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BUILDING DESIGN

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OUTPUT

at the end of design
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DESIGN OUTPUT
at the end of design

DESIGN ASSESSMENT
independent and isolated process
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- DESIGN OUTPUT: at the end of design
- DESIGN ASSESSMENT: independent and isolated process
- NON-COMPLIANCE: late detection
INTRODUCTION

DESIGN OUTPUT
at the end of design

DESIGN ASSESSMENT
independent and isolated process

NON-COMPLIANCE
late detection

rework
REDESIGN
INTRODUCTION

potential source of delay and overspending

DEROGATION PROCESS

DESIGN OUTPUT
at the end of design

DESIGN ASSESSMENT
independent and isolated process

NON-COMPLIANCE
late detection

rework

REDESIGN
INTRODUCTION

potential source of delay and overspending

DEROGATION PROCESS

DESIGN OUTPUT

at the end of design

REDESIGN

rework

DESIGN ASSESSMENT

independent and isolated process

NON-COMPLIANCE

late detection

can be understood as a design mistake
INTRODUCTION

AUTOMATION streamlines design assessment
INTRODUCTION

AUTOMATION streamlines design assessment

problematic with subjective requirements

human involvement

implicit and abstract requirements

(Nawari 2012; Dimyadi and Amor 2013; Lee et al. 2019)
INTRODUCTION

AUTOMATION
streamlines design assessment

HYBRID APPROACHES
degrees of automation
human involvement

problematic with subjective requirements
human involvement
implicit and abstract requirements

(Nawari 2012; Dimyadi and Amor 2013; Lee et al. 2019)
INTRODUCTION

AUTOMATION streamlines design assessment

HYBRID APPROACHES degrees of automation human involvement

problematic with subjective requirements

human involvement implicit and abstract requirements

(Nawari 2012; Dimyadi and Amor 2013; Lee et al. 2019)
How existing technologies can support mistakeproofing in healthcare design (theoretical analysis).
AIM

How existing technologies can support mistakeproofing in healthcare design (theoretical analysis).

METHOD

DSR

- ongoing PhD research preliminary findings
- Evidence from theoretical data from literature review
- Results partially informed by empirical data
AIM

How existing technologies can support mistakeproofing in healthcare design (theoretical analysis).

METHOD

1. Identification of technologies to support design
2. Classification according to the principles of mistakeproofing, based on their use in design
3. Analysis of technologies and their application
TECHNOLOGIES AND MISTAKEPROOFING

Prevent Occurrence of Human Mistake

Minimise Effects after Occurrence of Human Mistake

(Shingo 1986; McMahon 2016; Tommelein 2019)
TECHNOLOGIES AND MISTAKEPROOFING

ELIMINATE  PREVENT  REPLACE  FACILITATE

Prevent Occurrence of Human Mistake

DETECT  MITIGATE

Minimise Effects after Occurrence of Human Mistake

(Shingo 1986; McMahon 2016; Tommelein 2019)
TECHNOLOGIES AND MISTAKEPROOFING

FUTURE

Generative Design
  - Optimisation
  - Optioneering

NOW

ELIMINATE  PREVENT  REPLACE  FACILITATE

Prevent Occurrence of Human Mistake

MISTAKE

DETECT  MITIGATE

Minimise Effects after Occurrence of Human Mistake
TECHNOLOGIES AND MISTAKEPROOFING

FUTURE

Generative Design
- Optimisation
- Optioneering
  - Parametric Modelling
    - Constraints
    - Object Spatial Boundaries

NOW

ELIMINATE
PREVENT
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MISTAKE

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VPL Tools

NOW

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TECHNOLOGIES AND MISTAKEPROOFING

FUTURE

- Generative Design
- Parametric Modelling
  - Constraints
  - Object Spatial Boundaries

NOW

- Optimisation
- Optioneering
- VPL Tools

MISTAKE

- Efficient Approaches (VR / AR)
- Warnings and Alerts

ELIMINATE

- Prevent Occurrence of Human Mistake

PREVENT

- Design Assistant

REPLACE

- Current Automated Rule Checking Techniques

FACILITATE

- Minimise Effects after Occurrence of Human Mistake

DETECT

- Mitigate

MITIGATE
<table>
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<tr>
<th>TECHNOLOGY</th>
<th>APPLICATION</th>
<th>LIMITATION</th>
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<tr>
<td>E</td>
<td>Generative Design</td>
<td>Sorting layout of floorplans based on constraint requirements of area and spatial adjacencies.</td>
</tr>
<tr>
<td>P</td>
<td>Parametric Modelling</td>
<td>A window must have a wall as a host; minimum free distances in front and on both sides of beds.</td>
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<tr>
<td>R</td>
<td>VPL Tools</td>
<td>Repetitive operations - including, adapting and modifying objects with repetitive parameters.</td>
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<tr>
<td>F</td>
<td>Design Assistant</td>
<td>Suggest where, how and why elements should be inserted; track decision-making process.</td>
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<tr>
<td>F</td>
<td>Warnings and Alerts</td>
<td>Visually flag potential mistakes; promptly inform designers after any mistake is detected.</td>
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<tr>
<td>F</td>
<td>Immersive VR / AR</td>
<td>Use of VR headsets and software to walk-through the design.</td>
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<tr>
<td>D</td>
<td>Automated Rule Checking</td>
<td>Checking building models against set of encoded rules; can be isolated or continuous.</td>
</tr>
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DISCUSSION

MISTAKES IN DESIGN
MISTAKES IN DESIGN
THEORETICAL IMPLICATIONS

Requirements Subjectivity

Hybrid Solutions

Design Support Systems

Autonomation (Jidoka)

Mistakeproofing

People

Technologies
FINAL REMARKS

It is feasible to adopt mistakeproofing concepts in design

LIMITATION
technologies were theoretically assessed
validation in design practice is needed

FUTURE WORK
further investigate and test contributions from each technology in practice

Need to understand the relationship between
human designers and technologies
to further explore mistakeproofing possibilities in design
THANK YOU!

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