ESEML

Empirical Software Engineering Modeling Language

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MOTIVATION

Researches in Software Engineering proposes

new practices to improve quality attributes

A great part of these fail to present empirical evidence

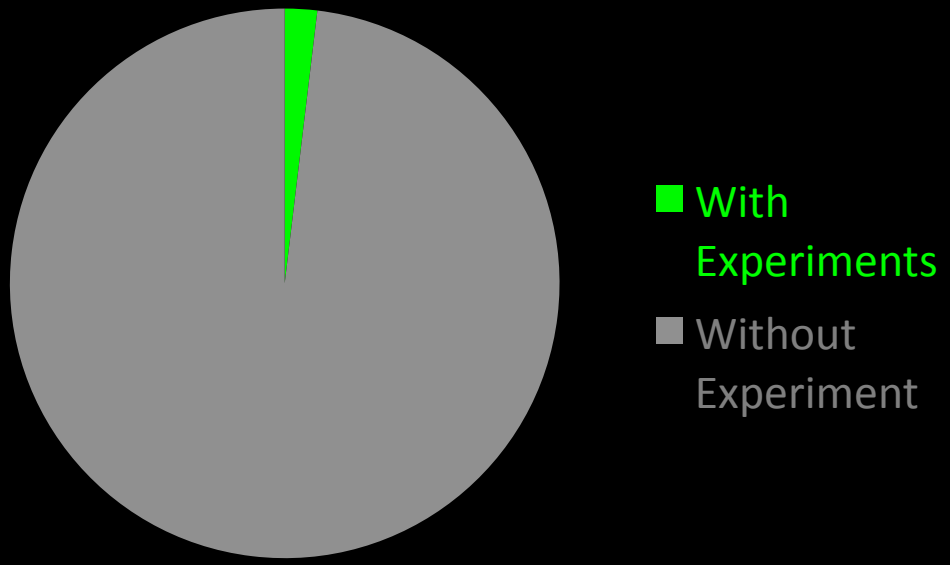
EMPIRICAL SOFTWARE ENGINEERING

There are several types of empirical studies

Such as, surveys, case studies, secondary studies, action research and controlled experiments

CONTROLLED EXPERIMENTS

According to Sjoberg only 1.9% of articles has a controlled experiment and the quality is not very high



CONTROLLED EXPERIMENTS

Wide range of skills is necessary to conduct experiments, often creating a barrier for adopting it

Skills in terminology, statistics know-how, and expertise in experimental design

GOAL

Facilitate the modeling process and the definition of an experimental plan

By mitigating social barriers between stakeholders

Such as statisticians, experiments designers, and domain experts

PROPOSAL

DSLs are efficient to model specific domains

+

Controlled experiments have their specific domain elements

=

ESEML guides controlled experiments modeling in software engineering and reduces social barriers

ESEML

A visual DSL for modeling controlled experiments in software engineering

Automatically generates the experimental plan from an instantiation of a domain model

