A QUANTUM APPROACH TO UNDERSTAND CONSTRAINTS ON THE WAY OF PLANNED ORGANIZATIONAL CHANGE UNDER THE RESOURCE-BASED PARADIGM

Abstract

How do planned organizational changes unfold and result in temporary outcomes that usually diverge from the original plans in uncertain environments? Literature does not fully answer this question in a future-oriented manner. Integrating the quantum approach introduced by Lord, Dinh, and Hoffman (2015) and the resource-based paradigm, this paper develops a theoretical approach to improve understanding the dynamic mechanism that underlies a change process and help judging the timing issue for a change goal in an ex ante manner. We argue that the organizational change process is quantum deterministic and can be illuminated by examining constraints and available resources. The constraint with its properties is the basic unit of analysis. Regarding the change process as a process of developing resources needed for the change, the system constraints impact on this resource development process through their properties. At a point of time, the probability of realizing a change goal can be learnt from the probability of being restricted by the system constraints on the way of acquiring relevant resources. The theory is then illustrated with a real case that is a market-oriented reform based on action research in a state-owned theme park in China.

Man proposes but God disposes (Thomas a Kempis).[1]

Planned organizational change (POC), or termed as strategic organizational change, is important for firms' survival and development in a rapidly changing business environment open to global competition (Lewis, 1999; Teece, 2007). Different from an organizational change (OC) that spontaneously happens, POC refers to seeking to "shift an organization from an initial state to a different end state in order to achieve one or more objectives" (Hempel & Martinsons, 2009: 461). Examples of POC can be launching new strategic deployment for international expansion, enhancing communication between functional areas such as marketing and sales of the firm, and so on. Extant literature on the change process is either prescriptive on sequential actions of implementation, taking Lewin's 3-Step as an instance (Burnes, 2004; Van de Ven & Poole, 2005), or analytical on key variables and their relationships (Robertson, Roberts, & Porras, 1993; Robertson & Seneviratne, 1995).

However, a common phenomenon that organizations diverge from their initially POC remains as a mystery. How does the POC unfold with unexpectedness? Answers from the school of sequential change steps is limited because of its context-based nature, and research on the process factors hardly explains all relevant factors in change (Hempel & Martinsons, 2009). The quantum approach to change introduced by Lord, Dinh, and Hoffman (2015), as an alternative perspective to understand POC, breaks through the above limitations of previous process theories.[2] Using the quantum theory in an analogical manner, it holds that the present is a result that collapses from multiple future potentialities based on dynamics of system constraints.

The purpose of this paper is to extend the quantum approach to change and explore how

the temporary outcome, usually unlike the expected, is projected onto by experiencing constraints of the organizational system.[3] In specific, we develop a theory surrounding the concept of *constraint*, and the analysis starts with the constraint's properties. The theory provides a future-oriented approach that enables an estimation of the temporary probability of resource availability needed in the implementation for realizing POC shaped by the constraints' impacts. The paper starts with the theory's goal, assumptions, basic premises, and framework, provides definitions to its analysis units—the constraint and its properties, and gives predictions of the POC probability at a point of time. It is then illustrated with a real case of reforming a theme park in China.

THE GOAL, ASSUMPTIONS, PREMISES, AND FRAMEWORK OF THE THEORY

A central goal of a leader is to realize the POC. Nevertheless, for the decision maker who is embedded in a dynamic multi-level organizational system that is to some extent open to the general society, he or she is usually confronted with uncertainty when initiating the strategic change for the organizational development. It is challenging for any decision maker who has a strong aspiration to implement favorable and influential POC (Battilana, Gilmartin, Sengul, Pache, & Alexander, 2010). Accordingly, the theory of constraints to the resource-based implementation process of POC proposed in this paper from the quantum approach is aimed to provide an understanding of how to realize the POC by making better decisions on change goals and timing and why.

