
Analyzing the Students' Perception of UML Diagrams: Instruments Used in Evaluation

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ABSTRACT

Unified Modeling Language (UML) has been adopted as a standard modeling language in the software industry for the graphical representation of analysis and design models. Due to its importance, UML is taught in most undergraduate majors in Software Engineering and Computing. However, little is known about the students' perception regarding the UML diagrams. We conducted an exploratory study to investigate the students' perception regarding UML diagrams acceptance. In this study, we investigated five UML diagrams taught for the undergraduate students from Federal University of Amazonas. These UML diagrams are: class diagrams, use case diagrams (and specifications), sequence diagrams, state machine diagrams, and activity diagrams. In order to evaluate the perceptions of senior undergraduate students on UML diagrams and thus help instructors improving the teaching of its importance, we applied Technology Acceptance Model (TAM) questionnaires. This technical report presents the TAM questionnaires for each UML diagram. Thus, other researchers may replicate it, providing outcomes in different contexts.

TECHNOLOGY ACCEPTANCE MODEL (TAM)

The Technology Acceptance Model (TAM) is usually employed to understand the users' acceptance of technologies [1]. It posits that user's behavioral Intention to Use (IU) a technology is determined by two constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEU). PU is defined as the extent to which a person believes that using a technology will enhance his or her job performance and PEU is defined as the degree to which a person believes that using a technology will be free of effort. In addition, PEU directly influences PU [1]. Other authors have used the original or the extended versions of TAM. They have applied it on different systems to better understand determinants of the technology acceptance [2]. Furthermore, TAM has been applied for the evaluation of several technologies, producing reliable results [3].

TAM QUESTIONNAIRES

Below we present the TAM statements adapted for each UML diagram, such as class diagrams, use case diagrams (and specifications), sequence diagrams, state machine diagrams, and activity diagrams. We hope that other researchers may replicate it, providing outcomes in different contexts on students' perception regarding UML diagrams acceptance.

- **CLASS DIAGRAMS**

Perceived Ease of Use							
	Totally Agree	Strongly Agree	Partially Agree	Neutral	Partially Disagree	Strongly Disagree	Totally Disagree
PEU1. My interaction (modeling and comprehension of these models) with class diagrams is clear and understandable.							
PEU2. Interacting (modeling and comprehension of these models) with class diagrams does not require a lot of my mental effort.							
PEU3. I find class diagrams to be easy to use (both for modeling and comprehension of these models).							
PEU4. I find it easy to get class diagrams to do what I want it to do (modeling and comprehension of these models).							
Perceived Usefulness							
PU1. Using class diagrams improves my performance better for understanding aspects of the software.							
PU2. Using class diagrams in my job has improved my productivity for understanding aspects of the software.							
PU3. Using class diagrams enhances my effectiveness in understanding aspects of the software.							
PU4. I consider class diagrams useful for software design.							
Intention to Use							
IU1. Assuming I had enough time to design software, I intend to use class diagrams.							
IU2. Taking into account that I have the domain to choose any notation for the analysis and project, I predict that I would use class diagrams.							

- USE CASE DIAGRAMS AND SPECIFICATION**

Perceived Ease of Use							
	Totally Agree	Strongly Agree	Partially Agree	Neutral	Partially Disagree	Strongly Disagree	Totally Disagree
PEU1. My interaction (modeling and comprehension of these models) with use case diagrams (and specifications) is clear and understandable.							
PEU2. Interacting (modeling and comprehension of these models) with use case diagrams (and specifications) does not require a lot of my mental effort.							
PEU3. I find this artifact to be easy to use (both for modeling and comprehension of these models).							
PEU4. I find it easy to get use case diagrams (and specifications) to do what I want it to do (modeling and comprehension of these models).							
Perceived Usefulness							
PU1. Using use case diagrams (and specifications) improves my performance better for understanding aspects of the software.							
PU2. Using use case diagrams (and specifications) in my job has improved my productivity for understanding aspects of the software.							
PU3. Using use case diagrams (and specifications) enhances my effectiveness in understanding aspects of the software.							
PU4. I consider use case diagrams (and specifications) useful for software design.							
Intention to Use							
IU1. Assuming I had enough time to design software, I intend to use the use case diagrams (and specifications).							
IU2. Taking into account that I have the domain to choose any notation for the analysis and project, I predict that I would use the use case diagrams (and specifications).							

