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Dynamic interactions between sustainability and competitiveness in construction firms: a transition perspective

Abstract

Purpose
Sustainability and competitiveness have received extensive attentions. Despite a large number of studies on sustainability and competitiveness in the construction industry, little research has been conducted to holistically explore the interactions between these two concepts. From a dynamic transition perspective, this paper aims to link sustainability and competitiveness of construction firms by developing a Sustainability-Competitiveness Dynamic Interaction Framework.

Design/methodology/approach
Conceptual theory-building approach was adopted to develop the conceptual framework. It is an iterative analysis and synthesis process, which involves reading literature, identifying commonalities and differences, synthesizing, proposing an initial framework, collecting additional literature, and revisiting and revising the framework.

Findings
There are complex interactions between sustainability and competitiveness of construction firms. This leads to uncertain relationships between sustainability and competitiveness, which is context dependent. Under evolving economic and socio-political environments, sustainability and competitiveness of construction firms could transition from mutually exclusive to mutually supportive, and finally merge into “sustainable competitiveness”.

Research implications
A Sustainability-Competitiveness Dynamic Interaction Framework (SCDIF) proposed in this study demonstrates that the interactions between sustainability and competitiveness evolve according to the evolving economic and socio-political environments and firms’ strategies, and thus the relationships and interactions between sustainability and competitiveness are context dependent. This framework helps corporate managers to understand how corporate sustainability and competitiveness interact with each other, thereby informing their decision-making of sustainability strategy. Similarly, the framework provides useful references for policy makers to understand the mechanisms of transitioning industries towards sustainable competitiveness.

Originality/value
The proposed framework offers a new perspective for understanding sustainability and competitiveness. From the dynamic transition perspective, this study effectively illustrates that the interactions between sustainability and competitiveness evolve according to the evolving economic and socio-political environments and firms’ strategies. Compared to existing approaches, the dynamic and holistic approach proposed in this paper provides the capacity to capture the complexity of sustainability and competitiveness.

Key words
Sustainability, Competitiveness, Construction Industry, Transition, Conceptual Framework, Theory Building

Paper type
Conceptual paper
Introduction

The construction industry is involved in creating the physical assets which are the foundation of virtually every aspect of human development (Spence and Mulligan, 1995). With the rising significance of the sustainability concept, the sustainability issues of construction industries have received a considerable amount of attention from scholars (Shen et al., 2010).

The rising significance of sustainability issues, however, presents a dilemma for construction firms. On the one hand they need to focus on cost, schedule and quality to maintain competitiveness; and on the other hand they need to respond to the sustainability challenges and become socially and environmentally responsible corporations. The central issue is: can economic competitiveness and corporate sustainability go hand in hand? Existing studies broadly indicate that there are no certain and unique relationships between sustainability and competitiveness (Forsman et al., 2013; Horváthová, 2010; Wagner and Schaltegger, 2003). These studies showed that sustainability could either contribute or be detrimental to competitiveness. Indeed, this presents a significant challenge to deal with economic competitiveness and corporate sustainability in firms that are usually resource constrained. The motivation for sustainability may not be as strong as hoped for, when sustainability meets the reality of tough economic times (Sekerca and Stimmel, 2011).

To promote sustainability transition of construction firms, it is imperative to explore how sustainability and competitiveness interact with each other. However, there are limited studies on the interactions of sustainability and competitiveness in the context of the construction industry (Tan et al., 2011). The purpose of this paper is to propose a conceptual framework, i.e. the Sustainability-Competitiveness Dynamic Interaction Framework (SCDIF), with an aim to theorise the dynamic interactions between sustainability and competitiveness of construction firms from a transition perspective.

Methodology

Conceptual frameworks form the foundation for research activities by providing an understanding of the underlying dynamics of concepts (Burnard and Bhamra, 2011). This paper follows a theory-building approach to develop a conceptual framework linking sustainability and competitiveness, namely the SCDIF, referring to the conceptual theory-building methods indicated by Meredith (1993), Lynham (2002), and Wacker (1998).

The essence of conceptualization is to see unique connections, commonalities and patterns from the different works, and integrate them into a unique and insightful perspective, revealing deeper theoretical meaning (Meredith, 1993). The theory-building process for developing conceptual frameworks usually entails “integrating a number of different works on the same topic, summarizing the common elements, contrasting the differences, and extending the understanding of the explored concepts” which Meredith (1993, p. 8) calls “philosophical conceptualization” and Wacker (1998, p.373) entails “analytical conceptual research”. Similar to other theory-building studies developing conceptual frameworks such as Gahm et al. (2016) and Burnard and Bhamra (2011), this paper developed the SCDIF frameworks based on an iterative analysis and synthesis process, which proceeds over a
period of 2 years initiated from November 2013. The process involves reading literature, identifying commonalities and differences, synthesizing, proposing an initial framework, collecting additional literature, and revisiting and revising the framework.

The process begins with an initial conceptualization phase with a focus on looking for empirical evidence, which is based on an examination and review of three broad strands of literature, namely the sustainability research of the construction industry, the competitiveness research of the construction industry, and the research exploring the interrelationships between sustainability and competitiveness. An initial framework was developed describing the interactions between sustainability and competitiveness. To theorize and explain the complex and dynamic interactions between sustainability and competitiveness, the second phase of conceptualization was conducted based on a holistic examination of relevant theories on firms. Focusing on explaining the dynamic interactions between firms and business environments, the approach of Triple Embeddedness Framework within the socio-technical transition theory was identified to be insightful in explaining the complex interactions between sustainability and competitiveness. Then, numerous attempts of synthesizing were conducted to integrate the initial framework with the transition theory, to develop the final SCDIF.

