

Triangulation in construction management research*

PETER E. D. LOVE*, GARY D. HOLT† & HENG LI‡

*School of Management Information Systems, Edith Cowan University, Churchlands, Perth, WA, Australia, †Built Environment Research Unit, University of Wolverhampton, Wulfruna Street, Wolverhampton, UK, and ‡Department of Building and Real Estate, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

Abstract There has been considerable debate in the construction management (CM) literature as to which research methodology is the most appropriate to CM research problems. This paper contributes to that debate by suggesting that postmodernity and multi-level research can extend the scope of CM theory. It is argued that if CM researchers are to effectively solve the problems that the construction industry faces, then they

need to adopt a robust methodological approach that takes account of both ontological and epistemological viewpoints. It is proffered that only then will we fully understand phenomena that influence organizational and project performance in construction.

Keywords construction management research, methodology, postmodernity, triangulation

INTRODUCTION

Research in construction management (CM) can be categorized as at the intersection of natural science and social science. At the cross-section of the two sciences, researchers in CM need to understand the distinctions between them. Natural science studies events consisting of a sequence of facts which are independent from what anybody says or thinks about them. The phenomena belong to one universe; the scientists' statements to another. The facts serve as independent objective criteria by which the truth or validity of the scientific statements can be judged. By contrast, events studied by social science have thinking participants (for example, construction managers); natural phenomena do not. The participants' thinking creates problems that have no counterpart in natural science: the subject matter is no longer confined to facts but also includes the participants' perceptions. The chain of causation does not lead directly from fact to fact, but from fact to perception and from perception to fact. Thinking plays a dual role. On the one hand, participants seek to understand the situation in which they participate; on the other, their understanding serves as a basis of decisions that influ-

ence the course of events. In other words, in social science research, the segregation between thoughts and events that prevails in natural science is simply missing.

The distinction between natural and social sciences explains many difficulties CM researchers have often encountered. Many CM researchers frequently ignore the difference between natural and social sciences. We borrow methods and tools from natural science and use them to try to understand or explain managerial problems. We also adopt the same research methodology: research hypotheses are formulated and submitted to a test; conclusions are drawn from a generalization of observations. However, thinking introduces an element of uncertainty which is absent from natural science. This uncertainty is responsible for the violation of the validity laws that govern the natural science. This is because managerial problems are based on imperfect understanding of decision-makers whose initial conditions and reasoning processes are not open to scientific observations. Yet only the effect of their thinking can be observed, so in this case, the universal validity laws of scientific generalization is destroyed because the given set of conditions for an observation is unknown.

Because of its uniqueness, there has been a great deal of debate amongst CM academicians as to which (generic) research methodology is most appropriate to CM research problems. For example, as expounded by Seymour & Rooke (1995), Raftery *et al.* (1997), Runeson (1997a), Seymour *et al.* (1997), Chau *et al.* (1998), Li & Love (1998) and Holt & Faniran (2000). Nonetheless, this debate has directed limited discussion

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toward the interaction of ontological (referring to the metaphysical nature of being) and epistemological (referring to the theory of method or grounds of knowledge) concepts, upon CM research settings.

Recent debate has however, suggested that CM research requires a hybrid approach in the context of these two somewhat contrasting, research approaches (Blackwood *et al.*, 1997; Holt & Faniran, 2000). The present authors concur that effective CM research methodologies can embody both of these paradigms to varying extents, often simultaneously. The lack of debate referred to, does not imply that robust approaches to CM research are being overlooked. On the contrary, it is impossible to formally describe aspects of the world in which we all operate, without such being grounded (implicit or explicit, conscious or subconscious) on a philosophy, and hence a methodology, whether distinct or hybrid.

In pursuit of knowledge, positivist and interpretivist approaches have different functions and accordingly, quote different viewpoints. This potential conflict is further complicated as a function of the *type* of research problem to be addressed (see Chau *et al.*, 1998). Moreover, careful consideration must be given as to how a research problem is initially framed (Black, 1993), so despite this apparent lack of a benchmark for 'approaching' CM research problems, a fundamental decision (i.e. which methodology?) has to be solved by the researcher at a very early stage. Robson (1993) suggested that if a research approach relied (solely) on a singular methodological standpoint, some unknown(s) part or aspect of the results obtained would be attributable to the restrictive aspect(s) of the method (not) used, in obtaining such result(s). Robson (1993, p. 290) further stated that 'we can never obtain results for which some method has not been used to collect them, [so] the only feasible strategy [therefore] is to use a variety of methods'.

