



ANALYSING GENDER DIFFERENCES IN BUILDING SOCIAL GOAL MODELS: A QUASI-EXPERIMENT

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Universidade NOVA de Lisboa, Portugal

25 September, 2019



FACULDADE DE
CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA



NOVALINCS
LABORATORY FOR COMPUTER
SCIENCE AND INFORMATICS



COGNITIVE DIVERSITY AFFECTS HOW
DIFFERENT PEOPLE USE THE **SAME** SOFTWARE

INDIVIDUAL CHARACTERISTICS IN HOW PEOPLE SOLVE PROBLEMS OFTEN CLUSTER BY **GENDER**





IN SOFTWARE SYSTEMS, FEATURES ARE MORE SUPPORTIVE OF
PROBLEM-SOLVING PROCESSES FOLLOWED BY **MALES**

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software



Information processing style

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software



Information processing style



Computer self-efficacy

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software



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Computer self-efficacy



Attitude towards risk

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software



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Computer self-efficacy



Attitude towards risk



Ways of learning new technology

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Motivation for using the software



Information processing style



Computer self-efficacy



Attitude towards risk



Ways of learning new technology



Abby

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software
To perform tasks



Information processing style



Computer self-efficacy



Attitude towards risk



Ways of learning new technology



Abby

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software
To perform tasks



Information processing style
Comprehensive



Computer self-efficacy



Attitude towards risk



Ways of learning new technology



Abby

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software

To perform tasks



Information processing style

Comprehensive



Computer self-efficacy

Low



Attitude towards risk



Ways of learning new technology



Abby

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software

To perform tasks



Information processing style

Comprehensive



Computer self-efficacy

Low



Attitude towards risk

Risk-averse



Ways of learning new technology



Abby

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Motivation for using the software

To perform tasks



Information processing style

Comprehensive



Computer self-efficacy

Low



Attitude towards risk

Risk-averse



Ways of learning new technology

Process-oriented



Abby

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Motivation for using the software



Information processing style



Computer self-efficacy



Attitude towards risk



Ways of learning new technology



Abby



Tim

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software
Source of fun



Information processing style



Computer self-efficacy



Attitude towards risk



Ways of learning new technology



Abby



Tim

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software
Source of fun



Information processing style
Selective



Computer self-efficacy



Attitude towards risk



Ways of learning new technology



Abby



Tim

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software
Source of fun



Information processing style
Selective



Computer self-efficacy
High



Attitude towards risk



Ways of learning new technology



Abby



Tim

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software

Source of fun



Information processing style

Selective



Computer self-efficacy

High



Attitude towards risk

Risk-tolerant



Ways of learning new technology



Abby



Tim

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software
Source of fun



Information processing style
Selective



Computer self-efficacy
High



Attitude towards risk
Risk-tolerant



Ways of learning new technology
Tinkering



Abby



Tim

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software



Information processing style



Computer self-efficacy



Attitude towards risk



Ways of learning new technology



Abby



Tim



Patrick

GENDERMAG: FOR EVALUATING USABILITY WITH A FOCUS ON GENDER-INCLUSIVENESS



Motivation for using the software



Information processing style



Computer self-efficacy



Attitude towards risk



Ways of learning new technology



Abby



Tim



Patrick



Patricia



RESEARCH QUESTIONS





RESEARCH QUESTIONS

1

Does a difference in the level of each facet influence the accuracy, speed and ease when performing **creation** tasks on iStar 2.0 models?



RESEARCH QUESTIONS

1

Does a difference in the level of each facet influence the accuracy, speed and ease when performing **creation** tasks on iStar 2.0 models?

2

Does a difference in the level of each facet influence the accuracy, speed and ease when performing **modification** tasks on iStar 2.0 models?

