WHAT IS THE MEANING OF ADAPTABILITY IN THE BUILDING INDUSTRY?

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ABSTRACT

In an age of sustainability focussed on the short term of carbon reduction, it is important that we maintain an understanding of the broader characteristics which make places sustainable over the longevity of time. Adaptability as a design characteristic embodies spatial, structural, and service strategies which allow the physical artefact a level of malleability in response to changing operational parameters over time. This paper starts by reviewing definitions of adaptability in the literature and sets forth a holistic definition, coalescing essential characteristics through a critical analysis. The following two sections contextualize the conversation about adaptability through two distinct approaches for achieving it along with its current perception. Subsequently, the paper subdivides adaptability into a set of strategies which provide a comprehensive resolution for describing the different types of changes a building may be forced to endure. The last segment then examines the relationship between the Open Building movement and our findings regarding adaptability. We conclude with some provocations towards the open building movement and industry shifting towards a more sustainable and time-based approach to design.

KEYWORDS

adaptability, strategies, sustainability, open building, time

INTRODUCTION

In an age of sustainability focussed on the short term of carbon reduction, it is important that we maintain an understanding of the broader characteristics which make places sustainable over the longevity of time. As society has progressed through economic prosperity and technological innovations our personal understanding of time has grown increasingly shorter. The disparate realities of these two perspectives on *time* are at the crux of shifting mindsets towards the design of a more sustainable built environment. Time as a design contingency relies on placing architecture in context, making it susceptible to its temporal reality and biggest fear - *change*. Designers tend to ignore these temporal aspects focusing on an aesthetic fixation and functional performance, freezing out time in pursuit of a static idealized

object of perfection. A reaction to this way of operating is the encouragement of a more dynamic and long-term understanding of the built environment. *How then, does one design for time?*

Adaptability as a design characteristic embodies spatial, structural, and service strategies which allow the physical artefact a level of malleability in response to changing operational parameters over time. This strategic shift reflects buildings, not as finished work removed from time, but as imperfect objects whose forms are in constant flux continuously evolving to fit functional, technological, and aesthetic metamorphosises in society. The capacity for buildings to respond to these changes are highly determined through *design decision*s early on resulting in the building's design structure – *what it is, how it is constituted* (Baldwin et al. 2000). Achieving adaptability then demands a shift away from the current emphasis on form and function in response to immediate priorities, towards a 'context' and 'time-based' view of design.

This paper puts forth adaptability as a design principle which brings to the forefront this critical dimension - *time*. As Croxton (2003) points out, "If a building doesn't support change and reuse, you have only an illusion of sustainability." This paper starts by reviewing definitions of adaptability in the literature and sets forth a holistic definition, coalescing essential characteristics through a critical analysis. The following two sections look to contextualize the conversation about adaptability through two distinct approaches for achieving it along with its current perception. Subsequently, the paper subdivides adaptability into a set of strategies which provide a comprehensive resolution for describing the different types of changes a building may be forced to endure throughout its life.

Unsurprisingly, our exploration of adaptability includes ideas and findings intertwined with aspects of the Open Building paradigm. The last segment of this paper then examines the relationship between the Open Building movement and our findings regarding adaptability. We conclude with some provocations towards the open building movement and industry shifting towards a more sustainable and time-based approach to design.

DEFINING ADAPTABILITY

Looking backwards, the etymology of the word adapt can be traced to early 14th century Latin, *aptus*, meaning "suited, fitted" to *adaptare* meaning "to join", through Middle French as *adapter*, to its English roots in 1610 to mean "to fit something for some purpose" (Harper 2001). Current definitions have changed subtlety, "to make suitable to requirements or conditions; adjust or modify fittingly" (Random House 2010). Adaptability then is concerned with the capacity to be adjusted to suit new situations. One could assume that is simple and straight forward enough, but through literature and conversation one finds dozens of interpretations of what adaptability means embodying the very plasticity it looks to describe. Depending upon its application and context, even within the built environment, one finds a wide range of subjective permutations. Within the architectural literature, for example, a high-level characterization can be made. Adaptability can mean:

Accessibility - to describe making spaces accessible for all concerning stages of life and various special physical conditions (Lifetime Homes 2009).

Open Plan - to symbolize a universal floor plan or open office which allows a company the capacity to subdivide a space based on its needs (Gelis 2000).

Building Responsiveness - to describe an interactive building via real-time changes through the use of kinetic systems in response to environmental changes through variable mobility, location, and/or geometry (Bullivant 2005, Hoberman et al 2009).

