Understanding the decision-making process of discrete choice modellers

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Relevance of modelling choices

People make choices every day and across dimensions.

- Products (e.g., smartphones, food), services (e.g., healthcare, transport), lifestyle choices (e.g., university, pensions).

Choices

- create demand, influence markets and shape industries.
- impact on economy, environment and society.

Choice modellers use choices

- to understand the factors that lead people to choose alternatives.
- to analyse policy and forecast demand.

Background

Discrete choice modelling (DCM) involves mixing theoretical behavioral knowledge and statistical methods for understanding or predicting choice behaviour[1][2].

- Researchers represent choices in a model and analyse their derived estimation results.
- DCM as an art: Multiple decisions across research phases
- Software packages have simplified several research processes
- Different workflows −> variability in the modelling results

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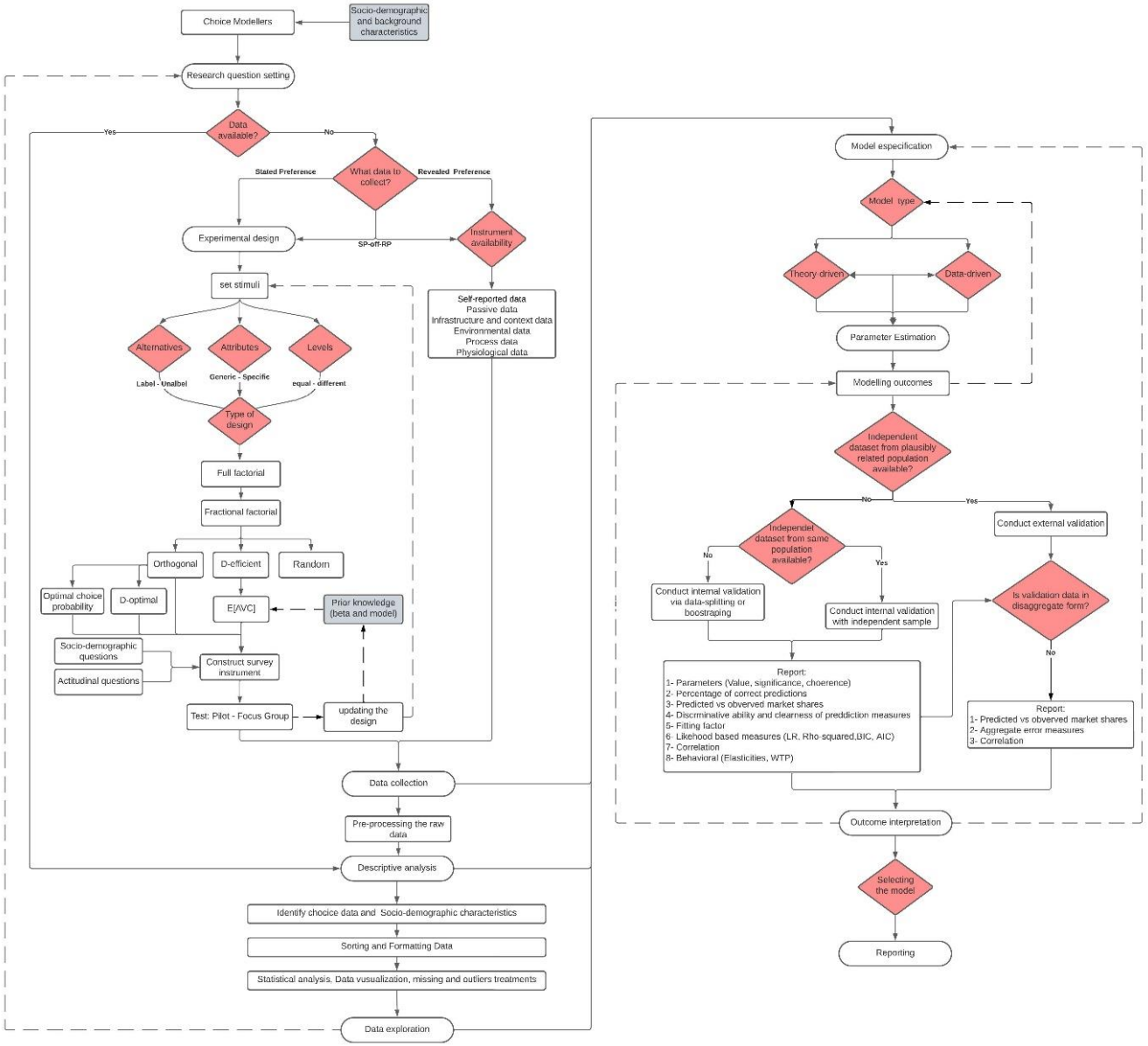
Choice modelling research decision tree