QUASI-EXPERIMENT WITH A COMBINATION OF MEASUREMENTS

QUASI-EXPERIMENT WITH A COMBINATION OF MEASUREMENTS



100 participants
50 per experiment

QUASI-EXPERIMENT WITH A COMBINATION OF MEASUREMENTS



100 participants
50 per experiment



1 eye-tracker,
1 EEG, 1 EDA

QUASI-EXPERIMENT WITH A COMBINATION OF MEASUREMENTS



100 participants
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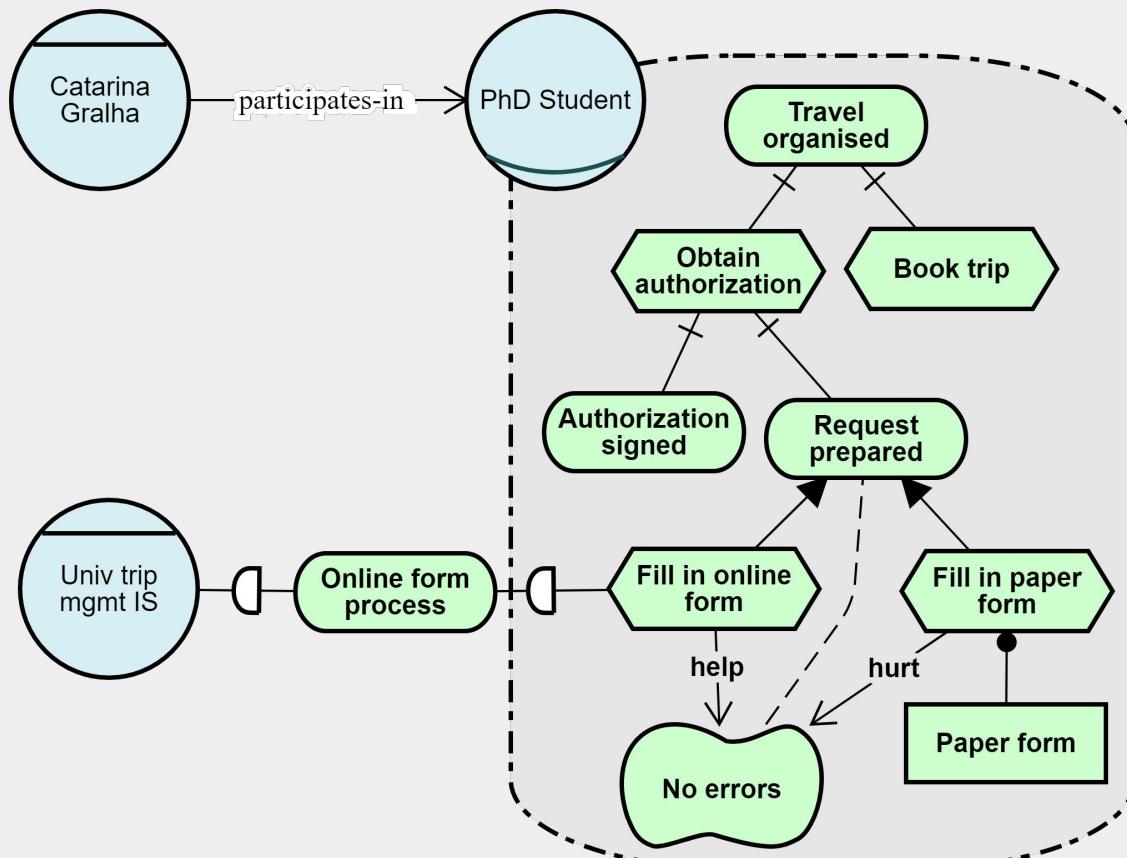


1 eye-tracker,
1 EEG, 1 EDA



booking management
system for an hotel

ISTAR 2.0 MODELS



CREATION AND MODIFICATION TASKS

Hotel Management System



Consider an hotel management system. The client accesses the system through the internet, and can book an hotel room, by choosing both check-in and check-out dates. The dates availability are verified and the reservation is confirmed and stored, if the selected dates are available. When booking a room in that hotel, the client needs to provide his/hers personal details.

Please specify an iStar 2.0 goal model describing this scenario, by using the tool on the right. When you finish, click on the button below.

[Continue](#)

Hotel Management System



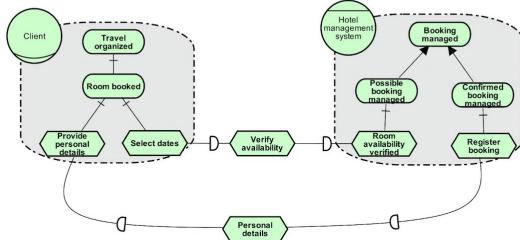
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Software engineers created an iStar goal model describing the previous scenario (presented on the right side of the screen). However, after a management meeting, a new scenario appeared:

At check-out, the system calculates the amount to be paid by the client. The payment can be made by using a debit or a credit card. When using a credit card, the client has to pay an extra fee.

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[Continue](#)

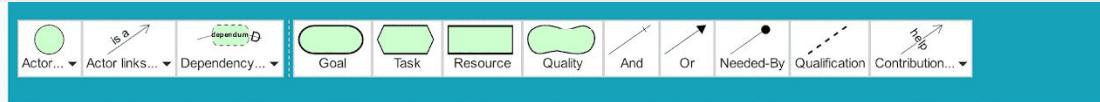


CREATION TASK

Hotel Management System

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Continue

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[Continue](#)