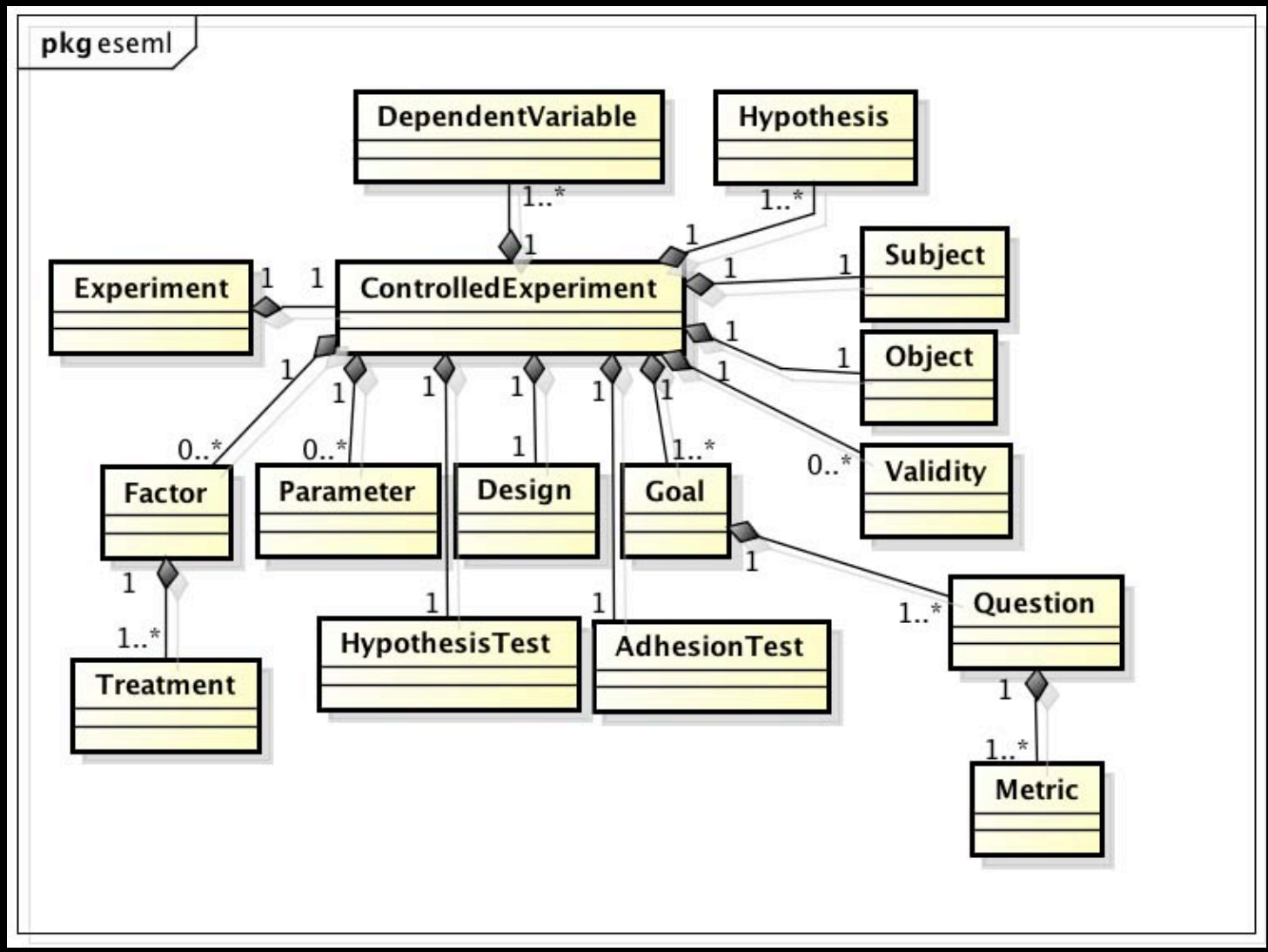
METHODOLOGY

Informal review of models, ontologies and formal representations for controlled experiments

