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Leveraging BIM and IoT for Enhancing Fire Safety in Historical Buildings

Anastasios Manos

Dr. Despina Elisabeth Filippidou

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OPERATIONAL PROGRAMME
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ENTREPRENEURSHIP
INNOVATION

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ανάπτυξη - εργασία - αλληλεγγύη

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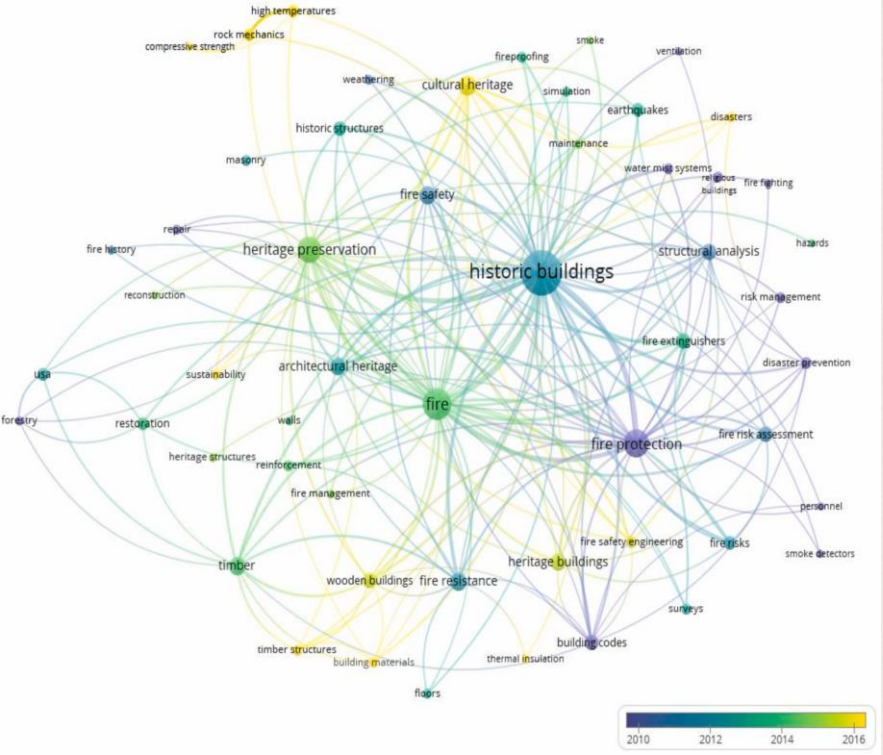
Historical Buildings

Number one Risk

Based on a bibliometric research study, the following graph demonstrates that Fire is considered the most catastrophic factor for a cultural building



Key characteristics

Historical buildings are an integral part of the cultural heritage of every place, and beyond the obvious need for protection against risks, they have specific requirements regarding the handling of hazards and disasters such as fire, floods, earthquakes

I

The building itself

Historical buildings are considered themselves as cultural heritage

II

The usage

Historical buildings are often used as museums or cultural spaces, necessitating the protection of both human life (visitors and workers) and the cultural treasures they house