**Problem
description**



CREATION TASK

Toolbar

Hotel Management System

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Problem
description



CREATION TASK

Toolbar

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Problem
description



Canvas

MODIFICATION TASK

Hotel Management System

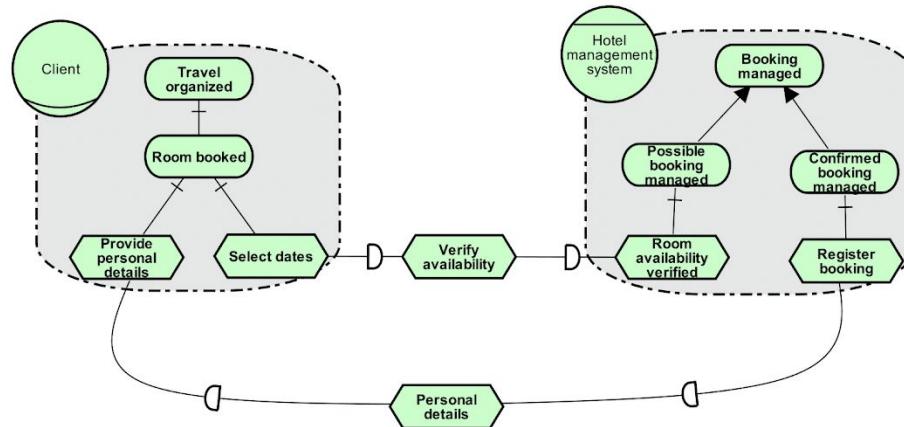
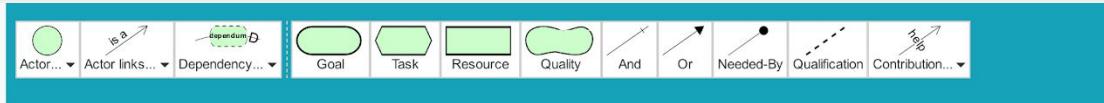
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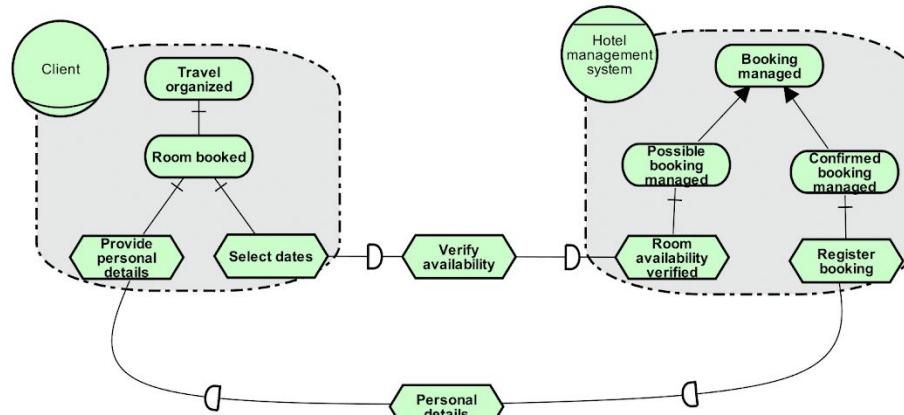
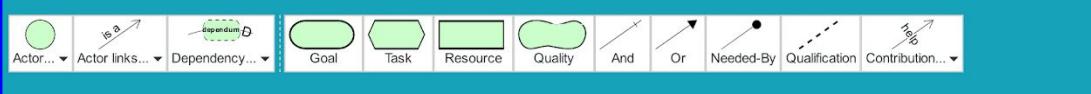
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Problem description



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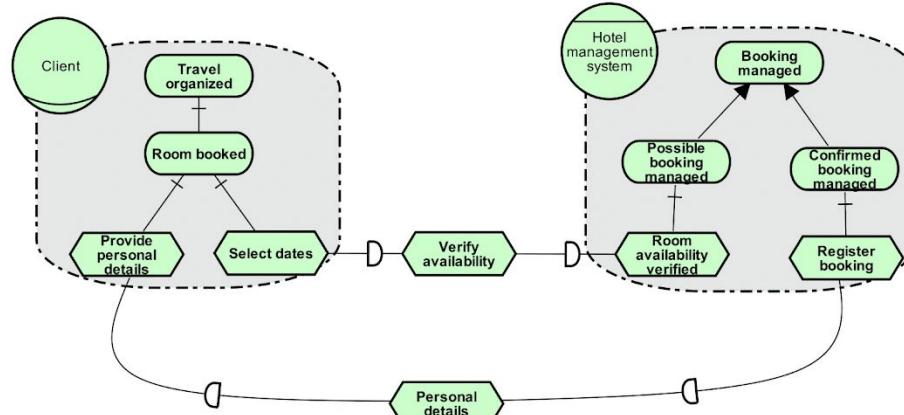
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Problem description



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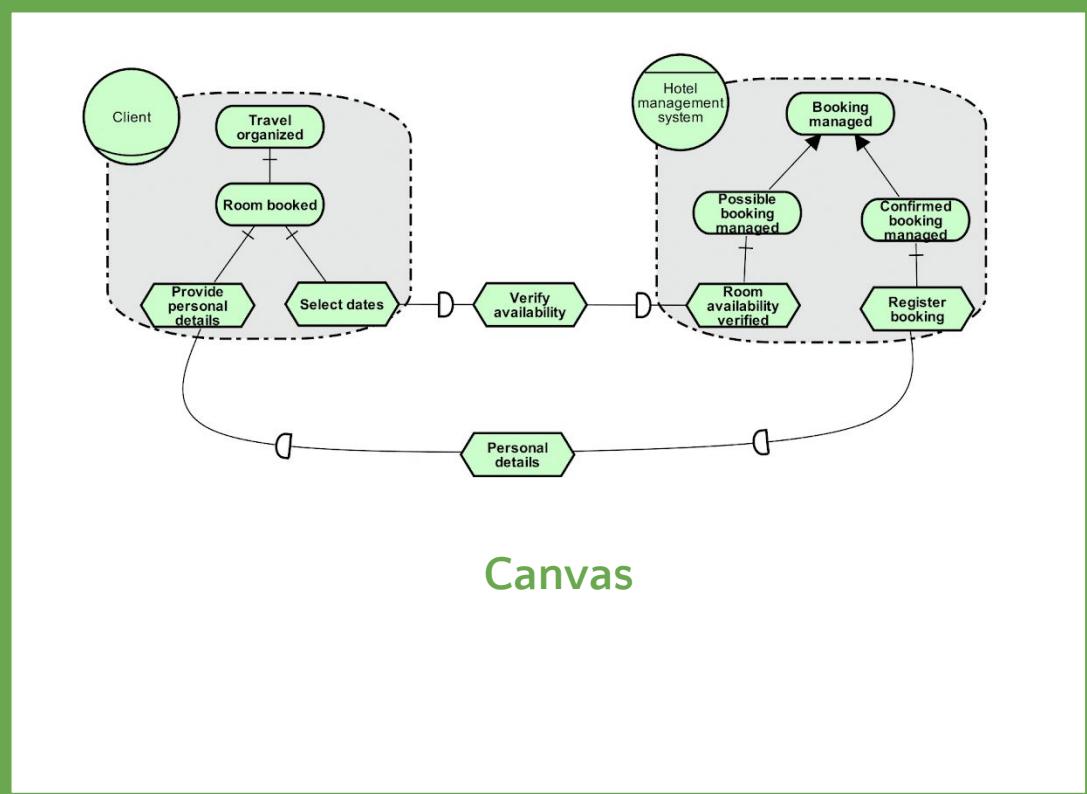
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Continue