Research gap and objective

Research gap

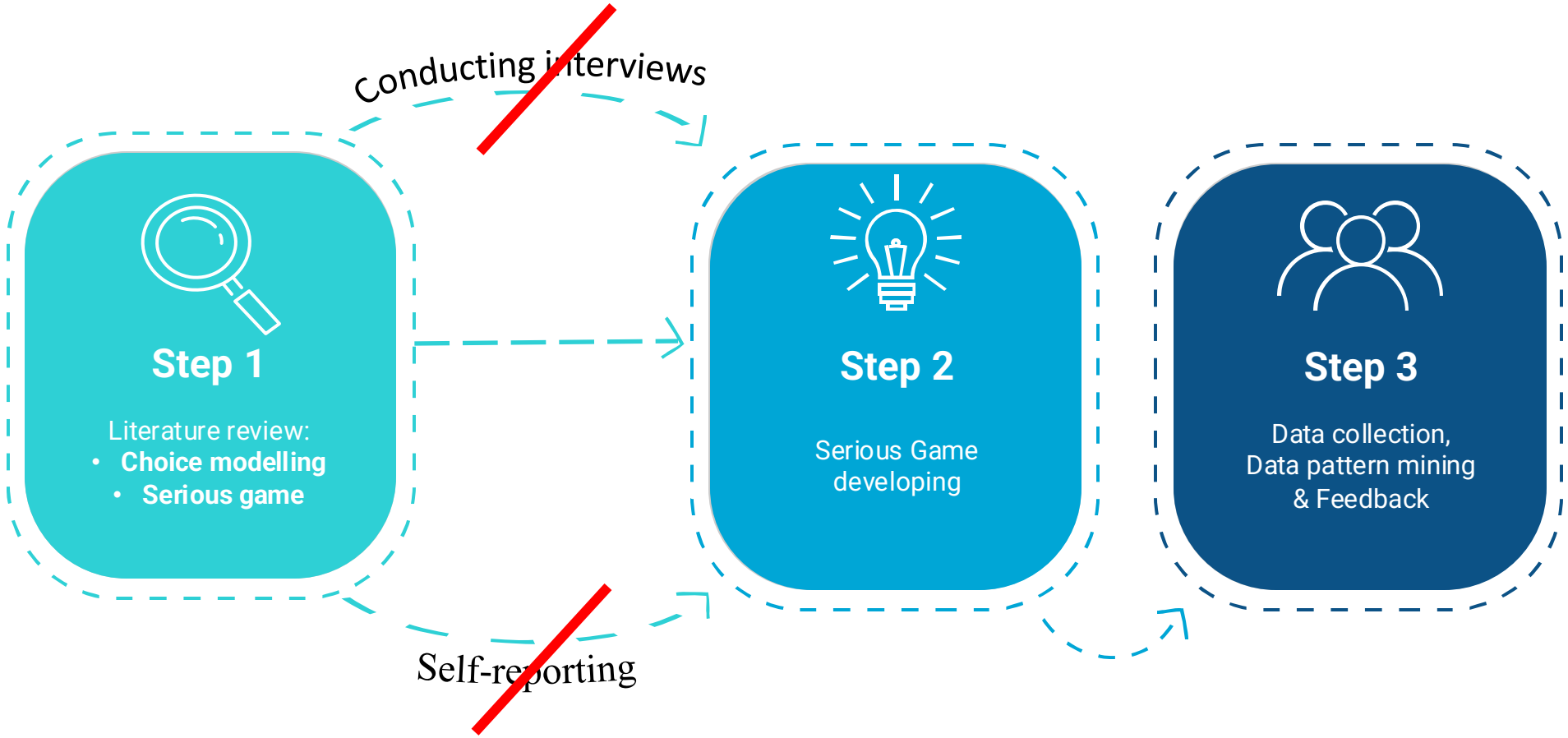
There is a lack of understanding of the decision-making process of the choice modelling process, the impact of the researcher's degrees of freedom[1] and the possible influence of forking paths[2] on the modelling process.

Objective

Deepen understanding how the decisions taken within the choice modelling process co-determine subsequent ones and modelling results.

[1]Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011) [2]Gelman, A., & Loken, E. (2013)

Methodology



Serious Game

Definition

- analogical or digital games beyond entertainment as their primary purpose
- focus on training, learning, behavioral change (… and in situ data collection)

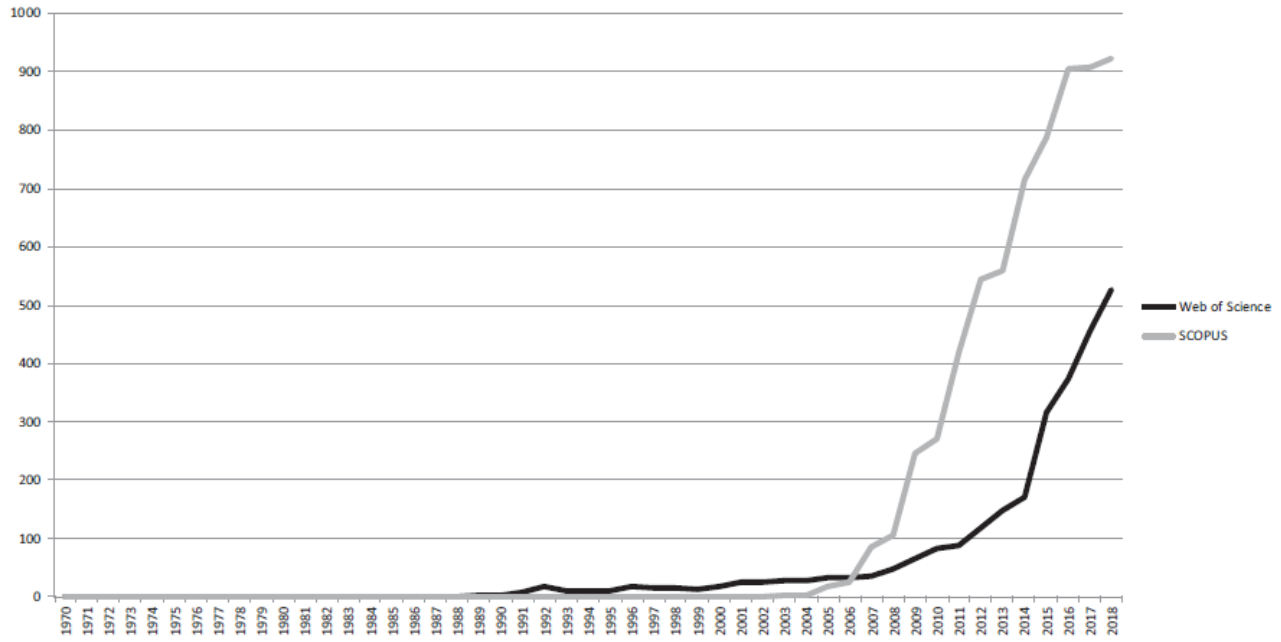


Figure1. Number of publications on serious games in Web of Science (WoS) and SCOPUS databases. (Olejniczak et la., 2020)

