LEVERAGING CONCEPTS FOR ENVIRONMENTALLY SUSTAINABLE BUSINESS MANAGEMENT IN CONSTRUCTION - A FOCUSED REVIEW (A PAPER SUBMITTED FOR CIB 2015 SYMPOSIUM ON 23-25 NOV 2015 IN LONDON, THE UK)

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The main objective of this paper is to advance applied conceptual knowledge about environmentally sustainable business management (BM) in construction. Environmentally sustainable BM is herein defined to encompass the utilization and development of natural resources in ways which are compatible with the maintenance of these resources, and with the conservation of the natural and built environments, for current and future generations. In principle, concept designers can incorporate environmental sustainability into their BM concepts as a dimension, an element, or an attribute of managing, or as a criterion in decision making. Readily, the 71 construction-related BM concepts have been published between 1990 and 2013. A focused review resulted in the expected findings, i.e., only the 11 (15%) construction-related BM concepts have been designed along the environmental sustainability dimension. Thus, it is posited that high-sustainability BM concepts be designed by coupling environmental sustainability with the three other necessary dimensions, i.e., content-free frames of reference on BM, schools of thought on generic BM, and focal contexts in construction, respectively. In turn, CIB-related researchers may adopt these couplings and engage themselves with cross-disciplinary BM conceptualization programs in collaboration with farsighted business managers in construction.

Keywords: business management, concept design, construction, environmental sustainability, research review.

INTRODUCTION

The background involves this author’s argument that business management (BM) is the most challenging, evolving, and critical area (or level) within strategic management in general, in research and practice as well as across all contexts (Huovinen 2003, 2015). Thus, I have been reviewing generic and applied research on BM since 1999. So far, the reviewing has resulted in the identification of the 71 construction-related BM concepts that have been published in English mainly via journals between 1990 and 2013 (e.g., Huovinen 2015). Construction relatedness includes the ownership, financing, life-cycle, design, implementation, and servicing aspects of capital investments in natural resources usage, energy supply, manufacturing, telecommunications, transportation, infrastructure, real estate, and general building concerns. Later, the terms “construction” and "construction-related"

are used to encompass all kinds of built environments and investment concerns. Besides the reviewing of construction-related BM concepts, I have conducted many focused reviews among the schools of thought on generic BM (e.g., Huovinen 2010) as well as along the four dimensions of the concept design, i.e., environmental sustainability (Huovinen 2011b), business ideation (e.g., Huovinen 2012a), collaboration (Huovinen 2012b), and international business (e.g., Huovinen 2011c).

My first focused review of the design of concepts along the environmental sustainability dimension addressed the 62 construction-related BM concepts published between 1990 and 2009 (Huovinen 2011b). No high-sustainability BM concepts were among them. Thus, I felt necessary to design the two such BM concepts (Huovinen 2011a-b) in order to pave a way for other concept designers.

In turn, this paper serves as a 4-year update covering altogether the nine new BM concepts published between 2010 and 2013. The main objective is to advance applied conceptual knowledge about environmentally sustainable BM in construction. The four sub-objectives include (i) the introduction of the pioneering reviewing, (ii) the overview of the 71 construction-related BM concepts, (iii) the reporting on the focused review of the design of these 71 concepts along the environmental sustainability dimension, and (iv) the choice and coupling of the four necessary dimensions for the advancement of concepts for environmentally sustainable managing of businesses in construction. The four parts of the paper are unfolding as follows.

71 CONSTRUCTION-RELATED BM CONCEPTS PUBLISHED BETWEEN 1990 AND 2013

The independent reviewing serves as a way of learning and understanding vis-à-vis construction-related BM research. The four review rounds have been carried out in 1999-2003, 2006, 2010-2012, and 2014. The same limitations have been re-adopted in order to protect the validity against the five threats. Hart's (1998) literature review guidelines have been relied upon. The design of and reliance on the method for the reviewing of conceptual research, i.e. the documented, replicable ways of searching, browsing, in-/ excluding, retrieving, inferring, moderate coding, describing, analyzing, and interfering with the construction-related conceptual BM data have been reported upon in Huovinen (2003, 2006, 2008).