- SEQUENCE DIAGRAMS**

Perceived Ease of Use							
	Totally Agree	Strongly Agree	Partially Agree	Neutral	Partially Disagree	Strongly Disagree	Totally Disagree
PEU1. My interaction (modeling and comprehension of these models) with sequence diagrams is clear and understandable.							
PEU2. Interacting (modeling and comprehension of these models) with sequence diagrams does not require a lot of my mental effort.							
PEU3. I find sequence diagrams to be easy to use (both for modeling and comprehension of these models).							
PEU4. I find it easy to get sequence diagrams to do what I want it to do (modeling and comprehension of these models).							
Perceived Usefulness							
PU1. Using sequence diagrams improves my performance better for understanding aspects of the software.							
PU2. Using sequence diagrams in my job has improved my productivity for understanding aspects of the software.							
PU3. Using sequence diagrams enhances my effectiveness in understanding aspects of the software.							
PU4. I consider sequence diagrams useful for software design.							
Intention to Use							
IU1. Assuming I had enough time to design software, I intend to use sequence diagrams.							
IU2. Taking into account that I have the domain to choose any notation for the analysis and project, I predict that I would use sequence diagrams.							

• **STATE MACHINE DIAGRAMS**

Perceived Ease of Use							
	Totally Agree	Strongly Agree	Partially Agree	Neutral	Partially Disagree	Strongly Disagree	Totally Disagree
PEU1. My interaction (modeling and comprehension of these models) with state machine diagrams is clear and understandable.							
PEU2. Interacting (modeling and comprehension of these models) with state machine diagrams does not require a lot of my mental effort.							
PEU3. I find state machine diagrams to be easy to use (both for modeling and comprehension of these models).							
PEU4. I find it easy to get state machine diagrams to do what I want it to do (modeling and comprehension of these models).							
Perceived Usefulness							
PU1. Using state machine diagrams improves my performance better for understanding aspects of the software.							
PU2. Using state machine diagrams in my job has improved my productivity for understanding aspects of the software.							
PU3. Using state machine diagrams enhances my effectiveness in understanding aspects of the software.							
PU4. I consider state machine diagrams useful for software design.							
Intention to Use							
IU1. Assuming I had enough time to design software, I intend to use state machine diagrams.							
IU2. Taking into account that I have the domain to choose any notation for the analysis and project, I predict that I would use state machine diagrams.							

• **ACTIVITY DIAGRAMS**

Perceived Ease of Use							
	Totally Agree	Strongly Agree	Partially Agree	Neutral	Partially Disagree	Strongly Disagree	Totally Disagree
PEU1. My interaction (modeling and comprehension of these models) with activity diagrams is clear and understandable.							
PEU2. Interacting (modeling and comprehension of these models) with activity diagrams does not require a lot of my mental effort.							
PEU3. I find activity diagrams to be easy to use (both for modeling and comprehension of these models).							
PEU4. I find it easy to get activity diagrams to do what I want it to do (modeling and comprehension of these models).							
Perceived Usefulness							
PU1. Using activity diagrams improves my performance better for understanding aspects of the software.							
PU2. Using activity diagrams in my job has improved my productivity for understanding aspects of the software.							
PU3. Using activity diagrams enhances my effectiveness in understanding aspects of the software.							
PU4. I consider activity diagrams useful for software design.							
Intention to Use							
IU1. Assuming I had enough time to design software, I intend to use activity diagrams.							
IU2. Taking into account that I have the domain to choose any notation for the analysis and project, I predict that I would use activity diagrams.							

References

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