Understanding Responsible Consumption and Production under Uncertainty

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Abstract. Responsible consumption and production is getting greatly attention in several research fields. Although it stays in the infancy stage, more and more studies try to explore the precise definition and framework to enhance the understanding of it. This study attempts to offer the definition and framework through integrating the concept of triple bottom line and corporate sustainability. Consequently, utilizing the fuzzy interpretive structural modeling develops a specific guideline to assist Chinese construction firms in launching responsible consumption and production toward sustainability. The conceptual framework and comprehensive literature review are addressed in the following content.

Keywords: Responsible consumption and production; Triple bottom line; Corporate sustainability; Fuzzy interpretive structural modeling

1. INTRODUCTION

Chinese construction industry is striving to develop sustainability for complying with international standards and government regulations. However, there are several barriers exit in the current market, such as rapid decline in the industry growth, labor cost increasing, intensive competition, contractor payment delay, highly risk during the constructing period and strict government regulations…etc. These barriers impede the firms to pursue the sustainability, especially, they have to pay the additional cost in launching the sustainable development and concerning the public expectations simultaneously (Tan et al, 2015). In addition, Chinese construction industry possess the features of high resources consumption and low value added, which generate the conflict between the industry and public expectations (Lai et al, 2016). Although construction firms realize and pay lots attention in this issue, they still suffer the difficulty to fine an appropriate method to solve it. Thus, this study proposes the concept of responsible consumption and production (RCP) to assist firms in considering triple bottom line and corporate sustainability simultaneously. It enables to play an important guideline in leading firms to deal with the depletion of natural resources, compliance with public expectations, reduction of environmental impacts and promoting the long-term competitive advantages (Govindan et al. 2013; Tomšič, 2015; Wu et al ,2016).

Recently, Chinese government declared the “Thirteen Five Project” to encourage firms to launch sustainable development, explore renewable energy, reduce environmental impacts, concern the social responsibility and so on. These demonstrate the essential need of RCP, which enable to guide firms in developing sustainability with considering the comprehensive considerations. Hence, this study attempts to enhance the understanding from integration of triple bottom line and corporate sustainability. For the concept of triple bottle line, Cater and Rogers (2008) introduced to integration of environmental, social and economic considerations that allow

firms to achieve long-term economic viability for developing the sustainability. Moreover, Tseng (2016) presented the idea of corporate sustainability as to meet the needs of the present without trading off the ability of future generations to address their own needs. Thus, the proposed definition of RCP is extended by these two studies as "to meet customer needs and expectations, and launch the implications for production and development under economic, environmental and social consideration without generates any risk to threat the future generation toward sustainability."

Although previous studies tried to enhance the understanding of RCP based on the triple bottom line and corporate sustainability individually (Nikolaou et al., 2013; Dočekalová, 2016; Maas et al., 2016), it still lacks a precise framework to illustrate it significantly. Wu et al. (2016) pointed out that triple bottom line contains with diversity aspects and needs a comprehensive consideration. Garcia et al. (2016) argued that if firms merely take more concentration on cooperate sustainability, it might generate the complexity in management, particularly in tackling the tradeoffs amongst several goals with financial and non-financial decision-makings, the impacts of environment and society, as well as the conflicts between the common interests of stakeholders. Therein, the linkage among triple bottle line, corporate sustainability and RCP stay in the infancy stage and the critical aspects are still undiscovered. To overcome these gaps, this study adopts fuzzy interpretive structural modeling (FISM) to explore the significant framework upon the integration of triple bottom line and corporate sustainability. FISM not only possesses the functions in transferring experts' linguistic preferences into quantitative measurements as well as reduce the items of questionnaire, but also group the criteria into different levels, which represent the critical aspects of RCP.

Therefore, the objectives of this study contain with (1) enhancing the understanding and contributing the development of theory; (2) constructing a framework for precisely guiding firms in launching RCP toward sustainability; (3) proposing a modified FISM method for reducing the questionnaire items that enables to increase the consistency of experts' judgements. These contributions are able to lead Chinese construction industry generate the long-term competitiveness and build up the well reputations to conquer the current barriers. The following section is literature review, which includes the theories background, proposed method in dealing with previous issues and proposed measures. The detail method of FISM and the measurement procedures are stated in the section 3. Case information and empirical results express in the section 4. Section 5 presents the theoretical and managerial implications, which based on the measured framework. Final section discusses the contributions, conclusion, research limitations and promising future studies.

