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MAKING THE LONG TAIL WORK - REFLECTIONS ON THE DEVELOPMENT OF THE CONSTRUCTION INDUSTRY THE PAST 25 YEARS

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The paper discusses the development and impact of construction research the past 25 years. Theoretically, the paper builds on two fundamental insights: The Pareto principle (the 80-20 rule) and the Thomas theorem: "If men define situations as real, they are real in their consequences" (Thomas and Thomas 1928: 572) - a fundamental sociological principle. The Pareto principle is applied using the concept "The long tail" (Anderson 2006). Based on "the long tail" the three different production paradigms of mass production, mass customisation, and individual customisation are identified. The paper argues that construction in the 1950s and 1960s was driven by a "mass production" paradigm that from the beginning of the 1980s was replaced by an "individual customisation" paradigm in which construction became a matter of tailoring unique buildings to each customer. These two different paradigms have been driven by two more or less unarticulated myths. In the 1960s buildings were viewed as standardised while they from the 1980s onwards have been viewed as unique. Based on the Thomas theorem it is argued that these myths have had a substantial impact on the way we build. Consequently, today's predominant view of buildings – as unique – implies that: 1) the nature of the construction processes is chaotic, 2) the buildings are realised through onsite project work rather than through offsite production; and 3) project management is the fundamental management principle. The paper further identifies how attempts to develop new construction practices like partnering and lean implicitly reproduce this myth. The result is that construction research the past 25 years has been constructing the long tail in a way that hinders radical development of the construction industry. The paper concludes that if we allow ourselves to view buildings as both unique but also as standardised we can create a new platform for developing the construction industry – a Mass Customisation paradigm.

Keywords: customisation, industrialisation, long tail.

INTRODUCTION

The ambition of this paper is to reflect upon the development of the construction industry the past 25 years and try to outline a new agenda for research in construction. Acknowledging this is a very ambitious goal, the paper will of cause be a target for substantial critique. We hope the critique can give input to the further development of the paper and the thoughts behind. As our intention with the paper is to open a debate

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regarding the historical and present development of the construction industry, the argument will consequently be held at a conceptual level.

The fundamental wondering is that there seem to be an ongoing development/drift in the construction industry, which is not supported by research – and which to a very large degree is unexplored and taken for granted. This paper introduces the long tail as a concept for understanding this particular development and indentifies some of the mechanisms, which for good and bad are structuring the construction industry.

We acknowledge that there exists a variety of perspectives on the development of the construction industry. This paper, however, is dedicated to explore how the long tail can create new insights on where the construction industry is today, where it has been and where it is heading. In particular, we will address the development from a company perspective while we in another paper will discuss the trend from a governance perspective.

The paper opens with an introduction to the concept of the long tail, which is our fundamental framework for understanding different production paradigms. This framework is subsequent used for understanding the development of production paradigms in the construction industry. It is argued that these production paradigms have developed simultaneously with a particular view or myths of buildings, which have tremendous influence on the way construction is practiced and developed today. The paper concludes with an introduction to Mass Customisation as a production paradigm that bridges the traditional Mass Production with today's construction paradigm - Individual Customisation.

THE CONCEPT OF THE LONG TAIL

Based on the Pareto principle (the 80-20 rule) Anderson (2004) termed the concept “The Long Tail” and developed it further in the book ”The Long Tail: Why the Future of Business Is Selling Less of More” (Anderson 2006). It gives an overview of a market by juxtaposing the volume/popularity of products with the number of product variants. The Long Tail refers to the tail of the Pareto distribution - that 80 % of the product variants represent only 20 % of the market. As we live in an increasingly individualised society and as new technologies enable production and distribution customised products - the tail part gets interesting. That’s why the future of business according to Andersen is selling less of more.

