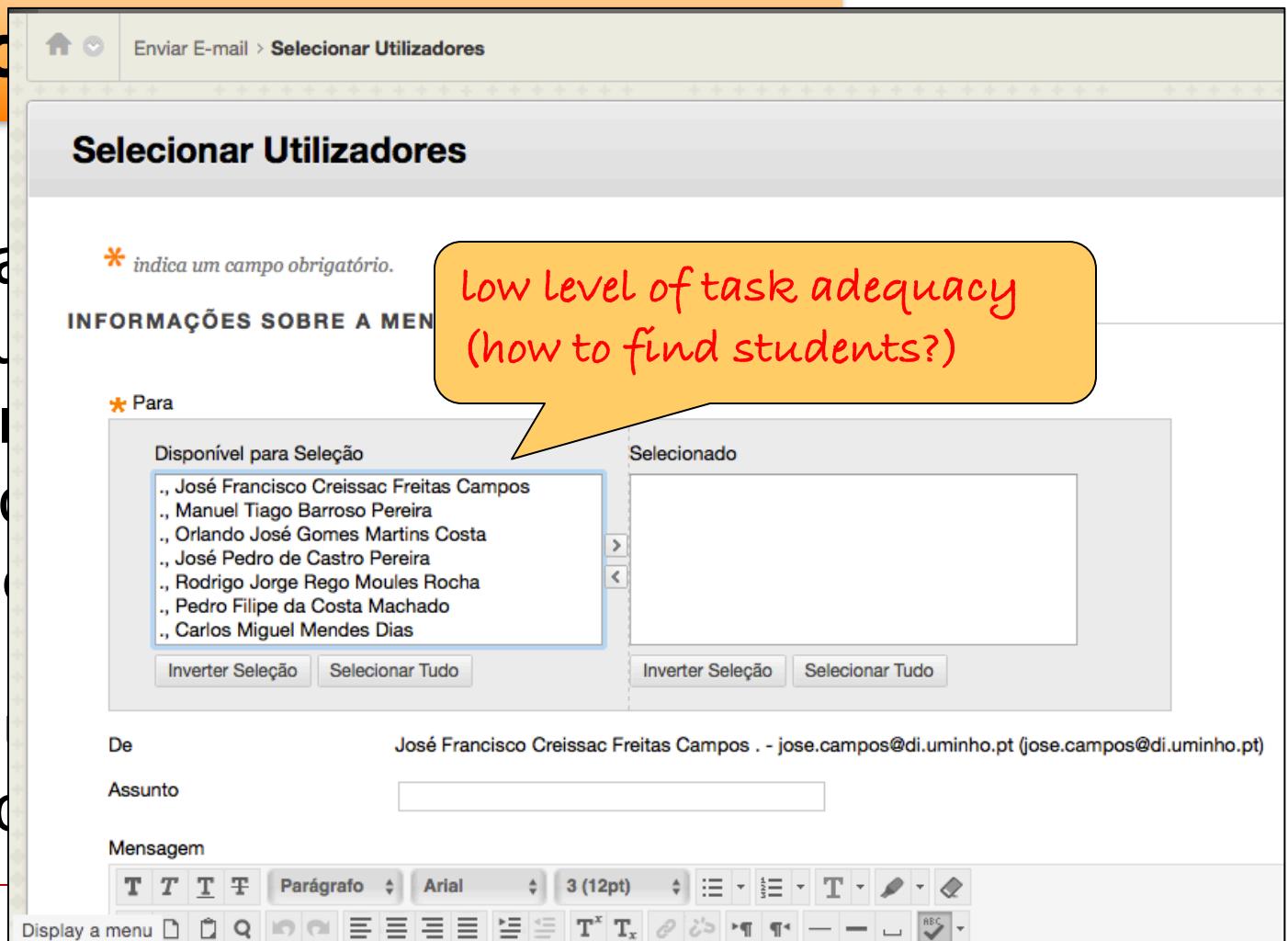
- Degree to which system services support the users' tasks
 - C.f. Gulf of Execution
- Task completeness
 - Level of support for users tasks
- Task adequacy
 - Match between system support for task and users understanding of task
- Exemplo: Adicionar autores a uma publicação?

Principles of robustness 4/4

Also, lackin in flexibility/
costumizability (sort order?)

Task co...

- Degree of users' tasks
- C.f. Guidelines
- Task consistency
- Level of difficulty
- Task adequacy
- Matching users
- Examples



Principles of usability