The quantum approach holds that the way of how the world operates has the quantum nature, with uncertainty principle as one of the fundamental rules. In specific, the thing is

uncertain, unless someone observes and measures, or say, interacts with it (Griffiths, 2016). In terms of the development of an entity, compared with identifying a definite or absolutely ended state, the probability of arriving at that state has more important implications (Cox & Forshaw, 2011). Different from the classic probability that tries to calculate a definite state of an entity, quantum probability captures the uncertain nature of the entity's movement with a probability wave function (Appendix). Therefore, quantum probability helps to understand how alternative possibilities can be created or destroyed by interacting with different contexts, actors, and events over varying expanses of time. The uncertainty principle has been applied in other human social activities such as cognition to understand the quantum nature of decision making (Bruza, Wang, & Busemeyer, 2015; Wang, Solloway, Shiffrin, & Busemeyer, 2014). In the process of POC, it is generally experienced that uncertainties exist, and unexpectedness emerges. The assumption—the future is uncertain, and the probability, rather than certainty, of reaching the expected outcome works—is also fundamental to understand POC.

Meanwhile, bounded rationality of individuals also matters in the change process, taking limited information processing capability as an instance (Gigerenzer & Goldstein, 1996). Moreover, individuals interpret the process of POC distinctively because of their different cognitive capabilities (Helfat & Peteraf, 2015). Both the bounded rationality and the distinctive cognition imply the heterogeneity of POC performance, except for the uncertainty principle.[4] In short, the theory of constraints to POC integrates the above assumptions that are nonnegligible to the POC process— the uncertainty, and individuals' bounded rationality and

distinctive cognition— in a channeling manner (Lord et al., 2015; Gigerenzer & Goldstein, 1996; Helfat & Peteraf, 2015; Frazier, 1983).

The basic premises of a quantum approach to understand POC can be summarized with two key insights: The POC implementation process is uncertain; the probability, other than certainty, of realizing the planned goal works. The second insight, as proposed in this theory, can be understood as the probability of achieving a target position of the organization at a point of time. The probability can be learnt by analyzing impacts of system constraints on the resource availability for change, which are rooted in the constraints' properties. Accordingly, the process of POC is framed with three components: (1) the change goal, (2) the process composed of the resource management from resource conceptualization to resource development and the constraints emerging on the way of relevant resource development needed for the POC, and (3) the change outcome (Figure 1).

Insert Figure 1 about here

A THEORY OF CONSTRAINTS TO POC UNDER THE RESOURCE PARADIGM FROM THE QUANTUM APPROACH

Defining Constraints

From a quantum perspective to OC by Lord, Dinh, and Hoffman (2015), the present is a result that collapses from multiple future potentialities based on dynamics of system constraints. In this process, the concept of constraints plays a vital role.

Constraint has been studied in terms of its impacts on individual behaviors and organizational outcomes in a variety of specific settings (Table 1). However, it is under-researched in the field of OC. The knowledge gap is mainly reflected from the following aspects. Firstly, extant literature does not have a consistent and clear conceptualization of the constraints. Previous discussions usually focus on particular situational constraints. Secondly, how the constraints matter in a complex and uncertain organizational system is unclear. Nevertheless, it is undeniable that constraints are important in a change process. They restrict the translation from goals to outcomes, and people can only successfully direct their efforts and abilities toward goal accomplishment when constraints are absent (Peters et al., 1982; Peters & O'Connor, 1980).

Insert Table 1 about here

The word, constraint, is generally explained as a limitation or restriction. It is "the obverse of discretion" (Hambrick & Finkelstein, 1987: 374). It has been regarded as "the rules of the game, within which business must operate" (Keim, 1978: 67). It is also referred to as "aspects of a work setting which inhibit persons from using their abilities or expressing their motivation effectively at work" (Peters et al., 1982: 9). In recent studies, constraints are specified as factors that prevent firms from exploiting opportunities (Diestre et al., 2015; Kumar, 2009), or factors that direct managerial behaviors and strategic choices (Crossland & Hambrick, 2007; Connelly et al., 2017; Fern et al., 2012).

Based on previous discussions, a constraint to POC is defined as a force exerted by a factor in the organizational system that restricts relevant resource development process toward

a specific planned goal. The factor's constrained effect displays through its connection with the implementation process of POC (Lord et al., 2015; Freeman & Ambady, 2011). For example, prior firm performance and resource allocation can be constraints to decision-making behaviors on innovation and corporate investments (Garriga et al., 2013; Souder & Shaver, 2010). In other words, any conditions of the organization can be constraints, if they inhibit the POC process.

The Constraints versus the Resources

The definition of constraints in this theory suggests both an important connection with and a necessary distinction from the construct of resources, which help address three main questions as follows on the theory's pragmatic use and the concept's boundary.