**Linking sustainability with competitiveness**

**Sustainability of construction firms**

The essence of sustainability is the simultaneous pursuit of economic prosperity, environmental quality and social equity, so that a human, natural or mixed system can withstand or adapt to endogenous or exogenous change indefinitely (Elkington, 1997). Du Plessis (2007) argued that the application of sustainability principals in the construction industry requires a broad interpretation of construction as a cradle to grave process, and it embraces not only technological responses but also non-technical aspects related to economic and social sustainability.

Despite the significant contributions made by existing studies, limited attention was received to empower sustainability practices in construction firms thereby transforming the industry towards sustainability. Construction corporations’ willingness of pursuing sustainability seems weak in the contexts of both developing and developed countries. For instance, in Malaysia, due to limited understanding and the concern about cost, many developers are still reluctant to pursue sustainability (Zainul Abidin, 2010). Similarly, sustainability has not been incorporated in the mainstream construction industry in other country contexts such as Chile (Serpell et al., 2013), South Africa (Othman, 2009), China (Qi et al., 2010), and UK (Stephen, 2010). Construction corporations’ reluctance to pursue sustainability is noticeable arguably due to concerns about the cost implications (Zainul Abidin, 2010). Indeed, Shi et al. (2013)'s study showed that “additional cost” is one of most critical factors that have seriously affected construction corporations’ willingness to promote sustainability. However, some other studies reveal sustainable practices may also contribute to cost reduction for construction firms (Zhang et al., 2011). This indicates the existence of complex interactions between sustainability and competitiveness. In fact, whether to adopt
sustainability practices is highly related to whether sustainability can contribute to economic competitiveness for construction firms (Zhang et al., 2011). However, this issue is rarely systematically explored by sustainability research in the construction industry.

By systematically illustrating the implications of sustainability on construction firms’ competitiveness, a framework linking sustainability and competitiveness could enrich the current sustainability research of construction firms.

**Competitiveness of construction firms**

Competitiveness reflects the improvement potential of performance which traditional economic indicators such as profitability are inadequate to indicate (Lu et al., 2008). Competitiveness, in essence, is firms’ ability to win in the business competition, relating to having better capabilities than competitors (Orozco et al., 2011). Similar to sustainability, there is no lack of studies on various aspects of competitiveness of construction firms such as competitive strategy and corporate performance of construction firms (Li and Ling, 2013; Zhao et al., 2009); competitiveness calculation and modelling (Orozco et al., 2011); and general competitiveness factors (Lu et al., 2008; Shen et al., 2006).

It remains vague whether the concept of competitiveness should include the elements of sustainability, indicated by the competitiveness research field. Some studies explicitly suggested that the construct of competitiveness covers various elements of sustainability. For instance, Shen et al. (2006) identified sustainability-related competitiveness indicators for contractors such as availability and effectiveness of safety and health system, and availability and effectiveness of environmental management system. Other scholars do not share this view. For instance, Orozco et al. (2011) identified 41 critical constructs relevant to the competitiveness of Chile contractors, none of which describes environmental performance. More interestingly, Lu et al. (2008) identified 35 critical success factors for contractor competitiveness. Their study found the most critical success factors include bidding strategy, competitive strategy, and relationship with government, which suggests that the traditional economy-centred perspective of competitiveness is still rooted in the mindsets of the surveyed contractors.

However, it has been argued that in the context of green economy, the traditional economy-centred perspective of competitiveness needs to be revisited to develop the new concept of “sustainable competitiveness“, with much of the research focusing on how sustainable development and competitiveness interact (Balkyte and Tvaronaviciene, 2010). Sustainable development has gained growing recognition in corporate, national and international policies (Hopwood et al., 2005), which has challenged the traditional view on competitiveness. For instance, the World Economic Forum has released global, regional and topical competitiveness reports for last three decades where sustainability is incorporated in its flagship “Global Competitiveness Report” since 2011 (World Economic Forum, 2011). Specifically for the construction industry, the European Commission has made “achieving sustainable competitiveness” the core strategic goal of the construction industry in Europe in the following decade (European Commission, 2012).
By illustrating the interactions between competitiveness and sustainability, a framework linking sustainability and competitiveness could enrich the concept of competitiveness and help to the transition towards the agenda of “sustainable competitiveness”.

The relationships between sustainability and competitiveness

Some studies have attempted to examine the interrelationship between sustainability and competitiveness in various industries. An examination of these studies suggests that the interrelationships between sustainability and competitiveness are very complex in nature. Our extensive literature review reveals that theoretical analysis, case study and econometric analysis are common approaches adopted by previous studies to explore the interrelationships between sustainability and competitiveness. To illustrate these approaches, a number of typical studies are listed in Table 1.