Meta-model based on the review

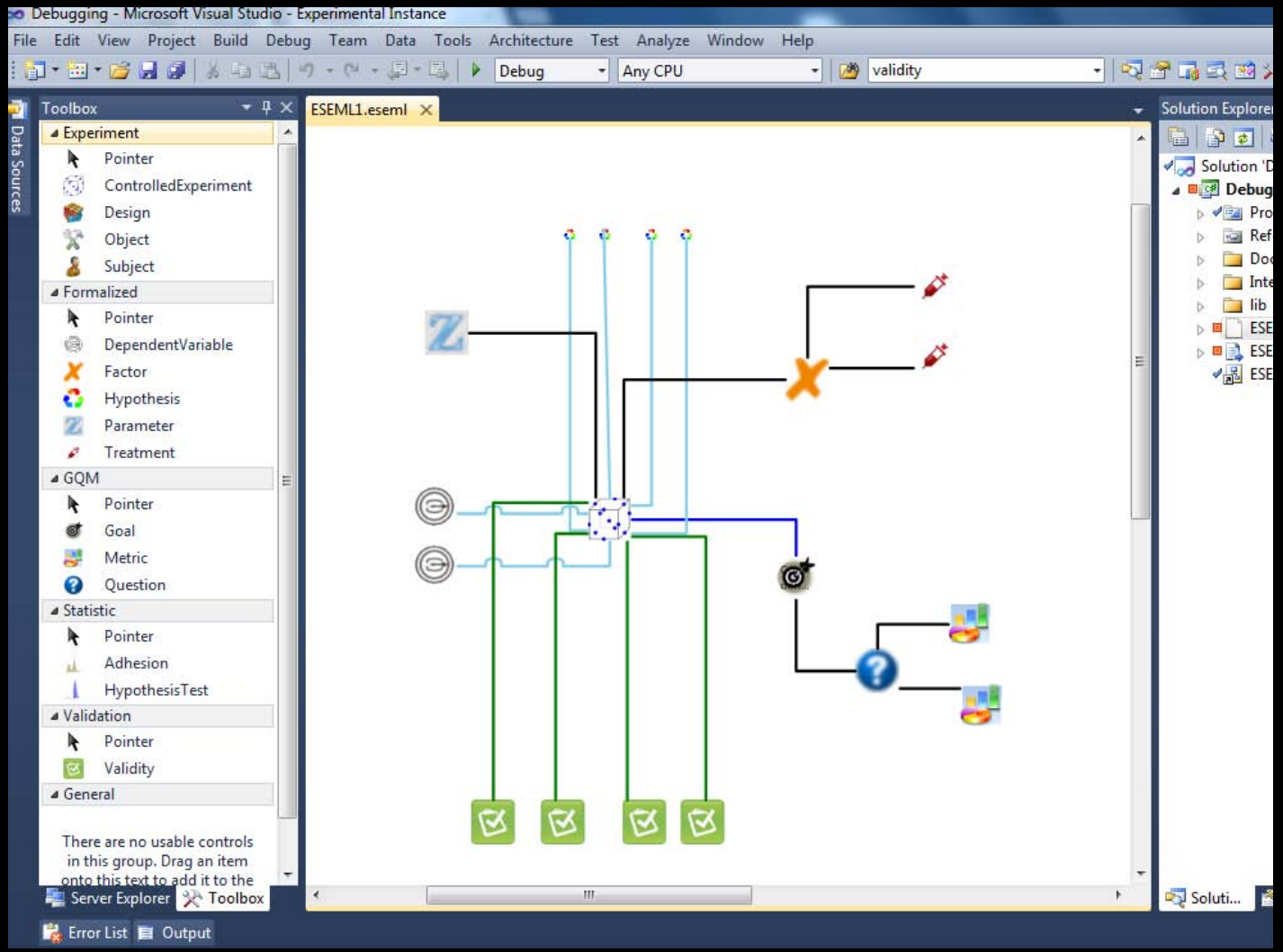
Microsoft DSL Tools to create the DSL and its workbench

META-MODEL


pkg eseml
DependentVariable
Hypothesis
Experiment
ControlledExperiment
Subject
Object
Validity
Factor
Parameter
Design
Goal
Question
Treatment
HypothesisTest
AdhesionTest
Metric
1
0..*
1..*