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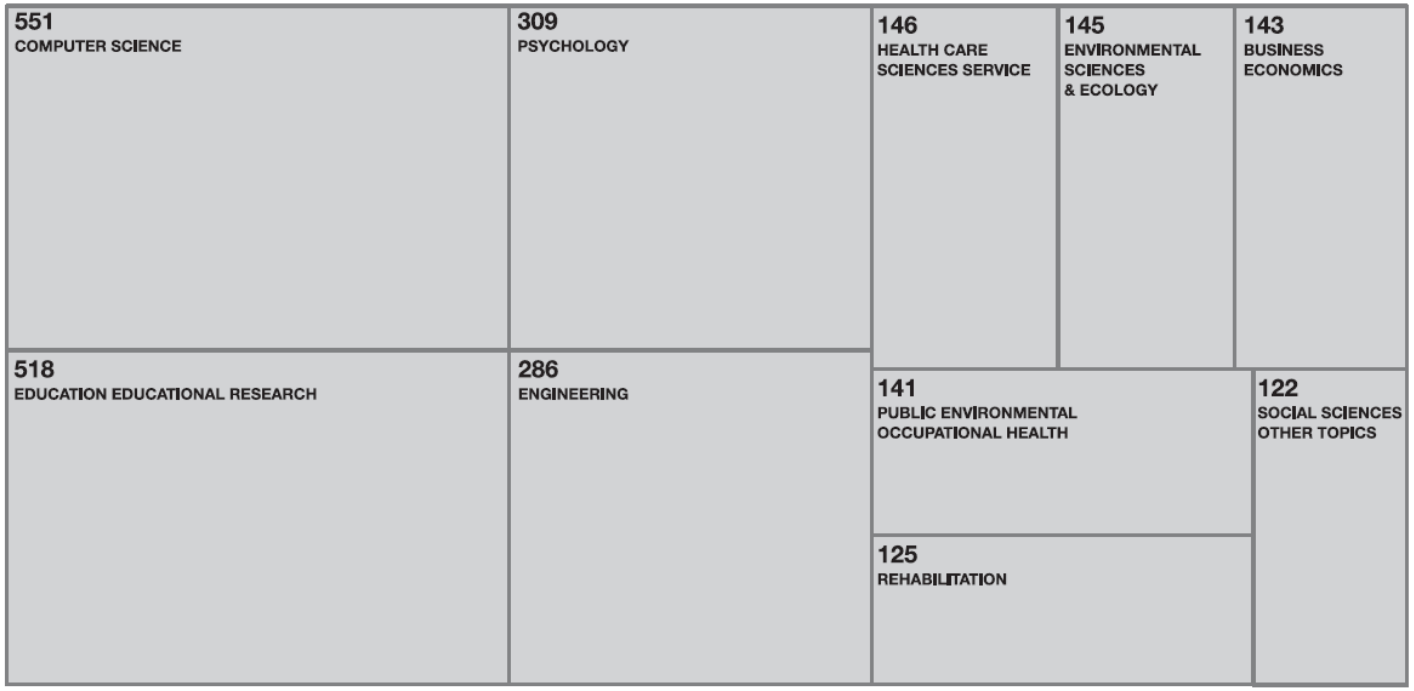