<Insert Table 1 here>

In regard to the theoretical analysis, Peng and Kerry (2013) theoretically argued that with the implementation of new policies, sustainability can be beneficial for the company’s long-term competitiveness. Based on empirical cases, Forsman et al. (2013) showed that even within the firms which accept sustainability and implement eco-innovations, their performance varies significantly. Econometric analysis has been widely used to quantitatively investigate the influences of environmental performance on firms’ economic competitiveness (Horváthová, 2010; Iwata and Okada, 2011). These studies found that sustainability could have either positive or negative impact on competitiveness. There are no certain relationships between sustainability performance and business competitiveness (Tan et al., 2011). Indeed, sustainability and competitiveness have very complex interrelationships, influenced by various factors such as government policy and firms’ competitive strategy.

Rivoli and Waddock (2011) argued that the question whether corporate responsibility and sustainability could contribute to profitability and competitiveness itself is a logical trap. Many existing studies showed there are no unique relationships between sustainability and competitiveness. This indicates the relationship between sustainability and competitiveness is context-dependent (Rivoli and Waddock, 2011; Tan et al., 2011). This is largely overlooked by existing studies on sustainability and competitiveness. Research and business practices should focus less on identifying the general correlations between sustainability and competitiveness, and more on building causal explanations in this area (Schaltegger and Synnestvedt, 2002).

The transition perspective

The fact that competitiveness and sustainability have uncertain and complex relationships presents a challenge, i.e. what are the underlying dynamics leading to the complex relationships? The SCDIF aims to explain the underlying dynamics, the theoretical basis of
which is the transition perspective explained in this section. To understand the transition perspective, the relationships between firms and their environments need to be firstly explained.

Firms are not static. Rather, they are constantly shaped by their strategies which are influenced by the fluctuating business environments. Environment plays a critical role in affecting the fates of firms (Hambrick and D’Aveni, 1988). Firms are in complex social systems composed of not only traditional groups such as suppliers, customers, and employees, but also non-traditional groups such as government, environmentalists, and activists (Freeman, 1984). Various stakeholders form the business environments for firms, which can be classified into two major categories, i.e. the economic environment and the social-political environment (Geels, 2014).

Evolutionary economics conceptualizes markets as primary environments which exert selection pressure on firms in the industry. Firms which are capable of adjusting to the changing economic environment receive more resources, and vice versa (Weitzel and Jonsson, 1989). Relevant actors in the economic environment include suppliers, customers, and new entrants (Turnheim and Geels, 2012). By contrast, neoinstitutional theory emphasizes the importance of institutional environment, in which organizations compete for social fitness rather than economic efficiency (Geels, 2014). Firms which have low social fitness may lower their legitimacy, which may damage their public acceptance, government protection and access to capital (Powell and DiMaggio, 2012). The socio-political environment contains non-market actors such as policymakers, wider publics, and social movements (Turnheim and Geels, 2012). Organizations operate in both socio-political environment and economic environment, and compete for both social and economic fitness (Scott, 2000).

Sustainability transition is a multi-dimensional transformation process through which existing systems shift to more sustainable ones (Markard et al., 2012). Various approaches are available for sustainability transitions, e.g. the Multi-phase Concept (Rotmans et al., 2001), Multi-level Perspective (Rip and Kemp, 1998), Strategic Niche Management (Kemp et al., 1998), Transition Management (Rotmans et al., 2001), and Triple Embeddedness Framework (Geels, 2014). To choose the appropriate approach as the basis of developing the SCIDF, this study draws on the existing researches which provide comparisons or critical discussions of these various approaches (see Geels, 2010; Geels, 2014; Genus and Coles, 2008; Lachman, 2013; Markard et al., 2012). The Triple Embeddedness Framework developed by Geels (2014) was chosen for this study since it particularly explains how firms and business environments interact with each other, thereby influencing the transition of firms towards the sustainability. Other approaches e.g. the Multi-level Perspective place more focuses on the wider scope of societal transitions beyond the firm level, and thus are not suitable for this study.

Triple Embeddedness Framework (TEF) is developed to explain the co-evolution between firms and their business environments (Geels, 2014). There are three key components involved in the co-evolution between firms and their business environments, namely industry regime, economic environment and socio-political environment (Geels, 2014). Industries have stability because of the established industry regime, i.e. technical knowledge, mindsets, values and regulations in the industry. However, industry regime can be gradually changed through the interactions between firms and the economic and socio-political environments.
(Penna and Geels, 2012). It is the interaction between external business environments and the endogenous strategic responses of firms that drive the transition of industries. Sustainability transition mainly involves two interrelated evolutionary processes, namely (1) the evolution of the economic and social-political environments towards sustainability and (2) the evolution of firms’ strategic responses to sustainability. These two processes are interrelated to each other and form the co-evolutionary process of sustainability transitions. (Geels, 2014; Penna and Geels, 2015).

In terms of the evolving business environments towards sustainability, Penna and Geels (2012) proposed a five-phase dialectic issue lifecycle model: (1) Affected groups and activists first articulate concerns and criticisms about a sustainability problem; (2) Concerns spill over to public debates, which put pressure on policy makers; (3) Public debates spill over to policy debates and policymakers engage in debates, hearings and investigations; (4) Policymakers introduce legislation to address the problem; (5) When public debates and tough policies lead to changes in consumer preferences, thereby changing firms’ economic environment, sustainability may become part of firms’ core beliefs (Penna and Geels, 2012).

Rivoli and Waddock (2011) explored how firms react to public issues related to social responsibility, which could be described as a public issue life cycle: first they ignore you, then they laugh at you, then they fight you, and then you win. These phase models suggest that it is the socio-political environment which evolves first and then exerts influences on the economic environment which evolves next.