The foregoing would indicate that in order to gain complete understanding of a given CM research phenomenon, triangulated approaches (which typically comprise a blend of methods that are very different from each other) should be used (Denzin, 1989; Robson, 1993; Todd, 1979; Blackwood *et al.*, 1997). While many academicians have advocated the use of triangulation, it is noteworthy that another school of thought (principally emanating from the 'purists' and 'situationalists'), argues that qualitative (predominantly epistemological) and quantitative (predominantly ontological) approaches should not be mixed (Blaikie, 1991).

According to Creswell (1994) however, the pragmatist argues that a false dichotomy exists between qualitative and quantitative approaches; and that

researchers should make the most efficient use of both paradigms (simultaneously if necessary), in understanding social phenomena. This is in essence the basis of the approach referred to as triangulation. Todd (1979) advocated triangulation as an appropriate research methodology whereby both qualitative and quantitative data collection is used to test, or understand, the research proposition(s). Typically, this 'blend' of research methods involves diverse data collection, and may embrace a mix of questionnaires, interviews, telephone surveys and case studies.

To extend the scope of theory in construction, the authors proffer that researchers should consider triangulation as a research methodology *per se*. This is so as to maximize understanding regarding both the ontological and epistemological aspects of CM (which is essentially a social phenomenon). After all, a fundamental objective of CM research is to understand a phenomenon based on what is considered the (correct) way to understand it; or to understand it using whatever means provide the best and most reliable results. Naturally, the latter should be paramount in research (method) decisions. This does not mean that CM research need adopt an anti-empirical stance. A reflexive postpositivist/postmodernist view is advocated, so that the research process may be perceived to some extent as a social act in itself. Based upon this proposition, this paper offers an alternative insight to considering the often 'taken-for-granted' assumptions about CM research method, and for thinking about method in relation to developing the scope (and robustness) of theory for CM research problems.

METHODOLOGIES IN CONSTRUCTION MANAGEMENT RESEARCH

Two methodologies appear to dominate the study of CM – the interpretivist (otherwise known as phenomenological) approach – and the positivist approach. Empiricism refers to a set of philosophical beliefs formed around the idea that experience rather than reason is the source of robust knowledge of the world (Morick, 1980). The term has also come to mean the practice of investigating the nature of the world using practical or experiential methods, rather than by applying or developing theories, or assuming guiding principles. Empiricism dictates that one settles questions about the nature of human thought and action by accepting only assertions and claims that can be probed by direct observation. The interpretist is, however, more receptive to theory and principles; not necessarily insisting that what cannot be measured should be ignored in this context.

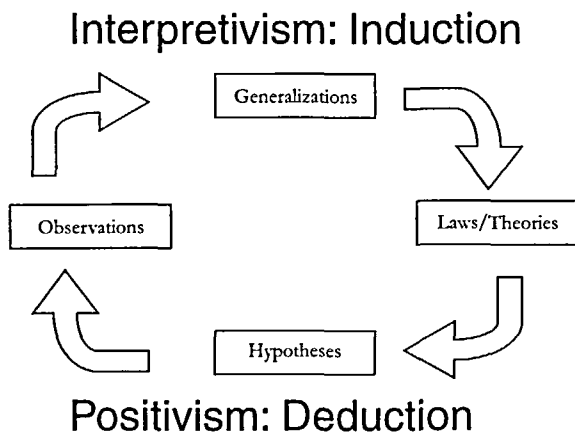


Figure 1 Induction and deduction in hypothetico-deductive scientific method.

