Optimising Porosity

A Temporal Framework for Architectural Innovation and Experimentation in Train Stations

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Positioning Experimentation

Reflecting on the interplay between the quest for certainty in the built environment and the role of experimentation offers key insights into architectural design and planning. As designers are increasingly pressured to deliver precision and predictive accuracy, experimentation emerges as an essential tool for engaging with and evaluating decisions and qualities. The increasingly ubiquitous use of big data often creates a misleading sense of precision, fostering a false sense of certainty. Indeed, while detailed models provide valuable insights, they also contribute to an illusion of security. This paradox highlights the need for a paradigm shift in addressing design challenges. Instead of relying solely on the perceived accuracy of data, embracing experimentation is essential in architectural and urban design.

Experimentation goes beyond merely testing ideas or relieving architects from constraints; it is a vital tool for fostering positive communication and collaboration. By prioritising experimentation, we can cultivate an environment where ideas and insights flow more inclusively across disciplines. This approach helps counteract the anxiety generated by rigid models and data, offering a more adaptive and resilient response to the dynamic challenges of urban development.

In essence, while the pursuit of accuracy and certainty is a natural response to complexity, embracing experimentation and encouraging cross-disciplinary dialogue is key to navigating and shaping the future of our built environment. This approach allows us to view buildings and urban spaces as evolving entities, better equipped to adapt and thrive amidst uncertainty, ultimately leading to more innovative and resilient design solutions.

EXTENDED ABSTRACT

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Keywords

Time Based Design, Porosity, Walking, Adaptability, Train Stations

Abstract

Cities are increasingly challenged by rapid urbanisation and resource scarcity exacerbated by the obsolescence of the buildings composing them. Civic buildings are particularly sensitive to uncertainty and disruptors, which underscores the necessity to enhance adaptability in these structures, exemplified by transit hubs. The research employs a design-driven approach to investigate how trains stations can evolve over time, concentrating on the concepts of learning framework illustrated by the participatory method offered by the movements and lack thereof within and around train stations. This investigation demonstrates how these structures live or atrophy through time, and rests on the investigation of porosity as a key factor enabling their capacity to adapt to shifting urban demands. By analysing case studies and utilising computational methods, this research aims to optimise the design of transit hubs, enhancing their resilience and integration into the urban fabric. Ultimately, the research envisions buildings as active participants, capable of learning and evolving through stakeholder engagement and experimental design processes

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Context

The interplay between rapid urbanisation and rampant uncertainty challenges cities globally to adapt to constantly evolving needs and pressures. In Europe, where the expansion of urban spaces currently surpasses population growth (1), adaptability has gained significant attention among designers, decision-makers and scholars. Indeed, the combined challenges of scarcity of space in cities, and use of finite material resources are putting an increasing pressure on governmental bodies and the environment. This issue is widely explored and recognised in the domains of housing and corporate offices, constantly in flux and shortage but remain, however, understudied in the domain of civic buildings, despite being particularly costly to society at large (Fig.1).

These typologies, which include educational institutions, healthcare facilities and mobility hubs are particularly sensitive to change and disruptors. As a consequence, they are often subjected to temporary design solutions, which creates in turn further disruptions to the urban life, or are neglected and demolished at high cost.
The case of Transit Hubs stations, exemplifies this mechanism, leading to the abandonment of shared transit, substituted by private mobility. Thus, a vicious circle is activated in the urban realm, spatially on the one hand, through the provision of alternative heavy infrastructures catering individual mobility, but also socially and environmentally, putting at risk the railway network at large.

