

FIVE AXIOMS FOR CORPORATE REAL ESTATE MANAGEMENT: A POLEMICAL REVIEW OF THE LITERATURE

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ABSTRACT

This paper argues from a review of the literature that five key roles for CRE and its management are such foundation concepts that they constitute axioms for the field from which current theorisation is derived. The roles are demonstrably long-standing in CREM but the treatment as axioms constitutes a new interpretation of this existing material. This interpretation is undertaken with the aim of adopting a more philosophical approach that represents an expansion in the field's knowledge production beyond a reliance on empirical studies or experienced practitioners' encapsulation of that experience.

Two recent key works that represent a theory of CREM theories are analysed using thematic content analysis together with a selection of illustrative literature across the history of CREM that display the theorisation that is based on the suggested five axioms. This analysis supports claims that the five axioms exist in the field. Furthermore, because such philosophical thinking is so rare in the field the paper then considers why this might be the case in its science-making.

Keywords: Axioms, corporate real estate management, knowledge production, theory,

INTRODUCTION

Corporate real estate management (CREM) is a real estate discipline that has emerged over the last twenty to thirty years. As such, it is still defining its core technology or knowledge base and how it demonstrates its usefulness for organisations (taken as 'adding value' by many, particularly in Europe). For instance:

CRE & FM needs to better understand what we do that creates, or adds, value (Varcoe and Hinks, 2012).

Much work is necessary to fully demonstrate CRE and CREM's contributions to organisational performance. A key to being able to do this is to dimensionalise the contributions' bases. Several authors in the past have attempted to do this, for example, McGregor and Then's (1999) exchange, operational and use values, Liow and Nappi-Choulet's (2008) business, financial and capital dimensions, and Edwards and Ellison's (2003) asset, cost and trading bases. However, we believe that these do not yet fully capture or best conceptualise the relevant dimensions.

Another challenge for CREM is the quality of the science that supports knowledge production in the field. This can be seen at the fundamental level of defining Corporate Real Estate (CRE). For some it is all real estate owned by corporations regardless of whether this is held for use purposes or is held more purely as investments, and it overlooks leasehold CRE altogether. For others CRE is the real properties that house the productive or business activities of an organisation that owns or leases and, consequently, manages real estate incidental to its business objectives where the primary business is not real estate (after: Rondeau (1992), Brown et al. (1993), Kenley et al. (2000) and CoreNet Global (2007)).

The consequences of the latter definition (which is the better of the two) that are not often recognised is that CREM represents the demand-side of the real estate economy (Heywood and Kenley, 2010) and has a use perspective that contrasts with an investment-ownership perspective (de Jonge et al., 2009). Such lack of agreement as to what constitutes CRE and CREM is indicative of a field that lacks precision in its knowledge base and lacks rigour in its knowledge production. This can also be seen in instances where theoreticians invent a new and slightly different model or explanation seemingly without reference to others that might have proposed similar things. For example, at least three categorisations of the strategic-ness of assets can be found (all different), eleven models of strategic alignment (many different) (Heywood, 2011) and five methods of doing discounted analysis of own-lease decisions (all different). Such variety suggests a lack of intellectual rigour in the field though it could equally be said to result from the field's evident complexity, the intrinsic

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knowledge production regime, the paucity of academics, or the practitioner ('educated public') basis to considerable quantities of knowledge production. To paraphrase Varcoe from above, perhaps:

CRE & FM needs to better understand what we do (period).

It is also true that any field needs to define its axioms (Linstone and Turoff, 1975). To date, CREM has not explicitly done this. It is evident, and the later analysis shows this, that the ideas have been in use throughout CREM's history, it's just that they have not been called 'axioms' before now. This suggests a short-coming in the field's knowledge production where deeper philosophical constructs are not deployed in that knowledge production.

REFLECTIONS ON KNOWLEDGE PRODUCTION IN CREM

The history of research in CRE and CREM is relatively short, often being traced to 1980s articles by Zeckhauser and Silverman (1983) and Veale (1989). By identifying the quantum of CRE assets in organisations these papers were important in raising the profile of CREM in organisations. Almost contemporaneous with these papers, an academic CREM discipline was also emerging (Johnson et al., 1996). Many early papers sought to identify relationships between CREM actions and changes in stockmarket values as the performance indicator of CREM success, for example, Alli et al. (1991), Allen et al. (1993), and Rodriguez and Sirmans (1996).