First, why to have resources in this theory of constraints to POC? We integrate the quantum approach to change and the resource-based paradigm in the change process because the impacts of constraints onto the change process cannot be specified without an implementable mechanism, while the implementation of POC is not enabled unless the needed resources are developed (Lewis, 1999; Kunc & Morecroft, 2010). Therefore, a POC process can be understood as a resource development process correspondingly. With this transformed understanding, the constraints' effects on the POC process are enabled to be analyzed in detail.

It then comes to the second question that needs to be clarified before applying the proposed framework into a real-case analysis—how to distinguish the constraints and the resources? Some people may feel confused and wonder—isn't a lack of resources a major constraint to the POC? Back to the definition of resources, which is generally regarded as very

inclusive (Barney, 2001), the resources can be "all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness" (Barney, 1991: 101). In implementation, the POC proceeds based on resource availability (Kumar, 2009). The resources emphasized in POC are those factors that are indispensable for achieving the expected outcome, rather than the factors that have been already possessed by the firm (Kunc & Morecroft, 2010). The intended organizational state has a different set of resource orchestration, compared with that of the original set (Sirmon, Hitt, Ireland, & Gilbert, 2011). In other words, a lack of resources that are needed for realizing the change goal is regarded as the initial state of a POC process. Some firms that have ample resources initially may still be interfered by emerging constraints in their POC implementation process because what they already have are not the resources required by their change goals. Thus, the POC implementation process corresponds to a development process of the needed resources associated with specific change goals. When the needed set of resources for the change goals is obtained, the POC with those change goals is realized (Barney, Ketchen, & Wright, 2011). In contrast, a constraint to POC is identified as a resisting force toward the development of a specific resource related to the change goal. One constraint can be specified only when it inhibits the process of acquiring a particular resource. Depicted in Figure 2, the POC process is a development process of needed resources; on the way to acquire each needed resource, several constraints emerge. For example, constraint a_1, a_2, until a_n respectively inhibits the process to acquire needed resource 1, which then arrives at obtaining resource 1'

as a temporal result that may differ from resource 1 as expected. The same applies to other resource development processes.

Insert Figure 2 about here

It relates to the third question—how to connect the constraints and the resources in the POC implementation process? Implied in Figure 2, managers are suggested to have an ex ante consideration about: (1) What resources are needed in implementation to realize a specific change goal? (2) What constraints, executed by factors of the organizational system, may block the ways of obtaining relevant needed resources?

A Refined Description of the POC Process Integrating the Quantum Approach and the Resource-Based Concern

The integration of the quantum approach to change and the resource-based paradigm provides an implementable foundation to analyze how the POC process is shaped by experiencing the system constraints with quantum probabilities of the resource development across time (Figure 3).

Insert Figure 3 about here

In the above extended interpretation of the POC process over time, built on that of Lord, Dinh, and Hoffman (2015), the POC process is divided into several slices, a, b, until n, along the timeline. Within each time slice that is a minimal period of time, an individual hardly makes prominent changes relative to the system constraints, supported by the assumptions of bounded rationality. Shown in Figure 3, the temporal planned organizational goal is represented by a corresponding set of conceptualized resources, and the perceived organizational outcome

within the time slice is represented by a corresponding set of developed resources. In short, the POC process is simplified and focused on assessing the temporal probability of resource availability, which is shaped by experiencing the corresponding system constraints. This simplified description is pragmatic, since the practitioners need to make such temporal decisions for acquiring needed resources with extant conditions along the POC process. The constraints interfere with others and coevolve over time (Van de Ven & Poole, 1995; Plowman et al., 2007). Thus, the effects of the system constraints within one slice of time are different from but related with those within another slice of time in a quantum deterministic manner, and so do the probabilities of realizing POC.

Properties of the Constraints

For how the constraints impact on the resource availability, we start from the constraints' properties. Literature suggests that constraints are featured with hierarchical level, interactivity, strength, perceptibility, and duration nature, and each of these properties influences the change process distinctively (Table 2).