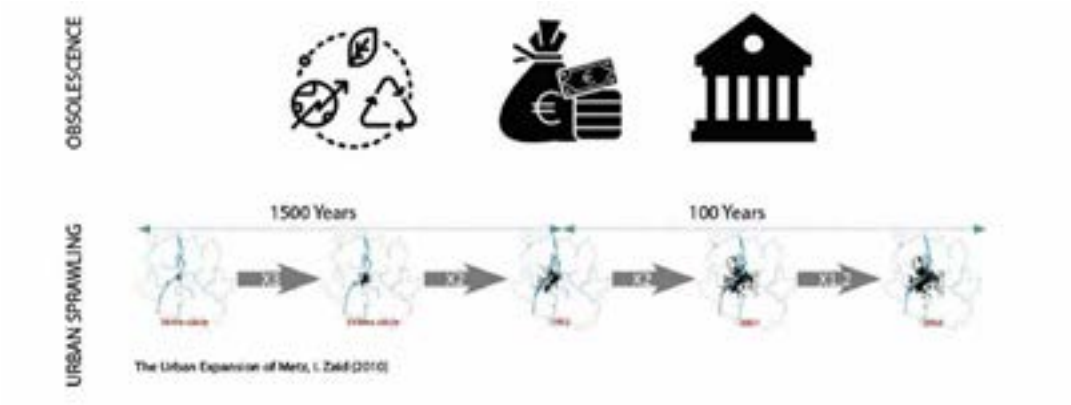

Fig. 1 The Environmental, soci-economic, exemplarity and social costs of the obsolescence of civic institutions, by Author

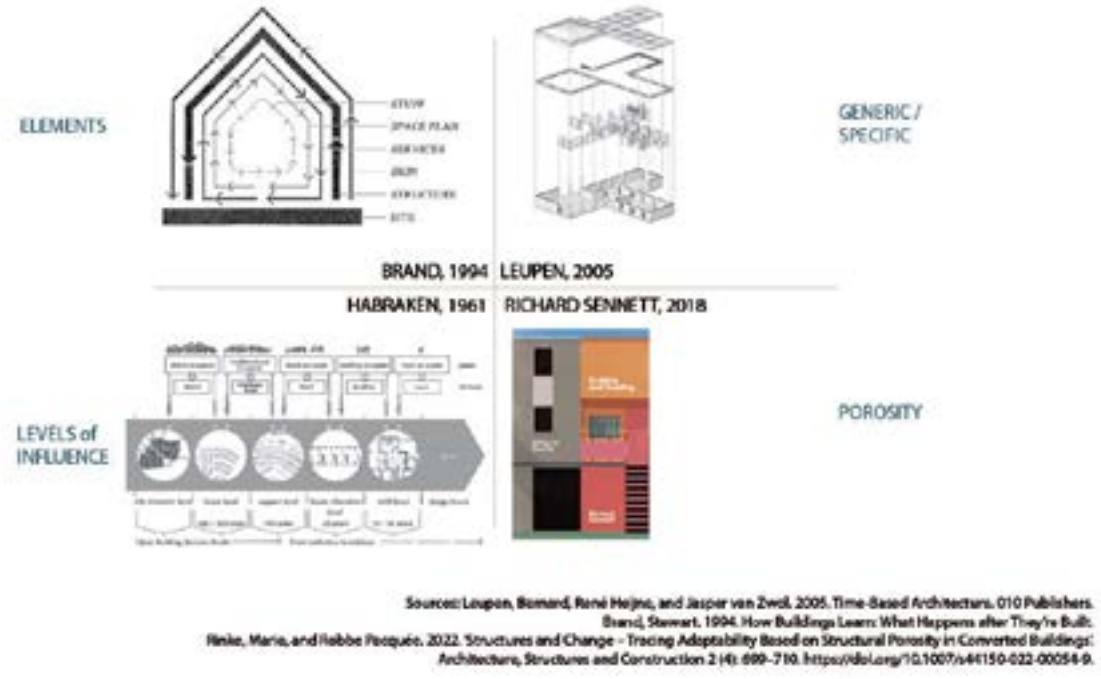

Fig. 2 The anchors of the conceptual framework, by Author

Challenges

Adaptability appears therefore as a possible solution to explore, for designers and decision makers, to salvage these anchors of urban life (fig. 2). However, the definition and scope of adaptable design is unclear to many parties, prompting a quest to define, measure and assess buildings from a material perspective, and placing adaptability as a new trend that is difficult to grasp and implement (2).