Performance-based buildings - to describe the performance aspects of a building related to functionality and maintaining fit purpose over time concerning issues of planning, programme, and people (Slaughter 2001, Blakstad 2001).

Although the above characterizations are not mutually exclusive, this work is concerned with the fourth area, and focused on clarifying a definition for adaptability within this broad realm without specific stakeholders or solutions in mind. In order to generate an informed definition we identified overarching characteristics gathered from the literature. The first is the *capacity for change*. Every definition in some way mentions change: "change the size or use of spaces" (DCSF 2008), "change its capacity, function, or performance" (Douglas 2006), "less frequent, more dramatic changes" (Leaman et al. 2004), "subsequent alteration" (OECD, 1976), or "modified, relocated" (Canadian Standards, 2006). A second overarching characteristic is the ability for the building to *remain "fit" for purpose* or "reduced in mismatches" between the building and its users (Friedman, A. 2002, Blakstad, 2001, Ridder et al 2008, etc.). A third leitmotif is *value*; "maximizing its productive use" (Graham 2001), "to fit both the context of a system's use and its stakeholders' desires" (Engel et al. 2008), and "at minimum cost" (Blue Mountains City Council, 2005). The last characteristic is *time*. Time is presented in two ways throughout the definitions. First to indicate the *speed of chang*e ; "quick transformations" (Juneja 2007), "respond readily" (Kronengburg 2007); and secondly, to indicate *through life changes*; "future changes" (Gorgolewski 2005), "in the long term" (DCSF 2008), or "extension of use" (Hasemian 2005).

Our current definition of adaptability is a synthesis of these four underlying characteristics, namely 'the capacity of a building to accommodate effectively the evolving demands of its context, thus maximizing value through life'. The intent of this definition is to provide a clear and robust view on adaptability in regards to buildings.

Adaptability Approaches

Our project research burgeoned on a simple premise that adaptability could take place before the building was occupied through the *preconfiguration* of initial design choices by way of industrialized building systems or after the building is occupied through the *reconfiguration* of the building for subsequent changes in use (Gibb et al 2007, Beadle et al 2008). The distinction was given to represent the two different approaches by the primary collaborators in the research project GSK and their Newways system (preconfiguration) (Fuster et al 2009), and 3D Reid's Multispace approach (reconfiguration) (Davidson et al 2006). Pre-configuration dealt with speed and quality of project delivery through the standardization of building components focused on the initial use (a kit-of-parts approach). In contrast, re-configuration represented the spatial geometry and interior furnishings focused on the prolonged use or re-use of the building ameliorating whole life cost. This particular distinction is not always helpful since both strategies are inclusive to initial design decisions and if successful both will accommodate or ease some form of change after initial occupation.

However, there is another distinction which can be more helpful and lies in the distinctively different *design approaches*. Newways represents a systems approach, a hard approach; where Multispace embodies a set of strategies to design, a soft approach. The distinction in this sense is clear. Newways is a technically determinant system looking to (re)invent the way buildings are delivered and assembled through product innovation offering a specific solution (i.e. kit of parts). Control of that said adaptability remains in the hands of the designer. Multispace, not tied to any specific solution or project delivery, offers a set of rules or specifications as guidance for the designer's decision making to enable the building to accommodate an appropriate range of uses through a broader understanding of the requirements various functions demand. This indeterminate approach embodies a social process between designer and user over time and demands a greater response from its users due to the greater ambiguity of the space. Such a distinction between approaches is not new (Schneider 2007), but is important because most guidance on adaptability tends to mix the two approaches without a conscious understanding of the difference or simply focuses at one extreme.

Perception of Adaptability

Through our pursuit into understanding adaptability, the most common perception has brought with it an expensive and negative connotation. For many people, it has been branded as costly, an 'extra', rarely used, and involves state-of-the-art gadgetry which only works half the time. This is all in an effort to safe-guard the end user against unpredictable changes in organizational structure, functional use, spatial arrangements, technological advances, and so on. This perceived view has been driven by technical attempts at future proofing buildings through the application of specific solutions (i.e. movable partitions, drop ceilings, raised floors); while other buildings, which have stood the test of time have been coined accidental adaptability or just simply *good design* (e.g. Georgian terrace houses, Dutch canal houses, industrial warehouses, etc.).