LANGUAGE WORKBENCH

ELEMENTS PALLETE



EXPERIMENT MODEL

LANGUAGE WORKBENCH

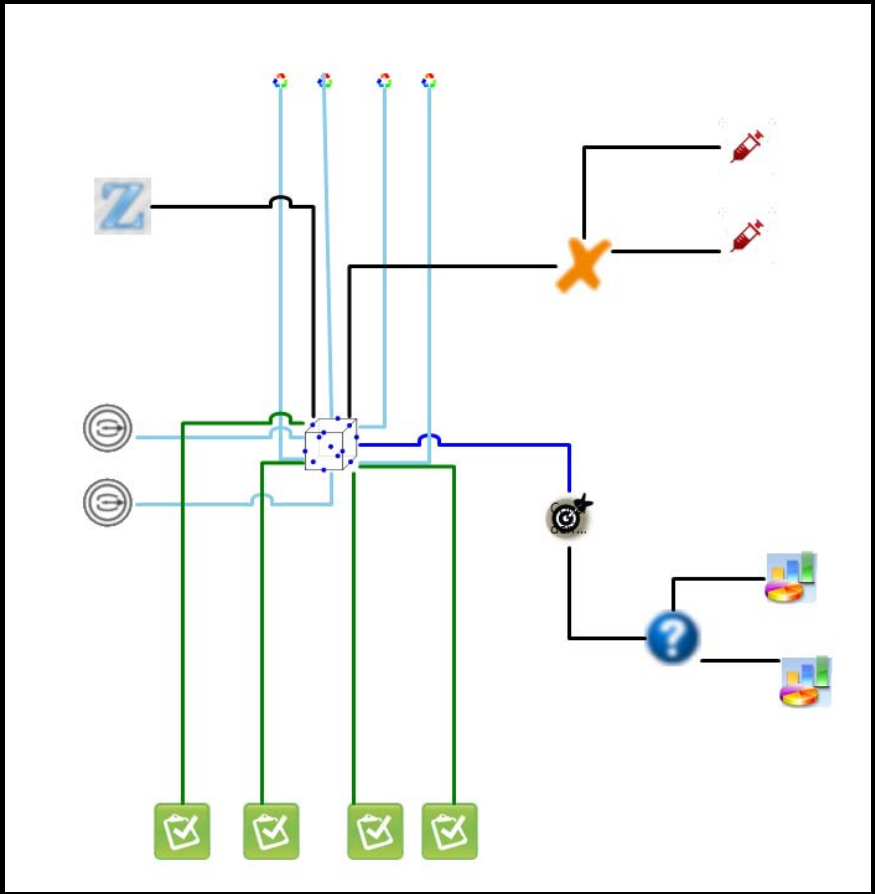
Hypothesis

Parameter

Experiment

Dependent Variable

Validity



Tratment

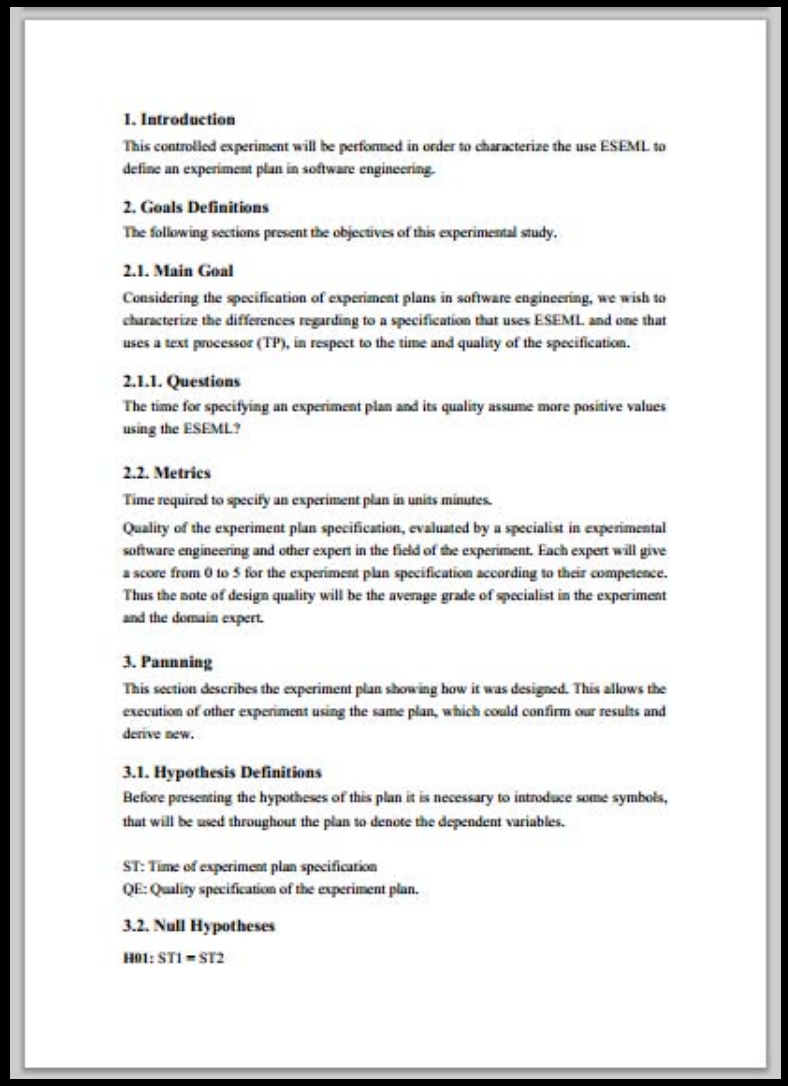
Factor

Goal

Question

Metric

GENERATED DOCUMENT



1. Introduction

This controlled experiment will be performed in order to characterize the use ESEML to define an experiment plan in software engineering.

2. Goals Definitions

The following sections present the objectives of this experimental study.

2.1. Main Goal

Considering the specification of experiment plans in software engineering, we wish to characterize the differences regarding to a specification that uses ESEML and one that uses a text processor (TP), in respect to the time and quality of the specification.

2.1.1. Questions

The time for specifying an experiment plan and its quality assume more positive values using the ESEML?

2.2. Metrics

Time required to specify an experiment plan in units minutes.