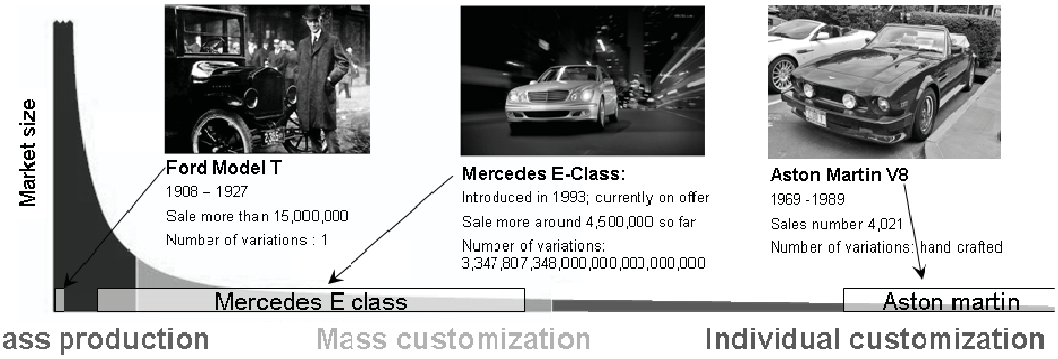

Figure 1: The long tail and production paradigms

Figure 1 relates the long tail to different production paradigms (mass production, mass customisation and individual customisation) exemplified by the car industry. The figure should be read as a conceptualisation of where each production paradigm's primary focus is regarding variation and market size.

Traditionally, industrial companies have focussed on the small amount of products that are the most popular, as these can be delivered, based on the mass production paradigm leveraging economies of scale. The most well know example is the Ford Model T, which in the beginning only was produced in one variant – an extremely standardised product. As Henry Ford put it: "You can have all the colors you want, as long as it is black"

However, the development of car manufacturing has evolved dramatically over the years. By the use of product platforms, customers can today design their own cars like the well know examples from VW, Skoda, Audi and Seat. This capability to deliver customer tailored cars increases the customers' perceived value of the car while the company can still leverage the economies of scale of mass production (Kruschwitz *et al.* 2000). In this way, car manufacturers have addressed the long tail, making it longer and bigger, by applying mass customisation strategies.

The last production paradigm of the long tail is the "individual customisation" strategy, where every product is realised uniquely for each customer. Within the car industry this paradigm is only adapted for certain extreme luxury cars such as the Aston Martin.

THE LONG TAIL OF THE BUILDING INDUSTRY

But what does the long tail of construction industry look like?

Back in the 1950s and 1960s the building industry in Denmark, as well as in the rest of Europe, was driven by a "Mass Production" paradigm (Bertelsen 1997). This development was initiated as early and in the 1920s fuelled by the ideas of Le Corbusier. By his work and blessing, it became legitimate for architects to think of industrialisation and the implementation of mass production principles in the construction industry began (Boxenbaum and Daudigeous 2007).

Buildings were erected for the growing population in the cities. A valued quality of the new buildings were an increase in the size of the apartments and they were further equipped with the latest technologies such as refrigerators, large bathrooms, large windows areas, etc.

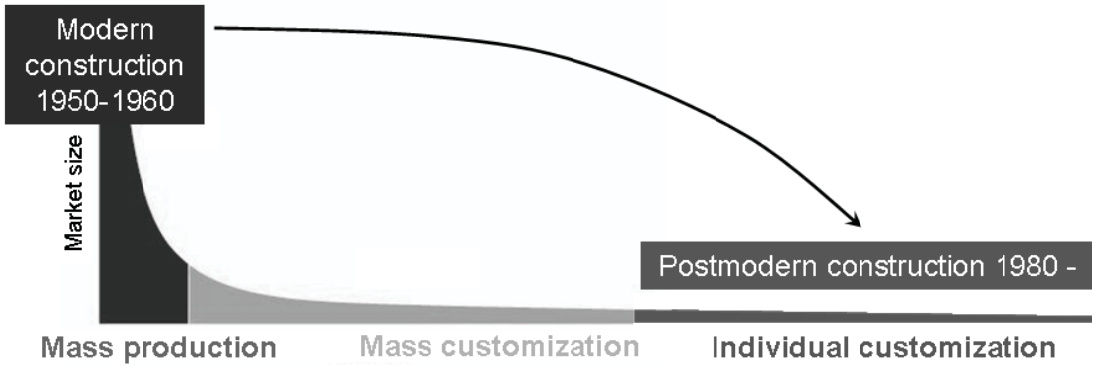

Figure 2: The long tail of the building industry

In the beginning of the 1980s the mass market for housing decreased and a revolution from upcoming architects against the results of the mass production paradigm evolved (Boxenbaum and Daudigeous 2007). In this new postmodern movement architects as Jean Nouvel and Frank Gehry challenged Le Corbusier's ideas of "living machines" and they developed a trend to produce buildings which were sensitive to the context in

which they were built. Consequently, construction became a matter of tailoring unique buildings to each customer and location. Figure 2 illustrates this paradigm shift.