European Guideline

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CFPA-E No 30:2013 F

Risk Assessment

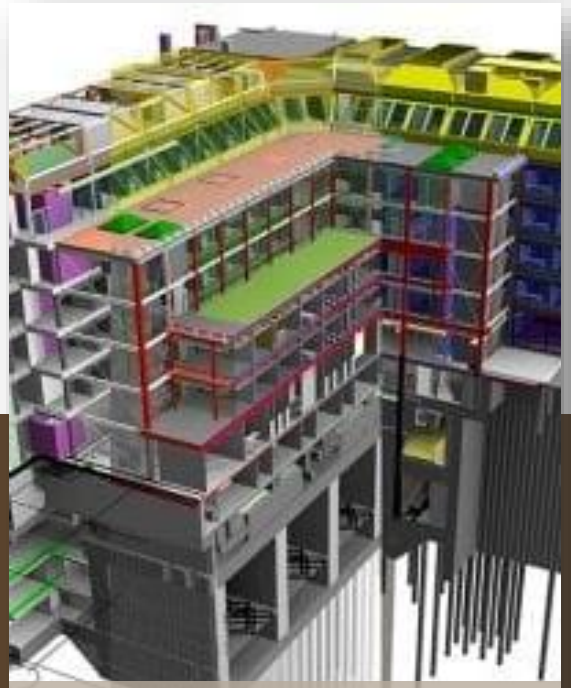
Risk assessment is the first step of fire protection management, an on-going process with a **goal to achieve and support a certain level of fire safety** in a historic building. Investment in risk assessment planning made by professionals – a team of fire protection consultants and restoration experts, and preparation of cost-benefit analysis can provide acceptable solutions and save money. Fire protection measures should be based on this risk assessment.

The risk assessment should be **kept up to date**. It should be reviewed on a regular basis, not less than annually, before and after maintenance works, special events, etc. Usually, trained in-house personnel can check if fire safety is on a required level and ask for help of fire protection consultants, if needed.

It is quite challenging to reshape and operate within the framework of modern regulations and protection measures for cultural buildings.

