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# Reconstructing Knowledge Integration in the Norwegian AEC-Industry

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Integration

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## Abstract

**Purpose** – The study purpose is to outline a conceptual starting point for an empirical analysis of the characteristic epistemic conditions of the AEC industry today – in its wide, multidisciplinary, industrial sense. This approach addresses a fundamental insight concerning adding value, notably that an actor only can add value to a project if his knowledge contribution is successfully integrated with other actors.

**Design/Methodology/Approach** – This study conducts a conceptual analysis of the knowledge management practises in the contemporary Norwegian AEC industry. This analysis draws on the conceptual distinction between logic-in-use and a reconstructed logic, allowing us to distinguish an important commonality between the current approaches.

**Findings** – Currently, a formalisation of the working principles of the Norwegian Building industry appears to be lacking in both research and practise. Most research is directed towards improving the industry's many practical challenges. The approach suggested here is a reconstruction of certain integrative aspects of current Industry's logic-in-use, contributing towards the development of a foundational methodology of the AEC-industry as a unified knowledge space.

**Research Limitations/Implications** – Several promising studies applying new information taxonomies have already been conducted (e.g. Skatland & Lohne, 2016; Skatland *et al.*, 2018). All these indicate that the modal aspect of building information – whether a given unit of information represents a conceived necessity or a valuable possibility – has a significant effect on the entire project organisation.

**Originality/Value** – There is value potential limited by the level of integration between different knowledge traditions/agencies within a project organisation. Reconstructing the integrative aspect of current logic-in-use will provide new insights that could be applied strategically in project knowledge management.

**Keywords** Knowledge integration, AEC-industry, Epistemology, Knowledge creation, Information density, Knowledge management practices, Strategy, Industrial theory

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## 1. Introduction

The architecture, engineering, construction (AEC) industry, similarly to many other contemporary industries, consists of information-dense activities. The industry in itself is increasingly becoming better and better documented; both informally (project-based and other) and formally (legal or official documents; [Skatland et al., 2018](#)).

Acknowledging the AEC-industry in a phenomenological manner as a practical endeavour – as opposed to a strictly scientific or purely reflective one – opens the understanding for how its epistemic unity manifests itself. Rather than appearing as pre-established agreements (explicit or implied) of the nature and dynamics of knowledge, any potential unity between the qualities of action can be established during the action sequences ([Latour, 2005](#)). Consequently, the potential for any epistemic unity of the industry emerges in action – as opposed to in description – in the pragmatic realm.

Apparently, if one is to take the routine completion of buildings as evidence (regardless of whether these are good or bad), the actors hardly need to agree upon the nature of knowledge, as long as they can integrate their different adverbial qualities (skills and perspectives) in action towards the completion of the aim. Therefore, it appears reasonable to infer that any epistemological unity in the industry – understood in the pragmatic sense – manifests itself as knowledge integration in practise. Consequently, instead of a pre-established, descriptive epistemological agreement, the building industry, understood as a particular knowledge phenomenon, functions according to a collective (practical) horizon of action.

The analysis addresses the following research questions:

- (1) How does epistemic unity manifest itself between and across the industry agencies, despite their respective differences in stakes, goals, motivations and education?
- (2) How can this phenomenon (of knowledge integration) be researched empirically, as opposed to normatively?
- (3) How can these specific insights into the epistemic characteristics of the contemporary AEC-industry be applied strategically to improve current knowledge management practises?

## 2. Theoretical framework

The art and business of constructing our shared environments can be conceived as one collective activity, or more precisely; as one knowledge space where a basic genus of knowledge, characteristic of the human condition ([Møystad, 2017](#); preface) is actualised and developed. The direct opposite of this thesis – a AEC-industry imagined as non-collaborative tug-of-war between interests – remains both intellectually unattractive and absurd. Such a conception of the industry would be like looking out the window and claiming that the structural similarities in the built environment are mere coincidences and not the result of some purposeful, collective activity.