Professionally directed and sponsored research, often conducted by the US academic community (for example, the International Development Research Council *CRE 2000* project), was also important in developing the field's knowledge foundations. By the mid-1990s this professionally-focussed research had almost overtaken and supplanted research originating in the academy (Johnson et al., 1996).

Since the early focus on stockmarket values the researched topics have proliferated, but these only reflect the field's diverse domains of practice (Heywood and Kenley, 2008), and the research base has spread outside North America. However, the research resource base remains thin with the relatively few academics consistently involved in CREM research geographically dispersed (Varcoe, 2010).² This paucity of academic theoretical capacity is contrasted with both a more numerous professional community (though this could be said of any professional discipline and its academy) and the more numerous general real estate academic community, but even there the number of individuals globally is not large. In CREM, the professional community, through CoreNet Global, also has an active knowledge creation program. Such knowledge is, self-evidently, practical though not without implications for theory. In the need to be practical the theoretical dimensions may be overlooked or not specifically articulated. This professionally driven knowledge creation can give the sense of practitioners getting on with solving their problems, leaving the few academics playing catch-up to then try to provide some sort of theoretical basis.

From the earliest ancestor papers the proliferation of topics in CREM has contributed to an ad-hoc body of knowledge generated partially through practitioner, and partially through academic efforts. There is apparently little coordination in the science, but why this might be thought of as natural in the field's knowledge creation is considered below. There have been relatively few efforts to systematise the body of knowledge. The few identified are Roulac and Muldavin (1994) and Roulac (1996:), Varcoe (2000), Chotipanich (2004), and Heywood and Kenley (2008). Of these, Roulac's seems to be a general real estate body of knowledge and Chotipanich's is most focussed on facility management.

It is also true that the academic efforts have responded to practitioner knowledge agendas either through well intentioned wanting to help, or, less positively, wanting to be thought of as relevant. Similar things could be said to be the case for general academic real estate research that it is driven by practical ends and wishing to address practical problems. This is itself not a bad thing. Real estate is a practical knowledge so dealing with both practical ends and problems is necessary. A danger is when dealing with the practical is that this is thought to be all that is sufficient, intellectually. Such a practice has a number of potential problems for CREM (and by extension the wider real estate research community):

- It can engender a superficiality where theorisation is little more than documentation of practice and practice events. While useful this has limited capacity to provide explanations beyond describing problems and circumstances in immediate practice. Real estate is thick with such problems as economic circumstances and drivers provide an ever-changing panoply of practice's dynamism that beguiles with warranted explanations;

² The distinction is made between those that classify themselves as CREM researchers and those in the general real estate research community that from time-to-time 'drop in' to research CREM topics, like lease forms and terms, and the reporting basis of CRE assets and commitments.

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MELBOURNE, AUSTRALIA, 13-16 JANUARY 2013

- Commensurate with that, being trapped in a churn of problems that, while ever-changing, does not actually advance knowledge;
- Academia is never shifted to thought leadership that changes practice; and
- In perpetually chasing topical practice issues that have the appearance of relevance, there is a potential to never address the underlying theory and therefore the deep conceptual basis of the field that may be required to make the necessary impact on organisations as to CREM's importance.

It is with the last objective in mind – addressing the underlying theorisation of CREM – that this paper advances five axioms for CRE. These represent five key ideas that underpin CRE and its management, but which to date, to our knowledge, have not been collated and classified with their implications discussed. This is, in our opinion, a shortcoming in the field's 'science-making'. The rest of the paper, therefore, discusses both the axioms and the resultant implications for that science-making.

METHOD

This paper is a review of the literature that uses thematic content analysis (Carney, 1972; Miles and Huberman, 1994) to identify themes in two key works that each represent a theory of CREM theories and an illustrative selection of papers across the history of the field. It is necessary to cover the historical papers to show the long-standing, embedment of the concepts in the field's theorisation. As such, the paper does not report an empirical study but seeks to contribute knowledge through newly interpreting already known material (Phillips and Pugh, 2000). The adoption of a critical, polemic stance in the argument and the synthesis of several ideas from various literatures, not just property, also provide potential contributions. This critical stance emerged from a recent deep immersion in the field's literature for the purpose of extensively analysing CREM theory that resulted in dissatisfaction with how the field went about its knowledge production. A key awareness was the disparity in what would appear to be fundamental aspects of the theory. This paper then constitutes a first step in reframing that theory.