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Serious Game

Data collection techniques

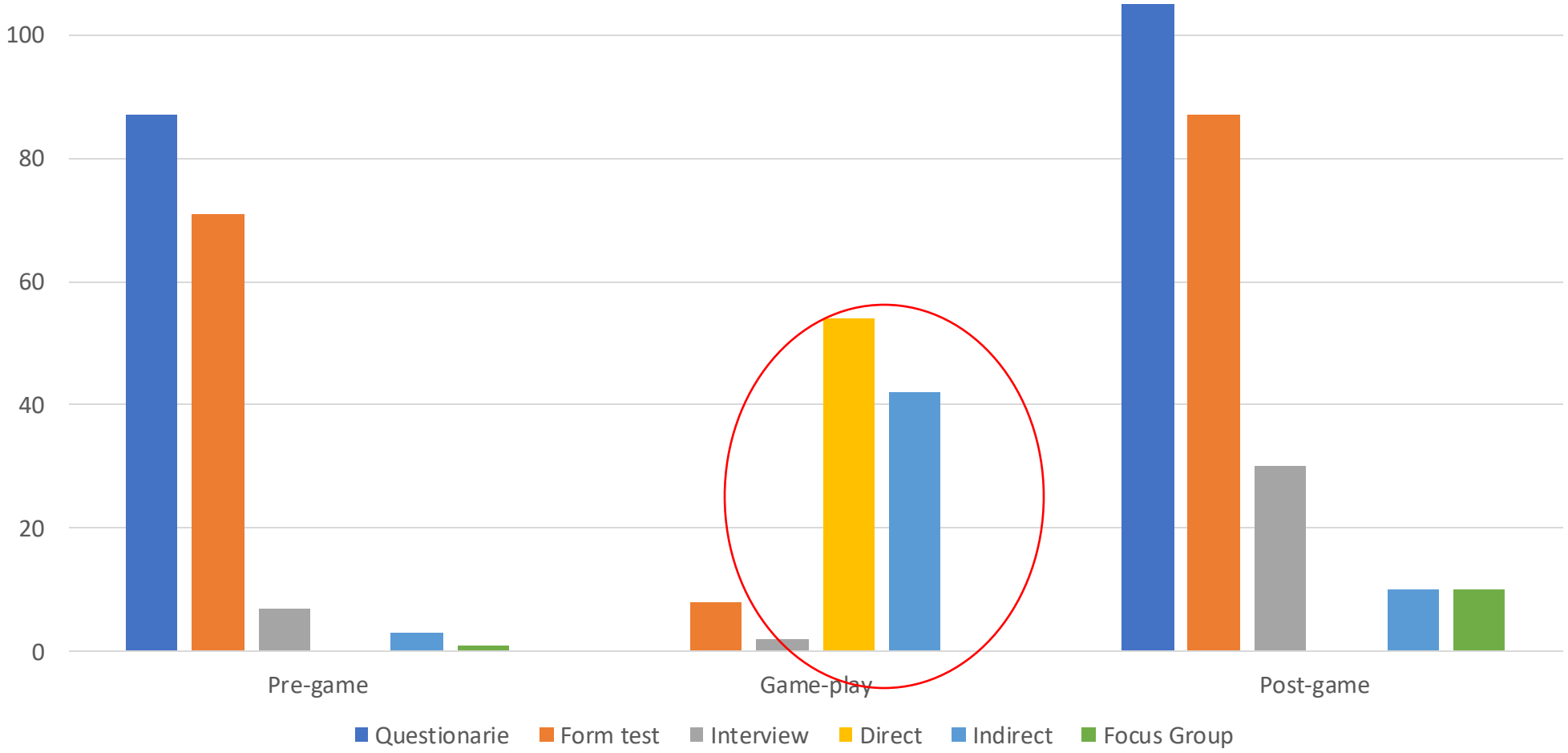


Figure 2. Number of specific data collection techniques used per phase of study. (Smith et la., 2015)

Choice Modelling Serious Game

Research game design

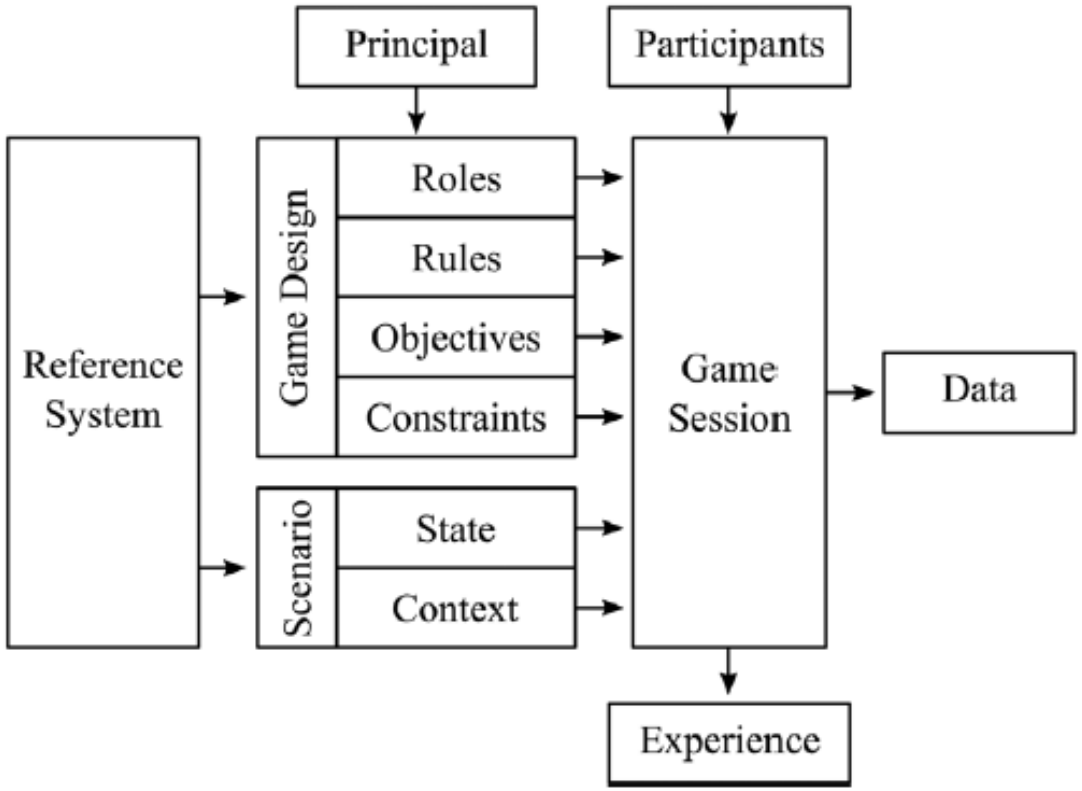
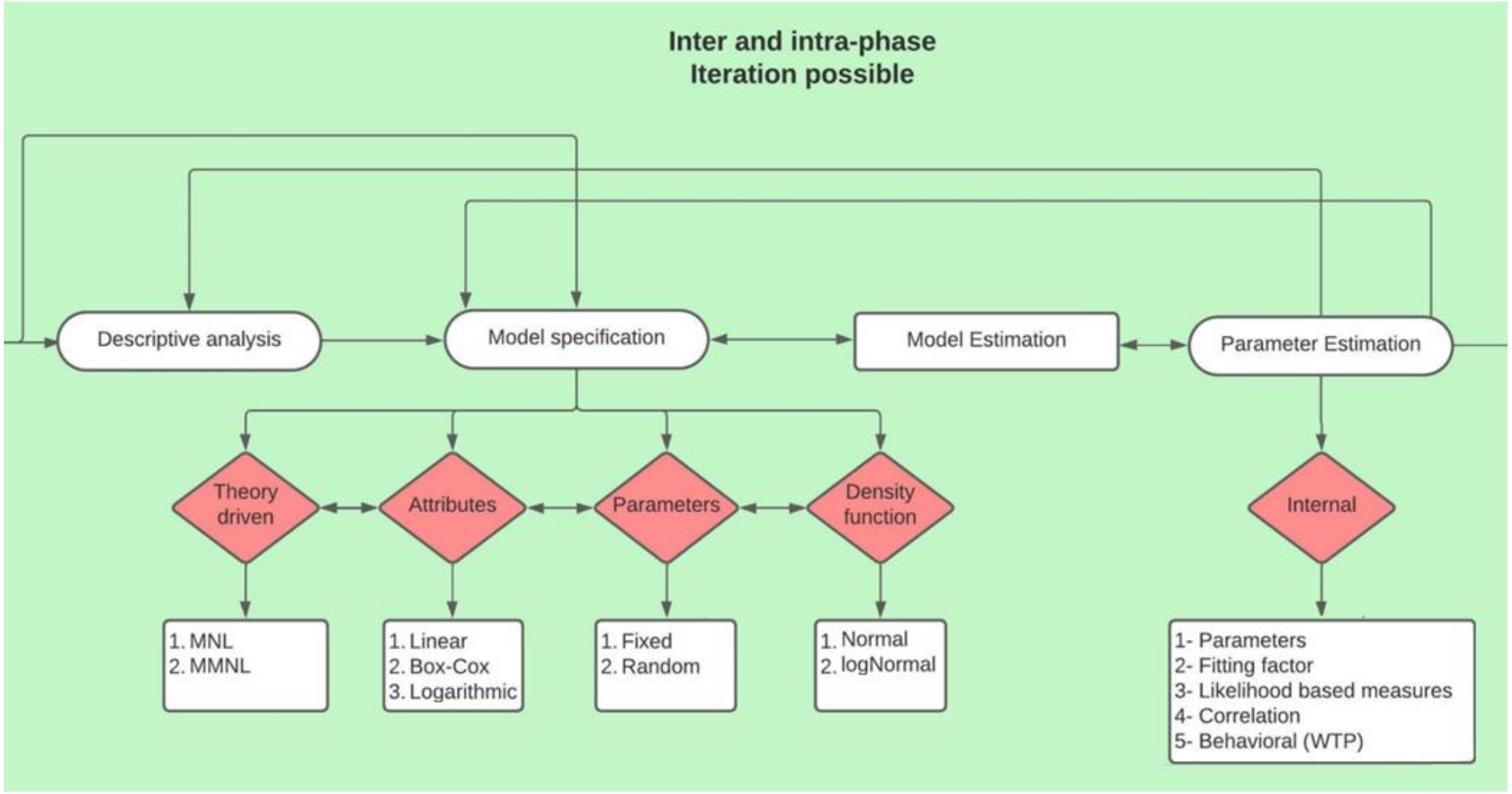