Problem description



Canvas

DATA COLLECTION AND ANALYSIS

DATA COLLECTION AND ANALYSIS

DATA COLLECTION AND ANALYSIS

Direct

DATA COLLECTION AND ANALYSIS

Direct

Indirect

DATA COLLECTION AND ANALYSIS

Direct

Indirect

Subjective

DATA COLLECTION AND ANALYSIS

Direct



Indirect

Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps

Indirect

Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps

Indirect



Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps



Duration
Detection time

Indirect

Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps



Duration
Detection time

Indirect

Subjective



DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps



Duration
Detection time



Precision
Recall
F-measure

Indirect

Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps



Duration
Detection time



Precision
Recall
F-measure

Indirect



Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps



Duration
Detection time



Precision
Recall
F-measure

Indirect



Fixations
Saccades

Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps



Duration
Detection time



Precision
Recall
F-measure

Indirect



Fixations
Saccades



Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps



Duration
Detection time



Precision
Recall
F-measure

Indirect



Fixations
Saccades



Frequency bands
Attention
Mental workload
Familiarity

Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps



Duration
Detection time



Precision
Recall
F-measure

Indirect



Fixations
Saccades



Frequency bands
Attention
Mental workload
Familiarity



Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
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Main flow steps



Duration
Detection time



Precision
Recall
F-measure

Indirect



Fixations
Saccades



Frequency bands
Attention
Mental workload
Familiarity



Heart rate variability
Skin conductive level

Subjective

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps



Duration
Detection time



Precision
Recall
F-measure

Indirect



Fixations
Saccades



Frequency bands
Attention
Mental workload
Familiarity



Heart rate variability
Skin conductive level

Subjective



Performance
Effort
Frustration
Mental demand
Physical demand
Temporal demand

DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
Dependencies
Actors
Main flow steps



Duration
Detection time



Precision
Recall
F-measure

Indirect



Fixations
Saccades



Frequency bands
Attention
Mental workload
Familiarity



Heart rate variability
Skin conductive level

Subjective



Performance
Effort
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Mental demand
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Temporal demand



DATA COLLECTION AND ANALYSIS

Direct



Elements
Relationships
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Duration
Detection time



Precision
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F-measure

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Fixations
Saccades



Frequency bands
Attention
Mental workload
Familiarity



Heart rate variability
Skin conductive level

Subjective



Performance
Effort
Frustration
Mental demand
Physical demand
Temporal demand



Motivation
Information processing
Computer self-efficacy
Attitude towards risk
Learning style

READ THE CONSENT LETTER

This experimental work is conducted within the NOVA Laboratory for Computer Science and Informatics (NOVA LINCS), in the context of a PhD thesis. NOVA LINCS is hosted at the Departamento de Informática da Faculdade de Ciências e Tecnologia da Universidade NOVA de Lisboa (DI-NOVA).

All information stated as part of this experiment is confidential and will be kept as such.

Prof. Miguel Goulão and João Araújo are the advisers of the PhD thesis where the results of this experiment will be used. They can be contacted at:
- mgo@fct.unl.pt; +351 21 294 85 36 (ext 1073); Office: P2/17.
- jao.araujo@fct.unl.pt; +351 21 294 85 36 (ext 1074); Office: P2/3

Catarina Graña, the student responsible for the PhD thesis, can be contacted at:
- acg.almeida@campus.fct.unl.pt; Lab: P3/12

We would like to emphasize that:

- Your participation is entirely voluntary;
- You are free to refuse to answer any question;
- You are free to withdraw at any time.

The experiment will be kept strictly confidential and will be made available only to members of the research team of the study or, in case external quality assessment takes place, to assessors under the same confidentiality conditions. Data collected in this experiment may be part of a final research report, but under no circumstances will your name or any identifying characteristic be included in the report.

