Utrecht University

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Instrumentation

Advanced Research Methods 2018-2019

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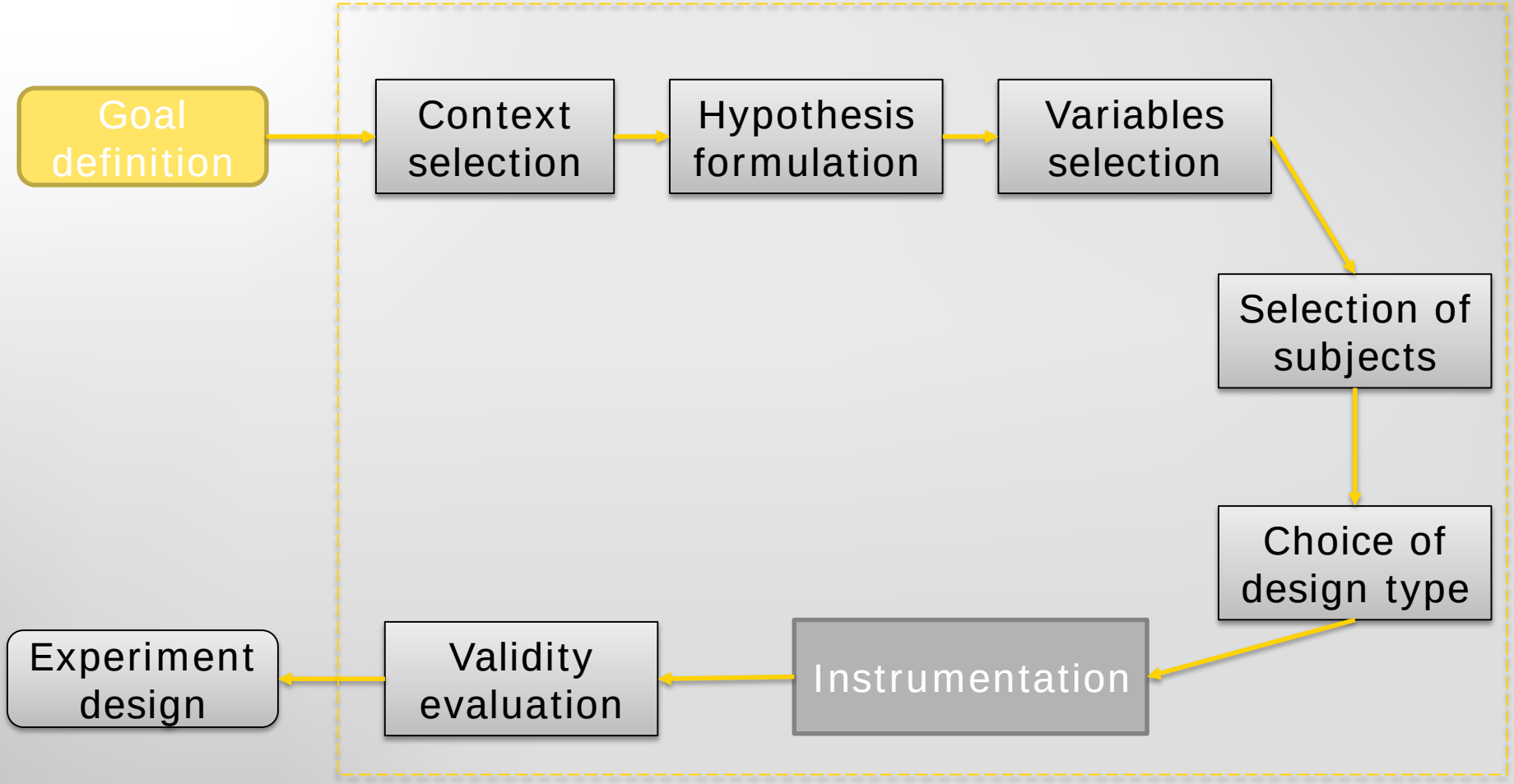
Planning phase overview



Instrumentation

There are three types of instruments: objects, guidelines and measurement instruments

Experimental object: The objects used in the experimental investigation. E.g., models, code documents, textual descriptions, etc.

Guidelines: The guidelines to guide the subjects in the experiment. It includes process descriptions and checklists, training in the method to be used, etc.

Measurement instruments: Objects to collect data during the experimental tasks. In human experiments, data is generally collected via questionnaires, interviews, results of performed tasks, time used when performing a certain task, etc.