Firms could adopt various strategies to respond to the evolving environments. Geels (2014) proposed four stages for strategic reorientation of firms towards sustainability: (1) In the first stage, firms tend to deny or downplay sustainability issues raised by actors in the social-political environment. Firms often argue that problems are temporary and measures to respond to the issues are costly and infeasible; (2) In the second stage, when sustainability issues can no longer be denied, firms engage in a local search for solutions, such as cost-cutting, tighter control, downsizing and incremental technical innovation. (3) In the third stage, firms start to recognize that sustainability issues are structural rather than temporary, and engage in a distant search for solutions such as changes in the range of product and radical technology innovation. (4) In the fourth stage, the continuation of sustainability issues triggers firms to rethink their taken-for-granted beliefs, such as their business models, corporate values and core competencies. Firms’ strategic reorientation towards sustainability were also illustrated by other phase models. For instance, Klewitz and Hansen (2014) proposed that firms’ strategic sustainability behaviour is an evolutionary process, ideally evolving from resistant and reactive, to anticipatory and innovation-based, and finally to sustainability-rooted.

The transition perspective systematically illustrates the dynamic interactions between firms and the external economic and socio-political environments. Since competitiveness and sustainability are attributes of firms, the transition perspective could also contribute to the conceptualization of sustainability and competitiveness, which will be illustrated in the following section.
Sustainability-Competitiveness Dynamic Interaction Framework for construction firms

The SCDIF has been developed to explain the dynamic interactions between sustainability and competitiveness from a transition perspective. The proposed framework consists of three interacting components, namely 1) construction firms, in which sustainability and competitiveness have positive and negative interactions, 2) economic environment, and 3) socio-political environment (Figure 1).

Positive and negative influences

Promoting sustainability in the construction industry may contribute to competitiveness, as sustainability practices can lead to more efficient process, higher productivity and more market opportunities (Zhang et al., 2011). Promoting sustainability, however, may also require higher investment, induce technological uncertainty and generate operation risk, which is detrimental to competitiveness (Shi et al., 2013). Similarly, studies have indicated that competitiveness could exert both positive and negative influences on sustainability. Therefore, it is imperative to explicitly differentiate these interactions.

1. Positive influences of sustainability on competitiveness. Adopting sustainability practices could contribute to the competitiveness of construction firms. For instance, cost savings could be achieved by implementing sustainability practices via reduced resource consumption (Zhang et al., 2011), improved energy efficiency (Häkkinen and Belloni, 2011; Oo and Lim, 2011), and governmental support (Lee, 2015). Other competitiveness related benefits include investors and customers’ preference for sustainable projects (Schrettle et al., 2014) and good corporate image (Oo and Lim, 2011).

2. Negative influences of sustainability on competitiveness. Promoting sustainability could have negative impacts on construction firms’ competitiveness. A prominent issue is the high upfront investment derived from the adoption of new design, material and technology with high sustainability performance (Häkkinen and Belloni, 2011; Heffernan et al., 2015), and sustainable construction practices (e.g. Serpell et al., 2013). Other related issues are high technical risk (Häkkinen and Belloni, 2011), incremental time to complete the project (Shi et al., 2013), additional responsibility for project maintenance (Shi et al., 2013) and lack of green manufacturers and suppliers (Häkkinen and Belloni, 2011).

3. Positive influences of competitiveness on sustainability. Focusing on competitiveness could motivate construction firms to improve their sustainability performance. To sustain development in the increasingly competitive construction market, construction firms may
choose the differentiation strategy and focus on sustainability technologies (Schrettle et al., 2014). To keep competitive and sustain good corporate image, construction firms need to consider the needs of various stakeholders such as the public and NGOs (Zhao et al., 2012). Rising energy and resource cost presents incentives for construction firms to improve environmental sustainability (Lee, 2015). The existence of these mechanisms implies that focusing on competitiveness could motivate construction firms to promote sustainability.

4. Negative influences of competitiveness on sustainability. Purely focusing on economic competitiveness could also lead to various sustainability issues. The clients’ low preference for sustainable projects is a key issue. In some construction industries, market demand from clients homogeneously focuses on low price, and clients generally don’t require sustainability since they have no information about the possibilities of sustainability, which make construction activities geared to price competition rather than sustainability improvement (Faber and Hoppe, 2013; Häkkinen and Belloni, 2011). Focusing on short-term competitiveness, construction firms are not willing to bear extra upfront costs (Häkkinen and Belloni, 2011). Other mechanisms such as low support of sustainable projects from financial actors, the culture of conservatism and incremental innovation driven by short-term cost reduction also impede the adoption of sustainable practices (Faber and Hoppe, 2013).

Results from adopting sustainability practices vary from one firm to another (Forsman et al., 2013). This uncertainty is reflected by the comparative strengths of the positive and negative influences. For instance, in one construction firm the practices of sustainable construction may generate a much lower energy and material cost, which offsets the investment on implementing this practice. In this case the strength of positive influences is stronger than negative influences, and thus overall sustainable construction practices help to enhance competitiveness in this firm. By contrast, in another firm the implementation of unfamiliar sustainable technologies may induce high risks, which offset the benefits of implementing these technologies. In this case sustainability weakens competitiveness of the firm. Thus, the comparative strength of the positive and negative forces varies, leading to uncertain relationships between sustainability and competitiveness.

