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MIXED METHOD COLLABORATION IN THE BUILT ENVIRONMENT INTER-DISCIPLINE

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Abstract

The built environment discipline or inter-discipline is a relatively new field in academic research. Its subject matter however is based on the traditional disciplines of the construction and property industries. Determining your ontological position and epistemological approach based on the research paradigm of one of these fields' may not provide an adequate solution to your research objectives. This paper outlines that framing your research within the broader confines of the built environment; drawing from related fields in an integrated manner may provide a more successful outcome. Arguments whether the built environment is an academic discipline or even the range of subjects that make up the discipline, although worthwhile, do not provide any meaningful insight into the issues and needs of society that are served by the practice orientated fields that constitute the inter-discipline. A more valuable argument is whether built environment knowledge produced in academic circles is transferable to the practitioners providing services within its borders and ultimately how this knowledge contributes to the real issues and needs of society. This paper outlines a number of eminent authors that state a disconnect exists between academic research and fulfilling the needs of construction and property industries. The alleged gap between research and practice maybe a result of the prevalent positivist paradigm which exists in academia or/and the positivist application of tools in a practical context. In the built environment many innovative solutions are based on knowledge and experience acquired over many years of practice based application. Externalising this tacit knowledge should be the goal of academics and practitioners, thus filling in the gaps and making explicit what were originally hidden. This paper outlines that knowledge in the built environment would be better served by an approach that combines the strengths of both a positivist and interpretist approach, giving rise to a plural research perspective.

Keywords: Built Environment, tacit knowledge, knowledge transfer.

1 INTRODUCTION

In order to explain epistemological positions, one must consider the fundamental elements of what constitutes knowledge. This paper will frame the historical and contemporary debate on ontological and epistemological assumptions of what reality is and what really constitutes knowledge in the context of built environment research and practice. Griffith's (2004) definition of the built environment is examined in an attempt to position the built environment discipline within Biglan's 1973 model on academic subject matter. The paper outlines the difficulty of positioning the built environment discipline within a model that is paradigmatic and static. Traditional disciplines of the property and construction industries are difficult to frame within Biglan's model as they are multi-disciplined in nature and thus occupy different academic areas within the model. Chynoweth's 2009 paper on the *Built Environment Inter-discipline* uses Biglan's model to characterise the build environment as a multi-themed, multi-disciplined academic field. The complexities of positioning the built environment within Biglan's model is evident in this context, as it is not only multi-disciplined but also multi-layered, combining the primary multi-disciplined traditional fields to form a composite secondary inter-discipline.

The effectiveness of the built environment inter-discipline can be measured on how successful it is in finding solutions to some of the need areas of society, such as sustainable development and fiscal challenges, and more particularly solutions to issues within the built environment itself. This paper outlines that integration in the built environment can be achieved through early communication and interaction between the disciplines that makes up its subject matter. In an academic context the use of Mode 2, mixed method research products are explored to provide a means to construct future research in the application of the author's own studies.

2 DISCOVERING THE NATURE OF REALITY AND HOW IT SHAPES RESEARCH

2.1 Deconstructing the unconscious

"People have sought to come to grips with their environment and to understand the nature of the phenomena it represents to their senses" (Cohen et al., 2011, p.3). Those that carry out these endeavors in a reasoned and methodological manner, such as scientists, philosophers and explorers, have generally tried to comprehend and make explicit the world around them. They do this by experience, reasoning and research. Most of us go through life experiencing the world around us and reacting to those experiences on an unconscious level. According to Dispenza (2007) much of our unconscious reasoning is ingrained over time into our unconscious and subconscious minds through repetitive conscious thought. Many of our haunches and feelings were originally recorded in our minds through explicit conscious experience. Pete Mann (1998) describes this process as tacit knowledge. Mann outlines tacit knowledge as the knowledge of the body, which is the knowledge of know-how and learning while doing. Over time the web of conscious knowledge we accumulate and lessons learned percolates into our deeper mind to reside in our unconscious and subconscious minds.

Decisions based on unconscious thought are not necessarily rational to the knower, but felt emotionally through feelings and haunches rather than logical reasoning. Cohen et al., (2011) outlines that scientists strive to make implicit feelings and hunches explicit by giving more reason than the layperson to the links and casual relationships between the external world and our perception of it. They state that scientists do this by developing their hypothesis empirically, so that our experiences have a firm basis in fact. Scientists are also "conscious of the multiplicity of factors and implement procedures and processes that test their hypothesis by manipulating and analysing the effect of their results by changing the factors" (Cohen et al., 2011, p.3). Research as described by Borg (1963, cited in Cohen et al., 2011, p.4) is a combination of experience and research and must be "regarded as the most successful approach to the discovery of truth especially in the natural sciences".