2. LITERATURE REVIEW

2.1 RCP

RCP is a relatively widely significant concept that not only for creating long-term value by making an eco-strategy aimed toward the natural environmental and taking into consideration each dimension of how a business operates in the social, cultural, and economic environment, but also as a conceptual framework for designing companies' strategies that addresses the standard issues of profitability and stakeholder concerns and support more sustainable action through transparency and embrace opportunities (Orth et al.,2013;Joyce et al.,2015; Tseng, 2016). RCP is considered to be an activity when the enterprise pursues sustainability equilibrium, containing TBL dimensions as well as their inter-relationships in the internal and the entire time dimension while solving the enterprise's system and its stakeholders (Lozano, 2012; Tomšič et al., 2015). In addition, RCP as a strategy, it demands the firms monitor their RCP compliance, improve their performance and assist the investors to comprehend the relation between the corporate financial performance and the RCP indicatives (Nobanee et al., 2016). D'Amato et al (2015) stated that RCP disclosure is especially relation to resource-based industries. RCP is defined as the set of skills and leverages that enable a firm to organize its business processes to achieve RCP performance (Gimenez et al., 2012).

However, lots of studies researched RCP only from a single angle of TBL aspects or corporate sustainability. The disadvantage is that there is no real understanding of RCP (Wu et al., 2016). Managers have realized the importance of the enterprise to the sustainable transformation and the realization of RCP, however, the implementation of the specific actions in terms of technology and other aspects also has a certain challenge (Engert et al. 2016). From the TBL perspective, construction of low carbon city is not the lack of corresponding technology, such as the green technology, planning scheme, economic instrument and social development strategy, in fact these techniques have in the cities and communities around the world, but the result is lower than expected, so just consider the environmental, economic and social aspects are insufficient (Cam, 2013). RCP is a criterial concept throughout the entire value chain in corporate management, and it not only contains environmental, social and economic pillars, but also includes corporate governance (Dočekalová et al., 2016).

2.2 Triple Bottom Line

Triple bottom line (TBL) was proposed as a strateg y towards sustainable development. Many studies have e xplored the performance of TBL, and the definition of T BL is given from different angles, not only among busin

esses, but also in other fields, such as agencies, consulta ncies, accounting professions and even NGOS(non-govern ment organizations) (Elkington, 1997; Rambaud et al., 20 15). Lozano (2008) and Gimenez et al (2012) stated that the TBL advices the companies not only focus on socia l and environmental responsible behavior, but also positiv e economic gains should be included in the process. Ber genwall et al (2012) and Cam (2013) elaborated that TB L means people-planet-profit, and is generally considered as society-environment-economy, as three fields of sustai nable development. In 2007 the United Nations approved it and companies and organizations applied it as criteria, such as the public sector assess and report their achiev ements and complete cost accounting. Joyce et al (2015) illuminated that TBL is a relatively widely understood p erspective for considering a company's economic, environ mental, and social and as a conceptual framework for de signing business strategies to support more sustainable ac tivities.

RCP performance is long-term performance steeped i n three aspects: the social aspect that includes taking car e of people's welfare, the environmental aspect that hand le the planet's ecosystems, and the economic aspect cond ucted to reduce costs and promote benefits (Sénéchal, 20 16).A few years ago the inclusion of environmental and social problems in finical decision-makings fell into noto rious, which caused RCP for companies' strategy (Infante et al., 2013). From the input and output of the environ ment expansion can be seen, the resource consumption h ave been analyzed from a holistic perspective. The meth od of input-output can also be used to quantify the RCP performance by quantifying the three pillars of TBL, bu t there is not enough researches considering all of the th ree pillars of the RCP simultaneously (Kucukvar et al., 2014). Previous research had the obvious limitation that lack of dynamic and multi angle measurement methods of RCP, the RCP performance was measured by individu al indicators at single aspects which merely concentrate on the environmental aspect (Lee et al., 2012; Komoto e t al., 2005; Tasaki et al., 2006). Bautista (2016) stated that it was identified weakness in the concept of enough indicators to measure the performance of RCP.

