Design Pattern Impact on Reliability and Usability an SMS

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Abstract—Blah:

Index Terms—

1. Introduction

2. Background and Related Work

2.1. Design Patterns

2.2. Reliability

2.3. Usability

Usability is a quality attribute that can be verified or measured in a software product. Usability is defined in numerous classifications including ISO 9126, ISO 9241-11, and ISO/TR 16982:2002 [1]. Usability as defined by ISO 9126 is "A set of attributes that bear on the effort needed for use, and on the individual assesment of such use, by a stated or implied set of users." [PlaceHolder]. ISO 9241-11 goes on to define usability as "The extent to which a system, product, or service can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use." [PlaceHolder].

2.3.1. Usability Quality Components. Jakob Nielsen a danish web consultant who posses a Ph.D. in human-computer interaction (HCI) from the Technical University of Denmark defined five quality components that make up usability. According to Nielsen, usability is a quality attribute that assesses how difficult a user interface (UI) is to use.

- **Learnability -** Deals with the level of difficulty a user will experience when first interacting with a system to accomplish basic tasks.
- **Efficiency -** Looks at how long it takes a user to complete a certain task once they've gained familiarity with the system.
- **Memorability -** Focuses on a users ability to return to a system after a period of time and regain efficiency using it.
- **Errors -** Looks at the frequency, severity, and recoverability of errors users make while interacting with the system.
- **Satisfaction -** Deals with the amount of fulfillment a user gets from using the system.

[2] Deals with this topic

2.3.2. Usability Inspection Methods. Usability inspection is a set of methods where an evaluator, usually an expert in the field, is brought in to inspect a user interface (UI) with the goal of identifying design issues as well as the associated severity of each issue. There are numerous inspection methods used in evaluating usability [3]:

- **Heuristic evaluation -** is a method for finding usability problems where a small set of evaluators, usually one at a time, judge the UI based on its compliance with a set of predetermined usability principles known as heuristics [3], [4].
- **Cognitive walkthroughs -**
- **Formal usability inspections -**
- **Pluralistic walkthroughs -**
- **Feature inspections -**
- **Consistency inspections -**
- **Standards inspections -**

2.3.3. Usability Testing Methods.

3. Systematic Mapping Approach

A systematic mapping study (SMS) is used to provide a broad overview of a particular research area by identifying previous primary studies whose results are then categorized to create a visual summary, the map. In this paper, the systematic approach used is defined by Kitchenham et al. and later refined by Peterson et al. There are five steps to this process: definition of research questions, searching for relevant papers, screening of papers, and keywording of abstracts. We chose to use this approach because it is well-defined, allows for more general conclusions, and in doing so helps to reduce bias. We decided to go with an SMS instead of a systematic literature review (SLR) for two reasons. The first reason is because we wanted a broader overview of the field and secondly, we were

more interested in general trends rather than the in-depth analysis that an SLR provides. Our goal with this paper is to identify what research has already been done with regards to design patterns and their affect on usability and reliability to determine where new or better research can take place **???**, [5].

3.1. Research Questions

- **RQ1:** What design pattern types do research study when considering usability and reliabiity?
- **RQ2:** What recomendations have been made regarding application of design patterns and in the context of usability and reliability?
- **RQ3:** How is the impact on usability and reliability from design patterns currently evaluated?
- **RQ4:** What type of projects or domains were studied?
- **RQ5:** Where are papers concerning design patterns and reliability and usability published?
- **RQ6:** What types of studies are conducted regarding design pattern impact on usability and reliability?
- **RQ7:** In what phase of development do proposed results apply?
- **RQ8:** What tools are utilized for the research and to which languages do they apply?

3.2. Data Sources

The data sources for this paper included IEEEXplore, ACM Digital Library, SpringerLink, Web of Science, and the Science Direct database. In order to provide a broad overview of the field and ensure relevant papers were selected we limited our search to the years between 2009-2019.

3.3. Search Queries

The search query used in this paper was created from keywords based on our research questions abd included: usability, reliability, design patterns, and pattern.

The specific search query used in this paper was: (usability OR useable OR learnability OR learnable OR efficiency OR satisfaction OR memorability OR memorization) AND (reliability OR reliable OR integrity OR maturity OR compliance OR "fault tolerance") AND ("design pattern" OR pattern)

3.4. Inclusion Criteria

- Only papers whose main focus is on design patterns and their effect on usability or reliability were available for inclusion.
- For papers where multiple iterations of the same paper exist only the latest version was eligible for inclusion.
- Papers that included either reliability or usability and design pattern or pattern as keywords to identify the paper topics.

3.5. Exclusion Criteria

- Papers not written in the English language.
- Papers whose title or abstracts did not contain the selected keyword phrases.
- Papers which discussed the impacts of design patterns on quality attributes excluding reliability or usability or their sub-characteristics.

3.6. Quality Criteria

3.7. Snowballing Approach

We utilized the snoballing approach defined by wohlin et al. [X] to dinf further sources overlooked by the initial search. Specifically, we utilized the following approach:

4. Threats to Validity

This is a blah

4.1. Conclusion Validity

4.2. Construct Validity

4.3. Internal Validity

4.4. Reliability

5. Results

6. Conclusion

7. Recommendations

References

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[5] B. A. Kitchenham, D. Budgen, and O. Pearl Brereton, "Using mapping studies as the basis for further research − A participant-observer case study," *Information and Software Technology*, vol. 53, no. 6, pp. 638–651, Jun. 2011.