

SURVEY PROTOCOL

This document addressing the survey protocol. We conducted an exploratory survey to analyze the perceptions of 10 professors concerning content, topic, methodology, and learning outcomes of the Academic Software Factory (ASF) in the context of IA-based systems development as a learning environment. The survey was planned to follow the process proposed by Kasunic (2005) and Kitchenham e Pfleeger (2008) for effective design of surveys for the software engineering area. Specifically, the document is divided into five parts: 1) Research Objectives; 2) Target Audience Identification; 3) Survey Instrument Design; 4) Survey Instrument Evaluation; and 5) Data Collection and Analysis.

1. Research Objectives

We used the Goal-Question-Metric (GQM) model (Basili, 1984) to set out the objectives of the experiment that can be summarized as follows: "Analyze **Academic Software Factory for AI-based systems developments** for the purpose of **evaluation** with respect to **content, themes, learning outcomes and methodology** from the point of view of **professors** in the context of **undergraduate computing course**".

For achieving the goal, we seek to investigate the two Research Questions (RQs):

- **RQ1. What is the professors' profile?** To answer this RQ, we identify some information about professors, such as their, gender, city, experience time, area and software factory know.
- **RQ2. What are the professors' perceptions about the ASF?** To answer this RQ, we analyze the professors' perception about content, themes, learning outcomes and methodology of ASF.

2. Target Audience Identification

The target audience of this survey is made up of men and women professors who knowing or teaching an ASF. These professors are distributed in four Universities of Brazil. From the target audience defined, the next step consists in the selecting sample. In this survey, we use a random sampling in which individuals of the sampling frame are selected at random (Thompson, 2012).

3. Survey Instrument Design

The survey was conducted using the Google Forms tool¹ for questionnaire design. The survey, including almost twenty Portuguese questions, was designed based on the RQs.

The questionnaire had several different types of questions such as 12 multiple choice questions and 8 open questions. The questionnaire is grouped into the following two sections: (i) information and experience of professors; and (ii) information of professors' perceptions about ASF. The first

¹ <https://www.google.com/forms/about>

section aims to gather background information about the professors and their experiences. The second section is designed to get information from the professors 'perception about the content, themes, learning outcomes and methodology of ASF.

4. Survey instrument evaluation

After the first version of the survey has been released, a pilot study was conducted aim to analyze instrument validity. According to Kasunic (2005), conducting a pilot survey is fundamental, as it allows detecting possible existing problems.

In this sense, we applied four open questions proposed by Hauck et al. (2011) to evaluate survey content, such as (1) Does the questionnaire contain everything that is expected to meet your goal?; (2) Does the questionnaire contain unnecessary information for the context and purpose of the survey?; (3) Did you adequately understand the questions?; and (4) Are there any errors or inconsistencies in the questionnaire?

Two professors were invited by email to participate in the pilot study. These professors were chosen by the criteria of availability and proximity as the group where this research was carried out. The professors (one from SE area and one from AI area) participated in the pilot study, answering the questions defined by Hauck et al. (2011) and sending their feedback. The professor's evaluation was positive, with suggestions to: (i) reduce the number of questions; (ii) leave some questions as non-mandatory; and (iii) include examples and artifacts to assist the proposal and methodology comprehension.

5. Data Collection and Analysis

After piloting the questionnaire to checking its consistency and legibility, the survey request was available to the professors. The questionnaire was sent by email for 10 professors and open for three weeks, from 20th May to 10th June 2024.

The obtained survey data is analyzed. To assist the analysis process, two activities were carried out previously Kitchenham e Pfleeger (2008): (i) we performed the data validation, checking the consistency and completeness of responses; and (ii) we partition the players' responses into two subgroups according to roles, design and methodology, before data analysis.

After these activities, the quantitative and qualitative analyses were conducted according to the type of questions used in the survey. We use descriptive statistics for the quantitative data interpretation, and discourse analysis and data visualization for the qualitative analysis.

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