Positivism places emphasis on facts as distinct from values or meanings, and the use of scientific method in which theory is deduced as a result of formulating and testing hypotheses (Hughes, 1980). This approach can identify cause-and-effect through 'the constant conjunction' of events, resulting in what has been called the 'covering law' orthodoxy (Popper, 1959). This orthodoxy is essentially devoted to the pursuit of explanations, which take the form of general laws. The reasoning behind interpretivism (induction) on the other hand proceeds from specific observations (data but not necessarily in quantitative form) to general principles (laws). The observations may suggest generalizations, which if repeatedly tested and confirmed can lead to discovery of a lawful relationship (Babbie, 1992). According to Babbie (1992, p. 45) both induction and deduction are essential to the process of hypothetico-deductive scientific method (see Fig. 1).

Induction always involves some selection of what data to attend, implying 'theory', no matter how implicit. Deductive inference, however, involves some intuitive aspects in that its predictions are tested inductively. Deductive inference is also heavily dependent on the initial step of generating hypotheses (or propositions) from general laws or theories. Hence, if the general law is false, then deduction can be logically valid but false in relation to the real world.

According to Popper (1959) theories can never be conclusively proven from repeated observations which 'confirm' them. They can however, be falsified by just one instance, that is, where their predictions are not confirmed. Fundamentally, the epistemological position of the interpretive perspective rejects the natural sciences as an appropriate foundation for social science inquiry (Bhaskar, 1989). The 'anti-naturalist' school of thought believes that the subject matters of the social sciences are

so different to that of the natural sciences that an entirely different approach to empirical work is needed.

Construction as a social system

A potential barrier to applying a positivist research methodology to developing theory in CM stems from the nature of the principal actors that are involved in construction projects, that is, people. If a positivist ontology were solely assumed then the actors being studied would be considered uniform and/or passive agents. If this viewpoint prevails then the social system that exists in a construction project would be taken to be no more than the sum of the individuals. Noteworthy, human beings are capable of learning and changing both consciously and subconsciously, so not only does this affect behaviour, but also the form and structure of any system that they are a part of.

Construction projects are extremely dynamic and complex and invariably consist of multiple interdependent components. These have multiple interacting feedback processes and non-linear relationships. In addition, they are essentially human enterprises, and cannot be understood solely in terms of technical relations among components and from a purely 'scientific' approach. Thus, a fundamental problem concerning the management of construction is that of explaining and predicting human behaviour; because the scientific approach assumes that human beings tend to follow regular behaviours (Chau *et al.*, 1998, p. 102). Of course in reality this is far from being the case.

According to Chau *et al.* (1998) the scientific method has no place if human behaviour is random and unpredictable. Nonetheless, most of the data needed to understand the evolution and dynamics of CM problems is concerned with managerial decision-making, and other so called 'soft' variables (Chau *et al.*, 1998; Smith *et al.*, 1998).

CONSTRUCTION MANAGEMENT THEORY

Theory has been described as 'a set of well-developed concepts related through statements of relationship, which together constitute an integrated framework that can be used to explain or predict phenomena' (Strauss & Corbin, 1998). Theories may also be described as 'ideas' about how nature works (Marx, 1963) and as the means of describing how a phenomenon exists in its environment (Strauss & Corbin, 1998). Construction management theory is that body of knowledge (concepts and linkages) of CM, which is (currently) established and accepted as explaining the most effective management of construction projects (Chau *et al.*, 1998).

Typically, the source of CM theory has been based on a mixture of experiential judgement, personal bias and opinion, intuition, observation, and discovered knowledge (known facts and ideas – principally from research). Popper (1976) suggested that truly creative theory, however, evolves from a combination of intense interest in a problem combined with critical imagination. Critical imagination includes a readiness to challenge accepted ideas (traditional wisdom). This calls for 'imaginative freedom that allows us to see so far unsuspected errors' in previous thinking about a problem (Popper, 1976, p. 269). In other words, critical imagination means travelling beyond the boundaries of 'rational' thinking about a problem or issue, which have (as a norm) been established by previous CM researchers.

In contrast somewhat, there are those who have suggested that there is no theory of CM and that by definition therefore, a need for such to be developed exists (Betts & Lansley, 1993; Betts & Wood-Harper, 1994; Seymour *et al.*, 1997). This contrast in beliefs is exacerbated by the fact that many of the issues that CM researchers are faced with, are (quite logically) practical in nature. Solving (or trying to better understand) these types of problem does not necessarily result in the discovery of new theories, because existing theories are often turned through an obtuse angle and re-applied to solve such issues (Chau *et al.*, 1998). Construction management is multi-disciplinary in nature so its research draws heavily on theories that have been developed in other disciplines (most notably for example, economics, sociology, psychology and law), in order to advance knowledge in the way described above. That is, about how construction organizations and projects *should* be effectively managed.