People’s experience of the world is grounded in metaphor which is an important tool for theory building (Llewelyn, 2003). For instance, Broman and Robért (2015) has employed a funnel metaphor to explain and build their framework for strategic sustainable development. Similarly, a particle metaphor could be used to explain sustainability and competitiveness in this framework. In physics, if attractive force between two particles is stronger than the repulsive force, the two particles will be attracted to each other, and vice versa. Imagine sustainability and competitiveness are two particles, and the positive influences between them are the attractive force, and the negative influences are the repulsive force. If the attractive force between sustainability and competitiveness is stronger than the repulsive force, like physical particles, sustainability and competitiveness will be dragged towards each other and have the possibility to form “sustainable competitiveness”. The merging process of sustainability and competitiveness is the transition process towards “sustainable competitiveness”.

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Three-phase transition process towards “sustainable competitiveness”

Firms are in dynamic business environments and can be influenced by various actors. The interactions between firms’ strategic responses and the environments could drive the transition of firms towards sustainability. The proposed framework integrates (1) the interactions between sustainability and competitiveness of construction firms, (2) the evolution of firms’ strategic responses to environments, and (3) the evolution of economic and social-political environments, to propose a three-phase conceptualization of the transition process towards sustainable competitiveness, i.e. repulsive phase, attractive phase, and integration phase (see Figure 2).

<Insert Figure 2 here>

Repulsive phase

Existing social-technical systems are stabilised through various lock-in mechanisms (Arthur, 1989). Typical lock-in mechanisms include: technical standards or government policies may favour existing technologies; the business network of corporations are difficult to change; engineering practice, consumer preference, ways of doing business are all deeply embedded in existing institutions or infrastructures, etc (Geels, 2014; Markard et al., 2012). The existence of these mechanisms determines firms-in-industries and their economic and social-political environments have a certain level of stability. This stability presents a huge challenge to dealing with sustainability issues. For instance, both industrial economies and rapidly industrializing countries are becoming locked into fossil fuel-based technological systems (Unruh and Carrillo-Hermosilla, 2006).

Activists and affected groups in the socio-political environment may articulate concerns about sustainability issues for the industry to respond. However, firms tend to ignore these concerns and resist any changes required at the beginning because of these lock-in mechanisms. The phase models of corporate strategic responses to sustainability issues indicate that resistance is the initial stage, even though different labels are used in different models, i.e. “non-compliance strategy” proposed by Ghorbadian et al. (1998), “resistant” proposed by Klewitz and Hansen (2014), and “reactive response” proposed by Winsemius and Guntram (1992). Rivoli and Waddock (2011) emphasized the difficulty of facilitating a change towards sustainability in industries, stating that firms can easily ignore sustainability issues discovered or raised by a small number of people who are without power.

Because industries resist taking measures to respond to the issues, activists and affected groups may coalesce into a social movement to attract the attention of the public and evoke public concerns, which further leads to policy makers’ increasing attention and political debate about the sustainability issues (Penna and Geels, 2012). However, it is still difficult to enable changes in industries to respond to the issues. Due to lack of public awareness, firms could argue that the issues are temporary and minor, and the measures to solve the issues are infeasible and costly (Geels, 2014). This is compounded by a certain level of dependence of the local economy on industry actors (Luger, 2005).
Such debates are mainly in the socio-political environment and the preference of most clients is not changed during this phase. Thus, firms could maintain competitiveness by adopting traditional strategies not addressing sustainability issues. At this phase the repulsive force is much stronger than attractive force, separating sustainability and competitiveness. For instance, since clients do not have a clear preference for sustainable projects, firms could maintain competitive by focusing on minimizing costs, regardless of the social and environmental consequences. If firms adopt sustainability innovations at this phase, the additional costs and risks generated by these innovations could impede their competitiveness, and thus firms have little motivation to be sustainable. This corresponds to existing empirical studies. For instance, the repulsive force is much stronger than the attractive force for the adoption of sustainable construction in China, and thus construction firms are reluctant to adopt these technologies. Shi et al. (2013)’s study found additional costs, incremental time, and limited green suppliers and information were most critical barriers for green construction in China. This is echoed by Qi et al. (2010), which found project stakeholder pressure had no effect on the adoption of green innovations. They further argued that in China, clients are more concerned about immediate economic outcomes than long-term benefits from improving environmental performance. According to these studies, due to the stable economic environment, there are substantial repulsive forces (e.g. high cost) to actively implement sustainability practices despite governmental policies to promote sustainability.

**Attractive phase**

At this phase, sustainability issues become increasingly important and receiving growing public attention. Thus, a niche market of sustainable products emerges that slightly change the mainstream economic environment, facilitating the local search for solutions to sustainability issues. Policymakers engage in hearings and investigations and introduce legislation to address the sustainability issues (Penna and Geels, 2012). If tough polices are introduced e.g. tax instruments or financial incentives, the economic environment could be further altered favouring sustainable firms. Generally, economic environment has greater influence on corporate strategy than the socio-political environment because firms will rarely change themselves merely to solve societal challenges. Similarly, when public debates and tough policies lead to changes in consumer preferences, sustainability may become part of firms’ core beliefs (Penna and Geels, 2012). However, public opinion in the social-political environment should not be overlooked as it exerts pressures on policymakers, influencing the cultural legitimacy of industries and the feasibility of policy reform (Turnheim and Geels, 2012).