Several originating ideas to the axioms can be identified:

- Isaac's (2003) 3 roles identified for real estate in the general economy:
 - Being a factor of production, which is most easily taken to be CRE;
 - As a corporate asset; and
 - As an investment;
- Graaskamp's (1977) real estate development model with user's (CRE), developers (initially) and investors (subsequently), and the public as a provider of services and recipient of tax resultant receipts, and recognising that the tax receipts were an externality effect of CRE and CREM (Heywood et al., 2010);
- Separating the real estate from its management where it could be the artefact that affects performance or its management. Making this separation is also a step away from the real estate focus which seems problematic (Varcoe and Hinks, 2012) towards having more of a business focus; and
- The incompleteness of previous classifications.

CHALLENGING A SUPPOSITION ABOUT REAL ESTATE IN CRE ORGANISATIONS

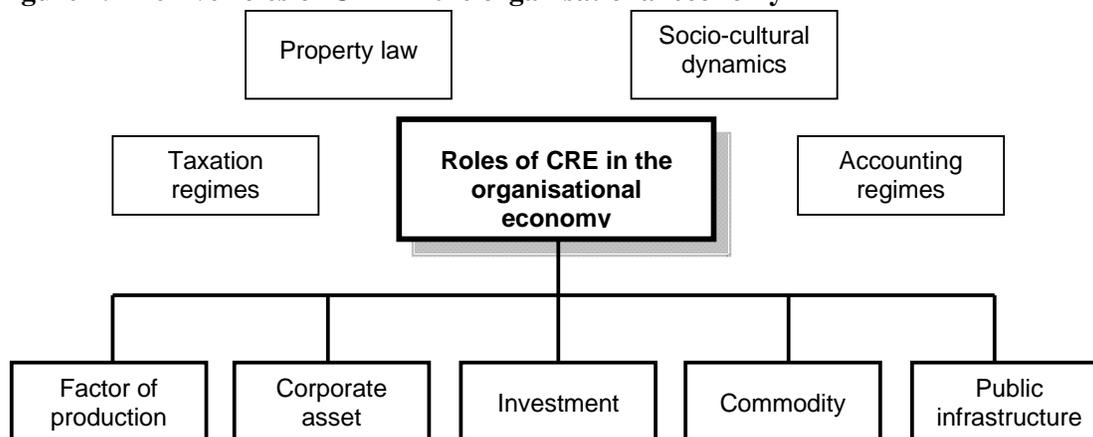
Recently revisiting Isaac (2003) confirmed that his roles were framed from an investment real estate perspective with a supposition, without further elaboration, that similar circumstances would apply for owner-occupier real estate (CRE, though not specifically called such). As a long-standing CREM researcher the response to this supposition has to be 'Yes, but ...':

- Owner-occupation is but one mode of corporate real estate occupation;
- Leasehold is omitted as a relevant form of occupation where these roles could also apply;
- There are other aspects of real estate that also play out in CRE organisations; and
- This means that there is an incomplete conceptualisation of CRE as an economic contributor in organisations.

It is evident from further reading of Isaac and the CREM literature that the three roles advanced above are joined by a fourth 'Commodity' role where real estate is traded and developed, for example, the sale-and-leaseback literature relies on real estate's tradability. A fifth role as 'Public infrastructure' emerged from several sources – Graaskamp (1977) and externalities, as noted above; with current workplace ideas including those of distributed and 'found' workplaces external to corporate locations (Duffy, 2008).

This then provides five roles for CRE in a CRE organisation’s economy (Figure 1). These five roles encompass three of the four responsibilities of the CREM function – provide shelter (physical space or envelope), optimising workplace (the production platform), and rewarding shareholders (financial return) (Heywood et al., 2004; Valenziano and Kious, 2005). The fourth relates to the provision of CREM services.

Figure 1. The five roles of CRE in the organisational economy



How these roles are enacted is affected by the operating context-based forces of taxation regimes in which a CRE organisation operates; similarly for property law for the operating jurisdictions, socio-cultural dynamics of the organisation; and finally the accounting regimes in place. In the latter, the first decade of the twenty-first century saw a more global accounting regime through the International Financial Reporting Standards which has had and continues to have impacts on CREM (Maiona, (in press)).