EQUIP AND CALIBRATE THE SENSORS

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WATCH A VIDEO OF FISH SWIMMING

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WATCH A VIDEO TUTORIAL

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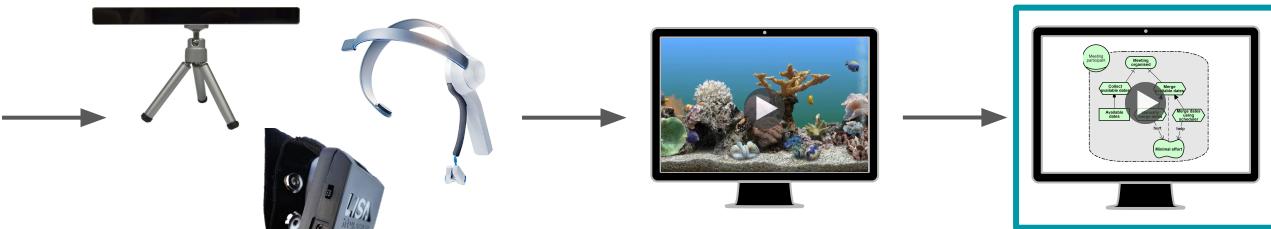
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PERFORM A TASK

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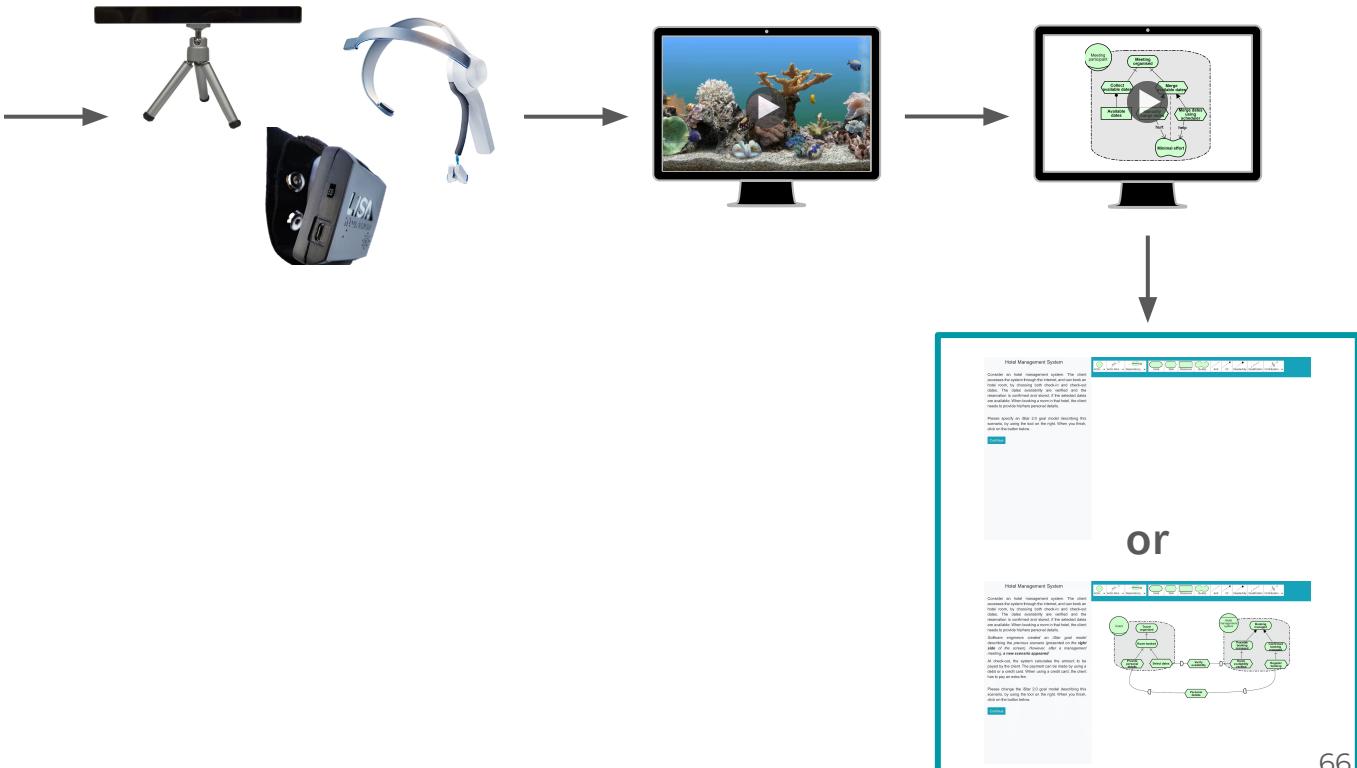
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ANSWER A NASA-TLX QUESTIONNAIRE