Under growing pressures from both the socio-political environment and the economic environment, firms start to actively engage in sustainability improvements. At this phase the attractive force becomes increasingly stronger. At a certain point it surpasses the repulsive force, which gradually lead to the merging of sustainability and competitiveness. Rivoli and Waddock (2011) stated that as the new norms become accepted practices, industry-wide capabilities will lower the costs of the associated practices. Implementing sustainable construction may generate risks and additional responsibilities for maintenance, which are negative influences. However, if incentives are in place, firms could implement these
sustainability practices since overall their competitiveness is enhanced. Häkkinen and Belloni (2011) assessed the barriers to sustainable buildings (Moretti et al.) in Finland, which found surprisingly cost related issues are not considered as significant barriers to SB and clients have a realistic understanding of the cost. Actually in their study almost all barriers related to decreased economic competitiveness by implementing SB are rejected by a majority of respondents in their study. This contrasts with similar studies in China (e.g. Qi et al., 2010; Shi et al., 2013).

There are empirical evidences for the critical role of the economic and social-political environments in the dynamics between sustainability and competitiveness. According to Heffernan et al. (2015), legislative and economic drivers are much more significant than drivers within the industry for zero carbon homes in the UK. In particular, enhancing public awareness and occupant education is identified as the strongest supporting mechanism for zero carbon homes. This shows firms alone are hard to actively embrace sustainability. Rather, it is the interactions between firms and the socio-political and economic environments that drive sustainability transition (Serpell et al., 2013).

Integration phase

In the integration phase, sustainability is addressed by most firms in the industry, and thus the industry is fundamentally transformed. At this phase the attractive force is much stronger than the repulsive force. Sustainability and competitiveness are quickly merging and eventually become integrated into one concept “sustainable competitiveness”. Under new economic and socio-political environments, promoting sustainability becomes the mainstream practice and in order to maintain competitiveness, firms have to become sustainable to be selected by the economic and socio-political environments. Peng and Kerry (2013) argued that with the implementation of new policies, all firms will eventually be required to achieve a certain level of sustainability. At this phase, firms integrate sustainability with competitiveness and they have various features which separate them with firms in the repulsive phase e.g. business models rooted in sustainability, proactive solutions to sustainability issues, and strong interactions with external actors (Klewitz and Hansen, 2014). To respond to the sustainability challenge and meet customers’ needs, firms optimize their functioning and integrate sustainability into business strategy to achieve economic, social and environmental values (Ghobadian et al., 1998; Winsemius and Guntram, 1992).

However, it presents a significant challenge to transition from the attractive phase to the integration phase. It calls for a paradigm shift where sustainability needs to be integrated into firms’ core beliefs and missions. Firms’ business models may also need to be fundamentally transformed in order to effectively address sustainability issues. Compared to technology and policy, core beliefs, missions and business models are fundamental regime elements that are more difficult to change (Turnheim and Geels, 2012). To facilitate the change of core beliefs and missions in the industry, a certain level of pressure from the economic and socio-political environments is required. Sources of such pressure include: (1) Public attentions of the sustainability issues increase dramatically and the mainstream market preference has changed favouring sustainable alternatives in the industry. (2) The government has issued strong incentive policies substantially changing regulations, subsidies and taxes, to encourage firms
to conduct sustainability innovations and consumers to purchase the new products. (3) The technological risk of the sustainable alternative is gradually reduced and the associated cost drops, making it a better choice for consumers than the traditional unsustainable products. Under the current economic and social-political environments, the construction industry of most countries is not yet in the integration phase.

The transition process illustrated by Figure 2 demonstrates the ideal situation of sustainability and competitiveness under dynamic economic and socio-political environments. In reality it is possible that the pressures generated by the environments are not strong enough to facilitate the transition process and thus the industry is stuck in the repulsive phase. Table 2 shows the panoramic view of the key dynamics illustrated by the proposed SCDIF.

<Insert Table 2 here>

Conclusions

Sustainability and competitiveness within the construction industry have been extensively studied. However, the linkage and interactions between sustainability and competitiveness of construction firms are largely overlooked. A Sustainability-Competitiveness Dynamic Interaction Framework (SCDIF) is proposed in this study to illustrate the dynamic interactions between these two issues from a transition perspective.

With a solid theoretical underpinning, the proposed framework systematically illustrates the dynamic interactions between corporate sustainability and competitiveness and the factors influencing their interactions. A metaphor of attractive and repulsive forces is proposed to denote the positive and negative influences between sustainability and competitiveness. From a transition perspective, the ideal transition journey of a firm towards sustainable competitiveness consists of three major phases, namely 1) repulsive phase, in which stronger repulsive force leads to the isolation of sustainability and competitiveness, 2) attractive phase, in which stronger attractive force leads to the merging of sustainability and competitiveness, and 3) integration phase, in which increasingly stronger attractive force leads to the integration of sustainability and competitiveness and eventually the formation of sustainable competitiveness. Under dynamic economic and socio-political environments, firms could embark on the transition journey towards sustainable competitiveness.