Elkington (1998) developed a TBL approach trying t o raise the operationalization of sustainable development in a business setting. Kleindorfer et al. (2005) integrated profit, people and planet into corporate culture, strategy and operations in terms of TBL. Carter and Rogers (200 8) used TBL approach, and made firms in the society a nd the environment to maintain competitive advantages a nd benefits have a positive impact. Gimenez et al (2012) exploded the significance of multifarious environmental a nd social programmers which were internal (in the comp any) and external (amongst supply chain partners) accord ing to their influence on each aspect of TBL. Buys et a l. (2014) proposed the Bayesian network model to assess the sustainability scorecard and aimed to evaluate the en vironmental, social and economic performance. Ahi et al (2015) used a triple bottom line approach to assess susta inability and proposed a unique mathematical model. By concentrating on the criteria inserted in the TBL perspect ive the proposed model can be deemed as a comprehens ive, three aspects sustainability instrument to evaluate the effects of different environmental, economic, and social p roblems.

2.3 Corporate sustainability

Sustainability has gradually become a major focus o f a large number of enterprises and organizations since i t was first proposed by the United Nation's report in 19 87 (Brundtland, 1987; Lu et al., 2016). Corporate sustain ability means to achieve sustainable development, which is defined as "satisfy the demands of present without da maging the ability of future generations to satisfy their o wn demands" (WCED, 1987). Salzmann et al. (2005, p. 27) stated that CS is a strategical and profit-driven corp orate countermeasures to the environmental and social pr oblems encountered by enterprises in business activities. Corporate sustainability is specified that "the ability to d evelop business with a long-term objective of keeping th e advantage of the TBL perspective" (Hassini et al., 201 2). In addition, CS describes business practices that creat es long-term enterprise value by creating a ""green"" stra tegy aimed toward the natural environment cultural, and economic environment. It also formulates strategies to bu ild a company that fosters longevity through transparency and proper employee development.

The traditional enterprises predominantly go after a market logic that concentrates on generating profit. As a result, they are unable to solve the complexities of RCP development and the multifarious preferences of their sta keholders (Schneider, 2015). Companies have deemed sus tainability as a criterial factor to determine company suc cess, and integrate environmental, economic and social a spects and RCP into corporate strategies to pursue long t erm boom (Lu et al., 2016). Economic, environmental an d social performance of strategic integration, as well as t he continuous improvement of these three aspects, still a main concern for companies. The challenge is no longe r whether or not carry out the RCP, but how to achieve it (Figge et al., 2002; Epstein et al., 2015; Journeault, 2 016). Few of studies has solved the integrative "how" is sue, especially "how firms should and do integrate RCP assessment, management accounting, management control and reporting" (Maas et al., 2016). The course of globali zation suggests that a global network of civil society is

suffering tremendous changes and it increasingly add to pressure on multinational firms to improve their RCP performance (Vermeulen et al., 2016).

Searcy (2012) conducted a concise review of critical literature published from 2000 to 2010, thus identified future directions for study in the design, actualization, utilization, and evolution of corporate sustainability. Hahn et al (2014) referred the literature about managerial cognition, corporate sustainability, and strategic paradoxes, they presented a framework of cognitive perspective on corporate sustainability. They developed two cognitive frameworks—a business case framework and a paradoxical framework—to find the three stages how differences in cognitive structure and content of tacit which consist of scanning, interpretation and response. Ha-Brookshire (2015) stated that in the quest to establish really sustainable enterprises, they proposed the theory of moral responsibility for the sustainable development of enterprises. Garcia et al. (2016) developed a model that assists managers considering the TBL framework and the stakeholder preference. Multi-criteria decision making method is used to produce a balance sheet measures and performance indicators of sustainable development. From the perspective of sustainability, Baumgartner et al (2016) linked three different, complementary aspects of strategic management so as to encourage enterprises to solve the problems in the process of sustainable development. The three aspects are strategy process, strategy content and strategy context.

2.4 Proposed Methods

Tan et al (2015) took an empirical researches of the relation RCP performance and company competitiveness of international construction contractors. Fuisz-Kehrbach (2015) utilized qualitative and quantitative content analysis of sustainability reports, and developed a three-dimensional frame to research RCP performance in the mining industry. Avota et al (2015) analyzed academic literature and proposed conceptual framework which direct the effect of personal and organizational on RCP and construct standards in order to develop the employees' values and the enterprise's sustainable development goals according to the existing literature. Miraka and Carvalho (2016) reviewed 261 journals and proposed a conceptual framework which distinguish three levels for taking RCP performance into business. Lloret (2016) employed correlative commercial and sustainability papers to propose a business model for RCP, and this model can allow company to produce and seize value, thus break through social, economic and environmental constraints.