The search for eligible construction-related BM concepts has been conducted comprehensively within the volumes of 21 journals related to construction and those of 47 journals in business administration. Concerning the other formal channels, the degrees of the comprehensiveness of the search have varied markedly. This reviewer will submit the itemized lists of all the publication channels on request.

The 71-concept population is herein overviewed only via the three questions. Question 1. What is the relatedness of 71 concepts to one or several of eight schools of thought on BM? Generic BM research involves the eight schools of thought: (1) Porterian school, (2) resource-based school, (3) competence-based school, (4) knowledge-based school, (5) organization-based school, (6) process-based school, (7) dynamism-based school, and (8) evolutionary school (Huovinen 2008). This reviewer could assign each BM concept to one of the eight schools based on the respective authors' rationales and replies to the fundamental question "What is the primary way (element) of managing that will enable managers to set challenging business goals and also to attain them?" The school relatedness appears in Table 1. The combined share of the four schools is

80% or 57 concepts (16 Porterian, 16 dynamism-based, 15 organization-based, and 10 knowledge-based concepts). Since 1999, none of the schools has triggered a coherent flow of construction-related BM concepts.

Question 2. What is the relatedness of 71 construction-related BM concepts to disciplines within engineering sciences? 34 (48%) concepts are primarily related to construction management (CM), 14 (20%) concepts are related to industrial management and international marketing, 12 (17%) concepts are related to project management (PM), and 11 (15%) concepts are related to corporate real estate services. The scholars of these four disciplines have designed 62 (87%) concepts. 9 (13%) concepts have been designed by the scholars affiliated with the business schools. No traditions in research on construction-related BM exist in the OECD countries.

Question 3. For which focal business contexts have the authors designed 71 construction-related BM concepts? 25 (35%) concepts address project-based, contracting, complex product systems, or engineering, purchasing, and construction (EPC) projects, 25 (35%) concepts address construction or building broadly, 10 (14%) concepts address real estate development and services, 5 (7%) concepts address businesses based on capital investment markets, 4 (6%) concepts address design and consulting services, and 2 (3%) concepts address building products supply.

The pioneering reviewing has been protected only in part against the formal publishing channel bias, i.e. an increasing difference between a number of 71 identified construction-related BM concepts and a number of an existing population of such concepts published via all formal scientific channels. It is likely that in total 80-85 construction-related BM concepts have been published between 1990 and 2013.

FOCUSED REVIEW AND THE ASSESSED DEGREES OF THE DESIGN OF 71 CONSTRUCTION-RELATED BM CONCEPTS ALONG THE ENVIRONMENTAL SUSTAINABILITY DIMENSION

In general, OED (2011) defines sustainable "to be capable of, relating to, or designating forms of human economic activity and culture that do not lead to environmental degradation, especially avoiding the long-term depletion of natural resources". Oxford Reference (2015) condenses sustainable into “capable of being sustained or continued over the long term, without adverse effects”, defines sustainability as “a concept that is used to describe community and economic development in terms of meeting the needs of the present without compromising the ability of future generations to meet their needs” and ecological sustainability as “the maintenance or restoration of the composition, structure, and processes of ecosystems” as well as couples sustainable management into “managing the use, development, and protection of natural resources in a way or at a rate which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety”.

Conduct of the focused review

For the focused review, the four degrees of environmental sustainability were pre-specified. A particular author may have designed a construction-related BM concept along the environmental sustainability dimension to:

- a high degree, i.e., environmental sustainability is one of the primary elements of BM such as one of business goals, a key attribute of offerings, a set of

competitive advantages, a synergy among strategies, an edge of competitiveness, and a key performance indicator of business processes, organizations, project portfolios, etc.