SCOPE OF CM THEORY

The understanding represented by theories may be expressed as verbal statements (e.g. controlling mechanisms), as mathematical equations (e.g. explanatory or predictive algorithms) or as systems (e.g. represented computer simulation). An important dimension on which theories differ is *scope*. The scope of a theory refers to the range of the phenomena that it seeks to explain or the extent to which it explains that phenomenon and within what context or parameters. The theory of 'flashbulb memory' for instance, attempts to explain why personal circumstances surrounding particularly surprising and emotional events (such as the explosion of the space shuttle challenger), are remembered better than are details associated with every day events (e.g. Brown & Kulik, 1977; McCloskey *et al.*, 1988).

In the context of construction the death of a person on a construction site is remembered far more easily, by far more people (associated with it), and for a longer time-span, than details associated with more 'mundane' everyday site events. According to Shaughnessy & Zechmeister (1994), however, the scope of flashbulb theory is relatively restricted because it does not make explicit the nature and cause(s) of a specific memory phenomenon. A theory of behavioural safety intervention, such as that proposed by Lingard & Rowlinson (1998) does have greater scope in comparison. This is because it attempts to explain how safety can be improved on construction sites by influencing human behaviour. Lingard & Rowlinson (1998) demonstrated that behaviour-based intervention is able to improve 'housekeeping' standards, though it may be ineffective in some cases. For example, in improving access to heights and performance, relating to the use of bamboo scaffolding in Hong Kong (because it is the preferred method of scaffolding in that country). They suggested that inadequate resources, poor management and an emphasis on production are factors that limit the effectiveness of implementing a behaviour-based approach to site management.

Clearly, the scope for theory can be enormous, and in general the greater its scope, then the more complex it is likely to be. Complexity is an inherent characteristic of construction given the nature, range and diversity of phenomena that CM researchers try to probe (Seymour *et al.*, 1997; Chau *et al.*, 1998; Harriss, 1998; Li & Love, 1998). The complexity of CM research can also be a serious obstacle to testing theory. Thus, resulting CM theories tend to be relatively modest in scope when contrasted to reality (Harriss, 1998).

Whatever the nature and scope of a theory, whether it be expressed mathematically, verbally or at some higher level, it should include assumptions and concepts that must be explainable. This is in order for it to be understood and ultimately tested. It must also include definitions of various events or concepts, information about the relationships between these events and so forth (refer definition by Strauss & Corbin, 1998 earlier). Thus, the major functions of a theory are to guide (further) research and organize empirical knowledge (Marx, 1963). The other more obvious aim is to help us better understand how phenomena work and/or therefore lead to alternative views on improving, rationalizing or changing such phenomena, most often for the betterment of mankind. This 'forcing' of knowledge to achieve betterment, particularly in construction, has been described as condensing the natural evolutionary process (Holt, 1994).

The authors suggest that if CM theory is to extend its scope then researchers need to mix methodologies and take a postmodern view of research to better understand the problem(s) that construction faces. In fact, do CM researchers really understand the problem(s) they are trying to solve? For example, some procurement problems identified by the Simon Committee (1944) over half a century ago, still prevail to some extent, notwithstanding a considerable amount of research undertaken to address these issues. Without really understanding the problem(s) at hand the industry cannot improve its performance. The implementation of emergent management fads in the hope of eliminating problems that are deeply rooted in the psyche of construction practice will not by default, lead to the improvements sought. These problems must be understood in a holistic manner and to that end, CM research cannot in itself be restricted to particular research paradigms.

POSTMODERN CHALLENGES TO EMPIRICISM

Postmodern thinking eschews reductionism and the fixing of meaning in favour of a 'style' that privileges action, movement, process and emergence (Chia *et al.*, 1995). Hassard (1994) suggested that postmodernism as epoch is based on the realist notion that we simply need to find the right way of describing the 'world out there'. Whereas postmodernism as epistemology according to Guba & Lincoln (1994) suggests that the world is constituted by our shared language; and that we can only 'know' the world through the particular forms of discourse that our language(s) can create.