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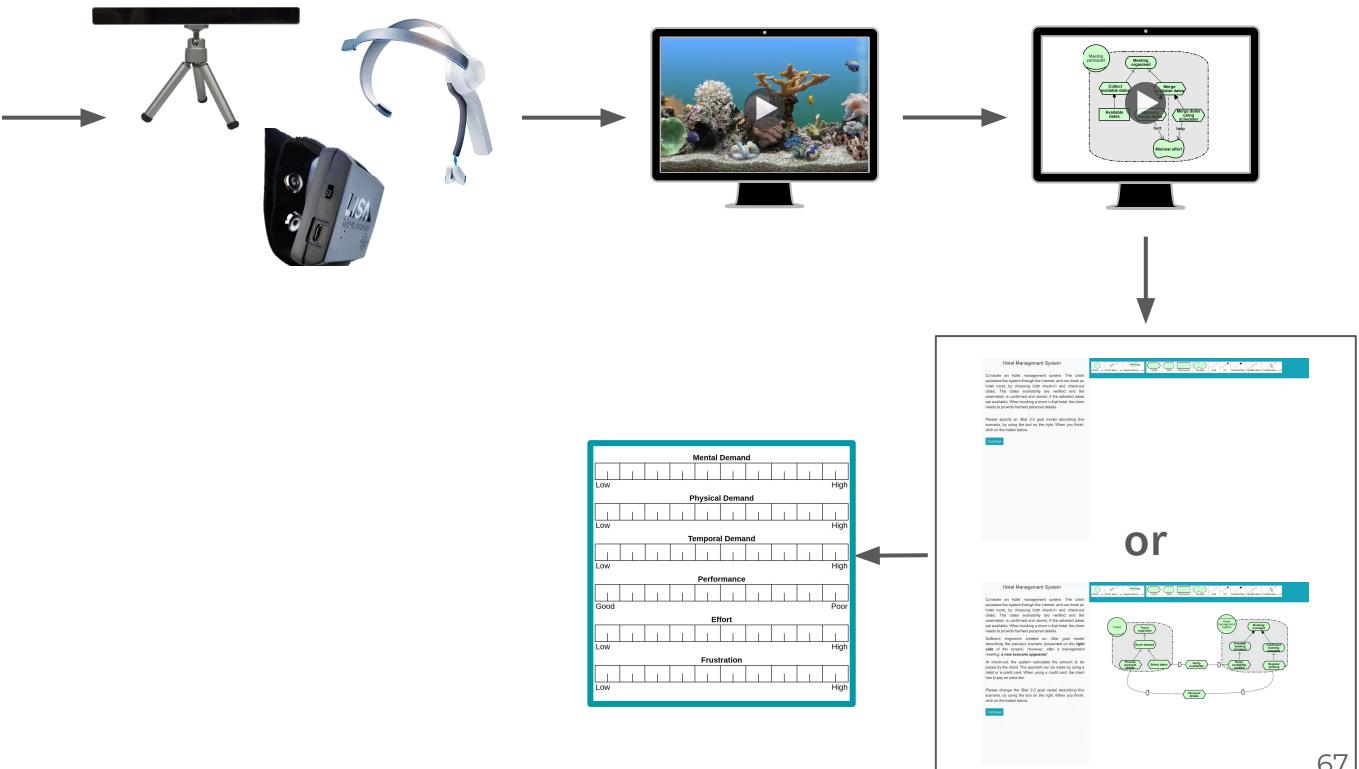
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ANSWER TO DEMOGRAPHIC QUESTIONS

This experimental work is conducted within the NOVA Laboratory for Computer Science and Informatics (NOVA LINCS), in the context of a PhD thesis. NOVA LINCS is hosted at the Departamento de Informática da Faculdade de Ciências e Tecnologia da Universidade NOVA de Lisboa (Di-NOVA).

All information stated as part of this experiment is confidential and will be kept as such.

Profs. Miguel Goulão and João Araújo are the advisors of the PhD thesis where the results of this experiment will be used. They can be contacted at:
- mgo@fct.unl.pt, +351 21 294 85 36 (ext 1073); Office P2/17.
- jao.araujo@fct.unl.pt, +351 21 294 85 36 (ext 1074); Office P2/3

Catarina Gralha, the student responsible for the PhD thesis, can be contacted at:
- acg.almeida@campus.fct.unl.pt; Lab: P3/12

We would like to emphasize that:

- Your participation is entirely voluntary;
- You are free to refuse to answer any question;
- You are free to withdraw at any time;

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If you want to receive the aggregated results, please give us your email (optional)

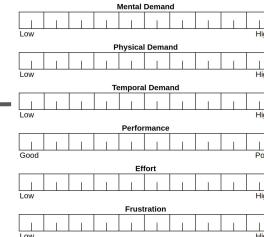
Nationality (*) Field of study (*)

Completed education (*) Current year of education (*)

Previous experience with the modelling language used in the task you just completed (*)