Many scholars (3–5) have contributed to defining and promoting the role of adaptability in the design of buildings as a means to celebrate their intrisinc value and contribution to the urban heritage and environment, but also as a way to address environmental concern posed by the building industry (6). Obsolescence, therefore, positions adaptability as a cure to obsolescence in the built environment, understood to be the process of declining performance resulting in the end of the service life (7).

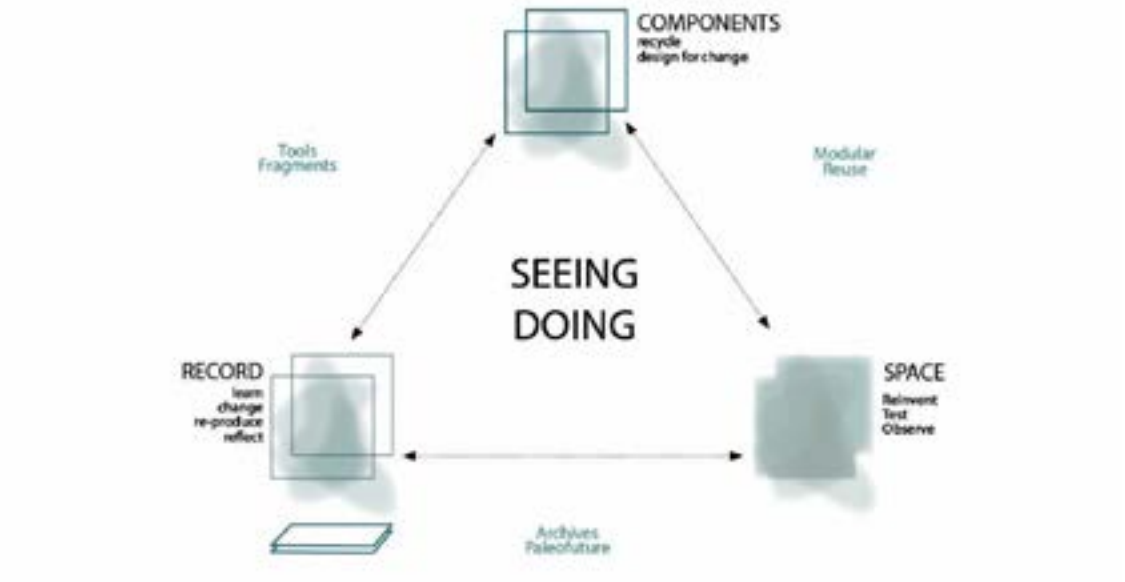

Fig. 3 Learning buildings as experimenting artefacts, by Author.

Fig. 4 Walking a line in Peru, By Richard Furlong (1972), Walking as a method of Research

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Indeed, by addressing the built environment's obsolescence, adaptability addresses space and material scarcity whilst acknowledging the dynamic interaction between buildings and entities, aligning with the principles of the Open Building concept (8,9). Specifically, this study endeavours to centre the topic of architectural adaptability to its temporal and spatial dimensions (fig. 2). Space is hereby "created by a constellation of natural and man-made objects [, where,] in the mind of the creator, user, or beholder; every architectural constellation establishes its spatial framework" (10) and is preserved as a valuable resource.

The time-based approach, a subcategory of adaptability, centres on the knowledge acquired through the temporal lens of experiences that test and measure the capacity of a building to reinvent itself to suit the demands placed on it, re-positioning the building itself as a learning entity (11) (fig. 3).
The learning building framework is thus exemplified by the movement and avoidance created by the users of buildings, illustrated in the art domain by Richard Furlong (Fig. 4). This serves as a catalyst to understand the importance and value of porosity in designing architecture, defined by Richard Sennett (12) and explored, albeit with a focus on structural adaptability by Rinke and Pacquée (13).