Topics for this lecture

1. Instrumentation
   a) Experimental objects
   b) Experimental procedure
   c) Measuring subjects perceptions/user satisfaction
   d) Measuring model quality: validity and syntactic correctness, completeness
   e) Measuring efficiency

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EXAMPLE: MEASURING SUBJECT'S PERCEPTIONS

Moody, D.L.: The Method Evaluation Model: A Theoretical Model for Validating Information Systems Design Methods. In: European Conference of Information Systems (2003)

MEM (Method Evaluation Model)

Reference method to evaluate subjects' perceptions and satisfaction
16 questions to evaluate:

PU: Perceived Usefulness

PEOU: Perceived Ease of Use

ITU: Intention to Use

TIP: Create a code book with the relationships between the questions and the variables to evaluate

MEM (Method Evaluation Model) Questionnaire

- **Perceived usefulness:** The degree to which the subject considers that a <treatment> is effective in achieving its intended objectives. This variable is measured using a 5-point Likert scale format to obtain users' perception.
- **Perceived ease of use**: The degree to which a subject considers that using a <treatment> is free of effort. This variable is measured using a 5-point Likert scale format to obtain users' perception.
- **Intention to use:** This variable will be measured using a 5-point Likert scale format to obtain users' perception.

MEM: Example

Questionnaire

Name: _____

Case: _____

This survey is related to your perceptions of the application of <treatment>. Please, rate the extent to which you agree with each statement. The values of the 5-point scale correspond to:

1 = Strongly disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly agree

	☹ 1	2	3	4	5 ☺	
1. I found the application of <treatment> <treatment> simple and easy to apply	o	o	o	o	o	PEOU
2. I believe that the application of <treatment> reduce the effort required <treatment> <treatment>	o	o	o	o	o	PU
3. <treatment> <treatment> is easy for other analyst to understand and modify	o	o	o	o	o	PU
4. Overall, I found the application of the <treatment> guidelines easy to use.	o	o	o	o	o	PEOU
5. <treatment> <treatment> <treatment> make it easier for analyst to correct <treatment> design errors of information systems under <treatment> construction	o	o	o	o	o	PU
6. I can explain how to obtain <treatment> <treatment> models applying the guidelines	o	o	o	o	o	PU
7. Overall, I found the application of the <treatment> guidelines to be useful	o	o	o	o	o	PEOU

… ETC

EXAMPLE: MEASURING SUBJECT'S PERFORMANCE

Lindland, O., Sindre, G., & Solvberg, A. Understanding Quality in Conceptual Modeling. IEEE Software Journal. Volume 11, Issue 2, 1994. Pages 42-49

Goal

Follow a set of quality goals in order to inspect conceptual models

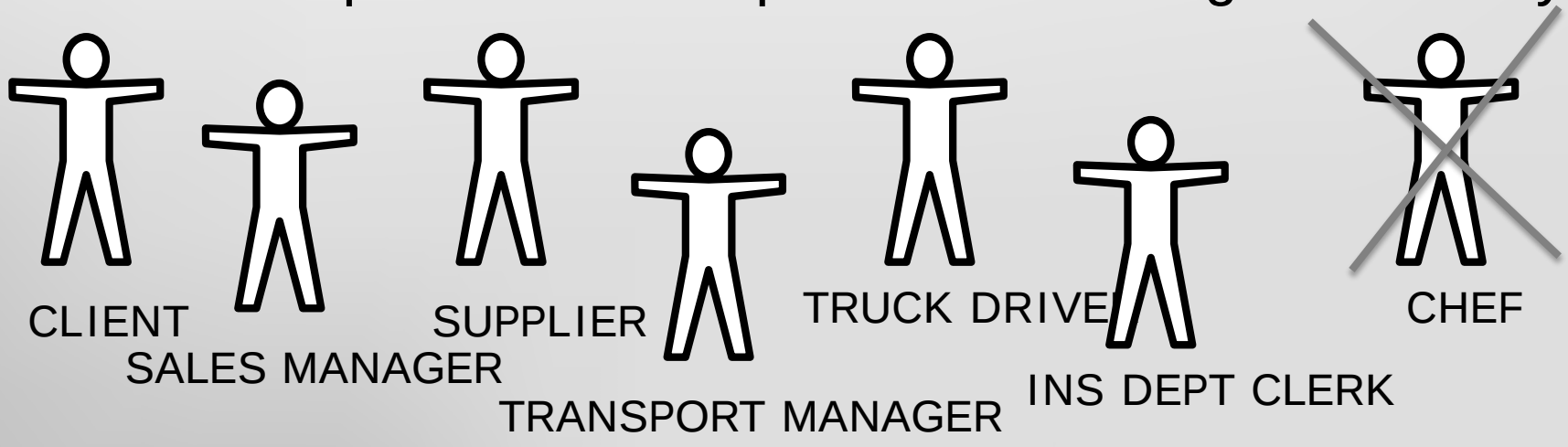
Reference: Understanding Quality in Conceptual Modeling by Lindland, Sindre and Solvberg