Figure 3. Element for a serious choice modelling game based on Meijer (2009)

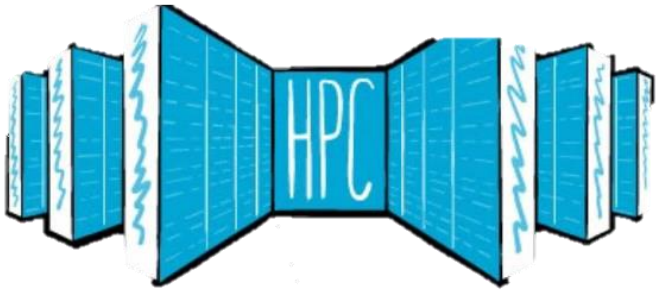
System: Choice modelling
Roles: Play as a choice modeller Rules: Conduct a research individually (35 min.) Objective: Develop a choice model to infer willingness to pay for reducing noise pollution Constraints: Not all pre-estimated Mixed Logit models.
State: Descriptive analysis (16), specifications (34) and interpretation (15) variable decisions. Context: Help with analysing a SC data set on residential location choices

Choice Modelling Serious Game

Game session



Serious Choice Modelling Game Development



Apollo + BIOGEME

plotly | Dash

Serious Game Context

Game context:

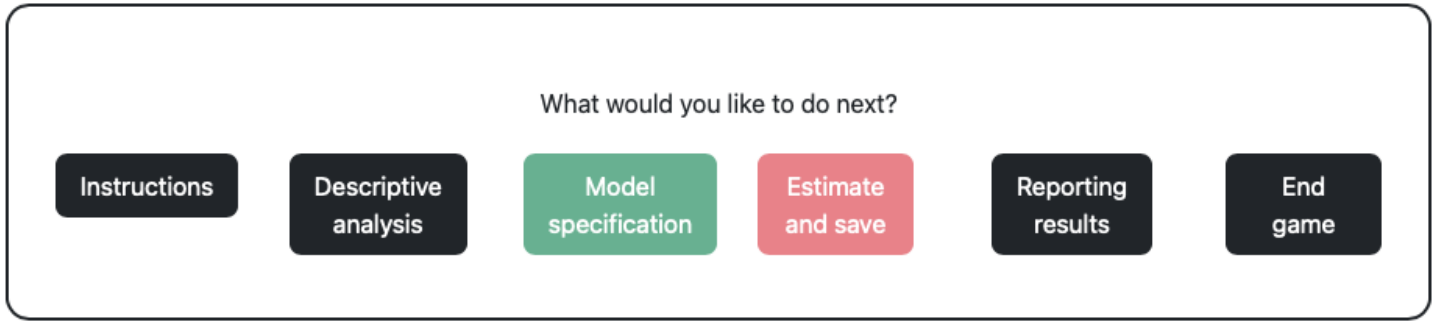
- Imagine a colleague has asked for your help in analyzing a stated choice dataset on residential location preferences.
- This dataset has been designed to determine the willingness to pay (WTP) for reducing noise pollution.
- Respondents were faced with 3 unlabeled neighbourhoods (A,B,C) and asked to select the one they preferred to live in.
- The data were collected across four different cities and are representative of the target population.