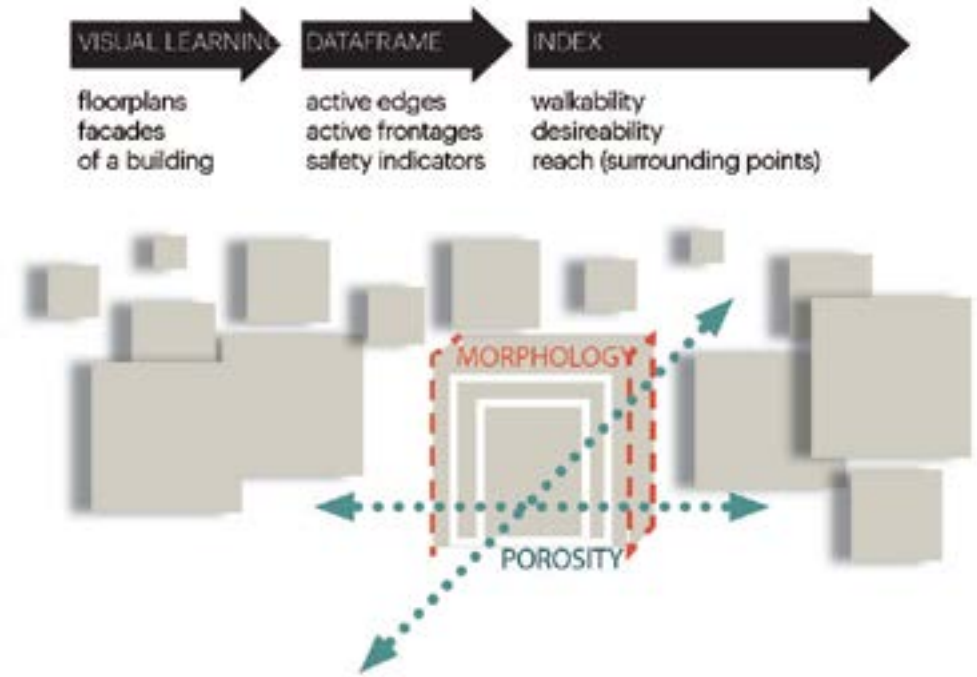

Fig. 5 Situating the train station as an entity interacting with other buildings in a dense urban area, through morphology and porosity, by Author.

Method

The design-driven method of research, therefore, revolves around the "artefact" of the building to speculate, project, test, and imagine (Fig. 3). Adaptability emphasises the role of time as the only constant as actors of architectural creation. Between the lifespan of a building and the transience typifying human activity, there lies a fundamental contradiction. Leupen suggests that within the design process, this contradiction results in the unpredictability of the program for the designer. Once construction of a building is completed, it will be used in ways other than initially intended (14). Thus, it extends the team of stakeholders beyond a selected team of individuals at a given moment and recognises that "a building is not something you finish; it is something you start", as aptly stated by Brand (1994) and places sevral entities within the design process.

The present doctoral research examines the role played by time in the architectural design process, by looking at the participatory role played by the users, avoiders and visitors of transit hub stations located in dense urban areas (fig. 5). Utilising methods of movement analysis coupled with archival investigation (fig. 7) of several European case studies with utilising computational methods, it strives to support the diagnosis of obsolescence to identify how buildings can atrophy or thrive (fig. 6). With this knowledge, that can be quantified and analysed from a qualitative perspective at both urban and architectural scales, the investigation seeks to identify and propose design measures to optimise porosity in transit hub stations located in dense urban areas, in view to enhance its capacity to adapt through time (fig. 6).