Clegg (1990) identified seven organizational dimensions that distinguish modernity and postmodernity (Table 1). Clegg's (1990) development of these dimensions derives from a recognition that by the 1980s, organizations were responding to the decline of Fordism and moving toward internationalization, de-industrialization and changing centre-periphery relations. Clegg

(1990) also suggested that the contemporary Japanese organization has become a 'beacon' of postmodernity, in contrast to the typification of highly differentiated bureaucratic organizations (characterized on the left hand side of Table 1). Under this view, postmodernism can be construed as that which comes after modernity (Clegg, 1990) or in Hassard's (1994) terms, as epoch rather than epistemology.

Similarly, Alvesson & Deetz (1996) identified seven themes within postmodernism but placed emphasis on epistemology. These themes were, the centrality of discourse; fragmented identities; the critique of the philosophy of presence; the loss of foundations and master narratives; the knowledge/power connection; hyper-reality; and research as resistance and indeterminacy. Alvesson & Deetz (1996, p. 211) stated that 'the point of social science is not to get it right but to challenge guiding assumptions, fixed meanings and relations, and to re-open the formative capacity of human beings in relation to others and the world'.

Postmodern epistemology

Postmodern epistemology is now entering the mainstream of CM research and has important consequences for the conduct, presentation and assessment of CM theory (e.g. Blackwood *et al.*, 1997). Hassard (1993) drew on the work of Lyotard to suggest that the method of epistemological postmodernity is serious play rather than empiricism. Hassard (1993, p. 10) stated that 'in doing science, we only enter into a number of games with our colleagues. We are in fact involved in a form of "serious play", which sees us intervene in a variety of language-games, make moves in a number of debates or discussions, and seek to oppose the moves and positions of other players while advancing our positions'. In line with the increased notions of play and interplay, Alvesson & Deetz (1996, p. 205) argued that postmodern research 'aims at resistance and indeterminacy where irony and play are preferred to rationality, predictability and order'.

Table 1 Organizational dimensions of modernity/postmodernity.

Organizational dimension	Modernity	Postmodernity
1. Mission goals, strategies and main functions	Specialization	Diffusion
2. Functional alignments	Bureaucracy	Democracy
	Hierarchy	Market
3. Co-ordination and control	Disempowerment	Empowerment
	Laissez-faire	Industry policy
4. Accountability and role relationships	Extra-organizational	Intra-organizational skill formation
	Inflexible	Flexible
5. Planning and communication	Short-term techniques	Long-term techniques
6. Relation and performance reward	Individualized	Collective
7. Leadership	Mistrust	Trust

Kilduff & Mehra (1997, p. 458) suggested that postmodern research can be provocative research, and that researchers 'can mix and match various styles in order to contrast with tradition'. Like Hassard (1994) and Alvesson & Deetz (1996), Kilduff & Mehra (1997, p. 458) pointed to the importance of irony, arguing for 'a postmodernity that is similarly informed by, and yet ambivalent toward classic statements and techniques of the field in question'. In postmodernity Kilduff & Mehra (1997) stated that 'style matters', as researchers eschew passive objectivity for an active authorial voice, and carefully craft an aesthetically pleasing narrative.

According to Alvesson & Deetz (1996) however, style is not all that matters as postmodernism's strong critique of empiricism and its emphasis on data as constructions, open up to a multitude of interpretations. This does not mean that reflective empirical work is not worth doing. Similarly, Chia (1995) stated that postmodernism thinking is not anti-empirical, but rather, it is ultra-empirical; dealing as it does with the concrete logic of order and organization (of phenomena). Such an approach therefore needs by default to embrace many, if not all of the principal research paradigms referred to earlier. Thus, triangulation may be viewed as being ultra-empirical.