The quality model framework

SEMANTIC	SYNTACTIC
VALIDITY	CORRECTNESS
COMPLETENESS	

Semantic quality
Feasible validity:

The elements of the model are correct and relevant to the problem domain.
Invalid statements are those that do not pertain to the problem or express something incorrectly.



Semantic quality
Feasible validity:

The validity of a model is the degree to which all the model elements contained in the model should actually appear in the model in the right way (e.g. an element representing phenomena that does not occur in the domain is invalid). The reviewers identified candidate invalid elements based on a reference model, and then discussed until they agreed on the verdict.

Validity
Syntactic correctness:

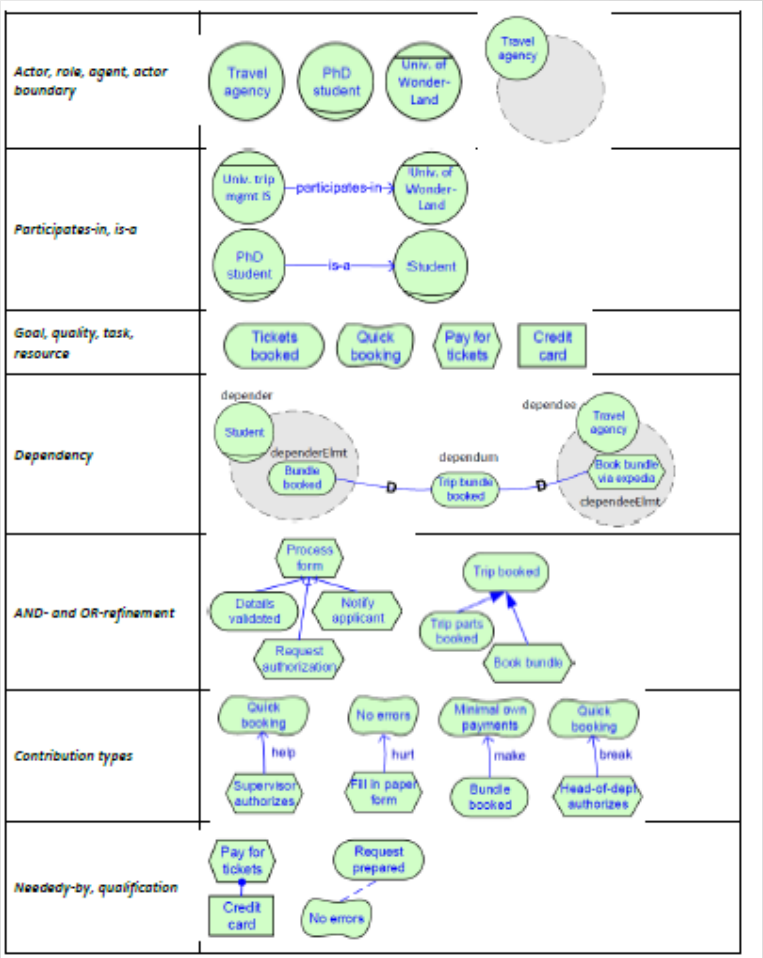
The syntactic correctness of a model is the degree to which all the model elements specified in the model use the correct syntax. The reviewers identified candidate invalid elements based on a reference model, and then discussed until they agreed on the verdict.

Syntactic correctness:

The elements of the model are according to the syntax. A model is correct if all the statements adhere to the language rules.