Quality of the experiment plan specification, evaluated by a specialist in experimental software engineering and other expert in the field of the experiment. Each expert will give a score from 0 to 5 for the experiment plan specification according to their competence. Thus the note of design quality will be the average grade of specialist in the experiment and the domain expert.

3. Pannning

This section describes the experiment plan showing how it was designed. This allows the execution of other experiment using the same plan, which could confirm our results and derive new.

3.1. Hypothesis Definitions

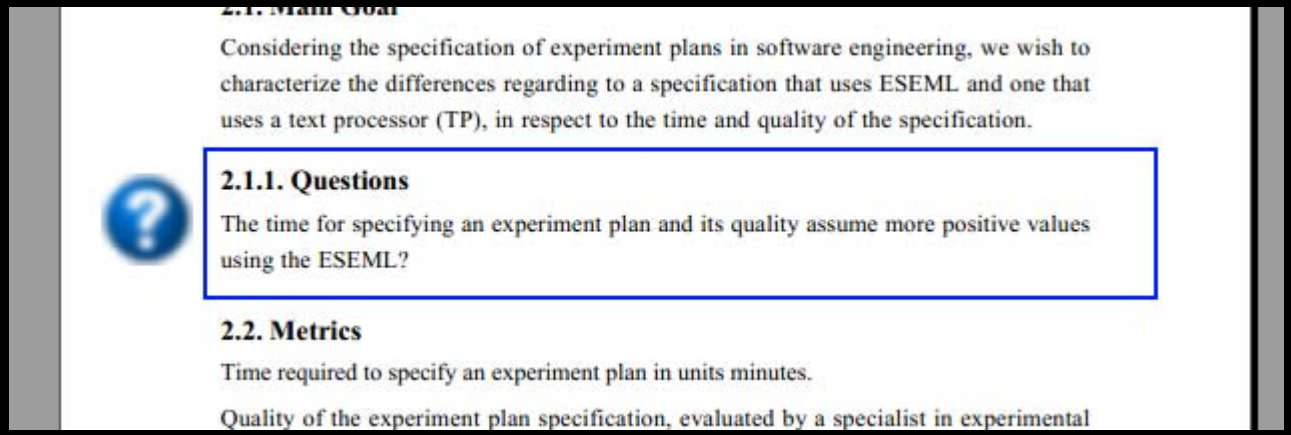
Before presenting the hypotheses of this plan it is necessary to introduce some symbols, that will be used throughout the plan to denote the dependent variables.

ST: Time of experiment plan specification
QE: Quality specification of the experiment plan.