Even though the SCDIF is proposed for the construction industry, it has significant implications for furthering the understanding of sustainability and competitiveness in other sectors. Existing studies were predominantly based on theoretical analysis, case studies and econometric analysis to explore the relationships between sustainability and competitiveness in various sectors. These studies have suggested that sustainability could have either positive or negative impacts on competitiveness. However, few studies systematically studied the underlying mechanisms explaining the uncertain relationships between sustainability and competitiveness. From the dynamic transition perspective, the proposed framework in this paper demonstrates that the interactions between sustainability and competitiveness evolves
according to the evolving economic and socio-political environments and firms’ strategies, and thus the relationships and interactions between sustainability and competitiveness are context dependent. Compared to existing approaches, the dynamic and holistic approach proposed in this paper capture the complexity of sustainability and competitiveness, providing an innovative perspective to understand sustainability and competitiveness not only in the construction industry, but also in other industries.

The framework can be applied by researchers to examine sustainability and competitiveness of firms in various countries. It can also be used by corporate managers to understand how corporate sustainability and competitiveness interact with each other, thereby informing their decision-making of sustainability strategy. Similarly, the framework provides useful references for policy makers to understand the mechanisms of transitioning industries towards sustainable competitiveness.

Limitations and recommendations for future research

This study develops the Sustainability-Competitiveness Dynamic Interaction Framework (SCDIF) following the methodology of conceptual theory building. Such an approach enables researchers to express new conceptual perspectives on theory to better explain the investigated relationships. However, this approach is not able to produce precise quantification of the relationships since no empirical data is used. Therefore, future researches could gather empirical data and employ quantitative models, e.g. statistical models, structural equation modelling and system dynamics, to provide deeper insights into the interactions between sustainability and competitiveness. For instance, this paper has revealed that sustainability and competitiveness have various positive and negative influences on each other. Future studies could build on this conceptualization to develop an indicator system of the positive and negative influences. Consequently, a questionnaire survey could be conducted to investigate how various indicators are perceived by construction enterprises with different sizes and sustainability levels.

Similarly, this paper mainly builds on the Triple Embeddedness Framework (TEF) in the field of sustainability transitions to propose the SCDIF. Therefore, this study inevitably shares the same ontology (i.e. “foundational assumptions about the nature of the world and its causal relationships”) with the TEF (Geels, 2010). Similar to the TEF, by viewing firms as selected by and influencing the economic and social-political environments, the proposed SCDIF implicitly adopts an evolutionary perspective to view the construction industry. The evolutionary perspective dominates in the sustainability transition literature. However, there are other perspectives to view sustainability transitions, such as the relationism and conflict theories. Future research opportunities exist to explore how the interactions between sustainability and competitiveness could be explained by other ontologies. Such an endeavour could further enrich the understandings of sustainability and competitiveness.

Last but not least, building on the TEF, the proposed SCDIF is inherently constrained by the analytical level of the TEF. Similar to other conceptual frameworks, the TEF is inevitably a simplification of the reality and could not cover all the various nuances involved in sustainability transitions. The TEF and the proposed SCDIF are frameworks mainly situated at the level of organisational field (i.e. firms and the actors influencing firms), without

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addressing what goes on inside the mind of corporate decision makers. Other theories and approaches e.g. psychological and biological approaches to cognition, could be explored by future studies to address this limitation. Similarly, by focusing on industry and firms, the SCDIF may be limited in explaining the interactions between sustainability and competitiveness of other domains, e.g. regions and countries. Future studies could explore whether the proposed SCDIF could be adapted (e.g. combined with Porter’s diamond model) to study sustainability and competitiveness issues of regions and countries.

References


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Table 1. Typical studies exploring the interrelationships between sustainability and competitiveness