2.2 Ontology and Epistemology

Grix (2004) argues that ontology and epistemology are to research what footings are to a house. If this is the case, (using the house as an analogy) ontology may be the foundations but epistemology may very well be the rising walls, as we can only construct how knowledge is acquired (epistemology) if we build on what is out there to know (ontology). Once we understand the deeper discussion of reality, we can go about discovering the nature of it. Many researchers focus on epistemology without ever asking about the nature of their assumptions and many more do not even analyse their epistemological foundations to shape their research methods. Any student undertaking research will normally need to convincingly argue how their research contributes to knowledge in a given field (Knight & Ruddock, 2008). Epistemology deals with the nature of this knowledge and a firm understanding of how others in your field acquired their knowledge is necessary if you are to build upon it.

2.3 The skin we are in

How scientists reason and thus how they research, has been the form of much debate since the 'original thinkers' of Greek philosophy. The root of these debates, which have been argued through different forms and with different terminology over the centuries are rooted in ontological assumptions of what reality is. These ontological arguments have revolved around whether reality is external to individual influence and thought or whether the cognitive process is part of the knowledge equation. It may seem strange to discuss the essence of ontological assumptions when researching a specific field such as the built environment but these assumptions shape how we perceive knowledge and thus how we might go about obtaining it. The failure of a great deal of research may arise from the researcher not fully understanding their own philosophical assumptions. Cohen et al., (2011) state the reason for this is that researchers automatically orientate themselves to a realist view of the world where objects have an independent existence and are not dependent on the views or actions of the observer. This view was central to research from the beginning of the scientific revolution and dominates the natural sciences which were the focus of scientific research initially. Many researchers will take a realist perspective because of this tradition, even if their research may be better served by a nominalist approach. This issue can be observed in the construction management research

community where quantitative research has been the dominate methodology, and even where qualitative research is employed it is predominantly semi structured (Knight & Ruddock, 2008).

Andrew Dainty argues against using only one type of methodology in built environment research (Knight & Ruddock, 2008, p.10**)** by suggesting "that no single methodology can ever provide a complete picture". In construction management the positivist approach to research possibly prevails not because of an undercurrent of a realist ontological assumption due to the nature of the subject matter, but rather a paradigm that exists in the built environment community that has been generally followed without query as researchers don't believe or know they have the right to question them. Cohen et al., (2011, p.8) describe paradigms in research as "a shared believe or set of principles, consensus on what and should be investigated in an academic area". Realigning or readdressing paradigms is difficult as they become embedded in the research community over time. According to Grix (2004) paraphrasing March and Furlong (2002) your ontological and epistemological assumptions end up being a "skin and not a sweater". Clough and Nutbrown (2002) describe a conscious choice between a positivist or interpretist paradigm as "extraordinary" implying that researchers are tied to the prevailing paradigms within their field. One of the ways researchers may break these norms is by starting their research by studying ontological and epistemological arguments and understanding the research trends in different subject matter.

3 SELECTING A RESEARCH APPROACH IN THE BUILT ENVIRONMENT 'INTER-DISCIPLINE'

3.1 Characteristics of different subject matter in academia

With different research traditions and paradigms in mind Biglan (1973) attempts to establish comparison among academic areas. Biglan draws comparison along a number of dimensions, notably an 'applied/pure' practical dimension and a 'hard/soft' social dimension.

Biglan as illustrated in figure 1 below; draws the social dimension along a 'hard/soft' horizontal axis and refers to this scale as paradigmatic.