Game objective:

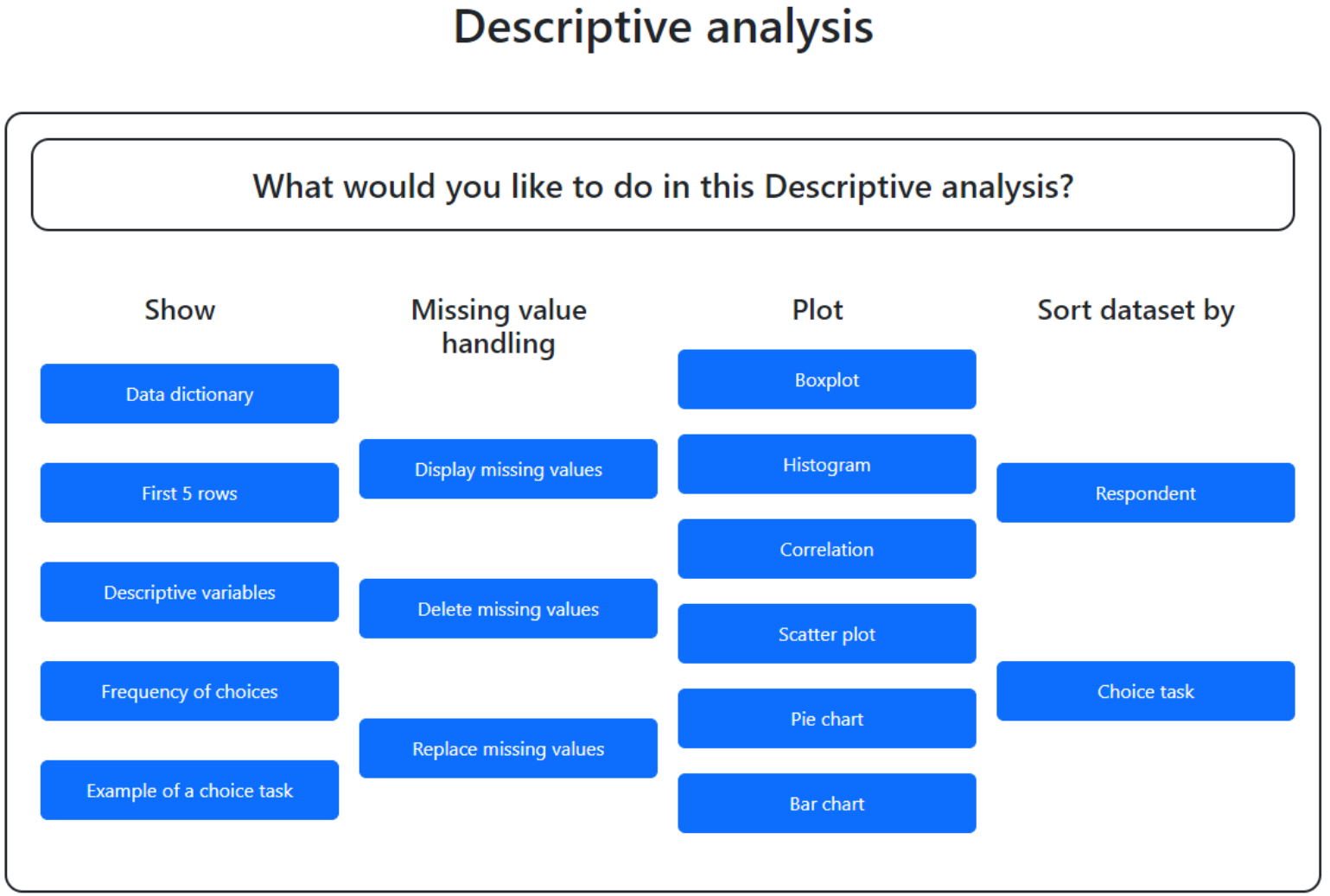
- **Develop a choice model to estimate the Willingness-to-Pay (WTP) for noise pollution reduction.**
- Your WTP estimate will be used by policymakers to make informed urban planning decisions.