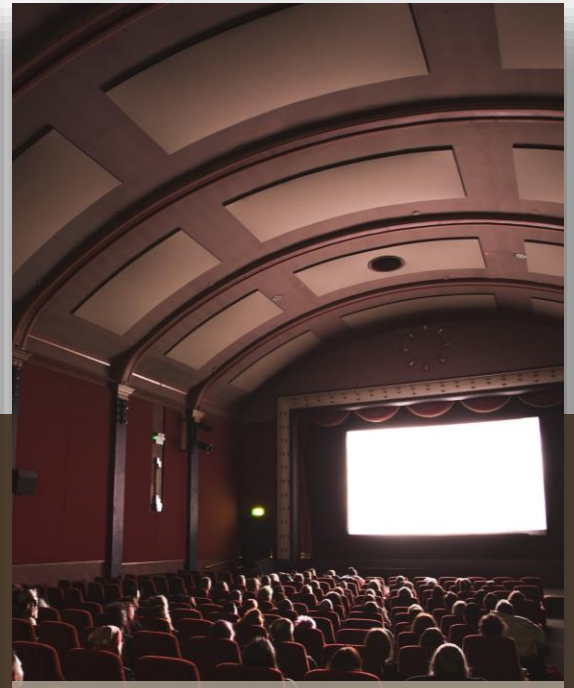
The need

Automatically track and collect digital information that can be assessed



Digital twin of the Building layout

Factors that affect fire safety



People in risk

What if scenarios

The approach

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BIM Scan

Model

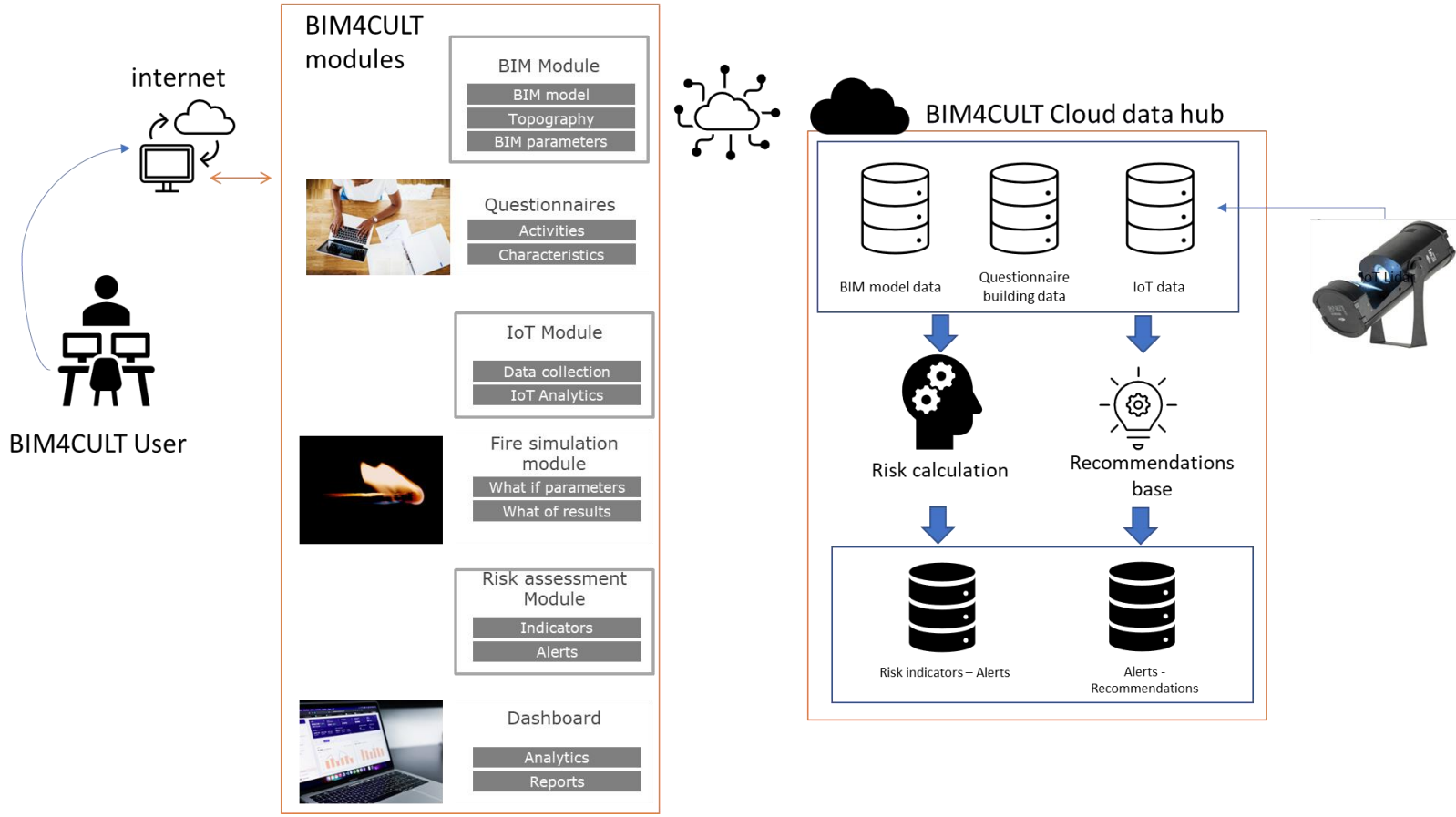
IoT

People Counting /
Doors blocked

Factor analysis

Logical **Data Flow**

BIM4CULT is a tool for timely assessing and monitoring of the fire safety level of historical buildings using BIM and IoT technologies in an integrated manner. The tool serves as a decision support expert system for improving the fire safety of historical buildings by continuously monitor-ing, controlling and assessing critical risk factors for fire.