TRIANGULATION

As interpreted in social science research, the term triangulation involves the use of multiple research

methods and/or measures of a phenomenon, in order to overcome problems of bias and validity (Black, 1993). It is also a means of validation or 'testing' of research outcomes in itself (e.g. Nesan, 1997). Denzin (1978) distinguished:

- data triangulation, where data are collected at different times or from different sources;
- investigator triangulation, where different researchers independently collect and analyse data on the same phenomenon and ultimately compare results;
- methodological triangulation, where multiple methods of data collection and analysis are used; and
- interdisciplinary triangulation, where the research process is informed not only for example by psychology, but also by other disciplines such as economics, law and sociology.

Obviously, in all of the above configurations of triangulation, ultimate validity of the resulting theory (for example) is achieved where a relationship exists between these disparate, but 'harmonious' approaches as noted in Fig. 2.

Miles & Huberman (1994) suggested triangulation as a way to achieve finding in the first place – by seeing or hearing multiple instances of it from different sources – by using different methods and by squaring the findings with others to be squared with. Jick (1979) on the other hand described triangulation through the language of capture and constraint – of fixing, positioning and confining. Similarly, Eisenhardt (1989) described

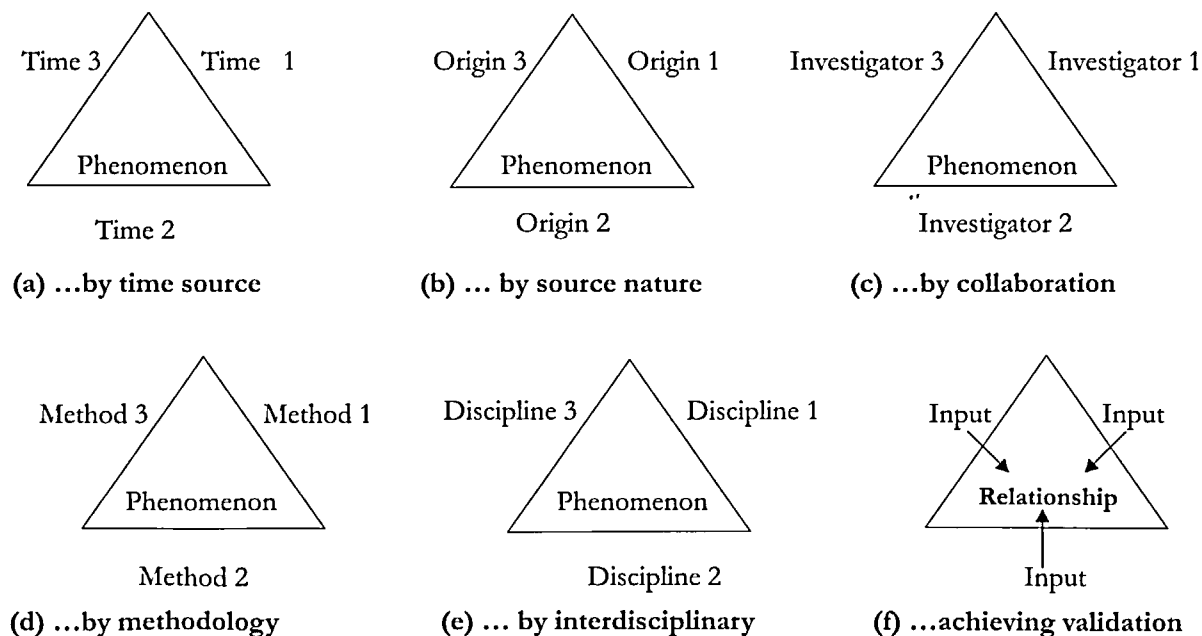


Figure 2 Forms of triangulation.

triangulation as a series of methods that aid data capture, which can be used to substantiate hypotheses and constructs (refer 'validation' above). Denzin (1989) also discussed the importance of data capture; this being defined as securing instances of the phenomenon being studied.

Positivist view of triangulation

Guba & Lincoln (1994) stated that in terms of epistemology or the relationship between the knower, would-be-knower and what can be known, positivism is dualist and objectivist. Further it assumes that:

- objective reality can be captured and analysed meaningfully;
- the observer can be separated from the observed;
- observations and generalizations are free from situational and temporal constraints;
- causality is linear and there are no causes without effects, no effects without causes; and
- inquiry is value free.