Still today we are predominately and tacitly following this “individual customisation” paradigm as every project starts from scratch trying to satisfy the customer’s individual needs. The result is that the long tail in the construction industry is extraordinary long.

THE DRIVING MYTHS OF CONSTRUCTION

"If men define situations as real, they are real in their consequences" (Thomas and Thomas 1928: 572).

The two paradigms treated above, mass production and individual customisation, have co-evolved with two more or less unarticulated myths which are discussed further below. First, we will however briefly explain the notion of myths, as it is used in this paper.

The concept of myths

We adopt a Laclaudian reading of the concept. According to Laclau a myth can be seen as: “…a space of representation which bears no relation of continuity with the dominant 'structural objectivity'. Myth is thus a principle of reading of a given situation, whose terms are external to what is representable in the objective spatiality constituted by the given structure.” (Laclau 1990: 61).

Departing from this definition a myth can be seen as a discourse which has been institutionalised to such an extent that its contingency is forgotten – i.e. as a discourse which was become objective. Objectivity in this sense should be seen as an extension of the political as a concept referring to the continuous constitution of the social in specific ways, which excludes other alternatives; the political takes precedence in the construction of social configurations. Objectivity can thus be seen as a historical result of political processes and struggles; as sedimented discourse, being the institutionalisation of certain rationalities and power in such a way that other alternatives are forgotten (Laclay 1990).

On the other hand, we have the concept of reactivation of the political, which takes place as new antagonisms dislocate existing structures and reveal the objective world as fundamentally contingent and constituted on basis of previous political struggles. Pedersen (1993) argues that antagonisms are the very basis for talking about political processes: “The political struggle consists of overcoming or eliminating these antagonisms hereby weaving together the ruptured social (dis)order in a new stable order” (Pedersen 1993: 42, own translation).

According to Laclau, this happens as various political groups advocate a specific critical version of a situation based on their own interests and perspectives. This process of weaving together the ruptured social order through the constitution of a new discourse (that is forming a new objectivity by means of rearticulation) is referred to by Laclau as proposing a myth. In this light, a myth can also be understood as a hegemonic intervention, a ‘dissolver’ of antagonisms, and “…a critique of the lack of structuration accompanying the dominant order” (Laclau 1990: 62, in Pedersen, 1993: 42). Thus, myths are on the one hand a misconception of the nature of reality and on the other hand a necessary horizon for our actions.

The myths of the Standardised and the Unique

We suggest - as figure 3 illustrates - that the myths of the Standardised and the Unique operated as horizons for action. During the modernist period (up into the 1960s) buildings were viewed as standardised while they in the post-modern era (most notably from the 1980s onwards) have been viewed as unique.

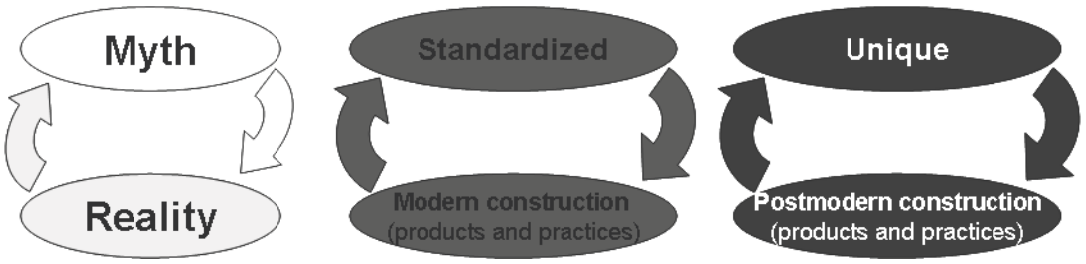

Figure 3: The construction of myths in modern and postmodern construction industry

We contend that these myths have had a definitive impact on the construction products and practices in each period.

Recently the myth of Individual Customisation has thus been implicitly embedded in what some have come to define as the "nature" of the building process.

As an example, the "Lean Construction" community often states that the nature of the building process is chaotic and consequently it follows that long term planning is more or less impossible. It is within this understanding the development of the Last Planner System (LPS) for short term planning should be understood, as LPS exactly enables managers to cope with a chaotic building process.