Game rules:

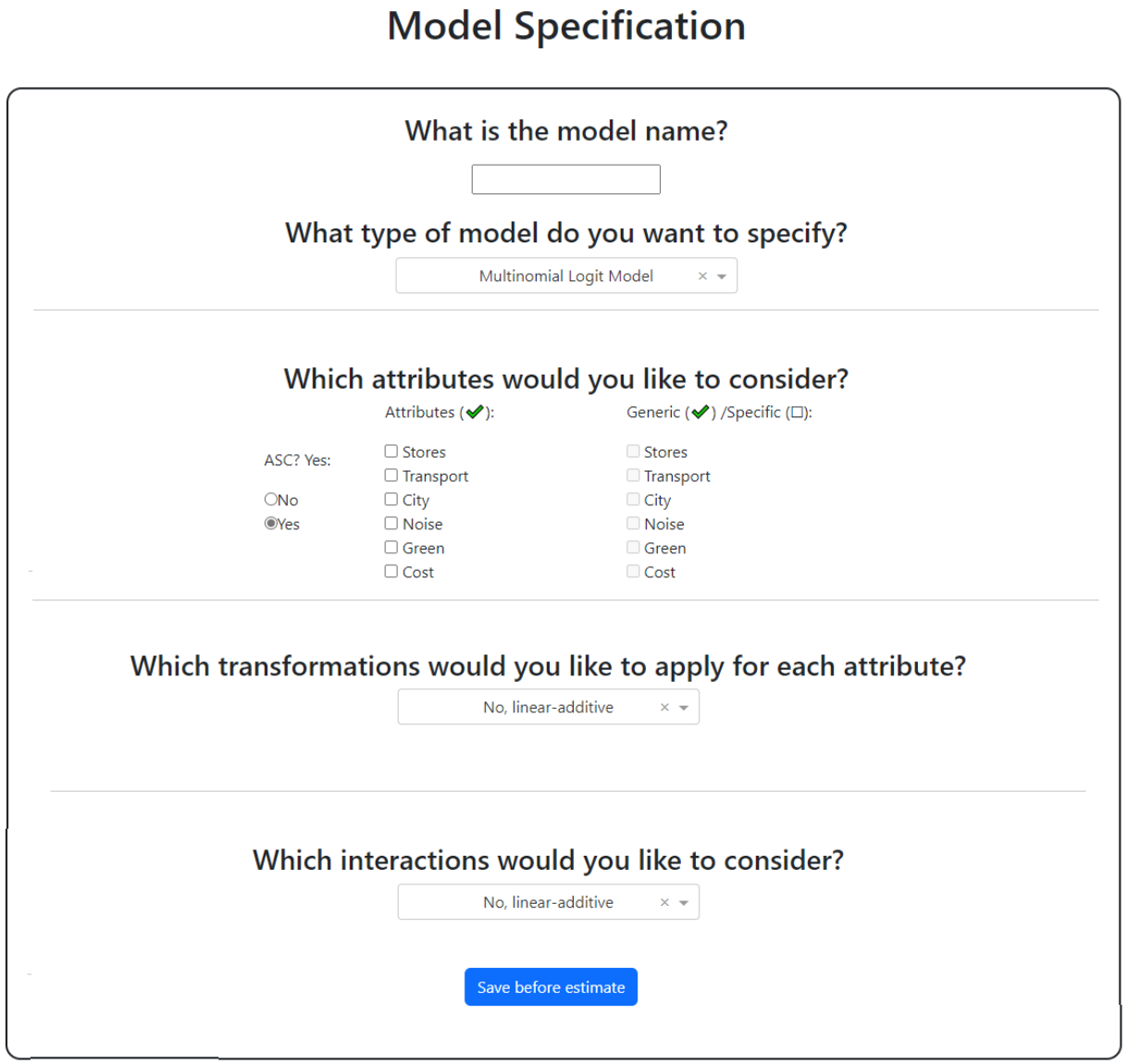
- Navigate freely between game phases: descriptive analysis, model specification, and outcome interpretation.
- Use the provided navigation buttons to move between phases as much as you like.
- The game takes around 45 minutes.
- Please avoid sharing information with co-workers during the game (if applicable).