Adopting positivist assumptions, then knowledge is hard, real and capable of being transmitted in a tangible form (Burrell & Morgan, 1979). Accordingly, convergent findings can allow greater researcher confidence in the reliability and/or validity of results, whereas divergence can lead to greater definition and theoretical elaboration as the researcher attempts to piece together many pieces of a complex puzzle into a coherent picture (Jick, 1979). While there may be problems in achieving such convergence (because of difficulties in, e.g. replication, lack of focus in or alignment with the research question, or varying sensitivities among research instruments), such problems with triangulation lie with its operationalization as a research strategy rather than its epistemology (Blaikie, 1991). Thus, if reality can be captured then how can we best understand and present it formally?

POSTMODERNITY AND POSTPOSITIVISM

In addition to such methodological concerns for triangulation from within a positivist framework, it is also important to consider epistemological concerns from without. In CM research, positivist assumptions have been the subject of considerable debate. For example, Runeson's (1997b) continued support for positivist CM theory has been met with opposition. It would appear from Seymour & Rooke's (1995) writings that under positivism the inquirer's voice is that of the 'disinterested scientist' (Guba & Lincoln, 1994) whose claim has been neglected.

Under postmodernity, the separation of the researcher and subject is no longer assumed. Indeed postmodernity is directed against a picture theory of language in which physical properties of the world are considered fixed, while language can be adjusted to meet the needs of description (Hassard, 1993). Rather than attempting 'to capture the impression of a pregiveness in the object of analysis' (Chia, 1995, p. 589), postmodernity attempts resuscitation (Clegg & Hardy, 1996). Further, if the living subject is no longer an object, its representation, capture and transmission can become more difficult (Stablein, 1996). Guba & Lincoln (1994) distinguish positivist, postpositivist and postmodernist inquiry, grouping postmodernity and poststructuralism within critical theory. The nature of reality, or ontology, assumed by positivism is realism, where reality is assumed to exist driven by immutable natural laws and mechanisms (Alvesson & Deetz, 1996). In contrast, postpositivism assumes that this reality is apprehensible, whereas critical theory is based on historical realism, where a once-plastic reality has become inappropriately shaped and re-defined over time.

Role of critical theory

Although positivism and postpositivism are to greater and lesser degrees, dualist/objectivist in that they assume detachment between knower and what can be known, critical theory adopts a transactional and subjectivist epistemology. This approach assumes that the investigator and the investigated are assumed to be actively linked with the values of the investigator, thereby influencing the inquiry (bias excepted). Thus in terms of research methodology and in particular triangulation, these differences have important implications. According to Guba & Lincoln (1994) under positivist assumptions research can, in principle, converge on the true state of affairs, whereas under postmodernism, emphasis is placed on triangulation as a way of falsifying (rather than verifying) hypotheses. Under critical theory, however, this is not possible, for the transactional nature of inquiry requires a dialogue between the investigator and the subjects of inquiry. Whereas the aim of positivist and postpositivist inquiry is explanation, prediction and control, the aim of critical theory is critique and emancipation.

Guba & Lincoln (1994) viewed postpositivism as a variant of the 'received' positivist position. Under postpositivism, triangulation (where inquiry is value free) is possible and indeed necessary, as claims about reality must be subjected to the widest possible critical examination (Denzin, 1989). Noteworthy, the state-

ment is in tune with the pragmatist but may conflict somewhat with the epistemologist. However, where a transactional and subjectivist epistemology is adopted, triangulation becomes more difficult because convergence means that consensus exists only on how reality is viewed (if such views hold congruence) or that a common reality is shared. However, a lack of convergence may reflect legitimate and different views of reality or habituation of different social worlds. The epistemology camp will readily admit in this context that differing views (in research 'results') are still, reliable (although the ontology camp may disagree!); it is simply the eyes through which such views were formed that differ. This doesn't necessarily mean that those (differing) views are wrong. This is where the 'judgmental' opinions of qualitative research have to be respected and likewise, where we have to readily admit that not all aspects of our world can be empirically defined or conveniently represented (see Strauss & Corbin, 1998, chapter 1).