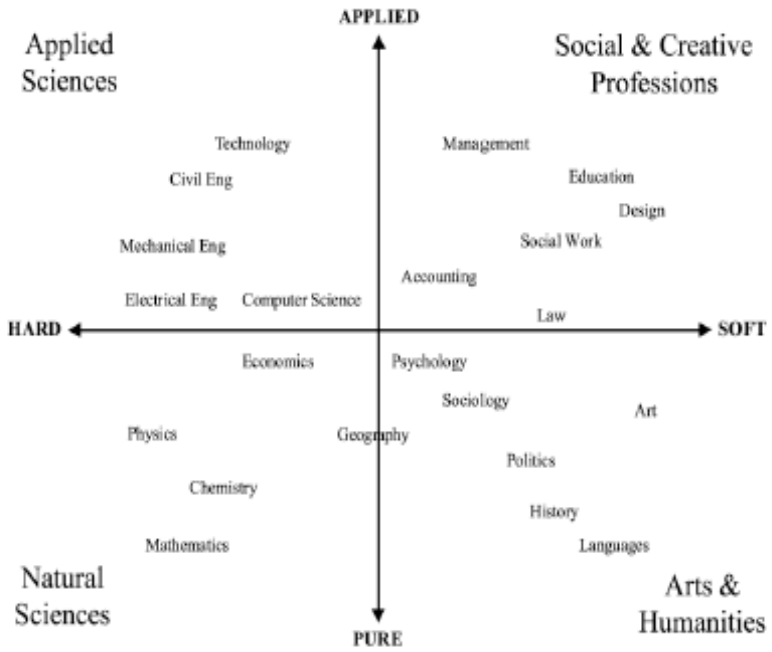

Figure 1. Source: Biglan 1973 & Chynoweth 2009

Biglan develops the horizontal dimension under the theme of Thomas Kuhn's (1962), paper, *The Structure of Scientific Revolutions,* where Kuhn describes that different academic disciplines are characterised by the presence of paradigms. Areas at the positive end (soft right end) of Biglan's model are not paradigmatic and thus do not have a clearly delineated research approach, these

subjects include art, social work, politics and history. Chynoweth (2009) commenting on Biglan's model, states that non paradigmatic academic areas tend to be more idiosyncratic. Areas at the extreme negative end of the social dimension (left end of the axis) such as engineering and the hard sciences are paradigmatic according to Biglan and occupy a common consensus on epistemology and methodology.

On the 'applied/pure' vertical divide, subjects are orientated along a practical application. Engineering, accounting and agriculture are distinguished from the pure sciences such as social science and the humanities.

Orientating your field of study along Biglan's axis is useful in determining similarities with other academic fields such as its paradigmatic proximity and its practical alignment. However Biglan does not explain or deeper probe the paradigms along the divide and does not allow for the concept of paradigmatic shift. Paradigmatic shift is described by Cohen et al., (2011) as the fluid nature of epistemological assumptions within an academic field where paradigms within a discipline can be replaced by a new epistemological orientation within the field overtime. Cohen et al., describe 'paradigmatic shift' as an hypocrisy of the definiteness of a paradigms meaning. Biglan also does not address the fact that researchers may employ mixed method research within a field and thus use a number of paradigms for different parts of their research. To this end Biglan's model is static and possibly a snapshot in time of comparison between different academic areas and may not help but hinder the researcher by orientating them to older (possibly out of date) epistemological assumptions and research methods.

3.2 Positioning the Built Environment within Biglan's model

The majority of the traditional disciplines of the construction and property industry such as architecture, quantity surveying and structural engineering are not addressed in Biglan's model. Positioning them within the model can be difficult as many of the attributes of these disciplines are included as disciplines of their own within the model and in many cases occupy opposite ends of the axis. For example quantity surveying draws from accounting, management, law, technology, economics and mathematics, which occupy all four quadrants of the model, possibly with the exception of the arts and humanities quadrant, which arguably is inherit in all facets of society and industry in which no fields can be truly separate. If it is difficult to position the traditional construction and property fields within Biglan's model, how do we frame the built environment discipline within Biglan's model and draw comparison to other fields.

In chapter 1 of Knight & Ruddock (2008), Andrew Dainty, reviewing the prevailing research approaches to construction management in a sample taken from *Construction Management and Economics Volume 24*, commented that there is an over reliance on quantitative research in construction management and even when qualitative research is employed it is predominantly semi-structured. Dainty suggests that no single methodology can ever provide a complete picture and thus a pluralistic approach should be encouraged to link between judgment and analysis. If drawing similarities to other research areas and analysing the cogitative nature of their knowledge base is difficult for the traditional disciplines of property and construction, how we can do it for a multidisciplinary field such as the built environment, which is now recognised as a field of study of its own by the international research community (Chynoweth, 2009).

If we are to use Biglan's framework as a method to articulate and illustrate the position of different fields of study within the arts/science dimensions and understand the nature of the field's knowledge base, one could only describe the nature of the traditional construction and property disciplines as multi-themed or multi-disciplined. The built environment field of study encompasses all the traditional disciplines that service the life cycle of the constructed asset and not surprisingly according to Chynoweth (2009) there is a broad acceptance that the field is multi-disciplinary itself, drawing from and interacting with the traditional construction and property professions.