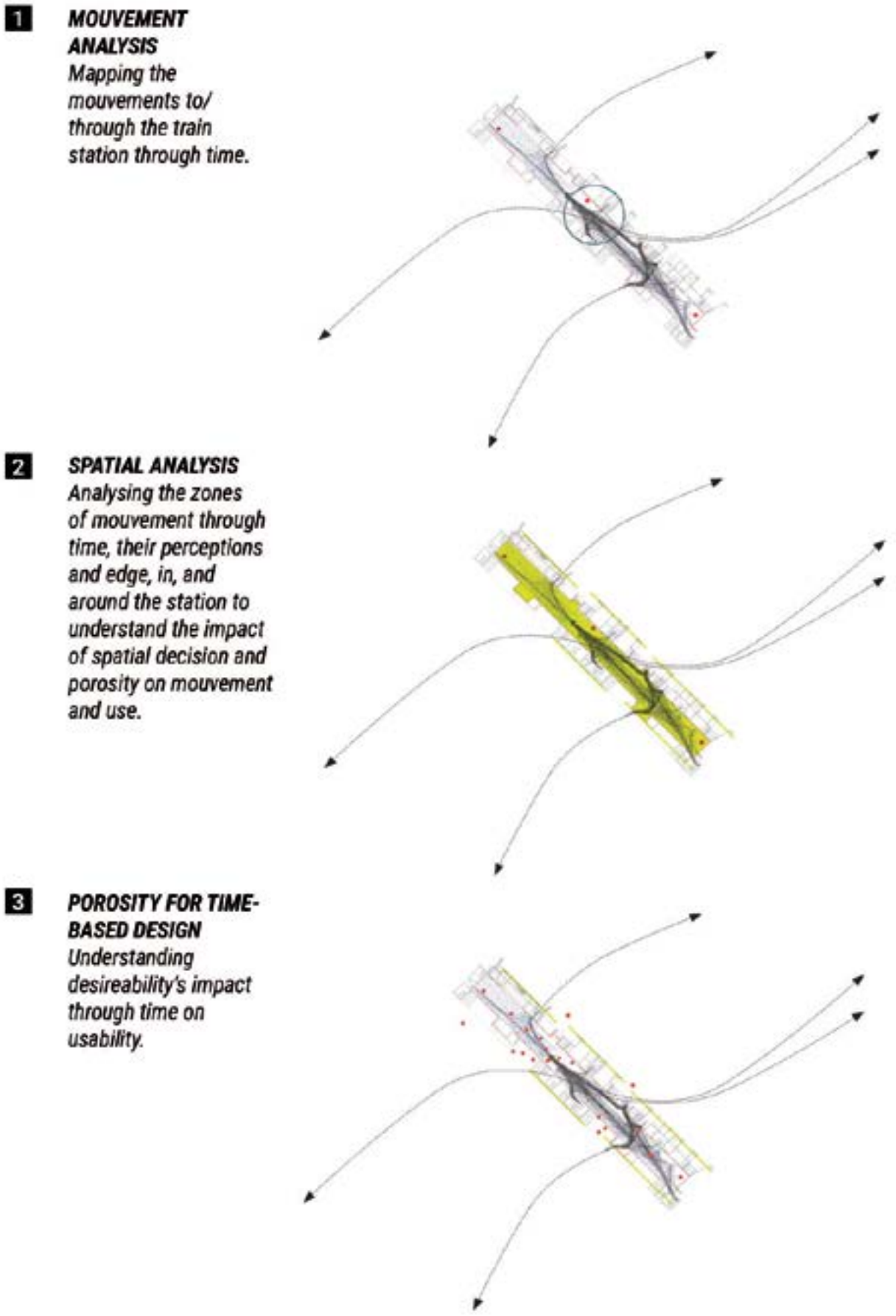

Fig. 6 Excerpt of movements analysis concept - evaluating porosity and desirability. Floorplan adapted from (Rinke and Pacquée 2022), by Author.

