

# UNDERSTANDING HOW BUILDING IS ADAPTED UNDER CHANGING SCENARIOS FROM A USER' PERSPECTIVE

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How a building is adapted has been studied mostly from its design stage in terms of improving its physical attributes to benefit the future. While this process is also influenced by other social aspects, such as how building users make decisions to adapt to changing situations or the actual practice after building has been constructed. During this stage, heterogeneous network of human or non-human actors will play their part, especially in public buildings where diverse adaptations are made. Different users also have different authorities or power to make changes. This research, therefore, invites the lens of actor-network theory (ANT) to view this process. Using ethnographic observation method in a public building to identify building adaptation incidents in daily, planned, and emergency scenarios. Semi-structured interview is then used to follow these incidents and track related users involved. The translation process from ANT is mainly used to analyse comparatively the three scenarios. Expected contribution will be in the theoretical and methodological exploration of building adaptation area and investigation of its social aspect.

Keywords: Actor-network theory; building adaptation; scenarios; translation; users

## INTRODUCTION

The recent outbreak of coronavirus (COVID-19) has brought us more thinking about the built environment we live in, and how we can provide a safe environment under different situations. Today's rapidly changing world gives the places where we live more challenges that they need to be adapted in response to these changes swiftly and in an appropriate way. The 'building' where we spend most of the time living, working, studying, or conducting other activities is the unit from which we can start to explore this adaptation process. Within the building, we encounter its physical attributes surrounding us, or in another way, we are communicating with the people who designed, constructed, or are using, adapting it continuously. These elements unfold the complicated adaptation process that we are still not clear about, and this is the starting point of this research.

Building adaptation or building adaptability is the main concept discussed in this area. When a building is designed, it is impossible and unnecessary to make all the predictions about how it will be used in the future (Rockow *et al.*, 2019). Therefore, building adaptation is unavoidable after the building has been constructed. It can

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mitigate the mismatch between the supply (what buildings provide) and demand (what users need) under different situations afterwards (Gosling *et al.*, 2013). Accordingly, building adaptability is the capacity for a building to make adaptations effectively under changing demands. Most of the studies explored how to increase such adaptability through the design stage by improving the building's physical attributes such as its openness, height, etc. (Wilkinson 2011). Nevertheless, there still lacks the understanding of how buildings make adaptations. Furthermore, it has been pointed out by some researchers that the existing studies neglected the involvement of users and other relevant stakeholders during the actual building adaptation process (Heidrich *et al.*, 2017). Beyond the discussion of building's physical attributes in making adaptations, there is still a gap in understanding the impact from users, and relevant stakeholders during this process. The focus of this study, therefore, is not to provide more strategies for improving building adaptability from the perspective of the building's physical attributes but aim to understand the building adaptation practice under changing scenarios from a social perspective that involves the users or relevant stakeholders. Specifically, actor-network theory (ANT) is used as the lens. Only by understanding the building adaptation can find the issues and then provide suggestions to improve building adaptability in the future. Since one of the problems in the building industry is limited learning from existing buildings' use and operation (Jensen 2012).

## LITERATURE REVIEW

### Adaptation of Existing Building

Building adaptation is any work to a building over and above maintenance to change its capacity, function, or performance (Douglas 2006). While maintenance work only maintains the existing state of a building without improving or increasing any capacity, building adaptations adjust, reuse, upgrade or extend the useful life of a building to suit new conditions. But why building needs to adapt? Changes in building use are key drivers for adaptation. The stimuli of changes may be factors such as legislation, sustainability concerns or user demands, and these will cause mismatch between the user expectation, actual use and building performance. In different situations, the mismatch varies at different levels and building adaptation helps manage it to balance the relationship between the building and users (Blakstad 2001). Nowadays, with increasing new situations, rapidly changing user or organisation demands, buildings are always facing different scenarios that they need to adapt to.

Instead of focusing on the design stage, the long time after building has been built is neglected when considering of making adaptations. The construction of a building is only the beginning of the process but not the end as it will interact with users, adapt to their needs, support their intervention with the surroundings. Nevertheless, this long-term stage after construction has not received enough attention. Very few studies revisit buildings beyond five years after the physical completion of the building (Patel and Tutt 2018). Therefore, it is significant to receive such feedback to understand how buildings adapt in practice. This ultimately helps improve the building adaptability for changes in the future (Ilesanmi 2010).