We have noted the existence of previous classifications. To fully analyse why these five roles are a better classification requires a fuller conceptual and semantic analysis of those classifications. This paper does not have space for reporting such analysis.

THE FIVE ROLES

It is clearly evident to us, from the immersion in the literature that these five ideas are found in much of the CREM literature, though not specifically acknowledged. Their ubiquity and that, seemingly, they sit behind much CREM theorisation leads us to posit that the roles do indeed represent deep foundational ideas for the field. As such, they then warrant much greater examination from that foundational perspective. How these play out for owned and leased CRE is now examined briefly.

Role 1: Factor of production

This CRE role emphasises it as an input into the organisation’s core business and its production which is taken in its broadest meaning of the processes used in creating and providing both tangible physical products and intangible services, which are then consumed by ‘customers’. This role is the one that is often meant most in definitions of CRE that include reference to real estate as *incidental* to the primary business, and real estate *not* being the primary business (after: Rondeau (1992), Brown et al. (1993), Kenley et al. (2000) and CoreNet Global (2007)). Similarly, this role is where management of the CRE is conceived as aligning real estate and its services with the core business, to maximise the value added (to the core business rather than to the real estate), and to contribute, in an optimal way, to the overall business performance (from Dewulf et al. (2000: 14)). What that performance is may be contestable as several possibilities have been identified including – efficiency, effectiveness, and competitive advantage (de Vries et al., 2008; Varcoe and Hinks, 2012).

The factor of production role is then central to framing CREM as a business discipline where its support for the business’ production matters more than the real estate ends themselves.³ As a production input, the real estate’s (future) economic benefit is for the organisation as a whole through the economics of its core business and not

³ Of course, because of the multiple roles identified here the real estate-based economic benefits are never far away, just significantly de-emphasised. The switch between roles seems almost to be unnoticed by many real estate practitioners and theoreticians because of the preeminent focus on the real estate itself in the discipline – hence the need for definition and distinction here.

specifically from the economics of the real estate itself. It is apparent from Varcoe and Hinks (2012) that this can be a difficult thing for CREM (as real estate people) to comprehend.

For CRE as a factor of production three key issues emerge:

1. Costs of that real estate in the production process;
2. Real estate's fitness for that productive activity (fit-for-purpose); and
3. CRE's contributions to revenue generation.

To suggest that there are only three key issues is a large claim given the multiplicity of themes evident in the CREM discourse and arguments for the complexity of multiple domains of practice. Nevertheless, a thematic review of the literature, for which this paper lacks space, suggests that those themes can be shown to belong to these three issues when considered as a factor of production.

Role 2: Corporate asset

This role is based on CRE's presence in corporate financial statements where it is reported as a corporate asset.⁴ Historically this has applied to owned CRE, leasehold CRE benefiting from being able to be treated as off-balance sheet. Most clearly the corporate asset role is expressed through the statement of assets with any associated debt funding appearing as a liability. Changes in CRE asset values through appreciation or depreciation flow through to profits and losses respectively. Reporting real estate values requires engaging with the basis of those values and therefore with valuation method and the real estate market within which those values are derived.

This role was crucial in the initial impetus to CREM's emergence in the 1980s when corporates (and CREM too it must be said) woke up to the quantum of their owned real estate assets. It was also important in the emergence of a CREM academic discipline. Figures like 25% of corporate assets (Veale, 1989; Zeckhauser and Silverman, 1983) became important in the argument that, as CRE was so valuable, it deserved better management, and *ipso facto* CREM should be taken seriously by senior management and corporate boards. The rise of CREM was not the only effect of realising the quantum of assets, but that the presence on the balance sheet required management – often presumed to be getting it off the balance sheet.

Other than the quantum of CRE on the balance sheet, there are three further aspects to this role grounded in corporate finance and accounting methods that act out in about CRE as decisions about financing the organisation.

1. The proportion of CRE on the balance sheet;
2. Assets' accounting basis; and
3. The relationship between debt and CRE.