Govindan et al (2013) used a fuzzy multi criteria for measuring sustainability performance based on TBL approach. Special advices are formulated related to sustainability that can assist overcome issues and provide approval for managers during execution of sustainability management. Hahn et al (2015) developed an integration system frame for analyzing tensions in CS. The frame is according to the new comprehensive view on CS, which emphasized the need to integrate economic, environmental and social aspects simultaneously, a priori, stressing in any other. Engert et al (2016) conducted a qualitative analysis and the objective to answer the set research questions, create new insight about CS and exploring the success elements behind the actualization of CS strategy according to an in-depth analysis of one company. Schulz et al (2016) used a new method to evaluating environmental, social and economic influence on competitive advantage as an instrument, and presented a sustainable model framework to be utilized by industrial enterprises to form competitive advantage. Through the above research, almost all studies are only from one perspective to explore RCP, the linkage between TBL and corporate sustainability remains in its germination.

Increasingly better understanding of RCP, this study uses a multi criteria decision method (MCDM) which in academic and industrial fields is often utilized to deal with subjective person’s preferences. Because the personnel's background, knowledge domain, educational level and other factors are different, So people's choices and preferences are fuzzy and complex, and decision makers cannot estimate their choices with an exact scale, linguistic assessments can only be given rather than a precise assessment. Hence, fuzzy set theory is drawn into the presented MCDM method, which is proposed to address such uncertainty issues (Erol et al., 2011; Govindan et al, 2013). Interpretive structural modeling (ISM) is a technique which enables to transfer the complex problems or issues in to a multi-level structure model (Warfield, 1974). Especially, the structural model is a way to reduce the complexity in making decision. Before reaching the structural model, it requires experts’ judgments to assess the relationships for proposed factors.

2.5 Proposed Measures

This study explores RCP between TBL and corporate sustainability perspective, and TBL perspective involves economic aspects. Efficiency enhancement (C1) often particularly includes the ability of a specific application of effort to generate a specific consequence with a smallest amount or quantity of waste, cost, or needless effort (Gimenez et al., 2012). Ahi (2015) developed risk management (C2), which refers to the identification, evaluation, and priority of risks. Technology capability (C3) is that the firms to approve technology innovation, its intrinsic quality is the company has knowledge (Govindan et al., 2

013). Delivery reliability (C4) and supplier selection (C5) are criterial strategic and operational duties (Govindan et al., 2013; Sarkis et al., 2015). Reverse logistics (C6) is useful to prolong the lifetime of materials and products and thus cut down environmental loads from industrial operations (Lai et al., 2013). Quality improvement (C7) is a method to reduce and remove waste, rework and losses in the process of manufacture (Ahi, 2015). In addition, price strategy (C8) can be utilized to maintain new entrants to the existing market, and increase market share or enter a new market (Wu et al., 2016).

Examining the environmental aspect, recycling (C9) means to gather the used materials, and remove and remanufacture them into new products (Nikolaou et al., 2013). Waste reduction (C10) is a process of elimination that involves reducing the amount of waste in society and generating a more sustainable society that helps to eliminate harmful and lasting waste generation, and support efforts to promote a more sustainable society (Nikolaou et al., 2013). Eco-design (C11) is a way to design products that consider the environmental impact of the product throughout its life cycle (Govindan et al., 2013). Life-cycle assessment (C12) is an assessment technology of the environmental impacts associated with the product life stages, from the cradle to the grave (Govindan et al., 2013). Green certification development (C13) is that related product, service, or system meet the environmental protection, ecology, energy saving, low carbon or health standards conformity assessment activities (Ahi et al., 2015).