For example:

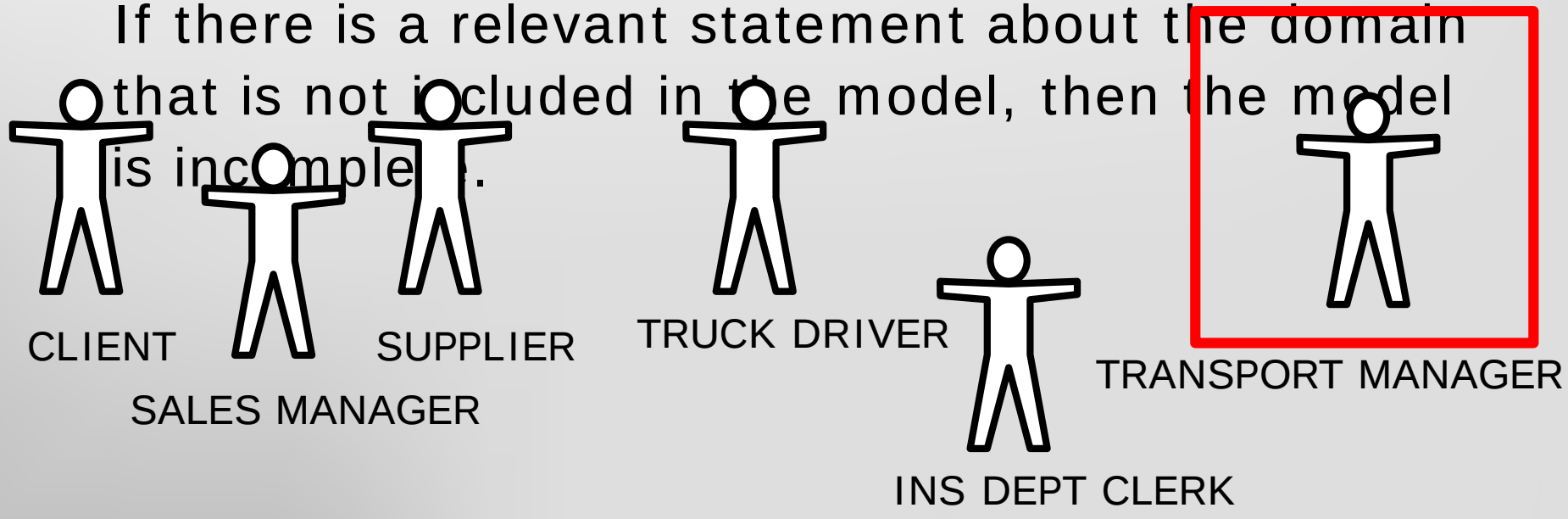
The *i** languange syntax



Semantic quality
Feasible completeness:

The elements of the model includes the relevant and correct statements about the problem domain.

If there is a relevant statement about the domain that is not included in the model, then the model is incomplete.



Semantic quality
Feasible completeness:

The completeness of a model is the degree to which all the model elements that should appear in the model (because they represent relevant phenomena of the domain) are actually contained in the model. To facilitate this calculation, the researchers take into account a reference model containing the minimum, indispensable elements

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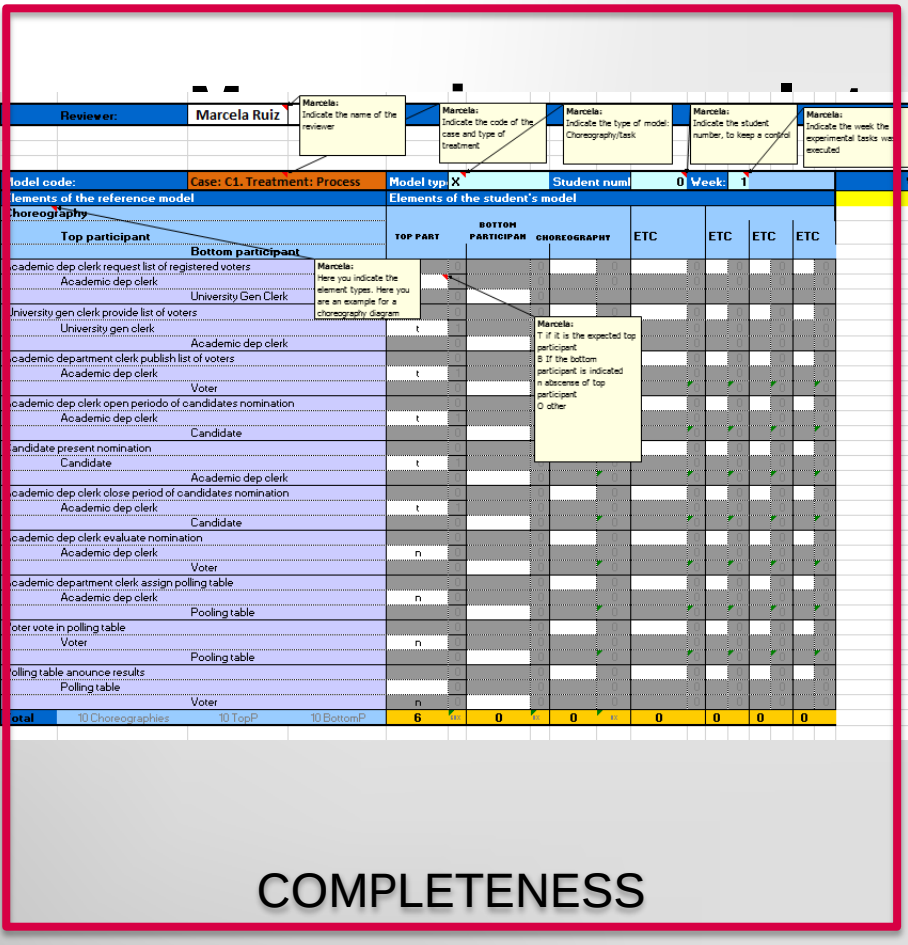