### Different Building Adaptation Scales

In terms of the different types of building adaptation, it can be classified according to different scales as small (minor improvement such as wall re-rendering, furniture

replacement, signage improvement), medium (major upgrading such as removal or insertion of walls, new air-conditioning system) and large (extensive changes such as restoration of a ruinous building, major extension of buildings) (Douglas 2006: 6). Table 1 also shows other categorisations in literature (Heidrich *et al.*, 2017): Adjustable, flexible, refit-able, convertible, scalable and moveable. However, these ways of categorising are not clear enough and there seems to be no accurate and commonly agreed categorisation of building adaptation. This may also confuse who should be assigned to the adaptation work and how. Clarification of building adaptation and its different scales is needed.

Table 1: Dimensions of building adaptation

Adaptation Main type	Decision level	Adaptation dimension	Meaning
User-driven adaptations	Users	Adjust-able	Change of tasks by users daily or monthly
	User	Flexible	Change of space and location of services, furniture, and equipment by users daily or monthly
Adaptations to the fabric	User or owner	Refit-able	Change of performance of some components without replacing the whole system
	User or owner	Convertible	Change of function (space or services)
	Owner	Scalable	Change of size of the building (e.g., expansion of buildings)
	Owner	Movable	Change of location of fabric (e.g., reusing rather than demolishing)

Therefore, another layer of soul was mentioned by Brand (1997) and Blakstad (2001) explained that souls represent every end-user of the building and the organisation’s needs. End users usually interact with the stuff and space layers, and the organisations can interact with slower layers beyond. The recent discussion also added the level: body (of the user), with its changing speed goes even in minutes. Nevertheless, the elaboration of how the soul or body layer interacts with other layers is limited and no empirical studies have been conducted for understanding this layer’s impact on building adaptation yet. Much exploration is needed. Here, user minor building adaptation includes the layers of soul, stuff, and space. This type of adaptation involves the decision-making usually done by ‘users’ in Table 1, e.g., the daily or monthly changes of furniture, signs, space, etc. Minor building adaptation has not been studied much especially in a systematic way. This area is fragmentary in various disciplines like architecture, building space, environmental psychology, organisational management, etc. However, it has close interaction with the building users’ daily life and presents the building performance directly.

### Users' Involvement in Building Adaptation

Users and stakeholders of different types of buildings have different motivations, autonomy, and interaction with building adaptation. However, the main tension between the buildings’ architectural or physical features with its user, stakeholder, or organisational management is similar. The prior studies paid a lot of attention to the buildings’ design or architectural attributes’ impact on the building’s adaptation in responding to changing scenarios (Herthogs *et al.*, 2019). Nevertheless, few have been investigated in the user, stakeholder, or organisation’s aspect and these two aspects should not be considered separately.

User adaptation links to how users adapt their buildings, since how a building can be adapted does not only depend on the building's capacity, but also on people's (users or owners) or the organisation's capacity to adapt (Schmidt III *et al.*, 2010). According to Heidrich *et al.*, (2017)'s dimensions of building adaptability, they classified two dimensions of user adaptation that do not affect the building fabric and the other four dimensions that make adaptations to the fabric as Table 1. Schmidt III *et al.*, (2010) further added the decision level of each adaptation dimension (the second column of Table 1), showing the different autonomy levels of them. This makes this process more complicated, dynamic, and never stops (Blakstad 2001).

In terms of different types of buildings, the users have different autonomy accordingly. Residential building users usually have higher autonomy than public buildings. However, at the same time, the public building users are also using their own way to adapt and communicate their needs, though implicitly to some degree. It is important to understand how they adapt the building as this matters to large groups of users with their satisfaction, safety of use or other potential aspects. In such public buildings, there is also a complex separation between decision-making by different stakeholders of how buildings should be adapted and how actually it is adapted.

### **Actor-Network Theory**

Although this discussion shows the importance of considering user impact during building adaptation, it cannot be considered separately from the physical attributes of the building. This brings about the question of how to link these factors together. Instead of understanding building adaptation in terms of shearing layers, nowadays, with the ever-changing circumstances from external and internal, there should be a more fluid theory or mechanism to understand how buildings respond to the changing situation and their interaction with human behaviour. This discloses that this process is not a unilateral and rigid process but bidirectional and dynamic adjusting system. This system requires further consideration of users' interaction with building, the stakeholders' involvement, and more factors. As Holland (2012) mentioned that 'ecosystems, governments, biological cells, markets, and complex adaptive systems in general are characterised by intricate hierarchal arrangements of boundaries and signals.' Understanding the origins and effects of signal and boundary interactions wherever they occur in different contexts is important. In the case of a building, how it reacts to different 'signals and boundaries' by external and internal changes and actors, keeping the balance is still not clear.