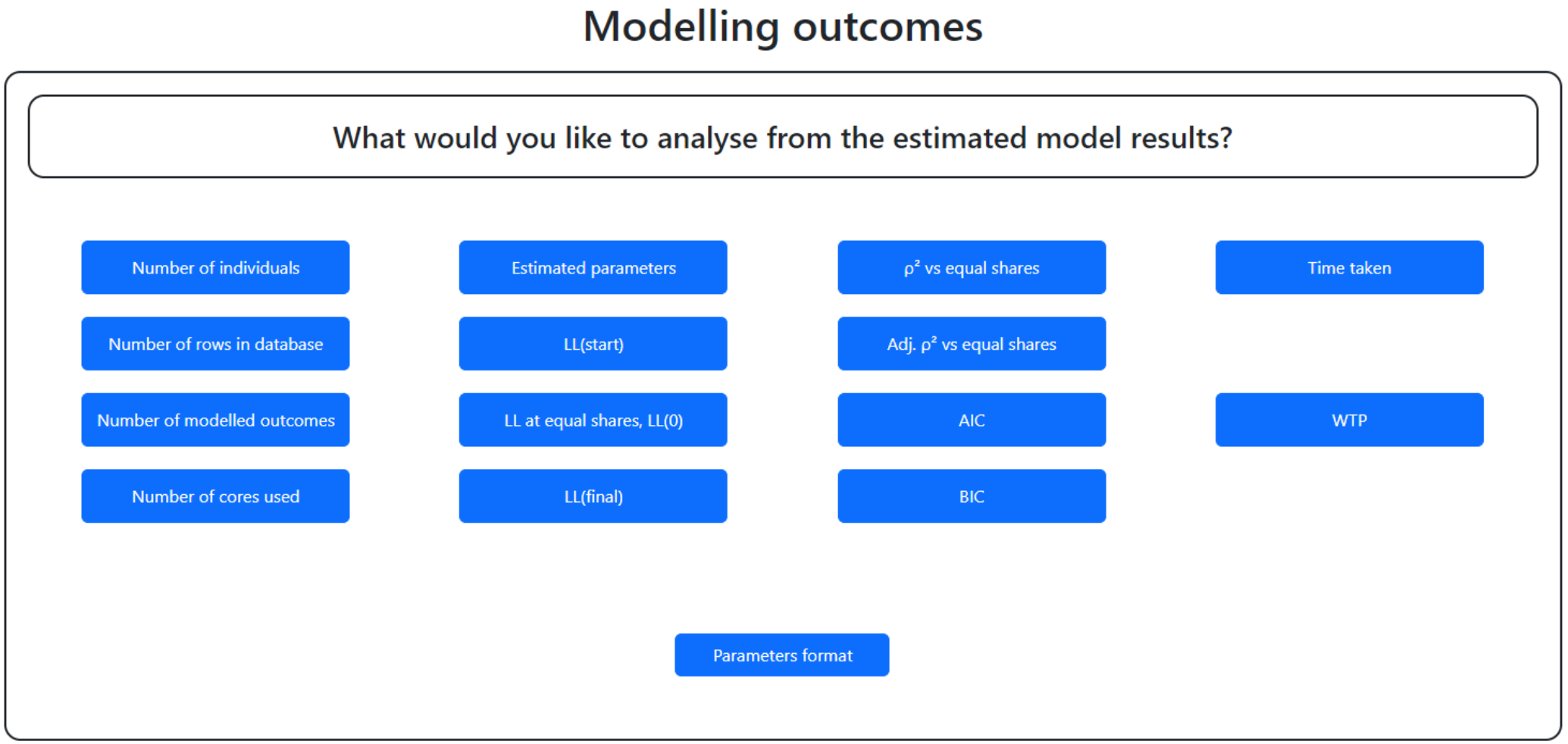
Choice Modelling Serious Game



Choice Modelling Serious Game

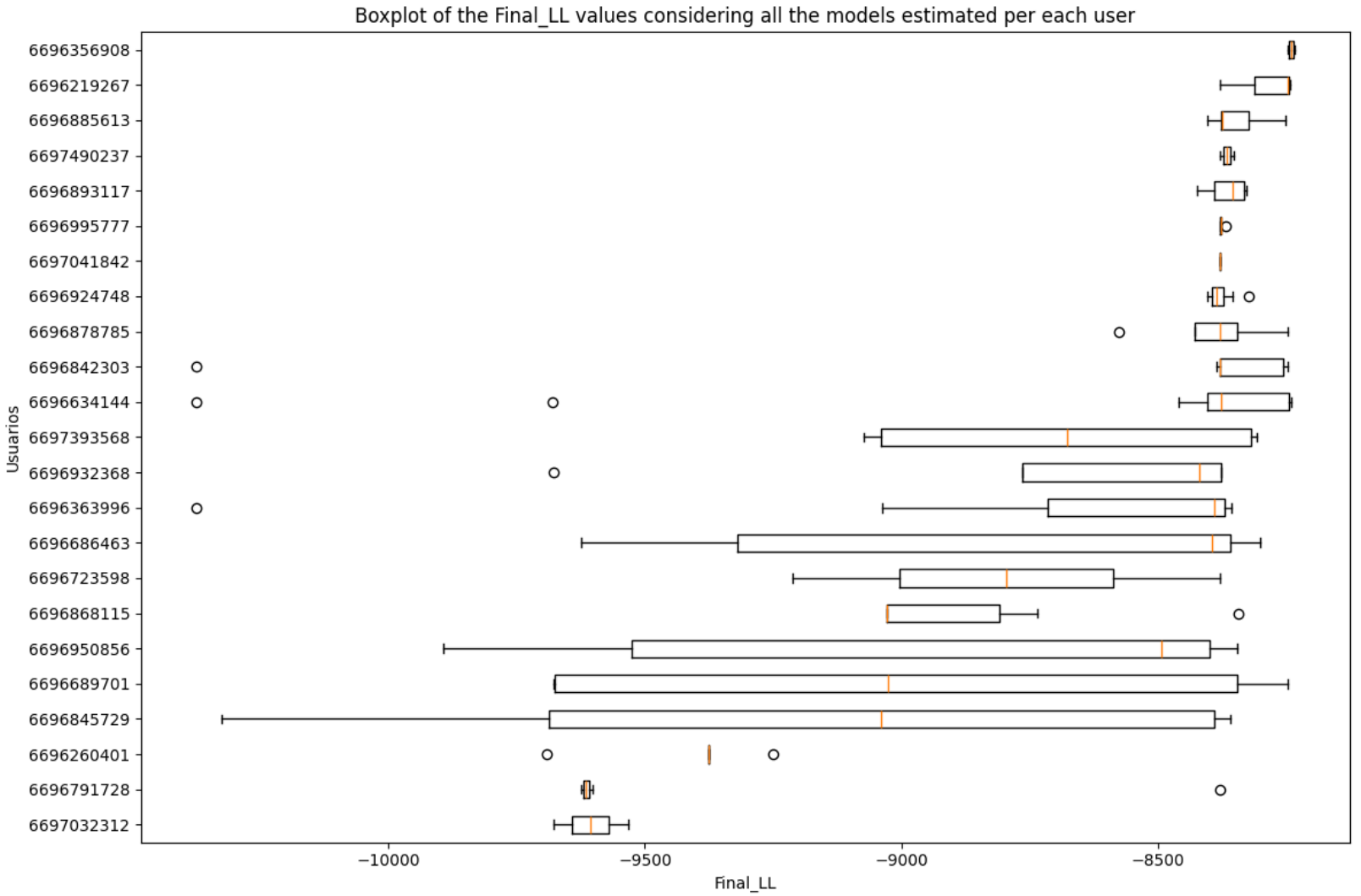


Choice Modelling Serious Game



Game session

Preliminary results



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