Reviewer: Marcela Ruiz

Marcela: Indicate the name of the reviewer

Marcela: Indicate the code of the case and type of treatment

Marcela: Indicate the type of model: Choreography/Task

Marcela: Indicate the student number, to keep a control

Marcela: Indicate the week the experimental tasks was executed

odel code: | Case: C1. Treatment: Process | Model typ: X | Student numl 0 | Week: 1 | Validity errors 0

lements of the reference model — Elements of the student's model

horeography

Top participant / Bottom participant	TOP PART	BOTTOM PARTICIPAN	CHOREOGRAPHY	ETC	ETC	ETC	ETC
cademic dep clerk request list of registered voters							
Academic dep clerk / University Gen Clerk	t						
niversity gen clerk provide list of voters							
University gen clerk / Academic dep clerk	t						
cademic department clerk publish list of voters							
Academic dep clerk / Voter	t						
cademic dep clerk open periodo of candidates nomination							
Academic dep clerk / Candidate	t						
andidate present nomination							
Candidate / Academic dep clerk	t						
cademic dep clerk close period of candidates nomination							
Academic dep clerk / Candidate	t						
cademic dep clerk evaluate nomination							
Academic dep clerk / Voter	n						
cademic department clerk assign polling table							
Academic dep clerk / Pooling table	n						
oter vote in polling table							
Voter / Pooling table	n						
olling table anounce results							
Polling table / Voter	n						
otal (10 Choreographies, 10 TopP, 10 BottomP)	6	0	0	0	0	0	0

Marcela: Here you indicate the element types. Here you are an example for a choreography diagram

Marcela: T if it is the expected top participant; B If the bottom participant is indicated; n abscense of top participant; O other

Aux table to review elements that are specified in the subjects model but not in the reference model

Element	Syntactic error?	it is related to the case?	Comments and decisions of interpretation
Chef	No	No	
Clerk	Yes, no good use of choreogra	Yes	
Number of errors		1	

COMPLETENESS

VALIDITY

Efficiency

The efficiency is the degree of success during the application of a treatment according to the time consumed (model completeness divided by time consumed). The term for this variable is Subjects_efficiency.

Example: Experimental objects and experimental tasks

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Session 2 (week 5): Evaluate the guidelines

Experimental objects

! You build the input and output models

Input model

Guidelines

! The guidelines are given

Output model

Isomorphic/equivalent

Experimental task to evaluate the guidelines

Name:_____
Student number: _____

Activity 1:

Read guidelines

Guidelines

Activity 2:
Read this case:...

Input model

You give guidelines and input model

Apply guidelines to obtain output model.
Please add your model in this blank space:

Output model

Subjects provide output model

Compare the two models to measure completeness and validity

Session 1 (week 4): Evaluate the process

Input model X 100%

Input model Y 40%

! You build the input and output models

! The process is given

Process

Strategy

Isomorphic/equivalent

Output model (100% model Y)

Experimental objects

Experimental task to evaluate the process

Name:_____
Student number: _____

Activity 1:

Read process

Process

Activity 2:
Read this case:...

Input model X 100%

Input model Y 40%

You give process and input models

Apply process to obtain strategies and output model:
Please add your strategies in this blank space:

Strategies

Please add your model in this blank space:

Output model 100%

Subjects provide strategies and output model

Compare the two models to measure completeness and validity