- a medium degree, i.e., environmental sustainability is one of the supportive elements of BM
- a low degree, i.e., environmental sustainability is only an implicit part of a firm's offerings and underlying expertise in built environments and/or it is taken into account only as one requirement or one tendency in client chains' buying behavior, one criterion in stakeholders' decision making, one factor in environmental analyses, etc.
- no degree at all, i.e., the author is silent vis-a-vis environmental sustainability, no single 'thing' is explicitly written along this dimension in the reference.

The concept-specific assessments were compiled in the tables, school by school (except that none of the identified 71 concepts belong to the 8th evolutionary school). The corresponding sentences, phrases, or single terms were quoted with the page numbers, respectively. This reviewer will submit a complete list of 68 references containing 71 construction-related BM concepts on request.

Overall, the assessment revealed that 11 (15%) construction-related BM concepts have been designed along the environmental sustainability dimension. Relatively, there are only indicative differences between the concepts belonging to the seven schools of thought on BM, i.e., 50 % (1 out of 2) of the resource-based concepts have been designed along the environmental sustainability dimension, followed by 19% (3 out of 16) of the Porterian concepts, 19% (3 out of 16) of the dynamism-based concepts, 14% (1 out of 7) of the process-based concepts, 13% (2 out of 15) of the organization-based concepts, 10% (1 out 10) knowledge-based concepts, and 0 % (0 out of 5) competence-based concepts (Table 1).

Ex ante, I knew that there are at minimum 2 (3%) high-degree construction-related BM concepts that I myself had designed (Huovinen 2011a-b). But I erroneously assumed that the other authors had designed some recent high-degree concepts as well. So far, 2 (3%) high-degree, 1 (1%) medium-degree, and 8 (11%) low-degree construction-related BM concepts have been designed along the environmental sustainability dimension (Table 1).

Table 1: Results of the four-degree assessment of the design of 71 construction-related BM concepts (published btw. 1990 and 2013) along the environmental sustainability dimension

School of thought on generic BM	High-degree concepts		Medium-degree concepts		Low-degree concepts		No-degree concepts		All BM concepts	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
1 Porterian	1	(1%)	0	(0%)	2	(3%)	13	(18%)	16	(23%)
2 Resource-based	0	(0%)	0	(0%)	1	(1%)	1	(1%)	2	(3%)
3 Competence-based	0	(0%)	0	(0%)	0	(0%)	5	(7%)	5	(7%)
4 Knowledge-based	0	(0%)	0	(0%)	1	(1%)	9	(13%)	10	(14%)
5 Organization-based	0	(0%)	0	(0%)	2	(3%)	13	(18%)	15	(21%)
6 Process-based	0	(0%)	0	(0%)	1	(1%)	6	(8%)	7	(10%)
7 Dynamism-based	1	(1%)	1	(1%)	1	(1%)	13	(18%)	16	(23%)
8 Evolutionary	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)
Sum	2	(3%)	1	(1%)	8	(11 %)	60	(85%)	71	(100%)

Protection of the validity of the focused review against the four biases

Concept Inclusion Bias 1 involves this reviewer perceiving that an author has designed a concept along the environmental sustainability dimension even if this author has not done so. This bias has been minimized by assessing each reference in the same way and quoting only the necessary part of each of the references that contain 11 (15%) construction-related BM concepts designed along the environmental sustainability dimension (Table 1). Future reviewers can test the inter-concept consistency of inclusion by repeating the assessments, i.e., reading the references and confirming my quotations or rejecting some of them and, thus, excluding the same.

Concept Exclusion Bias 2 involves this reviewer perceiving that an author has not designed a concept along the environmental sustainability dimension even if this author has done so. Twenty-two “no degree” assessments indicate that this reviewer did not identify any aspects on environmental sustainability. In turn, 38 “no degree” assessments coupled with the quotations, respectively, implies that these authors are using the terms sustainable, sustainability, and environment(al), but only within the scope of strategic, business, or project management. Future reviewers can test the inter-concept consistency of exclusion by repeating the assessments, i.e., reading the references and confirming the exclusions of 60 concepts or identifying sustainability elements in some of them and, thus, including the same.