Role 3: Investment

CRE, perhaps uniquely in the real estate world, sees two simultaneous forms of investment occurring – as a real estate project and as a contributor to business projects. This duality occurs because of the management of real estate in businesses where real estate is not core business. The distinction between the two investment forms is not always made and most often gets treated as a real estate project where the Return on Investment (ROI) is compared, often unfavourably, with other business investments' ROI. The second investment sees the real estate as a necessary Factor of Production input into business investments.

Role 4: Commodity

This role of CRE encompasses two key concepts of 'commodity-ness' – that it is a physical artefact for which there is a market (the real estate market in CRE's case) and that artefact is capable of transformation (in this case through property development). Two types of CREM commodity activities apply:

- Trading CRE which is about using the real-estate markets to acquire or dispose of CRE. Often this activity is taken to be selling existing surplus CRE (Adendorff and Nkado, 1996; Nappi-Choulet et al., 2009). Here the commodity value makes direct revenue contribution where the realised market values exceeds the value carried on the financial statements. Trading CRE can also be used to control CRE expenses by exchanging existing, expensive CRE for equally suitable, cheaper CRE (Adendorff

⁴ Historically, this has been owned CRE but recent moves (at the time of writing) to include leased assets has extended the concept to all CRE. There can also be liabilities related to debt used for any CRE.

and Nkado, 1996). CRE Sale and leasebacks are a classic trading activity that has some presence in the CRE literature, for example White (1987), Hordijk et al. (2010) and Tipping and Bullard (2007); and

- CRE development which is about applying property development practices to both existing CRE and new requirement CRE. In the commodity role the development processes' transformation of market value is emphasised rather than development's task of creating suitable factors of production.

The commodity role connects CRE very directly with real estate markets and the real estate practices of determining and creating real estate value.

Role 5: Public infrastructure

This role for CRE is derived from two ideas. The first idea is Graaskamp (1977) model that identifies a consequence in the public realm from real estate development where services flow from public infrastructure to the project and, *quid pro quo*, taxes flow towards the public (community). Similar effects can be demonstrated for the extant property. This can be seen in considerations of the impact of location decisions on communities (Rabianski et al., 2001). The second idea is that these are externality effects that arise from CRE (Heywood et al., 2010).

For the public the property's value are its externalities – economic (from the taxation flows), environmental and to society as a whole. Those effects can be seen in both the physical and social milieus where creating and operating a property affects the surrounding physical environment (the physical milieu). The interplay between CREM as the demand-side of the real estate economy and the supply-side's development and investment arms (Heywood and Kenley, 2010) create individual properties that over time transforms the physical environment as a whole.

As well as the physical milieu, CRE also affects the social milieu. This places CRE as both a stage for and a modifier of social interaction. This can be seen in recent discourse on CRE as workplace and its place in organisational change.

WHAT MAKES THESE FIVE ROLES AXIOMS?

It is one thing to say that these five roles represent deep foundational ideas; it is another to suggest that they constitute axioms. Therefore, on what basis can they be elevated to axioms?

An axiom is one of a select set of propositions presumed to be true by a system of logic or a theory, from which all other propositions which the system or theory endorses to be true are deducible – these derived propositions being called theorems of the system or theory. (Honderich, 1995, p.72).

This suggests that to be an axiom it needs to meet several conditions.

A select set of propositions

Only five ideas are being put forward and therefore they justifiably can be considered select. That they are propositions can be seen in the contentions advanced above as to what the ideas entail.

Presumed to be true

This can be considered in two ways. One is that, because so much of CREM theorisation appears to rely on them they can, or indeed, must be presumed to be true. Alternatively, it can be argued that they cannot yet be formally presumed as the argument is yet to be made – hence the need for this paper.

There is a system of logic or theory

CREM has a logic though is not often considered as such. It can be argued that its logic is demand-side or user focussed in the real estate economy (de Jonge et al., 2009; Heywood and Kenley, 2010). This is consistent with the definitions of CRE advanced earlier. CREM's logic is that:

- It is the demand-side of the real estate economy that is consistent with the use of real estate for business purposes, for other than real estate businesses;
- It includes both space (workplace) and place (location) considerations (Roulac, 2001);
- Real estate is managed to meet strategic business ends and value (Dewulf et al., 2000) rather than the real estate value itself; and
- It encompasses multiple domains of practice (Heywood and Kenley, 2007 & 2008) that must be deployed and balanced.