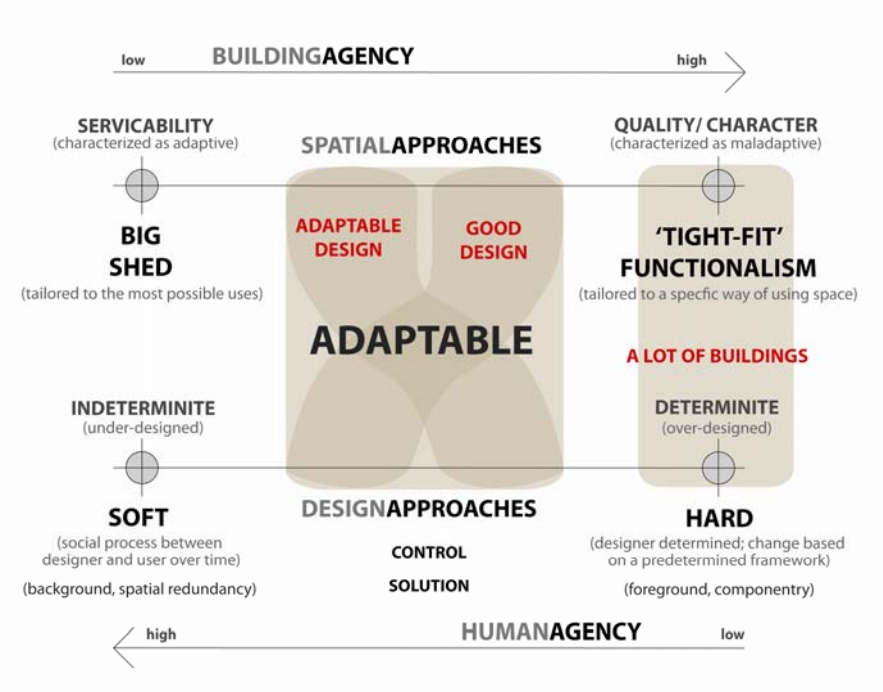

Figure 1. Summary of approaches towards adaptable design

The latter argument is that adaptability is not distinctly a result of technical detailing or special componentry which allow multiple configurations to take place. Meaningful adaptability can take place through an understanding of the fundamentals (i.e. getting the basics right). Understanding the subtle spatial and physical differences between various uses; grappling with the social, economical, political, legal, technical and environmental forces at play by designing architecture within a holistic context making it conscious of *time* and *change*. An architecture that is susceptible to a real set of operational parameters; a type of 'weak' architecture which needs continual work to stay balanced. In his essay on Weak Architecture, Kengo Kuma (2005) acknowledges the strength and uncanny longevity of 'weak' architecture because it demands constant attention from both designer and user; while 'strong' buildings, often left alone, only give an illusion of durability.

The scepticism looms large over the concept of adaptability. We are convinced that achieving adaptable buildings lies in a broadening of perceptions through a more balanced and integrated approach. This response lies in a re-conceptualization of time that goes beyond matters of durability to a more nuanced view of a building as a socialized product constantly in the making, a view that chimes with what Till (2009) describes as 'thick time'. Here architecture can no longer be thought of as a noun, but as a verb - always on the move - responding to a milieu of change.

In this sense, successful adaptability may not always need to come from the capacity of the building itself, but from the user or owner's capacity to adapt and/ or any other numerous variable which supports the dynamic interplay between building and context. Figure 1 above summarizes our current understanding towards adaptable design.

DESIGN STRATEGIES

Early in the project six strategies to achieve adaptability were identified as a series of '*ables'* to describe the physical capacity of the building to be adaptable - the building is *available, extendable, flexible*, *refitable, moveable*, and *recyclable*. As part of the iterative thought process some of the keywords shifted slightly to incorporate slightly different connotations (extendable to *scalable*, recyclable to *reusable*). After reviewing the literature, a plethora of design strategies were found; however, the result presented a mixture of terminology and correlating definitions leaving no clear way of easily deciphering the semantically tangled strategies. In an effort to confirm and compare our strategies with the literature, an exercise was conducted to position these approaches and meanings against our strategies (Figure 2). This analysis led to the elimination of two of the strategies (*available* and *reusable*) as they were deemed outside the scope of adaptability. *Available* was concerned with the speed of design and construction by shortening the delivery of a building (through a standard set of components) largely in regards to the commercial benefits of early occupation, although such a kit might lend itself to subsequent modification for new uses or sites. *Reusable* focused on the building's capacity for its components to be recycled after the building's life; while the capacity to deconstruct a building is of particular relevance to refitable as a characteristic it was determined to be outside the framework in regards to prolonging the life of the building itself.