Lean Construction were thus translated into an expression of a broader strategic field, governed by the myth of Individual Customisation, which focussed on project management as the strategy for managing construction (Kreiner and Christensen 1991). This project management discourse generated tools and strategies for navigating in a chaotic and imperfect world. The "project" thus became the vehicle for realising buildings – and project management became the management principle. This is still the predominant way organising the building process today. Table 1 summarises the differences of the two paradigms

Table 1 Construction in the light of Mass Production and Individual Customisation

	Standardised	Unique
Societal frame	Modern	Postmodern
Perceived nature of the building process	Complex - but known	Chaotic
Production paradigm	Mass production	Individual Customisation
Value chain	Integrated	Fragmented
Vehicle for realisation	Prefabrication	Project
Management paradigm	Scientific Management	Project management
Cost	Low	High
Implementation of Lean	Long term planning (Line of Balance)	Short term planning (Last Planer System)

In this way, concepts that were originally developed to support mass production have been re-shaped by the logics of the myth of the Uniqueness of buildings and tailored to support the perceived chaotic nature of the "individual customisation" paradigm as they have been put to use in the construction industry.

A limitation, as we see it in this perspective, is accordingly that most initiatives for improving the performance in the construction industry implicitly reproduce the myth of the unique and chaotic nature of construction. Consequently is the construction industry still struggling with inefficiency, high costs etc. To be provocative one could argue that most of the initiatives have been symptom treatment while not addressing the root courses to the problems of the construction industry.

However, despite the prevailing myth about the uniqueness of buildings, the buildings look (from an outsider's perspective) paradoxically the same. How come it is produced as unique and in a chaotic way, when in the end it looks like the adjacent building? The answer could perhaps be found in the institutionalised practice-based learning processes where the different professions in their mutual interactions continuously reproduce the dominant order (Thuesen 2007) and are shaped in the image of the myth.

From an industrialised perspective it is however absurd not to take advantage of these visible and hidden similarities as benefits of economies of scale could be achieved. One could thus raise the question whether there exists a "right" way to view buildings. The short answer is that this is dependent on the cultural setting. In this way the so called "nature" of the building process is socially constructed based on the myths. The interesting point is hence not whether there exists a "right" way to view buildings, but that our view of buildings have consequences. This implies that if we are able to reactivate the sedimented social strata; to experiment with our view of buildings as being both standardised and unique (instead of either standardised or unique), it will become possible to create a new "platform" for the development of the building industry – a platform which could be termed "Mass Customisation".

THE ROAD AHEAD

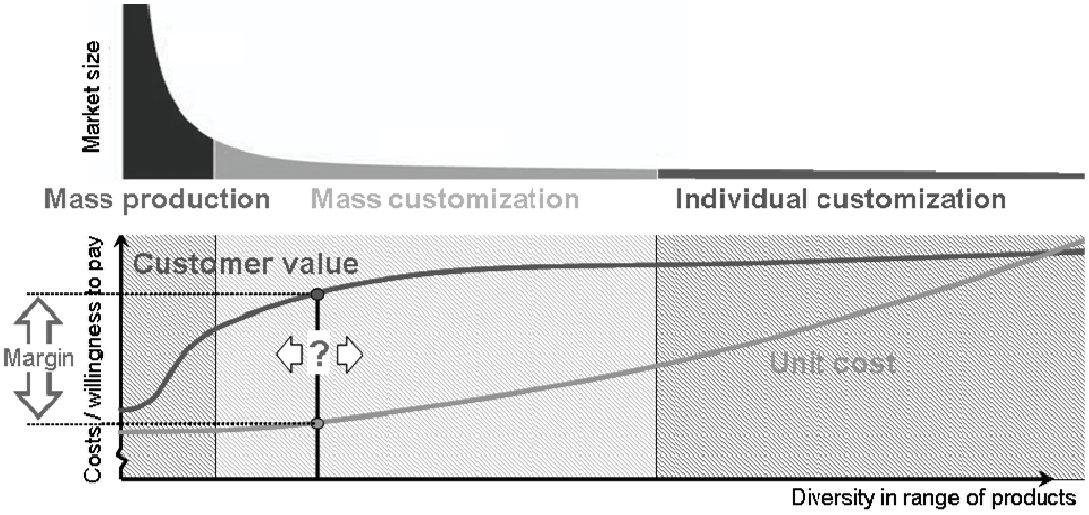

Figure 4: Optimisation of cost/value related to the long tail (based on Andersen 2006)

The concept Mass Customisation was first coined by Stan Davis in Future Perfect, and further developed by Joseph Pine in his book Mass Customisation - The New Frontier in Business Competition (Pine 1993).