It is also true that the field is rarely considered as a system, either by being systematised or conceptualised as a system of entities and relationships. The CREM books have partially done this but, in our opinion, not yet achieved anything approaching a complete conceptualisation as a system. This does give the field's knowledge base an ad-hoc appearance. Also, CREM as a system seems to be very open having external connections with both business and real estate systems.

Other propositions endorsed as true are deducible from these axiomatic propositions

Substantiating this claim requires two things. One is that the field's theory derived from practice reflections and empirical studies needs to be true. This has to be accepted as being the case because to do otherwise completely destroys the basis of knowledge. The second is that this claim can be demonstrated as being derived from our axiomatic propositions. This relatively lengthy exercise is conducted below as a key contribution of this paper.

These other propositions are theory or theorems of the system of logic

The examination of practice, either by practitioner reflection or empirical study has provided general explanations of CREM phenomena; hence they are taken as theory, though contestable in some cases.

THE DEDUCTIBILITY OF CREM THEORY FROM THESE AXIOMS

To fully document the claim that CREM theory is deductable from the proffered axioms would require a very extensive analysis of the literature which is beyond the scope of this paper. Rather, several proxies for the literature as a whole are used to get around this difficulty and to advance this first attempt to establish the deductibility of CREM theory from the five axioms.

1. Analyse the Technical CREM practice categories in Heywood and Kenley (2008). These practices constitute the core of CREM practice and theory. Their categorisation is based on an extensive analysis of the CREM literature so constitutes a useful proxy as a theory of CREM theories. These practices most closely focus on the CRE artefact and relate to the CRE roles in the organisational economy. A Managerial practice category is also evident and includes, among other things, the CREM function's organisational and strategic management and service provision;
2. Analyse the trends in CREM in Haynes and Nunnington (2010) because this is the result of an analysis of CREM, FM and workplace management literature and also acts as a theory of CREM theories. It is also the most recent comprehensive identification of key, pressing theoretical and practical concerns in the field; and
3. Thematically analysing several illustrative papers on key theoretical aspects of CREM across CREM's history.

Varcoe and Hinks (2012) was also considered for analysis as a broad-ranging, current statement of CREM issues but it was evident that their report was almost exclusively about CREM services.

Table 1. Deducibility of CREM theory from the five axioms

Axiom	CREM Theory		
	Technical CREM practice (Heywood and Kenley, 2008)	Key trends (Haynes and Nunnington, 2010)*	Illustrative papers
Factor of production	Holding practices (Lease structure alignment with business requirement) Measuring CRE expenses CRE accounting Location/Site selection Workplace styles IT purposes & Tools Metrics Benchmarking	Workplace transformation Multi-generational and diverse workforce ICT and real estate (impact there on) Globalisation Change management Sustainability Real estate procurement (outsourcing) Lease-buy criteria (also (Weatherhead, 1997))	Lease terms, assignment, flexibility (Cooke and Woodhead, 2008; Crosby et al., 2006) Internal rents (Andersson and Söderberg, 2011; Cock and French, 2001) Workplace (Brunia and Hartjes-Gosselink, 2009; Haynes, 2008; Knapp and Oliver, 2008; Oseland, 2009) Workplace productivity (Haynes, 2007a&b)