Other modelling languages that you know

(*)mandatory



or

Hotel Management System

Hotel Management System

ANSWER A GENDER MAG QUESTIONNAIRE

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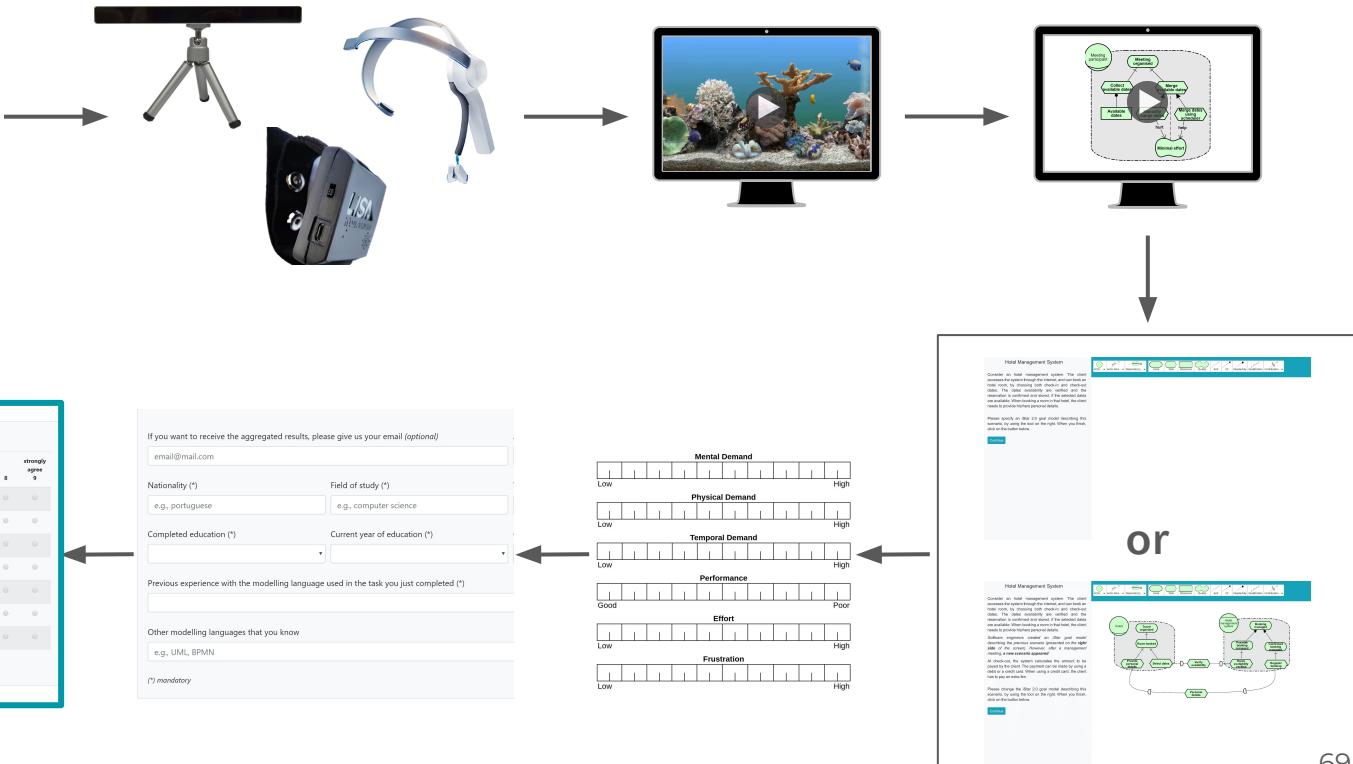
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PROTOCOL OF THE EXPERIMENTS

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Indicate your level of agreement with each of the statements listed below, selecting one per row (*)

	strongly disagree	1	2	3	4	neutral	5	6	7	8	strongly agree
I am able to use unfamiliar technology when...	<input type="radio"/>										
...I have just the built-in help for assistance	<input type="radio"/>										
...I have seen someone else using it before trying it myself	<input type="radio"/>										
...no one is around to help if I need it	<input type="radio"/>										
...someone else has helped me get started	<input type="radio"/>										
...someone shows me how to do it first	<input type="radio"/>										
...I have used similar technology before, to do the same task	<input type="radio"/>										
...I have never used anything like it before	<input type="radio"/>										
(*) mandatory											

If you want to receive the aggregated results, please give us your email (optional)

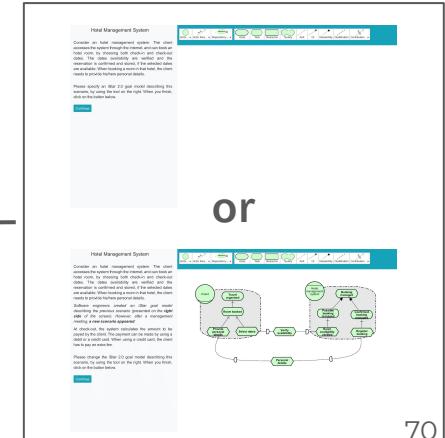
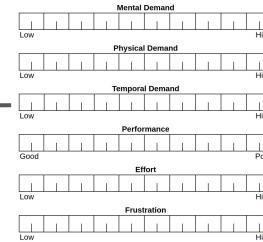
Nationality (*) Field of study (*)

Completed education (*) Current year of education (*)

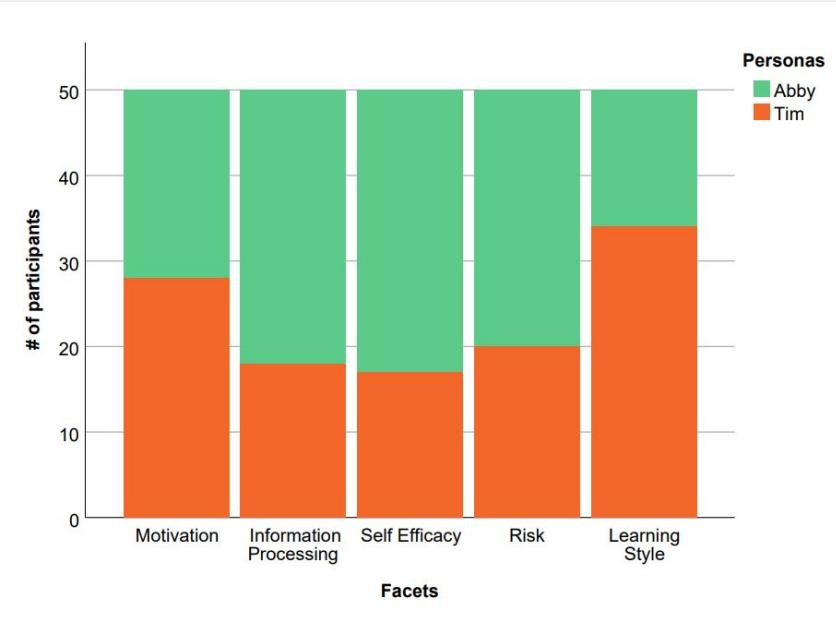
Previous experience with the modelling language used in the task you just completed (*)