The view of social material that the building, stuff, users are ever unfolding and entangled will help refresh the rooted problem in conceptualising building as solely material and static. Sociomateriality is also practice-based which matches this research's aim to understand the building adaptation from practice. It attempts to understand the interaction between social (human-related factors) and material (e.g., objects, spatial arrangement, technology, etc.) in everyday organisational life. And the social and material elements are shaping or are shaped by each other (Orlikowski, 2016). There are many theories under the umbrella of sociomateriality, such as activity theory, complexity theory, practice theory or actor-network theory (ANT). ANT does not emphasize like activity theory that human beings are the main actor to plan and interact with other human and nonhuman actors consciously. Instead, ANT contends that both are equal. This helps balance the two sides this study focuses on. Also different from complexity theory that considers more on the interactions between the actors and the outcome, ANT considers more of the minor details of the actors or

actants in the network development. This is more suitable for the minor adaptation studies. Practice theory is also used for understanding everyday activities in a socially structured way, but ANT has more strengths in offering both theoretical and methodological guidelines. In this explorative study, ANT provides more possibilities for flexible investigations.

ANT is a theory developed in the 1980s and is mostly associated with its key authors: Bruno Latour, Michel Callon and John Law. Its basic idea is to understand how human and nonhuman actors are brought together in networks. And by tracing the transformation of these heterogeneous networks, ANT explores how these actors' or actants' relations are forged, negotiated, or maintained in networks and compete with other networks (Law, 1992) (Tatnall and Gilding, 1999). Tracing such heterogeneous and dynamic interactions between different actors of building can help unfold how actually building is being adapted. ANT is argued that it does not define terms (Mol, Annemarie, 2010). The following concepts' introduction only wants to provide the basic platform to be enacted by these concepts but not to define or make them rigid.

#### *Actor-network*

Usually, many studies use actor to refer to the human and actant as the non-human that is involved in the activity studied. The dividing of human and nonhuman is argued as inevitable only because of the labour of division (Ruming, 2009). For an entity to be an actor, it is not required to have contentful mental states, but to be able to perform actions as intended. If an actor makes no difference, it's not an actor, showing the effects is important (Mol, Annemarie, 2010). During this process, some of the actors are treated as the focal ones that initiate the actor-network formulation, some may be made to act, but none of them acts alone. All actors form networks and work by the relational effect with other actors and such effect is also continually forming themselves (Latour, 2005). They may also relate to other existing networks. And network is fluid, they may be stable for some time, but they may falter eventually.

#### *Translation*

Translation is a process to understand how networks emerge, being transformed the interest to various actors. This is an ongoing process, never completed and may fail. There are four stages of translation: problematisation, interessement, enrolment and mobilisation. Problematisation is the stage in which a key actor attempts to frame the nature of the problem in their own terms and starts to involve several actors (human or non-human) in to initial problem-solving network. Also, it is suggested that the problems would be resolved if the actors negotiated and pass the 'obligatory passage point' (OPP) of the problem. OPP is the crucial point that forms the actors into a system of associations. The second stage, interessement is where the actors seek to lock other actors into the roles that had been proposed for them. However, the interessement does not ensure success, so the next stage, enrolment is where actors seek to define and interrelate with other actors. This may include negotiations, trails of strength or tricks to enable the success. The final stage, mobilisation is to use methods to assure that supposed actors properly finish their roles (Callon, 1984) (Law, 1992).

#### *Black box and punctualisation*

When the translation process finally gets a single-point actor, it is black-boxed or punctualised. So, these two concepts are about simplification. A black box can be a car or a computer or any other entity that have their complex operations inside but is

invisible to us (Cressman, 2009). Punctualisation is a process by which complex actor-networks are black-boxed and linked with other networks to create larger actor-networks. Currently, the whole networks are greater than the single parts. Therefore, this process transfers an entire network into a single point or node in another network (Tatnall and Gilding, 1999). But new actor can still enter and open the black box.