Table 1 (cont). Deductibility of CREM theory from the five axioms

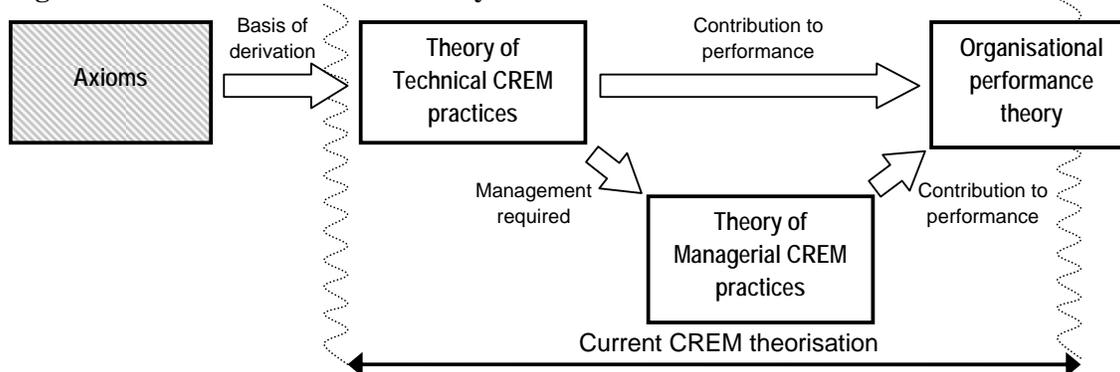
Corporate asset	Holding practices Financing CRE – Corporate instruments Financing CRE – CRE instruments CRE to support the organisation (financially) Measuring CRE expenses CRE accounting Metrics	Real estate procurement (accounting standards) Lease-buy criteria (also Weatherhead (1997))	CRE effect on corporate beta (Booth, 1999; Brounen and Eichholtz, 2005) On-off balance sheet (Evans et al., 2001; Maiona, (in press)) Asset-backing and shareholder comfort (Evans et al., 2001) Asset-backed refinancing (Brueggeman and Fisher, 2005) Impacts on capital markets (Hwa, 2008; Liow and Ooi, 2004; Nappi-Choulet et al., 2009)
Investment	Financing CRE – CRE instruments CRE to support the organisation (financially) Metrics	Lease-buy criteria (also Weatherhead (1997))	CRE effect on corporate beta (Booth, 1999; Brounen and Eichholtz, 2005) Cost of capital (Chen and Ward, 2000) Impacts on capital markets (Hwa, 2008; Liow and Ooi, 2004; Nappi-Choulet et al., 2009)
Commodity	CRE to support the organisation (financially)	Lease-buy criteria (also Weatherhead (1997))	Sale and leaseback (Hordijk et al., 2010; Tipping and Bullard, 2007) Real estate quality relative to market (Golan, 1999) Exposure to real estate risk (Golan, 1999; Haynes and Nunnington, 2010; Wainwright, 2000) Redevelopment potential (Haynes and Nunnington, 2010) Real estate market cycles (Golan, 1999)
Public infrastructure	Location/Site selection Workplace styles	Multi-generational and diverse workforce	Work's relationship to the urban environment (Duffy, 2008) Community impacts of location decisions (Rabianski et al., 2001) Community incentives to encourage location selection (Rabianski et al., 2001) Economic impact of CRE (Musil, 2011)

* This list omits their Strategic alignment which can be considered a Managerial CREM practice

This analysis shows that CREM theorisation, as practiced to date, can be traced further back into theory to these five foundational ideas. Demonstrating these origins to current levels of theory substantiates claims that CRE's five roles in organisational economies do constitute axioms for CREM. All the Technical CREM practices and all but one of the current CREM trends are demonstrably derived from the five axioms. In addition, many CREM theories beyond the five roles in the organisational economy that are specifically tied to the CRE artefact can also be derived; perhaps not all bodies of theorisation and practice as it was previously noted that

Managerial CREM is separate. Even here this body can be shown to be connected with the axioms, albeit indirectly through the Technical CREM practices (Figure 2).

Figure 2. Derivation of CREM theory from the axioms



If the achievement of organisational performance (however defined) is the ultimate objective then Technical CREM practices can directly affect this performance and the other two bodies of theory add their own contribution through use of the Technical practices.

DEALING WITH THE SCIENCE-MAKING

The previous section advanced an argument that CRE's five roles in organisational economies represent the field's axioms. It is extremely rare and possibly non-existent in CREM writing (and also for general real estate writing) to find such philosophical considerations. There are several reasons why this might be the case:

- It is a fundamental short-coming in the 'science-making' of the field that stops at providing theory (a general explanation of a phenomenon (Dainton and Zelle, 2005)) without going further to identify the generative cognitive concepts for that theory;
- Not seeing property theorisation as science and therefore not requiring science-making;
- Being captive to theorising the churn of dynamic practice;
- Considering it unnecessary to do this type of thinking because these things are understood. Articulating them is just going over old ground and a waste of time (this actually reinforces the paper's axiom claim); and
- Property has an ontological basis that precludes such thinking and therefore lacks an epistemology to support such enquiries.

This paper disavows this avoidance of deep thinking about the basis of knowledge production in CREM for several counter reasons.