<table>
<thead>
<tr>
<th>Authors</th>
<th>Interrelationships between sustainability and competitiveness of firms</th>
<th>Research approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wagner and Schaltegger (2003)</td>
<td>• Improved sustainable performance is a potential source of competitive advantage, but these benefits will be decreasing after the peak point due to the increasing investment on sustainable activities.</td>
<td>Theoretical analysis</td>
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<tr>
<td>Lee (2003)</td>
<td>• In terms of sustainability strategy, companies can be divided into four categories, namely proactive catalyst, environmentally sensitive, defensive compliance and lagging. Generally proactive catalyst and environmentally sensitive corporations believe sustainability could contribute to competitiveness, while defensive compliance and lagging corporations believe there are no potential benefits of sustainability.</td>
<td>Case study</td>
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<tr>
<td>Fergusson and Langford (2006)</td>
<td>• The growth in the construction organization’s environmental competence provides the opportunity for increased competitiveness.</td>
<td>Case study</td>
</tr>
<tr>
<td>Horváthová (2010)</td>
<td>• Theoretical and empirical research on the impact of environmental performance on economic performance of firms suggests that the interrelationship between sustainability and competitiveness is inconclusive.</td>
<td>Econometric analysis</td>
</tr>
<tr>
<td>Clarkson et al. (2011)</td>
<td>• Positive association between environmental and economic performance is robust. However, only the firms with sufficient financial resources could pursue the proactive environmental strategy to achieve economic competitiveness.</td>
<td>Econometric analysis</td>
</tr>
<tr>
<td>Sekerka and Stimmel (2011)</td>
<td>• The motivation for sustainability may not be as strong as hoped for when sustainability meets the tough economic times. During economic recession, firms should adopt a blended perspective combining the shareholder and stakeholder interests to create sustainable products.</td>
<td>Theoretical analysis</td>
</tr>
<tr>
<td>Peng and Kerry (2013)</td>
<td>• Even though adopting sustainability strategies may lead to cost increase and potentially be a disadvantage to a firm’s competitiveness, with the improvement of industry standards and the implementation of new policies, all firms will eventually be required to achieve a certain standard. And thus non-compliance will negatively impact firms and sustainability can be beneficial for the company’s long-term competitiveness.</td>
<td>Theoretical analysis</td>
</tr>
<tr>
<td>Forsman et al. (2013)</td>
<td>• Examined the influences of eco-innovation on corporate competitiveness based on the ten-year longitudinal data of ten case firms. During the ten-year period, five firms of them created superior competitiveness while the other five firms lost their competitiveness. The successful eco-innovators have achieved competitiveness by developing heterogeneous innovations which are difficult to imitate while the unsuccessful innovators have developed homogeneously eco-innovations that have created only temporary competitiveness for the innovators.</td>
<td>Case study</td>
</tr>
<tr>
<td>Tan et al. (2015)</td>
<td>• Examined the relationship between sustainability performance and business competitiveness of leading international contractors. The findings show that an inverse U-shape curve exists between sustainability performance and international revenue, and a U-shape curve exists between sustainability performance and international revenue growth.</td>
<td>Econometric analysis</td>
</tr>
<tr>
<td>Phases</td>
<td>External selection pressures from business environments</td>
<td>Firms’ strategic responses, competitiveness and sustainability</td>
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<td>----------------</td>
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<td></td>
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<td>Strategic responses</td>
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<td></td>
<td>The preference of most clients is not changed and thus no specific pressures in the economic environment.</td>
<td>Since the sustainability issues are new and people’s understanding about the issues is inadequate, firms tend to deny the issues raised by a small number of people who are without power, or argue that the issues are temporary and minor.</td>
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<td>Repulsive</td>
<td>Activists and affected groups articulate concerns about the sustainability issues, and may coalesce into a social movement to evoke public concerns, which further leads to policy makers’ increasing attention.</td>
<td>Since the preference of most clients is not changed at this phase, firms could still maintain competitiveness by adopting their traditional strategies even though they do not address the sustainability issues.</td>
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<td>Attractive</td>
<td>Sustainability issues become increasingly important and receiving growing attention from the public. Policymakers engage in hearings and investigations and introduce legislation to address the sustainability problem.</td>
<td>If firms adopt sustainability practices at this phase, the additional costs and risks generated by these practices could actually impede their competitiveness, and thus firms have little motivation to be sustainable.</td>
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<td>Integration</td>
<td>Public attentions of the sustainability issues increase dramatically and the government has issued strong incentive policies substantially changing regulations, subsidies and taxes, to encourage firms to conduct sustainability innovations and consumers to purchase the new products.</td>
<td>Repulsive force is much stronger than attractive force, separating sustainability and competitiveness. Sustainability and competitiveness tend to be incompatible.</td>
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<td></td>
<td>The mainstream market preference has changed favouring sustainable alternatives in the industry, and the technological risk of the sustainable alternative is gradually eliminated and the associated cost drops, making it a better choice for consumers than the traditional products.</td>
<td>Influenced by the public’s growing attention, a niche market of sustainable projects appears that change the mainstream economic environment, encouraging firms to promote sustainability.</td>
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<td></td>
<td>Firms start to actively engage in sustainability improvements, but the engagement is slow because it takes time that sustainable alternatives become mature and the cost drops.</td>
<td>Firms integrate sustainability with competitiveness and they have various features e.g. business models rooted in sustainability, proactive solutions to sustainability issues, and strong interactions with external actors.</td>
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<td>Obtaining competitiveness based on the unsustainable way of construction is increasingly challenged by the sustainable alternatives.</td>
<td>In order to be competitive in the industry, firms have to become sustainable simultaneously; otherwise they will not be selected by the economic and socio-political environments.</td>
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<td>Since a niche market for sustainable projects appear and government policies are issued providing economic incentives, firms start to implement sustainability practices.</td>
<td>Firms embrace sustainability totally since clients prefer sustainable projects and they need to survive in the market competition.</td>
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<td>The attractive force becomes increasingly stronger, and at a certain point it surpasses the repulsive force, which gradually lead to the merging of sustainability and competitiveness.</td>
<td>The attractive force is much stronger than the repulsive force, and thus sustainability and competitiveness are quickly merging and eventually become integrated into one concept “sustainable competitiveness”.</td>
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</tbody>
</table>
Figure 1. Sustainability-Competitiveness Dynamic Interaction Framework
Under new economic and socio-political environments, sustainability becomes the prerequisite of true competitiveness, which is "sustainable competitiveness".

Influences from economic and socio-political environments amplify the attractive force and weaken the repulsive force. Sustainability and competitiveness are merging.

Stronger repulsive force leads to the incompatibility of sustainability and competitiveness.

**Sustainability-competitiveness interactions**

S: sustainability  
C: competitiveness  
SC: sustainable competitiveness

Both socio-political environment and economic environment generate high pressures. Firms have to implement sustainability practices if they want to survive.

Socio-political environment generates moderate pressures which are conveyed to economic environment. Firms start to embrace sustainability.

Socio-political environment generates weak pressures which are not conveyed to economic environment. Firms ignore sustainability.

**Economic environment**  
**Socio-political environment**

**Figure 2.** Transition process enabling the formation of "sustainable competitiveness"