After the inclusion, Degree Assessment Bias 3 is related to this reviewer’s reliance on a pre-specified scale of the three analytical degrees instead of a quantitative scale. The 3-degree lens corresponds to the explorative nature of the focused review. This reviewer could assign one of the three degrees to each of 71 BM concepts without hesitation. Future reviewers can request this reviewer to submit the concept-specific quotations and assessments to them and test the inter-concept consistency of degree assignments by reading the references and confirming the same degrees or assessing

changes in some of them and justifying such changes with quotations. Or, they could re-specify a scale of degrees, e.g., by dividing each degree into two sub-degrees.

Concept Author-Reviewer Bias 4 is related to a fact that this reviewer has designed 14% or 10 out 71 construction-related BM concepts. I am a long-time member of the competence-based school of generic BM (the 3rd school). However, the school relatedness of my 10 concepts is not concentrated. Instead, it is spread between the five schools, i.e., I have designed 3 organization-based, 3 dynamism-based, 2 Porterian, 1 knowledge-based, and only 1 competence-based concept. Two (out of 3) organization-based BM concepts have been co-designed. Further, I have assessed that I have designed 2 high-degree and 2 low-degree concepts along the environmental sustainability dimension. Future reviewers can carefully test the inter-concept consistency of the assessment outcomes versus each of the three other biases in the case of my 10 concepts. Other reviewers can come up with some explanations for this reviewer being, so far, the only high-degree concept designer.

Briefing of 2 high-degree, 1 medium-degree, and 8 low-degree BM concepts

Concerning the 1st Porterian school with 16 BM concepts, only Huovinen (2011a: 6-12) has designed the high-degree managing of four businesses based on the multiplication of Porter's (1980) five forces framework and the design of the 8-arena framework for capturing complexity of managing businesses in arenas in construction, i.e. 1 Uses, 2 Ownership, 3 Life-cycle servicing, 4 Capital investing, 5 Contracting as wholes, 6 Contracting as parts, 7 Prefabrication, and 8 Materials. A high degree of environmentally sustainable BM is achieved by implanting 23 drivers into the four main business types coupled with 23 specified (sub-)arenas. In life-cycle contracting and development businesses (in Arena 4), the drivers include the coupling of object development ideas with sustainability advantages. In design-build contracting businesses (in Arena 5), the drivers include the re-engineering of value chains. In design businesses (in Arena 6), the drivers include the transformations of design firms into long viewers, path dependency breakers, stock programmers, object planners, impact blockers, and impact cause tracers. In supply businesses (in Arenas 6-8), the drivers include the adoptions of cradle-to-cradle certifications, product renewals, and responsibility takings over life-cycles. In turn, Veshosky (1994: 43-45) has used Porter’s (1980) strategies as a basis for developing an analytical framework and applying this to the design segment of the A/E/C industry in the USA. The cost leadership, differentiation, and niche strategies have been elaborated. A low degree of sustainability is indicated as environmental systems and facilities among a firm's project types as well as core competencies for managing hazardous waste. In turn, Huovinen (2001: 73) has designed a 4-area, competitive strategy framework for technology-intensive contractors. It is based on the idea of creating the best fit between the primary decision maker, i.e. the focal investor with its need and investment process and the most competent contractor with its solution and delivery process. A low degree of sustainability is designed as a criterion, i.e. clients take environmental impacts into account when choosing winning solutions or bids.

Concerning the 2nd resource-based BM school with 2 concepts, Lowendahl (1997/2000: 106) has designed a low-degree concept, i.e., the three generic strategies, the four resource types, the four dimensions for resource-based differentiation, and the three phases in the evolution of professional service firms. A low degree of sustainability is indicated as environmental protection among alternative markets.

Concerning the 3rd competence-based BM school with 5 concepts, the assessment resulted in the no-degree concepts only.