If the traditional disciplines of the built environment are multi-disciplined, the built environment discipline must be seen as a second level multi-disciplinary field interacting with and made up of other primary property and construction multi-disciplinary fields. This multi-layered analogy although possibly confusing is useful as it flags to the researcher from the outset the complexity of research within the field and the problem with employing a research methodology. Chynoweth (2009) states it is useful to attempt to frame the built environment within Biglan's model as it raises the question as to whether it is appropriate to describe the field as an academic discipline at all.

3.3 The Built Environment Inter-discipline

Considering the multi-themed elements of the built environment, Bercher and Towler (2001) state that the built environment is not a true discipline in the strict sense, but rather an inter-discipline. Jantsch's (1972) frequently cited taxonomy of inter-disciplinary, draws distinction between the levels of interaction within the disciplines of a multi-disciplined field of study. Depending on the level of interaction between the disciplines in an academic field, integration can vary from the lesser concepts of multi-disciplinary and pluri-disciplinary to cross-disciplinary and true integration in inter-disciplinary. According to Jantsh (1972), inter-disciplinary this takes place where traditional disciplines are brought together to form a new hybrid of knowledge that satisfies basic themes of society or need areas. Is the built environment an inter-discipline? – the answer may lie in weather the discipline provides solutions to the need areas of society and the environment and the level of interaction between the traditional disciplines in doing so.

One of the most prevalent themes and need areas of society is the issue of sustainable development and more specifically in a construction context, sustainability within the built environment. The very nature of this issue crosses all aspects of society such as our economy, social interactions and our environment. According to Marion Temple (2004) pursuing such an integrated issue leads itself to an inter-disciplinary approach. The use of more visual and interactive computer software within the construction industry is also breaking down barriers between the traditional disciplines as clients require input into information technology in a more integrated manner, which does not facilitate the traditional procurement delivery which prevails in the construction industry in the UK and Ireland. Interaction through construction informatics, especially through information exchange in Building Information Modelling (BIM), is beginning to change the way we build, the way buildings look, the way they function and the way buildings are maintained and managed (Godager, 2011).

The use of BIM as a contribution to sustainable construction is demonstrated in its application to simulate energy consumption for a perspective building during the design stage, connecting the disparate consequences of design, engineering and sustainability. When trying to implement sustainable principles the architect cannot design the building without bearing in mind green building practices such as thermal efficiency, water efficiency, sustainable site use, indoor air quality and the sustainable use of building materials, which are traditional concerns of the engineering professions of the industry. Sustainability cannot be an afterthought to the visual form as the form and orientation of building has an effect on its overall environmental performance. It is evident that early interaction between design professionals is paramount to the successful design and construction of sustainable buildings.

How successful the built environment is as an inter-discipline and how successful it is in meeting need areas of society will depend on how successful the respective disciplines are in interacting with each other. According to Chynoweth (2009) this will depend on the extent its disciplines are prepared to concede their own disciplinary goals in favour of the collective strategic goals. Chynoweth describes this as a realistic aspiration that would provide a framework for better understanding between the field's individual subject areas.

4 LINKING ACADEMIA AND PRACTICE THROUGH COLLABORATION

4.1 Knowledge transfer between academics and practitioners

Understanding the nature of the respective disciplines within the built environment in an academic context is a worthwhile endeavor in order to define the nature of its knowledge base but how does this translate to practitioners in the industry and how is it used to increase productivity and efficiency. Michael Eraut (1985, p.118) asks "to what extent is professional knowledge created by research or in practice; and to what is the relationship between the facilitation of knowledge creation and the promotion of knowledge use"? There has been much debate on the relevance of management research and the knowledge transfer between academics and practitioners in the last number of decades, and many viewpoints have been put forward that describe a gap between academic research and the practitioner (Aram & Salipante, Jr., 2003).

This debate is relevant to the built environment as many of the traditional fields of the construction industry have a management undercurrent. Joan Ernst van Aken (2005) agrees with Susman and Evered's (1978, cited in Van Aken, 2005) view that the disconnections between academic research and practical application is rooted in the widening gap between more sophisticated and complicated

research methods in academia and their practical application. Academics spend much of their time paying homage to research methodology, carrying out protracted research and writing up detailed and extensive reports. Barrett and Barrett (2003) state that industry is impatient with lengthy research reports and there is a desire for short solution orientated guides that are easily implemented into practice. In construction and property industries practitioners may not and cannot afford to wait for answers from academia. The issue may have already been resolved as lengthy research is being carried out or when the solution is generated it is too late or no longer relevant to have a bearing in a professional context.