Nomothetic and ideographic research

According to Blaikie (1991) such differences cannot be used to attribute bias to any method. This difficulty stems partly from different assumptions about research method. For example, Burrell & Morgan (1979) suggested that positivist epistemology is aligned with *nomothetic* research methodology, in which research is based upon systematic protocol and technique. In contrast, more subjectivist approaches to social science align with the *ideographic* methodology, which stresses the importance of letting one's subject unfold its nature and characteristics during the process of investigation (and is therefore more fluid in process) (Tsoukas, 1989). Allport (1942) suggested that nomothetic studies seek abstract generalizations about phenomena and often offer non-historical explanations, whereas ideographic research assumes that each individual case is unique.

Under positivism and postpositivism, knowledge will accumulate by accretion. In critical theory, triangulation becomes not only more difficult to accomplish but more problematic as the emphasis is on revision rather than accumulation (Guba & Lincoln, 1994). Furthermore, under postmodernism, where the proper understanding of a 'solution' can only be obtained from seeing how the problem was structured in the first place, the emphasis is more on problemizing than on finding answers (Cooper & Burrell, 1988). Here the concept of triangulation becomes problematical and the concern lies with the conceptual constitution (Kilduff & Mehra, 1997).

POSTPOSITIVIST VIEW OF TRIANGULATION

Triangulation can be considered as a metaphor and in its most literal sense the 'triangle' is indeed an enclosed shape. In the most figural sense used by Denzin (1989), triangulation is a means of representation based on the logic that we can move closer to obtaining a truer picture if we can take multiple measurements, using multiple methods, or at multiple levels of analysis (Gersick, 1991). Despite the caution that consensus is a horizon that is rarely reached (particularly in CM research), the temptation is to put it all together to impose a logic on events (Parker, 1992) and to forget the messiness of the research process (Isabella, 1997) or indeed the original research problem. In addition to the view that triangulation is a means to 'closing' a research problem, the converse view may be that triangulation provides 'convenience' to researchers, especially where other methodologies may have failed to achieve such closure. This is where the researcher must be careful and not simply utilize a method (or methods) for convenience. It further underscores the advocating of applying triangulation, because all other things being equal (and assuming robust application); then convergence usually equates to robustness in terms of knowledge acquisition. The latter is after all, what CM research sets out to achieve.

While the understanding of organization is inseparable from the organization of understanding (Jeffcut, 1994), human nature tends to perceive organizing as an accomplished phenomenon rather than as a limited project (Parker, 1992). If we accept that postmodern organizational analysis replaces the factual with representational, and if 'what we see depends on our angle of repose' (Richardson, 1994, p. 522), then we should consider not only the triangulation of distance but also the distance of triangulation. That is, not only triangulation of the distance to the true subject, but the reflexive stance of the researcher (Palmer & Dunford, 1996). In doing so, we focus not only on the metaphorical space within the enclosing triangle, but also on how and by whom the triangle is drawn, or as noted above, structured in the first place.

The constructivist or interpretivist believes that to understand the world of meaning one must interpret it. The inquirer must elucidate the process of meaning and clarify what and how meanings are embodied in the language and actions of social actors. To prepare an interpretation is itself to construct a reading of these meanings; it is to offer the inquirer's constructions of the actors one studies (Schwandt, 1994). It is therefore important to direct attention not only to the output of

empirical studies but to ultra-empirical ordering and organizing and to the dilemmas, inclusions and exclusions of the research process as a social act (Schwandt, 1994).

CONCLUSION

By taking a postmodern stance the authors suggest that triangulation is an appropriate research approach for extending the scope of theory in CM research. At the moment, this scope is narrower than it could be in many instances, because to date and in this specific discipline, there has been a reluctance to mix methodologies. While there are persuasive arguments as to why we should mix methodologies, there are also arguments as to why we should not. On arriving at a proposition of mixing methodologies under the theme of reflexive postpositivism/postmodernity, a critical review of the literature has indicated a need for CM researchers to think about how they might best understand the reality of construction. The alternative is to 'limit' data accrual and analysis (for example) in favour of 'pedigree' paradigms, but this may also limit understanding. Given such scenario, it follows that the scope for CM theory development will be limited also. If CM researchers are to effectively solve the problems that industry faces then they need to adopt a robust research methodology that is able take into account both ontological and epistemological viewpoints. This is so that we can better understand phenomena that influence organizational and project performance in construction.

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