Concerning the 4th knowledge-based BM school with 10 concepts, Love et al. (2002: 12) have designed a low-degree model for long-term learning alliances, TQM, and supply chains. A low degree of sustainability is designed as alliances taking into account the ethical consideration of social and environmental responsibility.

Concerning the 5th organization-based BM school with 15 concepts, Flanagan (1994: 312, 316, 318) envisioned that, by 2000, a successful construction company will have many desired features of a low-degree service provider. A low degree of sustainability is designed as (i) environmental consciousness and sustainability driving strategies, (ii) energy, traffic, waste, and ecology becoming more important, and (iii) successful companies being concerned about the environment and the community. In turn, Huovinen and Hawk (2003: 158) have designed a collaborative client-supplier relationship model for globally operating building product suppliers. A low degree of sustainability is implanted as a product's environmental impacts among 11 decision making criteria that clients use for choosing winning bids.

Concerning the 6th process-based BM school with 7 concepts, Anderson and Merna (2005: 175) have designed a low-degree framework for managing new business development processes of PM services firms. A low degree of sustainability is implanted as environmental management among 11 domains in development.

Concerning the 7th dynamism-based BM school with 16 concepts, only Huovinen (2011b: 11-13) has designed a high-degree, 5-element business system, i.e., environmental sustainability is (1) customized into competitive strategies and offerings so that no/low negative impacts enable a firm to meet its high-sustainability goals, (2) leveraged into business processes to minimize carbon footprints, (3) crafted into a firm’s core competitiveness, (4) fused into a business frame and governance, and (5) linked to an extended business frame in terms of collaboration with like-minded stakeholders. In turn, Chinowsky with Meredith (2000: 130, 142, 146) have defined an engineering organization’s strategic management as a medium-degree, dynamism-based, 7-area feedback wheel. A medium degree of sustainability is incorporated as environmentally sensitive core designs, project-specific solutions, an environmental engineering competency, an environmental knowledge area, and an environmental testing competency. In turn, Mutka and Aaltonen (2013: 170-171) have built a low-degree, 8-element business model framework for deepening the understanding of both relationships between and dynamics of business models as part of firm-level management and project-level management within project-based firms. A low degree of sustainability is indicated via the case firm providing life-cycle solutions, based on environment-friendly technologies.

ADVANCING CONCEPTS FOR HIGHLY-SUSTAINABILITY BM WITH CONTEXTS IN CONSTRUCTION

The focused review revealed a white space with no high-sustainability construction-related BM concepts. Thus, this reviewer defines the five couplings necessary for advancing BM concept design processes and their outcomes. It is assumed that BM concepts are environmentally sustainable, content-freely framed, theoretically advanced, and contextually applicable in respective focal contexts in construction when they are designed, at minimum, along the four corresponding dimensions:

1. Environmental sustainability. A concept designer may adopt the existing definition (e.g. OED 2011) or define a new one as the core of this dimension.
2. Content-free frame of reference on BM. A concept designer may choose one of many references (from within strategic management and planning, systems design, etc.) framing BM as a whole and setting boundaries for a scope. More importantly, frames can be coupled with other content-laden dimensions.
3. School of thought on generic BM. A concept designer may prefer one or more school-specific dimensions from among the eight schools (Huovinen 2008).
4. Focal context in construction. A concept designer may prefer one or more contextual dimensions such as business types, environments, and dynamism.

Each of the five couplings involves the two dimensions of BM concept design, i.e., environmental sustainability is coupled theoretically with frames of reference and schools of thought on generic BM as well as contextually with business types, environments, and dynamism in construction. Geographically, each coupling may be bounded by an area inside a country, a country as a whole, or a group of countries.