However, Barrett and Barrett (2003) contend that the disconnectness that exists between research and practice as argued by Lansley et al., (1994, cited in Barrett and Barrett, 2003) may not exist to the same extent in the built environment as many researchers have had significant practical experience in the industry as practitioners before they enter academia. Academics in the built environment may retain these links throughout their academic endeavors and thus create a natural empathy between researchers and practitioners.

Joan van Aken (2005) articulating the research products of the seminal work of Gibbons et al., (1994) outlines three approaches to improve the relevance of academic management research. The first two approaches deal with improving communication and interaction between academics and practitioners, an approach previously advocated by Eraut (1985). Van Aken does stress however that these suggestions are not entirely new as research practitioner collaboration has been practiced in various forms under the guise of 'action research'. Aram & Salipante, Jr. (2003) claim one of the shortfalls of action research is its emphasis on context and action, leaving 'action research' without an understanding of what knowledge can result from the action process and how this may be applied in a different context.

The third approach, which Van Aken advocates is the use of Gibbons et al's., (1994) Mode 2 research products, which she states provides a solution to the problem in action research outlined by Aram & Salipante. However, the solution Van Aken outlines is not rooted in pure Mode 2 knowledge production as Mode 2 knowledge itself, similar to action research, tends to focus on the research process rather than the actual knowledge produced by the process. Van Aken articulates a Mode 2 research product, viz the 'field tested grounded technological rule' which is a 'solution concept' that she states includes the problem solving activity in the research process. The 'field tested grounded technological rule' differs from pure Mode 2 knowledge production in that it can produce reflective knowledge that can be transferred to contexts other than the one which is produced. Aram & Salipante, Jr. (2003, p.192) state that Mode 2 knowledge production "results from a convergence of specialised disciplines often working in different institutions in the context of a defined problem", if this statement holds true Mode 2 knowledge production may work well in finding solutions to issues in the built environment inter-discipline through a more integrated approach between disciplines.

4.2 Producing knowledge through collaboration

To truly understand an issue in the context of collaboration between disciplines a researcher may have to outline an approach, document the process in action observing the interaction between disciplines and actors, observe the outcome and determine its potential application to a different problem or issue. This could be viewed as an interpretative outlook of knowledge production and possibly more specifically Mode 2 knowledge as outlined above, which interestingly seems to run counter to the paradigm that exists in construction management (Knight & Ruddock 2008). The positivist approach that exists in construction management research maybe the legacy of the dominate positivist approach of the natural sciences but it may also be a result of the nature of work carried out by the design and construction team.

With the possible exception of the architect, design & construction management professionals and contactors arguably do not take stock of social consequences when working within their respective fields. Agents of the construction industry and their stakeholders tend to produce constructs, be it drawings, specifications and bill of quantities to illustrate and articulate the nature and detail of work to be carried out. Contractors realise these constructs by manifesting them physically into reality. Documented reflection is rarely applied outside the fairly strict procedures outlined by the actor's respective bodies and the state codes and regulations with which they have to adhere – and thus the possible lessons learned from using these processes may not be recorded outside the practitioners own work environment. More importantly very little time is spent in the industry as a whole analysing and trying to improve on these procedures and often true innovation and expertise remains in the tacit realm of the practitioner.

Although possibly limited, these constructs in evolving forms over the years have provided a language for built environment disciplines and are understood by all the agents in articulating client objectives. The empirical nature of these tools derive solutions based on experience, procedures, data collection, calculations and the production of descriptive and illustrated reports. Deriving a completely new practice epistemological approach based on a purely anti-positivist position in the built environment would not provide any real or tangible benefits to deeply ingrained practice orientated approaches. It may be better to take a post-positivist research paradigm which combines the 'how' (understanding which is linked with interpretivism) with the 'why' (explanation linked with positivism)" (Chynoweth 2011, p.11). Although in a built environment context it may be better to turn it around and follow the why with the how. Introducing an interpretist approach as an dimension in built environment academia to the practice based traditional processes of the built environment industry may help bridge the gap between research and practice and address Andrew Dainty's issue with the positivist "single" research approach in construction management research (Knight & Ruddock 2008).