- Property theorisation (of which CRE theorisation is part) does constitute a science as it is part of a formal knowledge production activity specific to a discipline field (Whitley, 2000);
- The type of science also matters. Whitley (2000) provides seven categories for classifying the type of knowledge production (science) according to:
 - The science's dependence on ideas and results from fellow specialists in order to construct competent and useful knowledge claims (degree of functional dependence) (p.88);
 - The extent to which a researcher must persuade colleagues of the importance of their problem and approach in order to obtain high reputation (degree of strategic dependence) (p.88);
 - The extent to which scientific work techniques are well understood and produce reliable results (degree of technical uncertainty) (p.121); and
 - The extent to which the fields variability in the problems are dealt with at different research sites and the field as whole. This reflects the uncertainty about intellectual priorities, the significance of research topics and preferred ways of tackling them, the likely reputational pay-off of different strategies and the relevance of task outcomes for collective intellectual goals (p.123).

Property research can be said to belong to two of these seven reputational fields. General property research could be a 'technologically integrated bureaucracy' that produces empirically-based, specifically useful knowledge. Engineering is a similar such knowledge field. In this reputational field there is low technical task uncertainty with well understood techniques, like quantitative, financial regression analyses. The theoretical framework is relatively stable with little competition for resources

so individual researchers can focus on particular sub-problems (like property investment risk in various circumstances or the impact of sustainability on property investment) and goals.

Property management research (and CREM) could also be a 'fragmented adhocracy' where research is rather personal, idiosyncratic and only weakly coordinated across research sites.⁵ Commonsense, everyday objects are often investigated and as a result it is difficult to exclude the 'educated public' and 'amateurs' who may be able to, relatively easily, make competent contributions (Whitley, 2000, p.159). Management studies is a comparable knowledge field, and indeed CREM research could be considered as a subset of that field. This latter reputational field is particularly pertinent to CREM research because CREM consists of many domains of practice and theorisation. This makes it possible for an individual researcher to, over an extended period, productively investigate one or more of those domains without specific reference to other domains, for instance, issues of CRE finance relevant to CRE as a corporate asset and investment without acknowledging how factor of production issues like workplace design or facility management impact on their analysis. It is also very evident that professionals (educated public) make major knowledge contributions;

- It is a responsibility of academics to make apparent what may be known but overlooked and unarticulated. This may seem to entail going over old ground but if doing so highlights an unacknowledged importance then an academic has made a contribution that they, rather than practitioners, are equipped to do. It is this type of deep thinking that creates systems, typologies and bases for classifications that is the responsibility of academics to do. This is basic science-making where intellectually robust foundations are laid down onto which later knowledge production is built;
- Unless the academy occasionally, not all the time, but occasionally, questions and charts its fundamental bases and concepts then its members are little more than glorified reflective practitioners (uses Schön's (1983) definition of the term). This questioning is very important for emerging discipline fields, like CREM, because otherwise how can its theoreticians and practitioners know what it stands for, what knowledge it contributes, and what distinguishes it from other knowledge creation processes. This is part of the frustration aired in Varcoe and Hinks (2012) about the field's inability to achieve traction in arguing its importance to organisations; and
- CREM as a real estate discipline needs to transform into a business discipline and therefore needs to move beyond real estate's financial and physical asset ontologies to include business and management realities in a blended ontology. There will be consequences for CREM's epistemology and knowledge production methods.

CONCLUSION

CREM is an emergent real estate (and business) discipline that faces challenges in its knowledge production with regard to its research and theorisation capacity, its required or useful knowledge, and the science-making used to create such knowledge. In an effort to (re)lay foundations for the science-making in the field this paper advances five axioms on which CREM theorisation is demonstrably based. By introducing the idea of axioms to the field's knowledge production we avail ourselves of academics' rights and responsibilities to adopt deeper, more philosophical approaches that can strengthen the field's theorisation. This is necessary because of the evident struggle with developing a business-useful knowledge base that results from dynamism of both the business and real estate systems. This suggests that the business-useful knowledge may need to be built from the ground up because the existing one (such as it is) may not be as useful as it needs to be. Perhaps then we can begin to overcome the fundamental problems with knowledge production in the field and in creating a body of knowledge that meets practitioners' needs better than currently and which is based on robust and deep science.

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⁵ This could also apply to general property research but that does seem to belong more in the former reputational field.

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