Insert Table 2 about here

The hierarchical level of a constraint. Constraints are embedded in multi-level organizational systems. They are born with hierarchical nature (Pettigrew, Woodman, & Cameron, 2001; Kozlowski, Chao, Grand, Braun, & Kuljanin, 2013). The hierarchical feature of a constraint refers to which level of the organizational system that the source of constraint originates from. In specific, whether it stems from a contextual level, an organizational level, a group level, a dyad level, or an individual level (Lord et al., 2015). Within a social system, it

is regarded as a top to bottom path if moving from the contextual level to the individual level, and vice versa (Morgeson, Mitchell, & Liu, 2015). The contextual level is a higher level compared with the organizational level, and the organizational level is a higher level compared with the group level, and so forth. For example, an organization's strategic choices need to fit its contextual tendency for survival and development (Boeker & Goodstein, 1991), and the organizational environment such as culture underlies its internal dynamics such as its team members' characteristics (Randel & Earley, 2010). Hierarchical differentiation generally exists in various organizational systems and influences their development, while its importance varies according to particular situational contexts (Franke, Hofstede, & Bond, 2010).

The interactivity of a constraint. It is at the nexus of the multi-level processes of the system that the temporary outcome is created, wherein the interactivity property of the constraints refers to interactions between at least two parties that can be individuals, groups, and organizations. The interactions enable information and resource exchanges, which may take a path as either top down or bottom up across the hierarchical organizational systems and further accumulate to complex integrations (Kozlowski et al., 2013; Dionysiou & Tsoukas, 2013; Gulati, Nohria, & Zaheer, 2000). Therefore, the interactivity property is a key to understand the system constraints' variances and coevolution (Koza & Lewin, 1998).

The perceptibility of a constraint. Whether the constraints are perceptible is crucial for decision makers (Gilbert & Wilson, 2007). While some constraints such as regulatory restriction can be explicitly described (Gruca & Nath, 1994), some others such as mental activities operate implicitly (Bargh, Chen, & Burrows, 1996). The varied perceptibility of

constraints may be partially explained by the limited individual cognitive capabilities in environmental scanning and interpretation process (Day & Lord, 1992; Teece, 2007). On the other side, it is related to the uncertainty nature of the change process in the quantum view, which may stem from the interferences among different organizational systems, levels, and agents (Jones, Hesterly, & Borgatti, 1997). Consequentially, the perceptibility property operates in a manner that some constraints happen unexpectedly to the change agents. It implies that a constraint that can be analyzed ex ante is perceptible to some degree. Coincident with the quantum probability of changes (Appendix), there are still some constraints that are not perceptible and thus hardly analyzed in the forward process. Since different individuals located at different levels of the organization may perceive different constraints to the POC (Hirsch, 1976; Corley, 2004), it indicates the importance of collective wisdom for better perceiving various system constraints.

The duration of a constraint. The duration property refers to the length of time that the constraint lasts. Some constraints have enduring influence, taking the constrained effect of organizational performance on the firm's long horizon investment as an instance (Souder & Shaver, 2010). Some others such as temporary response of an employee may only matter in a short run (Fugate, Kinicki, & Prussia, 2010). The durations of the constraints may be associated with their hierarchical levels, for a constraint from a higher level is difficult to be changed and tends to last longer without other inputs. The constrained effect of national systems on different latitudes of CEO actions is one example (Crossland & Hambrick, 2007). Varied durations of the constraints may be partially due to their interferences with other factors of the

organizational system. A constraint's effect can be extended along the timeline when it is interacted with other factors with homophily, and vice versa (Burt, 2000). As a consequence of the duration property, some POC can only emerge when the corresponding system constraints fade away.

The strength of a constraint. It may be confusing to discuss the constraint's strength property and the constraint's overall influence toward the POC, since the term "strength" is usually used to describe a factor's influence in the literature (Peters et al., 1982; Hallam, 1975). To clearly distinguish the constraint's strength property and its influence toward the POC, here learn from the work of Morgeson, Mitchell, and Liu (2015) and define the constraint's strength as how disruptive and critical of the restrictive force, whereas the constraint's overall impact is represented by a corresponding quantum probability. The impacts of constraints vary from weak to strong at a point of time, and they may be strengthened or weakened over time, as a consequence of interferences with other system factors (Freeman & Ambady, 2011; Burt, 2000). The strength property performs in a manner that a weak constraint enables incremental changes, while a strong constraint promotes the system stability.