An applicable use of this concept is the approach of the 'design sciences' which Van Aken (2005, p.22) outlines as a core mission "to develop knowledge that can be used by professionals in the field in question to design solutions to their field problems". Van Aken describes the process as solution orientated using first description orientated research to support the explanatory process. Van Aken building on the deficiencies of Mode 2 knowledge production uses the 'field tested and grounded technological rule' as a tool under the design sciences approach to emphasise the link between the tool to be chosen and the outcome or performance in a certain field of application. Rules, Van Aken explains in design sciences are described as 'tested and grounded' as they are derived using methods of the natural sciences and grounded on the laws of nature. In the context of the built environment a researcher could devise and test their research with empirical methods first and then observe its use by field testing the model in a practical context. It may be preferable to use a number of field tested grounded rules across a multitude of disciplines within the built environment to devise 'building a new artifact' in order to apply it to an issue such as sustainability in construction in which a solution cannot be found in one discipline.

An example of this is the application of financial calculations (derived in the field of financial management) to the built asset in order to determine the whole building life cycle cost. A practitioner must take these financial factors and apply them to costs that transcend the entire scope of a building's life cycle. Understanding the technological rule is not enough in applying financial calculations across a range of materials, components and building systems, it is necessary to exercise judgement in order to translate the rule to a solution that is specific to the building. Input from other disciplines is also necessary and contusive to a successful outcome. Observing this process and learning from the experience may then inform the next whole life cycle estimate. An articulated theory of this process can be found in Nonaka and Takeuchi's theory of organisational knowledge creation (1994) where the generated positivist theory - practical interpretative application is articulated in four processes of externalisation-internalisation, which outlines the move from personal tacit knowledge, to cross disciplinary collaboration, to the formalisation of explicit conceptual knowledge.

5 CONCLUSION

The built environment discipline or inter-discipline is a relatively new field in academic research. Its subject matter however is based on the traditional disciplines of the construction and property industries. These disciplines themselves are multi-dimensional when framed as academic subject matter within Biglan's (1973) model. Determining your ontological position and epistemological approach based on the research paradigm of one of these fields' may not provide an adequate solution to your research objectives. Framing your research within the broader confines of the built environment, drawing from related fields in an integrated manner may provide a more successful outcome.

Arguments whether the built environment is an academic discipline or even the range of subjects that make up the discipline, although worthwhile, do not provide any meaningful insight into the issues and needs of society that are served by the practice orientates fields that constitute the inter-discipline. A more valuable argument is whether built environment knowledge produced in academic circles is transferable to the practitioners providing services within its borders and ultimately how this knowledge contributes to the real issues and needs of society. Many authors have stated that a disconnect exists between academic research and fulfilling the needs of industry. The alleged gap between research and practice maybe a result of the prevalent positivist paradigm which exists in academia or/and the positivist application of tools in a practical context. Knowledge in the built environment would be better

served by an approach that combines the strengths of both a positivist and interpretist approach, giving rise to a plural research methodology.

Field tested grounded technological rules under the guise of an altered Mode 2 research product underlines an epistemological assumption that generates knowledge within a specific context but can be used to produce knowledge that can be transferred to other contexts. This type of Mode 2 knowledge production is suited to the built environment discipline as it results from a convergence of specialised knowledge (traditional disciplines) sources in the context of a defined problem. Knowledge drawn from the specialised disciplines is arguably knowledge originally produced by empirical methods within the original speicialisation. Much of this empirical knowledge can be applied successfully without reason to specific contexts by practitioners in their respective disciplines. The success stories of practice are generally based on the lauded work of practitioners rooted in their tacit knowledge from lessons learned over years of applying empirical knowledge.

Externalising this tacit knowledge should be the goal of academics and practitioners thus filling in the gaps and making explicit what was originally hidden. However taking a hardline nominalist approach and discarding positivist knowledge because it is not interpretive enough would be defeating. Academics and practitioners might find a solution in the integration of two or more empirical products from a number of disciplines where the skill is the selection and integration of the relevant products rather than the selection and use of one product. In the built environment, similar to Nonaka and Takeuchi's (1995) theory of organisational knowledge creation in management research, the answer may lie in a combination of the positivist and anti-positivist approaches which could be achieved by implementing a number of processes. First, (1) identify the issue to be addressed. Second, (2) collect and disseminate applicable knowledge (tacit and explicit in academia or practice) across a number of built environment disciplines based on the nature of the issue being addressed. Third, (3) select the appropriate knowledge to produce an inter-disciplined articulated concept or model, and finally (4) observe and record with interpretative products the process in action and whether knowledge resulting from the action process can be transferred to another context and even inform the original data.

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