Firstly, in this research context we conceive the phenomenon referred to as “the AEC-industry” – at its most general – as the multidisciplinary sequence of acts towards a more or less defined aim within the built environment, typically that of a building.

Secondly, the AEC-industry constitutes a context of a productive activity as opposed to a purely reflective pursuit. In such contexts, knowledge, in the pragmatic sense, can be understood as the adverbial quality of an action ([Kaplan, 1998](#)). In the specific context of the building industry, this adverbial quality fundamentally consists in informing the shape and content of a building project; as well as enabling the realisation of such shape and content.

Acknowledging the AEC-industry phenomenologically as a practical endeavour – as opposed to a strictly scientific, or purely reflective one – opens for interpretations of how epistemic unity manifests itself. Rather than a pre-established agreement (explicit or implied) upon the nature and dynamics of knowledge, any potential unity between the adverbial qualities of action can be established during the action sequence, by mediation of controversies (Latour, 2005). Consequently, the potential for any epistemic unity of the industry emerges in action – opposed to in description – in the pragmatic realm. Therefore, it appears reasonable to infer that any epistemological unity in the industry – understood in the pragmatic sense – manifests itself as knowledge integration in practise.

The information produced by the actors during the building process, containing the adverbial qualities of their actions (knowledge) and their effect on the final aim, contains the best chance of discovering a positive manifestation of the collective horizon of action that characterise the industry as a knowledge phenomenon. A common denominator of knowledge is most likely to manifest as a feature of information that is universally recognised and accepted cross different aims, stakes and educational backgrounds.

### 3. Method

Methodically, this research conducts a conceptual analysis of current knowledge management practises in the Norwegian AEC-industry. The purpose of this analysis is to identify a starting point for an empirical platform of research into the epistemological constitution of the AEC-industry.

Our primary conceptual tool is the theoretical distinction between logic-in-use and a reconstructed logic, stemming from pragmatic behavioural studies (Kaplan, 1998, pp. 6–12). By applying this dichotomy, between practical operations and their formalisation and description, we analyse and classify the conceptual content of some current knowledge management approaches. A pattern, appearing like a preference for operational improvement, occurs when comparing the different approaches. Also, the reconstruction and formalisation of the principles of knowledge integration – appears to be lacking.

In the context of our research questions concerning the epistemic nature of the industry, this apparent asymmetry between reconstruction and logic-in-use appears to be something of a gap in both industry research and practise. Consequently, we suggest developing a new research framework upon the reconstructive aspect of knowledge, which appears to be lacking. Intuitively, it is by addressing this least developed aspect of knowledge management we are most likely have the greatest possible impact back on the industry.

Finally, we assume that it is indeed possible to establish a positive reconstruction of the AEC-industry's common principles of knowledge integration. This final assumption serves as the foundational hypothesis – or more precisely – as an abductive starting point in its Peircian sense (Peirce, 1955, Mcauliffe, 2015) for the future development of a conceptual approach: Basically, we postulate something that does not yet exist (a comprehensive reconstruction of the AEC-industry's operational principles), and then proceed to investigate this as if it does indeed exist, and furthermore, what practical consequences this would have for the industry – if these principles were known, understood and re-applied in project management.

### 4. Results

#### 4.1. A general tendency

Currently, the building industry – both in Norway and within the international context – appears to be most concerned with improving efficiency and avoid losses to bottom line

projections (e.g. [Johansen and Rolstadås, 2017](#); [Ballard, 2000](#); [Svalestuen et al., 2015](#)). The emergent complexity (implied risk) of large-scale project appears to have biased large parts of the AEC-industry towards favouring the quest for efficiency ([Samset and Volden, 2016](#)). Some entrepreneurs on the Norwegian market, like HENT even fantasise about taking the LEAN project execution model to its logical conclusion, by virtually removing the structured physical interaction between the actors on-site, reducing agency interaction to standardized information exchange in databases and resolving controversies according to specialised enterprise contracts. This may partly be explained as loss aversion, partly as a reaction to pre-established and very competitive profit goals and formalised client demands. A significant part of the present efforts towards knowledge integration gravitate towards improving communication efficiency and enhancing decision process linearity ([Knotten et al., 2015](#)). That this process entails significant ethical challenges has so far only been explored in a limited number of publications (e.g. [Lohne et al., 2017](#)). Production process efficiency becomes a goal in itself due to stakes and time-preference structure rather than identifying when and how to maximise/improve the added value benefit/potential from the multiplicity of knowledge agencies.