PREDICTIONS OF THE THEORY TO POC

To cope with the challenge in understanding the complex integration and interference of the diverse effects of the constraint's properties among different system constraints along the timeline, a strategy with three scenarios is adopted. Scenario A is aimed to analyze a constraint's influence at a point of time. Scenario B is intended to examine the influence of multiple constraints that simultaneously exist in the organizational system at one point of time.[3]

Scenario C analyzes the variations and coevolution of multiple constraints over time. Note that Scenario A and B only consider the situation of one point of time, which is assumed to be an extremely small unit of the time. Therefore, no interactions that require time spans among the hierarchical level, perceptibility, and strength properties are considered. In other words, it is regarded that each of the hierarchical level, perceptibility, and strength properties acts independently at the point of time. Because of the scope of this paper, here address the first two scenarios only with testable propositions. In order to state the theory clearly, it is necessary to discuss Scenario C in another paper subsequently.

Scenario A: One Constraint and the Probability of Realizing POC at a Point of Time

Organizational systems are born within the dynamic and hierarchically structured human society (Pettigrew et al., 2001). The orders of hierarchical levels are arranged as the contextual level, the organizational level, the group level, and the individual level from the high to the low, according to their respective power in the social system (Lord et al., 2015; Morgeson et al., 2015). The higher-level phenomena constrain, shape, and influence lower level phenomena. For example, the environmental force underlies organizational survival and development (Hannan & Freeman, 1984; Peng, Sun, Pinkham, & Chen, 2009), and the organizational forces such as organizational culture influences individual behaviors of their top managers and employees (Ravasi & Schultz, 2006). On the contrary, the low-level factors need to accumulate and aggregate to manifest at higher levels (Kozlowski & Klein, 2000; Kozlowski et al., 2013). Accordingly, it is expected that at a point of time, a constraint originates from a high level is

more influential in blocking the resource flow of POC process than that from a low level, in a sense that the constrained status is harder to be overcome in the former situation.

Proposition 1: Ceteris Paribus, a constraint originates from a higher level is associated with a higher probability of restricting the resource development process for the POC, which corresponds with a lower probability of arriving at the target position of the organization at a point of time.

A constraint cannot become explicit without shifting dynamics from an automatic process such as automatic mental activities to at least a conscious process that can be clearly described with language (Bargh, Chen, & Burrows, 1996). Therefore, an implicit constraint tends to remain at a relatively low level until it is formalized, especially in a situational context that values formality. On the contrary, an explicit constraint is formally presented and thus tends to be regarded as more stable and more legitimate than the implicit constraint. Formality is related to the organizational legitimacy and power that are beneficial for and thus desired in the social construction of large, bureaucratic, impersonal and competitive work organizations (Morand, 1995). For example, it is found that new ventures that are advantageous on formality and legitimacy by having associations with established firms, creating a history of product innovation, or hiring reputed experts gain more from innovation than others (Rao, Chandy, & Prabhu, 2008). Accordingly, the explicit constraint is more influential in resisting the resource flow of the POC process, compared with the implicit constraint, in such a situation that emphasizes the formality and legitimacy.

Proposition 2: Ceteris Paribus, a constraint that is more explicit is associated with a higher probability of restricting the resource development process for the POC, which corresponds with a lower probability of arriving at the target position of the organization at a point of time.

Strength is a property that depicts the constraint's power. Weak constraints are not that powerful, which leaves space for resources needed by the incremental change. For example, resistant attitude of one employee to change can be transformed into positive attitude with proper leadership (Bommer, Rich, & Rubin, 2005). Strong constraints disable the resource flow for change and foster stability. For example, it is generally discussed that OC is limited by strong inertial pressures that are generated from the firm's history, structure, politics, and individual bounded rationality and external legal and economic barriers, information asymmetry, legitimacy concern, and problem of collective rationality. Consequentially, OC that diverts resource allocation and leads to uncertain outcomes is infrequent (Hannan & Freeman, 1984; Haveman, 1992). In short, the strength of constraint determines the resource availability for change.

Proposition 3: Ceteris Paribus, a constraint that is stronger is associated with a higher probability of restricting the resource development process for the POC, which corresponds with a lower probability of arriving at the target position of the organization at a point of time.