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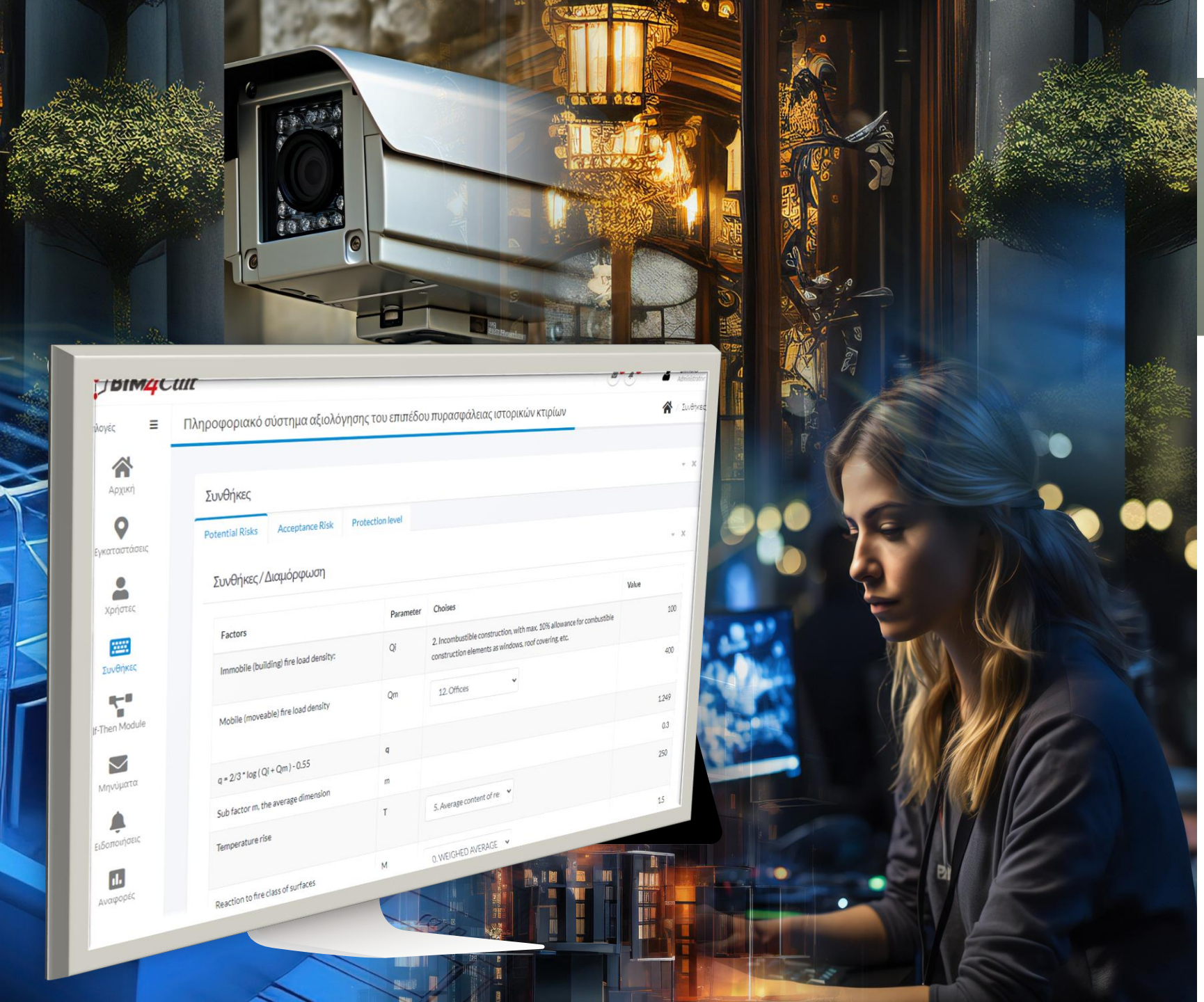

BIM4Cult
Web app

The platform brings together BIM mode building factors, other parameters that affect fire safety risk indicators and IoT data

To gather real-time data, Lidars were installed in the building, enabling unobtrusive people counting analyt-ics and providing information on exits that might be blocked during emergencies. The tool was then utilized during a pilot validation period, showcasing its ability to monitor fire risk assessment in real time. Further-more, it served as a test-bed for evaluating different fire protection scenarios by modifying building factors that influence the risk assessment results.

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The methodological steps

Risk assessment is an iterative process

Baseline setup (BIM)

Decide

Create new strategical actions and investments plan for lowering risks

What if

Re-assess Risk indicators based on what if scenarios for building factors and crowd policies

Monitor

Risk indicators based on BIM, infrastructure factors and IoT live data

Pilot

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end.

Phone:
+302310500181

Gmail:
info@dotsoft.gr

Web Address:
www.dotsoft.gr