Coupling 1. Environmental sustainability and frames of reference. Environmental sustainability in construction-related BM is herein defined to encompass the utilization and development of natural resources in ways which are compatible with the maintenance of these resources, and with the conservation of the natural and built environments, for current and future generations (applying OED 2011 and Oxford Reference 2015). The design of highly environmentally sustainable BM concepts begins with the choices and incorporation of the four necessary frame elements, i.e., (i) envisioning preferred states and ways in dealing with environmental sustainability issues (e.g. in 2025 and beyond), (ii) widening business goals management with the targeting and attainment of environmental sustainability levels and causal relations between sustainability, business performance, and social issues, (iii) adopting environmental sustainability as a decision making criterion, and (iv) adding the minimization of a business' negative impacts on natural and built environments onto agendas (Huovinen 2011b). The four frame elements need to be designed so that they accommodate variety in managing a business with focal contexts in construction.

Coupling 2. Environmental sustainability and schools of thought on generic BM. The design of theoretically advanced, high-sustainability BM concepts can be based on one or more of the eight schools of thought on generic BM (Huovinen 2008). The choice of a particular school can be based on a concept designer's knowledge about BM schools and perceptions on a fit between a particular school's assumptions on, generic concepts for, explanations of, and normative advice for (un)successful BM with focal context types as well as her or his pre-understanding of business types and information about status of real business contexts in construction. School-specific and environmental sustainability elements need to be designed so that they accommodate variety in managing of a business with focal contexts in construction.

Coupling 3. Environmental sustainability and business types in construction. In part, contextually applicable, high-sustainability BM concepts need to be designed along the business type dimension. There are nine broad business types in construction, i.e., (i) technology-intensive contracting, (ii) construction-related contracting, (iii) process engineering, design, and consulting services, (iv) construction-related design and consulting services, (v) building products, systems, and materials supply, (vi) machinery, components, etc. supply, (vii) construction machinery, equipment, and tools supply, (viii) real estate ownership, development, and management services, and (ix) life-cycle services related to stocks and objects in built environments. The choice

of a particular business type may be based on the rationales of a concept designer and her or his stakeholders, respectively. Business type-specific and environmental sustainability elements need to be designed so that they accommodate variety in managing of this business type with focal contexts in construction.

Coupling 4. Environmental sustainability and business environments in construction. In part, contextually applicable, high-sustainability BM concepts need to be designed along the business environment dimension. This dimension consists of multiple sub-dimensions that cover political, economic, social, technological, and also environmental (so-called PESTE) sustainability developments in all countries, economies, societies, etc. across the globe. The choice of focusing on one, more, or all the five business environments may be based on the rationales of a concept designer and her or his stakeholders, respectively. Some concept designers may choose to deal with additional sub-environments such as law, digitalization, industrialization, or servicing. The high applicability of business environment-focused BM concepts needs to be ensured by using relevant foresight crafting, scenario building, business intelligence, market and social research, risk management, etc. tools and services. PESTE-specific and environmental sustainability elements need to be designed so that they accommodate variety in managing of a business with focal contexts construction.

Coupling 5. Environmental sustainability and business dynamism in construction. In part, contextually applicable, high-sustainability BM concepts need to be designed along the business dynamism dimension, which involves all kinds of fast, moderate, and slow developments on the demand and supply sides with periods, cycles, stages, and states, typically named as chaotic, random, evolving, growing, increasing, stable, decreasing, downturn, stagnated, or recession. The choice of focusing on particular kinds of dynamism may be based on the rationales of a concept designer and her or his stakeholders, respectively. The high applicability of business dynamism-focused BM concepts needs to be ensured by using relevant forecasting models, market intelligence systems, risk management programs, etc. tools and services. Business dynamism-specific and environmental sustainability elements need to be designed so that they accommodate variety in managing of a business with focal contexts in construction.

CONCLUSIONS

It is recommended that principal stakeholders adopt the five couplings in concept design and engage themselves with cross-disciplinary, construction-related BM conceptualization programs as follows. (a) CIB-related researchers launch high-sustainability BM programs concerning critical northbound and southbound contexts, (b) BM-related and sustainability-focused researchers jointly produce viable BM knowledge about how to avoid and minimize negative implications, and (c) CIB-related researchers and farsighted business managers jointly craft breakthrough high-sustainability concepts for managing major business domains in construction.

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