In addition to finding these two strategies outside our scope, the large cluster of definitions surrounding our interpretation of *flexible* led to the splitting its meaning into two specific strategies. Our initial definition of *flexible* covered a spectrum of possibilities from how the

space was defined physically to how the space was being used functionally. In this regard, flexible was split into *versatile* to represent the physical change of space (i.e. spatial layout), and *convertible* to signify change of use. The dissolving of flexible as a strategy along with the more specific meanings of *versatile* and *convertible* resulted in one last addition of *adjustable* to correspond to equipment and/ or furnishing changes which respond to changes in task or user.

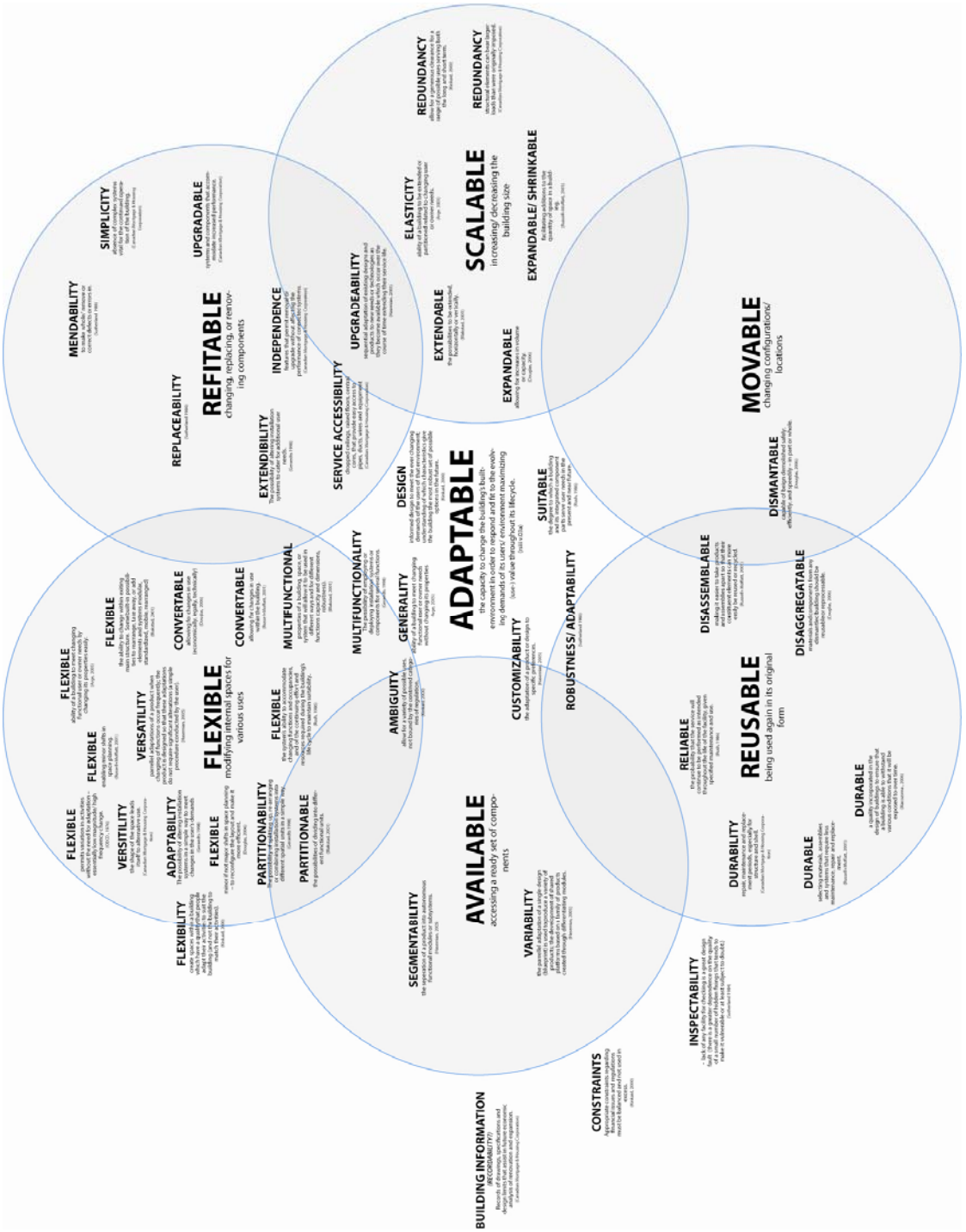

Figure 2. Mapping of literature against AF strategies

The above exercise resolved the desire to map our strategies against literature and assure a level of comprehensiveness. However, it still left the strategies themselves as descriptors floating rather ambiguously. With that in mind, each strategy was given a one to one correlation to a specific type of change, which provided a clear and concise definition. Furthermore we have positioned each strategy in relationship to a decision level (i.e. stakeholder), a built-environment scale, a time scale or cycle length, and Stewart Brand's physical layers (Brand, 1994). Figure 3 provides a summary.