Traditionally, customisation and low cost have been perceived as mutually exclusive. Mass production provided low cost but at the expense of uniformity. Customisation, on the other hand, characterised the products of designers and craftsmen and its cost generally made it a privilege of the rich. (It is tempting to state that the construction industry's customers today are stuck with this privilege despite their income).

The basic idea of Mass Customisation is to bridge these two paradigms by optimising the cost/value ratio - as illustrated in the figure 4. Tseng and Jiao (2001: 685) define it as "producing goods and services to meet individual customer's needs with near mass production efficiency".

The interesting point is that the field of Mass Customisation in construction is already in the making. Various actors are experimenting with mass customisation strategies like the (now discontinued) Danish initiative Building Lab DK (www.buildinglab.dk).

Especially the large contractors are moving towards mass customisation strategies. Both Skanska and NCC have launched initiatives for leveraging their size through coordinated purchasing, supply chain management, development of standard solutions and platforms, etc.

Thuesen and Jonsson (2009) have evaluated two NCC initiatives (NCC Komplett™ and the German platform for housing), which both have aimed to implement the mass

Figure 4: Optimisation of cost/value related to the long tail (based on Andersen 2006)

two initiatives - being their point of departure. While NCC Komplett™ was trying to benefit from flexibility through industrialised manufacturing processes, the effort of the German platform was to manage flexibility in traditional construction - focusing on delivering value to the customers and to reduce costs.

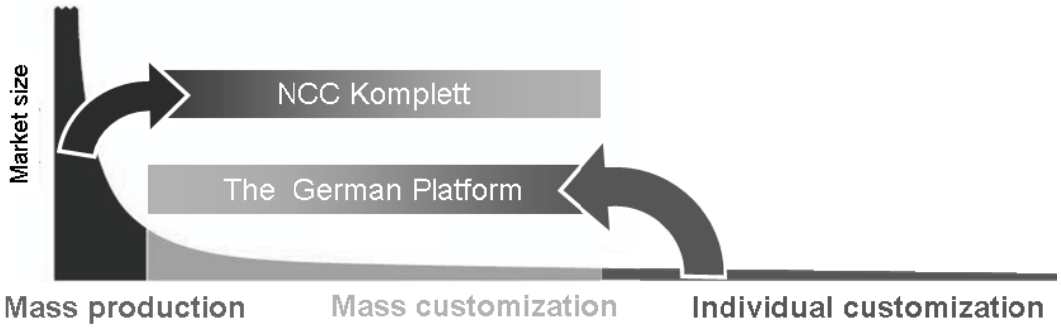

Figure 5: NCCs flirting with Mass Customisation

As illustrated in figure 5 was their point of departure different, and so was the result. NCC Komplett™ seemed to do all the right things theoretically speaking and they indeed developed a profound new approach for building – a well celebrated case on radical innovation throughout the industry. However, they lost control of the costs compared to their normal construction practices and the NCC Board decided in December 2007 to abolish the investment. Compared to this, the German platform has managed to reduce the production cost with more than 30 % over the past 10 years while still offering a high quality product carefully targeted at a specific market segment.

The German case is interesting as it contradicts the predominant understanding that a high degree of manufacturing is the way forward for the construction industry. Compared to NCC Komplett™ the German platform is extremely practical and low-tech as it takes its starting-point in existing, predominant in-situ construction practices.

The two NCC initiatives show that finding a successful mass customisation strategy is a challenge. Salvador, Holan and Piller (2009) reach a similar conclusion in the analysis of 200 companies working with mass customisation. Their conclusion was that there is no best way to do mass customise, but that "Managers must tailor [mass customisation] to an existing business - rather than vice versa" (p79)

On a generic level, the movement towards Mass Customisation in construction can be seen as a development focusing on leveraging similarity - a “stair model” as illustrated in figure 6. The figure should be read as how to integrate the ability to leverage similarity and still maintain the necessary flexibility. The more you move to the left towards mass production the more you standardise your processes and products and reduce the flexibility towards the market.