#### *4.2. Responses to the increasing need for knowledge integration*

The architect historically managed knowledge in the entire course of the building process. Lately, this traditional role of the architect as the leading organiser of the comprehensive building process is proving increasingly inadequate for handling the span of different interests and competencies characterising the AEC-industry as a whole through all its phases. Architecture theory's reaction to the increase of complexity that can be observed in the AEC-industry since World War 2 and especially the 1980s has largely been driven by professional introspection and a strong theoretical autonomy project ([Norberg-Schulz, 1965](#)). This has been characterised by some authors – like [Lang \(1987, pp.3-13\)](#) – as an inheritance from the modernist project. The architects' attention has largely been directed towards the aesthetic form and social content of buildings, typically user affordances ([Gibbons, 1979](#); [Chemero, 2003](#)) – that is generally the product of the AEC-industry process. The architect's work is largely directed towards developing an increasingly insightful representation (such as drawings) of the output – that is the building. Architectural work, as first noted by Aristotle (*Metaphysics*) has been and continues to be an intentional focus on gaining knowledge of the causes and effects of the building through the development of direct (and indirect) representations of this building. Less attention has been given to the increases in mediation critical to successful production processes ([Lang, 1987, preface](#)). Reflecting the profession's strong internal history and self-image as advocates of building quality, architecture theory has been somewhat antagonistic to the influence of other disciplines and interest in the building process.

Over the last couple of decades, the *de facto* leadership of the comprehensive production process that admits a multiplicity of relevant roles, stakes and competencies has been assumed by a growing group of dedicated project managers. The role of these has been defined as “to manage people and information” ([Emmitt & Ruikar, 2013](#)) through the several critical phases of building production. Project managers are often the main users of Building Information Systems and other project data bases. Project managers come from various backgrounds, and their agencies are often instrumental. They are senior craftsmen, engineers, controllers, economist, etc. Their competencies as managers are often based in experience. They typically come to represent various stakeholder positions (owner, contractor and technical aspects) as well as creating interfaces between different agencies as this is where information, and by implication knowledge, is interchanged.

Analytically, beyond their obvious differences, these actors appear to have one characteristic trait in common: They address problems on the level they occur; that is the level of practical action, which is natural, as the building process is indeed a practical one. They actively try to improve the building process, in one way or another. In a more technical language the current industry efforts are directed towards developing what Kaplan (1998, pp.6-12) calls a logic-in-use.

#### *4.3. The lacking reconstruction of the operational principles of the industry*

Presently, what the leading agencies in the industry appears to not be addressing in practise is what Kaplan (1998, pp.18–27) calls methodology in the strict sense. Methodology should not be confused with method or technique, as it is obvious that the industry continuously is developing and improving these. Methodology, according to Kaplan is the process of reconstructing a present logic-in-use. It is the process of making logic-in-use explicit, as opposed to applying and developing a characteristic cognitive style of discipline. In this research framework, we suggest adopting Kaplan's distinction, understanding a reconstructed logic, in contrast with logic-in-use, as the formalisation (e.g. the analysis, structuring and explanation of) of a currently applied set of operations that characterise a specific practise or knowledge space.

Consequently, if our above analysis of current practises holds true, this research points towards the need to investigate the apparent knowledge gap in the reconstructed understanding of the building industry as a unified knowledge space – a knowledge space characterised by a certain species of productive behaviour. This gap must not be confused with just any possible existing knowledge gaps in the operative logic in use, as these also exist, in plenty. The situation is hardly just an underdevelopment of know-how and mediation practises, such as project organisation structures. Isolated in their own chambers, the different agencies might be very well aware of their own knowledge contributions to a building process. Rather, to put it bluntly, what appears to be unclear in the Peirican sense (1955, "How to make our ideas clear?") is what the unifying principles of the present logic-in-use consist in. And by conjunction, it is also presently hard to characterise what knowledge that is valid and applicable across agencies in this productive process actually consist in given that knowledge can be imagined as the adverbial quality of actualising the logic-in-use to produce value in the end product.