#### *Power and control*

ANT is also about power as an effect rather than a set of causes. Those who wish to exercise control over others need to create an actor-network. When an actor-network forms, there are certain entities that control others (Law, 1992). To study this, Latour proposes 'following actors' to trace the associations (Latour, 2005).

## **METHOD**

Mixed qualitative methods are used to trace how different actors mobilised different materials to adapt the building and achieve specific goals under changing scenarios. How they interpret the situation, initiate actions, and collaborate with different people are investigated. ANT guided the data collection with its main principle of 'following the actors'. And with the ethnographic methodology used, the data collection and analysis are conducted in a parallel and interlinked way, which separates them into several phases (O'Reilly, 2012). One specific building, Building S is used as the unit to conduct this study. Building S is a building where a university School A is in the UK. It started to be used since 2017 and was designed to facilitate a sense of community, enable teaching, research activities that reflect collaborative working in industry. It has two floors, with the ground floor as central classroom for the whole university and the first floor as home of School A. The first floor has two teaching and research labs, social break-out spaces, academic offices, and a resource room as its main facilities.

Firstly, the participant observation is conducted for around 8 months mainly in the public area and some offices. Observations are made to identify the initial adaptation incidents happening in this building with the role of building user. The main categories of different scenarios are then identified as the daily, planned and emergency. Initial data mapping is used to plan for the next stage data collection. In phase two, semi-structured interview is used to investigate further. 12 interviews have been conducted. Specifically, to better trace what the actors did, photo-elicitation skills are used to help remind them the incidents of what they did and how did they do with the collaboration from whom or more details. The next phase of data collection was to follow further the actors these interviewees mentioned. During this process, parallel analysis of collected data helps compare and determine who and what are really needed to achieve the research aim and objectives. Setting the boundary and interpreting with the chosen theoretical framework is important to make sure the data collected are relevant enough. For analysis, compared with content analysis and constant comparative method that used a lot in qualitative analysis, a better way is to understand the data with researcher's experience as an ethnographer (Chow, 2016). Getting more familiar with the data and then starting categorising and developing themes based on the theoretical framework during the data collection will better suit this study. The social network mapping is used only for showing the relationship between different actors visually.

## FINDINGS

The initial findings will show some vignettes as example incidents. Here a resource room in Building S will be used to illustrate its adaptation under three scenarios.

### Daily Vignette: Various Functions

The resource room is one room that belongs to the School A on the first floor in Building S. Therefore, it is different from the classrooms on the ground floor that are centrally bookable for the whole university. The resource room's main function is to provide School A's students with study space and other resources like books and relevant facilities. In a daily context, this room may also be altered for other uses. Such as Figure 1 and 2 show, 'Resource Room is Booked for interviews today until 3 pm' and 'Risk workshop till 12:00, please do not disturb, thank you'. When these things happen, the room would be set up accordingly. Usually, the interview would invite staff in School A and Human resources staff at university level to come. The executive team would work with them and book the room by updating the timetabling frame on the door as well as putting up the temporary signage. This is a routine problematisation phase in ANT's translation moments to frame the nature of this interview activity. And this relies on existing network of different staff and room space to complete.



Figure 1: Interview notice



Figure 2: Workshop notice

The temporary signage can also be understood as the interestment phase that existing actors wish to invite other actors (e.g., students who usually use this room) to agree with the interview activity going on and do not disturb. This is also an ongoing translation until the interview is finished and temporary signage is removed. Similarly, in Figure 2, the academic staff also went to the executive team to book the room and used the temporary signage to make it clearer for students. The flip chart was also borrowed from the post room to show the work of students and is convenient for discussion. The tables in resources room are reassemble and easy to move when more space is needed. They can also be put back after all these activities are finished. These nonhuman actors were enrolled and mobilised to help finish the translation along with the existing actors.

Compared with daily context, the less happening but more planned vignette is from the open day. It is open to potential students and their parents interested in studying at the university to come and visit. This is a university operating event that there is a central open day team under the Department of Marketing, Communications and Engagement to organise. The central open day team gives general guidance and then each school has their own team to arrange the 'show' for the visitors in the building specifically. It is usually planned four months in advance. For the resource room, the existing table, and chairs for students to study should be moved out to make space for visitors and staff to drink and have conversations.