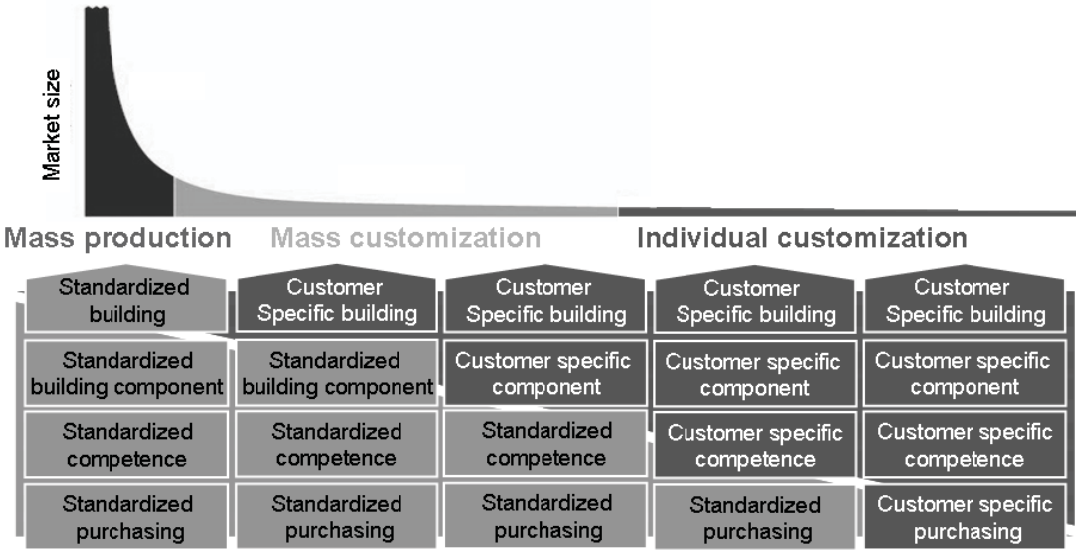

Figure 6: Leveraging similarity in the long tail - a “stair model”

A prerequisite for leveraging similarity is an integrated value chain. This implies that operating with mass customisation presuppose the development of strategic partnerships and maybe even new types of companies. Here it is extremely interesting to follow the development of AEC companies, which due to their position in the value-chain have the organisational capabilities for working with mass customisation.

Today the institutional setup however hinders the application of mass customisation. It is therefore of outmost importance that the regulators of the industry is starting to be aware of what kind of structures they are enacting within the industry. This further discussed in Jensen *et al.* (forthcoming).

RESEARCHING THE ROAD AHEAD

Despite an increasing interest in applying mass customisation principles in construction and the existence of plenty of cases of implementations - encompassing both failures and successes – the movement is more or less unsupported by research.

The only example in Denmark is the work of Center for Industrial Architecture (Cinark) which looks upon this field from an architectural perspective.

Existing research within this field (including Cinark and Manubuild[1]) share the belief, that the road ahead for the development of construction is increased off site production. This however seems like a too rigid conclusion as NCCs German platform for housing has showed that substantial results can be achieved by on site production.

There is an urgent need for supporting the development with research. There is however no reason for reinventing the wheel. There is a large potential for exploring the existing body of knowledge (e.g. Hvam, Mortensen and Riis (2008); Cooper and Slagmulder (1999)) regarding traditional development, planning and realisation of products and the possibilities for application in the construction industry. This includes tools and practices like:

- Modularisation
- Configuration
- Platform thinking
- Purchasing activities, volume concentration and internationalisation.
- Postponement strategies
- Target costing and value engineering

In developing a new field of research it is important to be aware what kind of reality we are constructing by our research. As mentioned, construction is not driven by its own nature – although it sometimes could appear so. As practitioners and researchers we are constructing this nature ourselves while we are at the same time also constructed by it. Accepting this introduces a dilemma in terms of the validity of the research. A way forward is to legitimate research within construction in two ways – a constructive and deconstructive way. Within the constructive area focus should not be on "finding the truth", but in what kind of "truth" we are creating with the research. Research within this area should be driven by the impact of the research.

But this paradigm can't live without a deconstructive paradigm continuously operating to deconstruct the developed solutions and the nature/culture of construction. It is within the dialog between these two paradigms – a fruitful research agenda for construction can be developed.

CONCLUSION

This paper has introduced the concept of the long tail as a framework for understanding the development of the building industry. It is argued that most of the construction industry today is driven by the myth of uniqueness of building. This myth is inherently disabling the possibilities for fundamentally changing the construction industry into an effective and systematically innovative industry. The paper argues further that if we allow ourselves to look at buildings as both unique but also similar we can create a new platform for developing the construction industry – a platform within the Mass Customisation paradigm. The industry is already developing and implementing strategies inspired by this approach, but research to backup and question this development is missing.

[1] An industry-led collaborative research project on industrialised construction, part-funded by the EU (www.manubuild.org).

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