able	type of change	decision-level	B-E scale	Time (cycle speed)	Brand's layers					
					Stuff	Space	Services	Skin	Structure	Site
adjustable	change of task	user	components	daily/ monthly	O					
versatile (flexible)	change of space	user	components	daily/ monthly	O	O				
refitable	change of performance	user/ owner	components	7 years		O	O	O		
convertible	change of function	user/ owner	building	15 years		O	O	O		
scalable	change of size	owner	building	15 years		O	O	O	O	
movable	change of location	owner	building	30 years					O	O

Figure 3. Summary of Strategies in relationship to other dimensions

OPEN BUILDING & ADAPTABILITY

Open Building's (OB) roots developed as a reaction to the housing boom post WWII in the 1960s with the desire to empower the user (e.g. Bosma et al 2000, Cuperus 2001, Kendall et al 2004). As a design philosophy, it equates levels of individuals' control with environmental levels both in *design* and *use* in an effort to evince a realistic understanding of how *'things work'* - understanding limits and roles (i.e. a separation of responsibilities/ 'power' amongst a strong collaborative/ multi-stakeholder effort). As a resulting physical object, it bolsters the capacity for change to take place through an ease of tension between building components, particularly at the distinctive levels of short-life/ *infill* and long-life/ *base building*. This mindful separation supports a conscious effort by the designer(s) to think about the durability (or foreseeable life) of the materials and systems and their relationships to other components.

The approach, while not neglecting the social and wider context, has had most success being implemented from a top down approach focused on the technical detailing of the building. Several examples supported by the Japanese government have led the way to promote the dissemination of the philosophy through a technical interpretation (Fukao 1987, Eguchi et al 2010). Despite tremendous efforts in Japan it has met with mild success. Century Housing System is one example which has had little industry impact (Utida 2002) primarily because of: a) its complexity/ unfamiliarity and b) its minimum grasp of the holistic context, including social and economic (Matsumura 2009). The examples from Japan demonstrate the technical feasibility associated with designing for change, but not its sustainable or wider contextual application.

All of the above supports a re-structuring of how buildings are made and the inclusion of time into the design 'consciousness'. It is here, where a designer may find useful the specific strategies we have proposed, removing some of the ambiguity of thinking about time and change under the OB philosophy. While the philosophy becomes a useful way of framing mindsets regarding time and change, its reductionist focus on levels (a determinate approach to design and use) limits its expression of adaptability to a particular approach. While more elements of the construction process have begun to accommodate the OB approach (Kendell 1999), it will inevitably take a broadened understanding of adaptability to expand its reach and sustain its application. This paper is not meant as an anecdote, but as an introductory

provocation towards a re-conceptualization of adaptability which offer implications towards the OB approach.

CONCLUSION

This brings us back to the question posed in the introduction: *How does one design for time?* Technical feasibility alone does not accomplish a sustainable solution. If adaptability brings an understanding of time, it brings an emphasis on process and enabling the building to 'learn' and the users to 'teach' or shape the space themselves. Adaptability forces design to become an ongoing social process between designer and user over time. The designer must focus on enabling adaptation to take place; as opposed to attempting to control experiences and anticipate the future. Hertzberger (1991) stresses, "*Architecture should offer an incentive to its users to influence it wherever possible, not merely to reinforce its identity but more especially to enhance and affirm the identity of its users.*"

Architecture in reality is placed inside a highly volatile context where it is forced to respond to and act on exogenous demands or suffer premature obsolescence. It is here where good design takes place through the conscious understanding and negotiations of these demands towards a synthesized solution which recognizes the dynamic nature of the *context* in which the building exists and will continually evolve with time. It is our view that adaptability as a design principle brings time and change to the forefront of thought, but requires a re-conceptualization of time through shifting mindsets and (re)shaping of values. Placing architecture in context demands a balanced design approach between hard and soft as well as 'big shed' serviceability and 'tight fit' character. It may suggest to under design rather than over design; to leave space unfinished as a mechanism for engagement.

The overwhelming focus on regulating energy performance as the driver for sustainability standards has relegated building longevity into initial design considerations as just good practice. This situation leaves designers and government authorities with a lack of legal power to enforce 'adaptable' schemes on clients. This reality presents the conscious designer the challenge of embodying these strategies within their design philosophy, rather than finding them as part of a brief, in an effort to create more meaningful adaptability.

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