As a summary of propositions 1 to 3, one constraint and its corresponding probability of realizing the POC via resource development at a point of time can be represented as follows:

The probability of realizing the resource development for POC at the point of time ~ β_1 * hierarchical level of the constraint at the point of time;

The probability of realizing the resource development for POC at the point of time ~ β_2 * perceptibility of the constraint at the point of time;

The probability of realizing the resource development for POC at the point of time ~ β_3 * strength of the constraint at the point of time

In the above formulas, β_1, β_2, and β_3 are coefficients of the three properties of constraints. Multiplying the coefficients and the scaled values of the properties represent respective magnitude of their impacts onto the probability of developing resource development for realizing the POC. A context-based concern is suggested in using the above proposed relationships (Greenwood & Hinings, 1996; Peng et al., 2009; Barney, 2001). In specific, the values of the above coefficients are determined by the situational context at the point of time in the POC process. For example, in some other contexts, implicit forces may be valued more than the explicit ones. "In situations where formal constraints are unclear or fail, informal constraints will play a larger role in reducing uncertainty, providing guidance, and conferring legitimacy and rewards to managers and firms" (Peng et al., 2009: 68). For example, in China, un-coded information shared only among insiders is sometimes considered more valuable than formally coded information, for transparency is limited relying on personal agreements rather than formal contracts (Martinsons, 2008). It is concluded that in such kinds of context, the implicit constrained factor may be more impactful, represented by β_2, in resisting the resource flow of the POC process than the explicit one. Another example can be in a situational context

that emphasizes power distance and does not value much in terms of the formality and the strength of the factor, the coefficient of hierarchical level (β_1) is supposed to be the largest. It is to say that, in this context, with the same scaled measures of the above three constraint properties, the hierarchical level plays the most important impact on the POC at that point of time. In short, a particular context determines the unequal importance of the constraint properties, and the most influential property, evaluated by both its scaled value and the context-based coefficient, sets the boundary condition that involves the impact range of the other properties and shapes the POC at the particular point of time.

Proposition 4: At a point of time, the probability of restricting the resource development process for the POC relies on a context-based concern of the most influential property of the constraint.

Scenario B: Multiple Constraints and the Probability of Realizing POC at a Point of Time

At a point of time, there are usually multiple constraints from various organizational levels simultaneously impacting on the POC. Within the extremely small unit of the time, interference among the multiple constraints is not supposed to happen. Accordingly, at the point of time, the simultaneously existing multi-level constraints independently impact on the POC. Therefore, in Scenario B, it is supposed to firstly analyze the associated probabilities of realizing the POC through resource development of these constraints one by one. As a result, several probabilities of the POC would be estimated, and the one with the smallest value is regarded as a boundary condition that shapes the POC at the point of time.

Proposition 5: At a point of time, the probability of restricting the resource development process for the POC relies on the most influential constraint among all the constraints simultaneously exist in the multi-level organizational system.

As a summary, to estimate the probability of realizing POC through obtaining a needed resource, a core equation of the theory is presented as follows:

The probability of arriving at a target position of the organization (through obtaining the corresponding needed resource) at a point of time ~

1 - the probability of being restricted by the system constraints at the point of time (toward the development of the needed resource for the planned goal)

In this equation, 1 (or 100%) represents the full probability of realizing the resource development process at the point of time. Note that the "~" means being similar in size to.[5] As Proposition 5 states, the impact of the system constraints is determined by the most impactful constraint at the same point of time. The proposed equation is to estimate the probability of arriving at a target position of the organization by deducing the probability of restricting the resource availability for the POC of the most impactful constraint from 100%, with the assumption that within such a minimal unit of time any interference, including that of the individual agent, is not allowed.

Consistent with the core equation stated above, Figure 4 depicts the relationship between the supportive force on the side of change agents and the constraints at a point of time within the space interpreted as 100% probability of the organizational system for the POC. The analysis focus is the overall impact of the constraints.

Insert Figure 4 about here

ILLUSTRATION WITH A REAL CASE

Case Narration: Battlefield Park's Market-oriented Reform

A case of market-oriented reform in a state-owned theme park in China,[6] started from action research (Coghlan, 2011; Shani & Coghlan, 2014), is used to help illustrating the use of the theory proposed above.