3.2. Null Hypotheses

H01: ST1 = ST2

DOCUMENT PARTS



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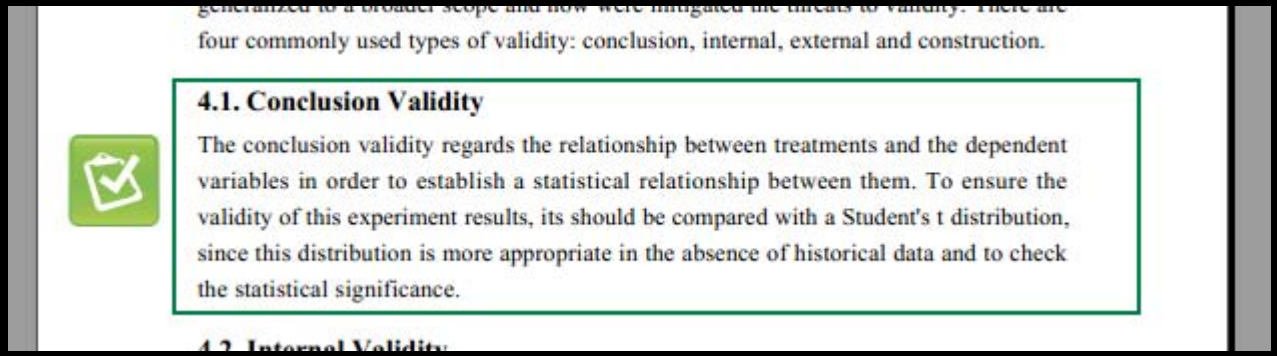
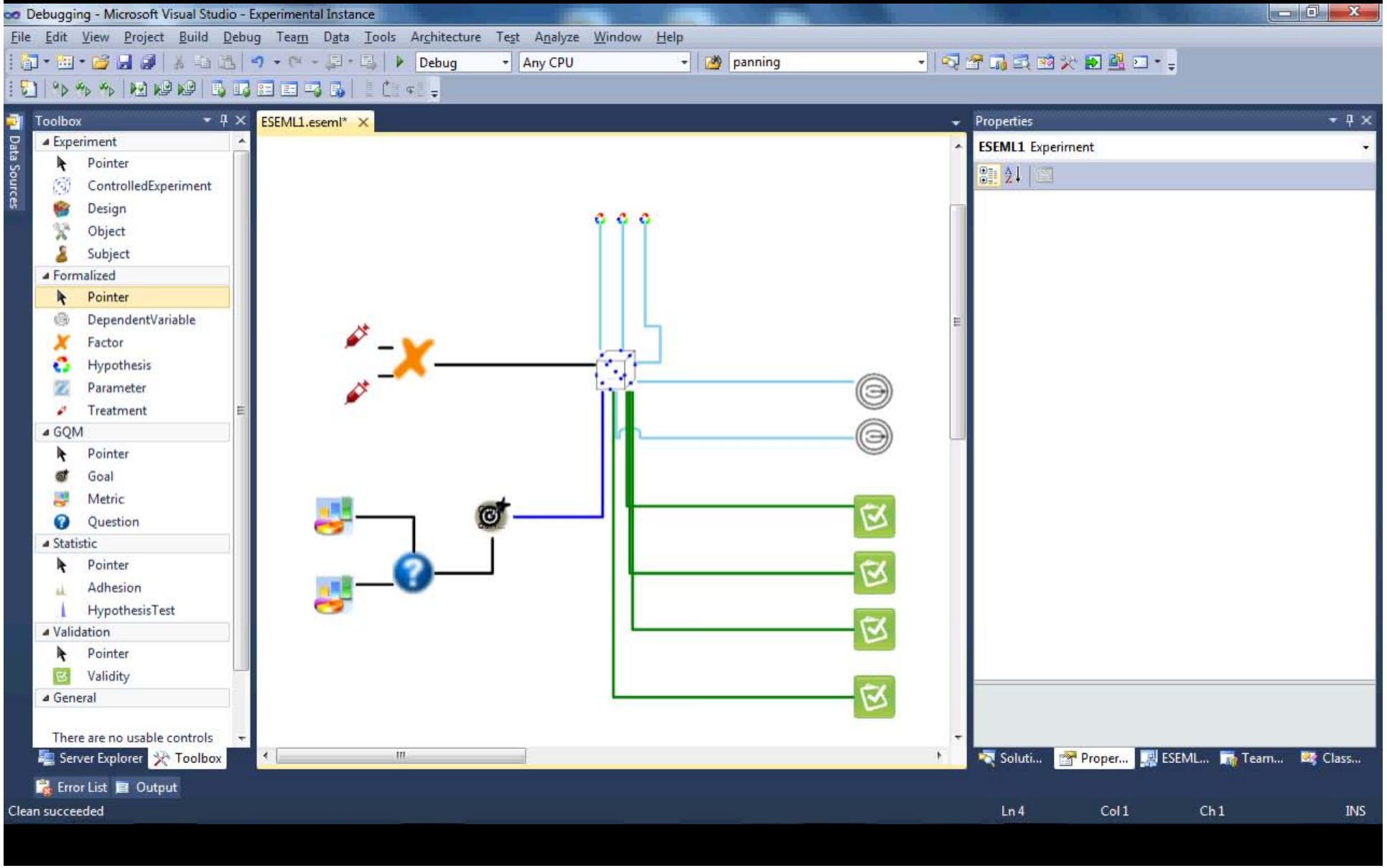


four commonly used types of validity: conclusion, internal, external and construction.

4.1. Conclusion Validity

The conclusion validity regards the relationship between treatments and the dependent variables in order to establish a statistical relationship between them. To ensure the validity of this experiment results, its should be compared with a Student's t distribution, since this distribution is more appropriate in the absence of historical data and to check the statistical significance.

2 minutes demo



CONCLUSION

ESEML is part of a major initiative for defining a platform of empirical studies in software engineering

ESEML guides the definition of the experimental plan 1st version

FUTURE WORK

Automatically generation of artifacts to collect data and execute experiments

Systematic review to more accurate meta-model

Empirical evaluation of ESEML