DTU

DTU Entrepreneurship
DTU Entrepreneurship

Improving festival crowd safety measurability utilizing AI-enabled video surveillance analysis

Thesis subtitle

Master Thesis

Improving festival crowd safety measurability utilizing AI-enabled video surveillance analysis
Thesis subtitle

Master Thesis
Date, year

By
Torben Albert-Lindqvist

Cover photo: Vibeke Hempler, 2012
Published by: DTU, DTU Entrepreneurship, Diplomvej, Buildings 371 & 372, 2nd floor, 2800 Kgs. Lyngby Denmark
www.entrepreneurship.dtu.dk/
ISSN: [0000-0000] (electronic version)
ISBN: [000-00-0000-000-0] (electronic version)

ISSN: [0000-0000] (printed version)
ISBN: [000-00-0000-000-0] (printed version)

Approval

This thesis has been prepared over six months at the Section for Indoor Climate, Department of Civil Engineering, at the Technical University of Denmark, DTU, in partial fulfilment for the degree Master of Science in Engineering, MSc Eng.

It is assumed that the reader has a basic knowledge in the areas of statistics.

Torben Albert-Lindqvist - s233587

.....

Signature

.....

Date

Abstract

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Acknowledgements

Torben Albert-Lindqvist, MSc Civil Engineering, DTU
Creator of this thesis template.

[Name], [Title], [affiliation]
[text]

[Name], [Title], [affiliation]
[text]

Contents

1 Introduction

1.1 Background and motivation

https://web.archive.org/web/20180830051336/https://www.rollingstone.com/music/music-news/nine-dead-at-pearl-jam-concert-235167/

On June 30th 2000, 9 young men passed away in a crowd crush during a Pearl Jam concert at Roskilde Festival in Denmark [1]. An uncontrolled surge, pushing the crowd towards the scene, caused immense pressure on the frontmost concert-goes, thrusting them against the barriers. The high-energy crowd unknowingly trampled the victims, who succumbed under the pressure of the crowd. This incident is unfortunately not the only one of its kind, as crowd crushes continue to occur at mass gatherings around the world.

1.2 Crowd safety pain points

1.3 Brief history of Fluxense

Together with two classmates, I founded Fluxense in January 2024.

1.4 Scope and limitations

1.5 Problem statement

1.6 Thesis structure

Hubka and Eder (1995) characterize the design process as intuitive, iterative, innovative and unpredictable.

Process needs to organized. (citation?)

Blah blah, following product design methodology / frameworks. Many frameworks exist

1.6.1 Comparison of frameworks

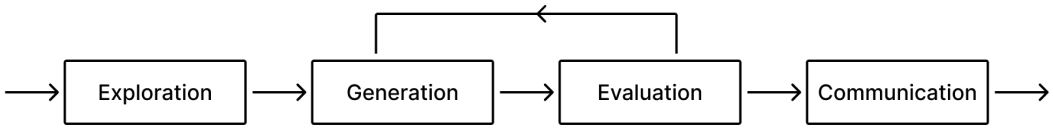

Figure 1.1: Cross' four-stage model of the design process

Cross [2] proposes likely the most simplistic, yet well-known framework: a four-stage model comprised of *exploration*, *generation*, *evaluation* and *communication* (Figure 1.1). Cross describes this type of modal as descriptive, as it merely attempts to model the conventional, heuristic design process. More detailed models of this type exist, such as French's [3] "anatomy of design," (Figure x) detailing four stages, most distinctly underlining the problem analysis and definition, as conducted in section 1.5. According to Cross, these models differ from prescriptive models, which offer a more systematic procedure, as well an emphasis on analyzing and understanding the design problem before generating solution concepts. Perhaps the most well-known of these is offered by Pahl et. al [4], and is based on the following design stages: *clarification of the task*, *conceptual design*,

embodiment design, and *detail design*. Combining the aforementioned models, Ulrich and Eppinger present a rather comprehensive framework. Their process is based on the following stages: *concept development*, *system-level design*, *detail design*, and *testing and refinement* [5].

These frameworks provide varying degrees of structure to the design process, but all share the commonality of being highly engineering-focused. In engineering a physical product, a rigid, structured process is often necessary as each iteration must be designed, manufactured and tested. This is costly, both in effort and material costs. Software, on the other hand, is much more flexible, with iterations being a magnitude faster and cheaper to develop. This demonstrates a need for adapting the design process to the context of the product being developed. Conveniently, Ulrich and Eppinger present a multitude of adaptations to their framework, including what they refer to as ”Quick-Build Products” and ”Digital Products.” Here the *detail design* and *testing and refinement* stages are omitted, and replaced with a cyclical design-build-test process. Whereas the linear, rigid processes described previously are labelled as ”waterfall methods”, this iterative process is most often referred to as *agile development*.

Agile development has a myriad of implementations, with the most popular being *Scrum*. Scrum is based on the following stages: *sprint planning*, *daily stand-up*, *sprint review*, and *sprint retrospective*, with a sprint typically lasting 2-4 weeks [6].

Blah blah, these have engineering-focused prescriptive, software needs more flexibility, as explained by ulrich and eppinger, agile, scrum, double diamond

2 Theory

3 Examples of figures, tables, equations and listings

3.1 Tables and figures

References

[1] David Fricke. *Nine Dead At Pearl Jam Concert*. Aug. 2000. URL: https://web.archive.org/web/20180830050458/https://www.rollingstone.com/music/music-news/nine-dead-at-pearl-jam-concert-235167/.

[2] Nigel Cross. *Engineering Design Methods: Strategies for Product Design*. Third Edition. John Wiley and Sons, Ltd, 2000.

[3] Michael Joseph French. *Conceptual Design for Engineers*. Second Edition. Springer-Verlag Berlin Heidelberg GmbH, 1985.

[4] Gerhard Pahl et al. *Engineering Design: A Systematic Approach*. Third Edition. Springer, 2007.

[5] Karl T. Ulrich, Steven D. Eppinger, and Maria C. Yang. *Product Design and Development*. Seventh Edition. McGraw-Hill Education, 2020.

[6] Ken Schwaber and Jeff Sutherland. *Scrum Guide*. Scrumguides.org. Nov. 2020. URL: https://scrumguides.org/scrum-guide.html.

A Title

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Technical
University of
Denmark

Diplomvej, Buildings 371 & 372, 2nd floor
2800 Kgs. Lyngby
Tlf. 4525 1700

www.entrepreneurship.dtu.dk/