Shifting to considering social dimension, health and safety (C14) is that companies to make sure that employees to make full use of the workplace safety and health must be under management, in prophylaxis workplace safety and health management objective of the occurrence of disasters, staff casualties, in order to keep the physical and mental health of staffs (Nikolaou et al., 2013; Wu et al., 2016). Responsiveness (C15) is a responsibility of each person to be executed in order to keep the balance between the economy and the ecosystem (Wu et al., 2016; Morioka et al., 2016). Wu et al (2016) emphasized employee regulations (C16) refers to the responsibility of employees and workers is formulated by a system of laws, regulations, and compliance regulations. Bautista et al (2016) stated that working conditions (C17) is to exhibit the employee in the work of the equipment condition, working atmosphere, the total of the intensity of labor and working hours. Furthermore, employment contract (C18) a kind of contract utilized in labor law to divide rights and responsibilities between parties to a bargain (Infante et al., 2013).

Several scholars explored RCP from corporate sustainability perspective. Equal remuneration (C19) is an element affecting retention of skilled labor. Organizational remuneration inequality can cause damage of corporate image and legal disputes and discrimination (Dočekalová et al., 2016). For measuring a firm's products and services how to satisfy or exceed customer expectation, customer satisfaction (C20) is proposed (Dočekalová et al., 2016). The code of ethics (C21) which is measured by the amount of violation cases mirrors enterprise's values, all the employees are familiar with is very necessary (Dočekalová et al., 2016). In addition, human capital (C22) is located in many aspects, such as storage of knowledge, custom, social and personal attributes as well as creativity, embodied in the ability to perform labor, resulting in economic value so as to generate economic value (Tomšič et al., 2015). Organizational culture (C23) means the model of faiths, values and studied ways of dealing with experience that have developed in the process of an organization's history, and often reflected in its material arrangements and the behavior of its members (Formentini et al., 2016). For strengthening employee's' advice, and in turn improve the design of the program and initiative, establish transparent communication channels (C24) is very impotent (Formentini et al., 2016).

Furthermore, Nobanee and Ellili (2016) stated that companies should compliance with environmental regulations (C25). Organizational structure (C26) is defined as in order to accomplish the organization goal, how to carry on the task allocation, cooperation and supervision (Engert et al., 2016). Engert et al (2016) emphasized that sometimes organizations aim to manage, command, order, control more convenient, will adopt the control system (C27). Besides, manager attitude and behavior (C28) and employee motivation and qualifications (C29) play a vital role in the formation implementation of sustainable strategy for company (Engert et al., 2016). Stakeholder engagement (C30) refers to lot of different elements with respect to various stakeholder groups that committee to value creation and strategic process development (Antolin-Lopez et al., 2016; Tseng, 2016). Sustainable Leadership (C31) is the relationship between the building and the community, the collaboration between stakeholders, and the objective of it to promote long-term sustainable values (Tomšič et al., 2015; Lloret, 2016). Lloret (2016) stated that corporate governance (C32) dominates the internal and external activities of managers, staff, and various business stakeholders. Tseng (2016) illumined employee talent development (C33) plays an important role in approving global, hence, companies need to introduce policies to retain talent, and to find the difficulty of the timely talented employees mobilization. Eco-innovation (C34) gives a result that can reduce environmental risk, pollution and other negative effects of resources utilize compared to relevant alternatives (Ying Dong et al., 2014). In addition, Tseng (2016) proposed that enterprises attach great impor

tance to investor relations (C35) and corporate reputation (C36) in the process of management. The proposed evaluation aspects and criteria can be seen in Table 1.

Table 1: Proposed evaluation aspects and criteria.

Aspect	Criteria	
Economic	C1	Efficiency enhancement
	C2	Risk management
	C3	Technology capability
	C4	Delivery reliability
	C5	Supplier selection
	C6	Reverse logistics
	C7	Quality improvement
	C8	Price strategy
Environment	C9	Recycling
	C10	Waste reduction
	C11	Eco-design
	C12	Life-cycle assessment
	C13	Green certification development
Social	C14	Health and safety
	C15	Responsiveness
	C16	Employee regulations
	C17	Working conditions
	C18	Employment contract
Corporate sustainability	C19	Equal remuneration
	C20	Customer satisfaction
	C21	The code of ethics
	C22	Human capital
	C23	Organizational culture
	C24	Establishing transparent communication channels
	C25	Compliance with environmental regulations
	C26	Organizational structure
	C27	Control system
	C28	Manager attitude and behavior
	C29	Employee motivation and qualifications
	C30	Stakeholder engagement
	C31	Sustainable leadership
	C32	Corporate governance
	C33	Employee talent development
	C34	Eco-innovation
	C35	Investor relations
	C36	Corporate reputation

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