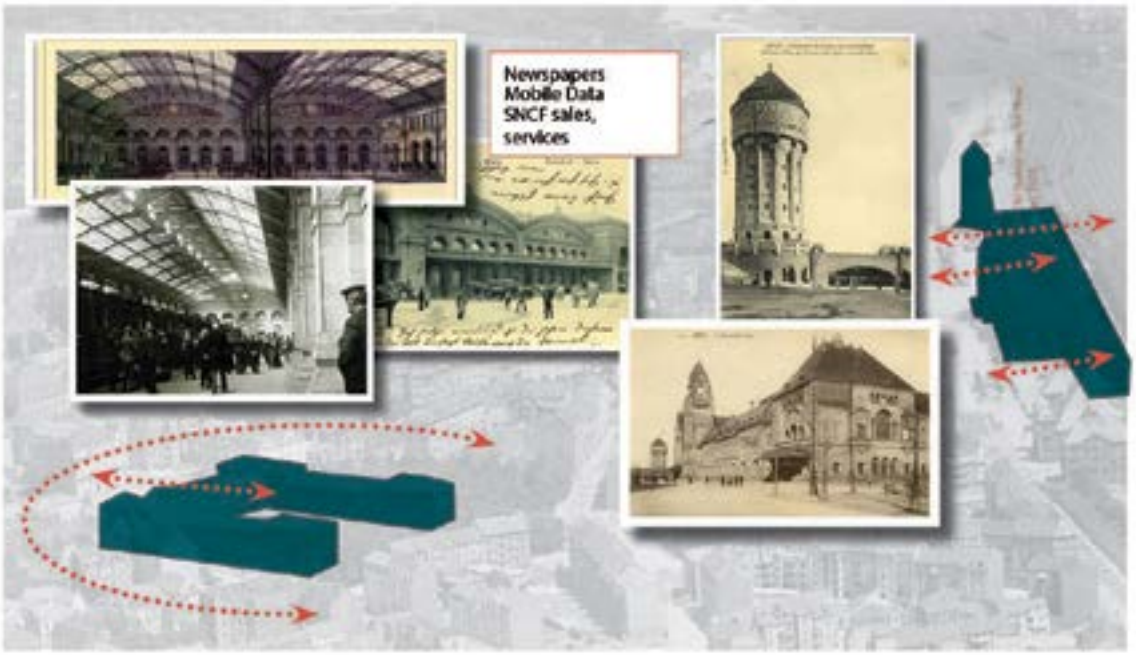

Fig. 7 Excerpt of archival analysis of Metz Train Station, by Author.

Conclusion

This vision of buildings reinforces the subjectification of architecture as an actor in its own right (15) that finds its theoretical roots in the Open Building movement (9), emphasising the collective involvement in the design process. The built environment becomes, therefore, a laboratory where urban and architectural forms are tested, ideas explored, and lessons learned. Indeed, architectural adaptability is the capacity to adapt to any change. It transforms the buildings into a design process as an exploratory quest where the building becomes both the tool, the entity and the recipient of new knowledge. It strives to transform the building into an experiment by constantly formulating wicked problems (15) that the building can sense and measure (16,17). Within this conceptual framework, stakeholders can, therefore, envision the physical, speculated, feasible, and expected building, to inform their design interventions in the way of experimentations (18). In this setting, the building and the events (i.e., pandemic, floods, etc.) are all key players in the building's conception, creating data that can be measured and implemented towards a design agenda (17).

By focusing on the morphology and porosity of the train station, this study aims to highlight how key civic buildings that form part of the urban fabric are fundamentally living organism that require destinations and qualities in areas not directly connected to their direct immediate commercial values. By optimising their accessibility and distribute the lifeblood (movement) in areas typically neglected, fashion, we can ultimately make transit hub thrive, and that this service, in turns serves a higher purpose which is the lifelong of the building itself. It also seeks to utilise the experience of the building as part of the design process, embodied by movement (agents) and learn about the building that can become a integral part of the experiment, which is the lifetime of an architectural structure.
This paper delves into research by design, shedding light on the continuum of design and stakeholder engagement, emphasising a passive yet impactful contribution to the design of buildings. Additionally, it explores methodologies for measuring this research by design through layered data sources, offering insights into the dynamic interplay of experimentation, stakeholder engagement, and architectural innovation.

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