#### *4.4. Some possible explanations for why a reconstructed logic is lacking*

There are at least four plausible reasons why such an industry-wide methodological inquiry has not been conducted: Firstly, the leading agencies have all been focused on solving the manifolds of considerable practical challenges before them. In other words, they have been busy developing the tacit logic-in-use to cope with practical, actual challenges as they have occurred as the industry has grown more complex.

Secondly, reconstructing industry logic would unavoidably imply transgressing professional borders in a competitive environment where all are dependent on goodwill (and reputation). Articulating a knowledge space between and across all the angles at play in contemporary building industry would quickly lead to transgressions of professional, institutional and academic frameworks, as they exist as Lakatosian research projects (Lakatos, 1978).

Thirdly, the problem of efficient/sufficient knowledge integration could easily be interpreted as a practical problem of setting/establishing a common goal, intention or meaning across agencies with different interest, knowledge contributions and criteria for success. This mix-up is far from trivial. Because such a common goal appears to be increasingly implausible proportional to the number of agencies involved, the challenge of integrating knowledge can be taken to be too difficult to achieve – if not downright impossible.

Fourthly, the lack of a formalised reconstructed logic, or any other kind of epistemological reflections on the unified principles of the contemporary building industry might be caused by the abstraction level associated with these kind of problems: The developments of logic and epistemological reflection is typically found within the philosophical domain. Yet, owing to its very practical, down-and-dirty nature, the problem has not attracted the attention of professional philosophical analysis. The problem of building industry knowledge integration thus appears to be stuck between abstraction levels. It remains too abstract to be addressed as a practical problem of handling the building process, as indicated by our quick review of the general strategies of the leading building management agencies.

## 5. Discussion

In this paper, we set out, firstly, to examine how epistemic unity manifest itself between and across the industry agencies, despite their respective differences in stakes, goals, motivations and education. Secondly, we proposed to address how this phenomenon can be researched empirically, as opposed to normatively. And thirdly, we have examined these specific insights into the epistemic characteristics of the contemporary AEC-industry can be applied strategically to improve current knowledge management practises.

The response first of these questions was outlined in the theoretical framework section, underlining how the practical nature of the industry trumps epistemological challenges, seemingly rendering them obsolete for the actors. The response to the second of these questions was outlined in the methods chapter. The most important lesson to be learned from enquiring into the epistemological foundations of the industry seems to be that to arrive at some sort of common fundamental ground of understanding, the analysts needs to raise their heads from the most immediate practical concerns of the industry. Thirdly, the third research question cannot, in fact, be said to have been sufficiently answered. The question of manners by which to strategically address management practices within the industry seems lagging under the weight of the non-existence of a proper epistemological understanding. This knowledge gap remains essential for future research to fill.

## 6. Conclusions

Logic in itself is not superior to action. The aim of reconstruction as carried out in this paper, will not be to articulate some final truth, but rather to enable and further a continuous process of inquiry, discovery and improvement (of understanding and explanatory powers).

While the building industry logic-in-use has grown ever more sophisticated over the course of the last century, so has the complexity of its context. The level of mediation in the industry appears now to have reached a state where practical problems are becoming hard to surmount. This situation is likely to be aggravated by lack of a reconstructive understanding of its governing principles and operative mechanisms that unifies it as a knowledge space.

It is presently hard to characterise what knowledge that is valid and applicable across agencies in this productive process actually consist in. Currently, the Norwegian AEC-industry is lacking a reconstructed logic that gives expression and clarity to the operations that/what currently enables the integration of knowledge across building industry agencies, so that value creation can be achieved – regardless of how we are to measure and define value.

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