### **Planned Vignette: The Open Day Room Arrangement**

Firstly, such decision was made by School A's open day team since School A moved to Building S in 2017. At that time, the school director of teaching and learning told the executive team how the resource should be set up with the drawing (Figure 3). And through many years, they just found it useful, and they know how it works for the visitors by their experience. Secondly, how to set up the space. The resource room is not a central classroom, so School A can directly book the room through its executive team. The date and time were given by the central open day team. The setting up includes the rearrangement of tables and chairs as an outcome (Figure 4).

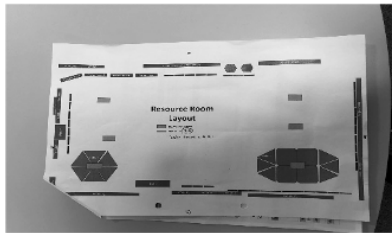


Figure 3: Drawing for the reset



Figure 4: Resource room after reset

This is done by the university campus service, part of the Estates department. The executive team needs to request the service through the online platform at least one week before. The booking information will be received by the porters showing how and when they should set up the resource room, with drawings attached. Basically, the porters just know how to set up the room. They may still have the layout at hand to follow when I observed how they set up the room, but they have done this a lot and they can rely on their own understanding, common sense, experience, communication with the school's executive team, etc. After the open day, they will put everything back. Apart from this, the executive team also need to book the catering for drinks and food, print the brochures and register form for visitors.

The whole process all shows that they already have much experience of doing this and the translation phases went smoothly in terms of they know what and how to do it. Such planned case involves more actors and networks like more staff from higher level of the university, online platform, brochures, drinks and food, existing working relationships, etc. All these actors make this event happen and the visitors will also be part of it.

### **Emergency Vignette: Signage and One-Way System**

Under the situation of Covid-19, the whole Building A needs to be adapted under changing policies and decisions made by the university. This is a long process with numerous people's effort, and this is not a usual case. Use the resource room as an example, firstly, users approach the resource room through only one-way system. During the early stage, the whole building was closed that only staff who had applied could enter. When people slowly returned to the building, the resource room's capacity had been recalculated that only limited number of users can stay at the same time and keep distance. They were also provided with sanitiser and wipes. Signages were also used to remind people about the encouraged behaviours. How did these happen?

These were done by the university's major incident team (MIT) with their interpretation of the government rules. The university set up the MIT to respond to the COVID-19 with many important, high-level people such as the chancellor, heads



of school, Health and Safety director, the Estates director, Communication and Marketing director, etc. They had a lot of meetings and discussions to establish the one-way system on campus buildings. Specifically, the local buildings designed the plan for each building, done by each building's health and safety coordinator under the line of technical service. They designed it based on their familiarity with the building, building users and generated the updated floor plan. The university's Creative and Print Services (CPS) team designed the signage. All these signages were put on by the people appointed by the MIT. The same as other decisions of room capacity or sanitiser, they are also from the decision making from MIT and then interpreted locally. Compared with the prior two scenarios, each phase of the translation was much more difficult to achieve. And there were many tensions when so many actors were involved.

These three vignettes from three scenarios have shown part of the findings. Comparatively, the daily vignette has more stable network with the user as focal actor to initiate. The planned vignette requires existing and larger teams from the university level to achieve specific goals. Usually, more stuff are mobilised by both school and university teams' collaboration and is usually planned long time in advance. While the emergency scenario requires more, even outsourcing actors to achieve the goals and should respond in short time. The focal actor is not the building user anymore, but more from the top-down policy. This network is not stable but very flux and dynamic with many trials. Various materials, digital technology played their roles as intermediaries to help.

The findings open the black box of building's minor adaptation, which is rather hidden and invisible before investigation. How the building space use is changed under different scenarios is not simple, but involves various human and non-human actors collaborating, networks forming and adjusting. Unfolding this process helps identify and clarify what or who are needed when planning for future adaptations. The minor but not minor adaptations behind is playing important roles influencing other layers of buildings.

## **CONCLUSION**

This study attempts to explore how building's adaptations are made in practice from the lens of ANT. The minor adaptations in a public building are investigated with ethnography observation and semi-structured interviews following the different actors involved. Building's minor adaptations are made by different human and nonhuman actors with networks initiated, motivated, formed, worked, or ended. Identified daily, planned and emergency scenarios have different patterns of actor- networks. The main contribution will be mainly in the new perspective to view building adaptation under changing situations. Understanding this process will help prepare future cases and solve the current conflicts. Somethings that we view as common sense, may have its different mechanisms to work.

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