Other modelling languages that you know

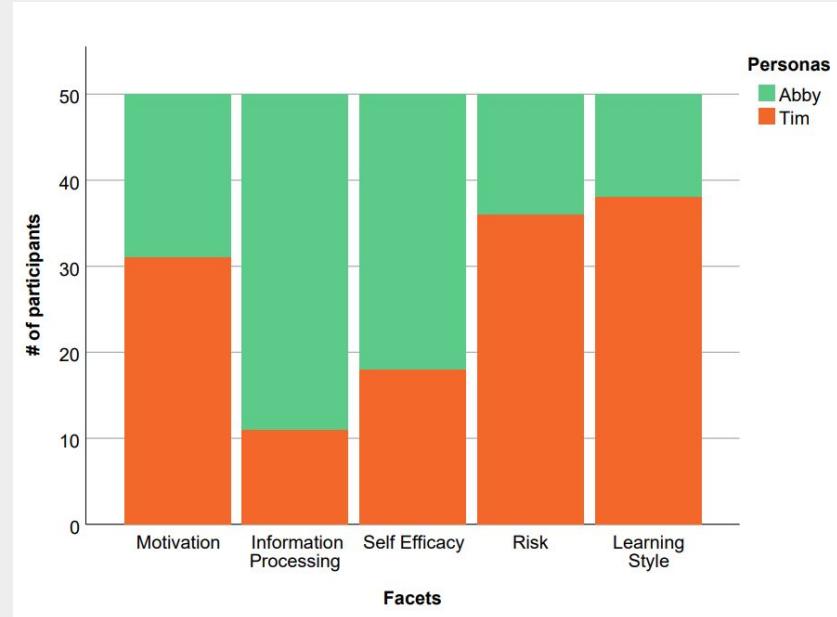
(*) mandatory



PARTICIPANTS GENDER MAG CHARACTERISATION



Creation task



Modification task

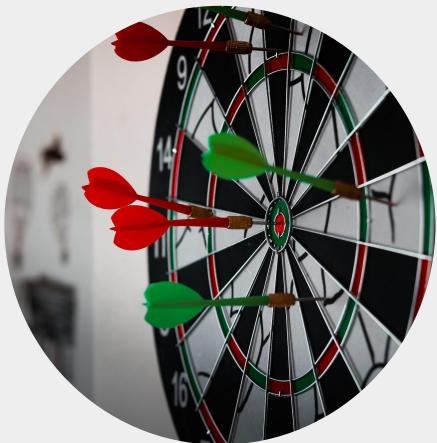
INFERENCES

INFERENCES



information processing and
risk have impact on **accuracy**

INFERENCES

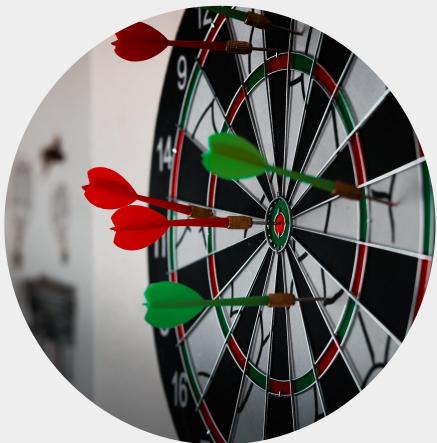


information processing and risk have impact on **accuracy**



information processing,
self-efficacy, risk and learning
style have impact on **speed**

INFERENCES



information processing and risk have impact on **accuracy**



information processing,
self-efficacy, risk and learning
style have impact on **speed**



information processing,
self-efficacy and risk have
impact on **ease**

THREATS TO VALIDITY

THREATS TO VALIDITY



conclusion

number of participants
distribution of participants on the facets

THREATS TO VALIDITY



conclusion

number of participants
distribution of participants on the facets



internal

convenience sampling
limitations of biometrics devices

THREATS TO VALIDITY



conclusion

number of participants
distribution of participants on the facets



internal

convenience sampling
limitations of biometrics devices



external

size of the models, problem domain
little or no prior knowledge on iStar 2.0

THREATS TO VALIDITY



conclusion

number of participants
distribution of participants on the facets



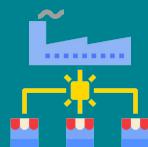
internal

convenience sampling
limitations of biometrics devices



external

size of the models, problem domain
little or no prior knowledge on iStar 2.0



construct

video tutorial
no information on what was being tested



DIVERSITY IS KEY

THANK YOU

QUESTIONS?