The case is a military theme park based on the frontier of battle between Taiwan and mainland China in the late 1950s. Because of its historical heritage, the park serves as a base for defense and patriotism education. The park has possessed beautiful natural environment, fresh seafood, and unique local architecture and custom as its other potential competitive advantages to attract local consumers and non-local tourists. However, poor management and maintenance of the park had resulted in an unsatisfying market performance. Because of this, the park has been controlled by a local investment group that belongs to the district government since 2012. Similar as other state-owned companies in China, the park needs to achieve annual economic indicators assigned by its state-owned system and wait for approvals from the state-owned system for large-scale development and human resource mobility. Small-scale changes rely on the park's operational fund, which is sourced from its rest profits. To enhance the park's market-oriented competitiveness, the state-owned parent company hired an experienced top manager and his assistant from the tourism industry without a strong relationship background as the park's chief executive officer (CEO) and the marketing manager respectively. When the

CEO and the marketing manager arrived at the park in June 2012, they planned to launch several new projects, such as exhibitions of gun and torch collections through collaborating with external private partners. They also planned to develop an official website of the park as a public information source for potential visitors, which was conducted with the action research method.

A package of service innovation for enhancing the park's market competitiveness, which was expected to be provided via the park's official website, was designed at the planning stage of the action research. The action research was mainly contracted with an external IT team, cooperated by the researcher (i.e., the first author of the paper), and approved by the park's CEO. The action research of the park lasted from mid 2012 to mid 2013. Originally, there were 26 specific goals, mainly for broadening the park's communication channels with its potential consumers and providing varied innovative service programs. Experiencing multi-level constraints emerging on the way, the project failed to fully realize those change goals but generated several temporary results. However, some of the goals that were shelved during the action research period became realized at different time points in the following years from 2013 to 2017. It is worth noting that some of the constrained factors, such as the unclear strategic direction of the local government, were known probably as the conditions in the beginning. However, the change actors were unclear at that time about how these conditions would matter in the follow-up action research process. Some other constraints, such as a lack of the support of the park's employees, were out of expectation in advance. With the uncertain and unexpected issues emerging on the way, the action research was ended at a state of the park

that was divergent from the planned one. The action research process of the park is a common and exemplary case that shows how quantum probability works in the POC process.

Data of the case was collected before, during, and after the action research project. The data came from multiple sources, including archival data from 2009 to 2011 before the action research, e-mails, online chat records, interview transcripts, consulting plans and designs, research diaries, web pages, statistical data on website performance, and records on park performance during the action research, and follow-up communications and supplementary online materials until October 2017 after the action research. There are 136 data files, totally containing 658 pages and 140,952 words without covering words in figures. With the relatively rich filed data, the case is supposed to serve as a solid foundation for better illustrating and initially testing the theoretical approach to understand quantum POC proposed in the paper.

Simulation to Estimate the Probability of POC in the Action Research of the Case

The simulation is adopted to see how the emergence of multi-level constraints shapes the temporary outcomes of the action research. Specifically, the objective is to test whether the simulated outcomes coincide with those perceived in the case. The simulation is only ranged toward the action research period for two reasons. First, the researcher's experience of the action research enables a detail analysis toward the process. Second, the park's changes after the action research were hardly known explicitly.

Following the proposed theory, the simulation is conducted with the steps below. Step 1 to 6 are aimed to calculate the probabilities of acquiring needed resources for corresponding change goals, which can be also used for a future-oriented estimation in practice. Step 7 to 8

require information of the phased outcome that is evaluated, and therefore can only be used in a retrospective manner together with the previous steps. The retrospective analysis from Step 1 to 8 may serve to help learning from the POC experience.

Step 1. Identify the change goals of the POC.

Toward the park's strategic goal—to enhance its market-oriented competitiveness, 26 specific goals were planned (Table 3).

Insert Table 3 about here

Step 2. List the conceptualized resources for each change goal.

List all the relevant resources toward each of the change goal that are listed in the result of Step 1. There were 89 resources considered as necessary for realizing the above 26 specific goals (Table 4).

Insert Table 4 about here

Step 3. Identify the factors that may play the role as constraints in the POC process.

From the data of the action research, 12 factors were coded as playing the roles of constraints in the action research process. The coding process followed Maitlis's (2012) suggestions of thematic analysis. In specific, the narrative paragraphs were firstly summarized into short sentences or phrases, which were further categorized into different themes according to their similarities on the attended issues as the second-level inductive coding results. Exemplary quotation of these constraints and their sources are shown in Table 5.

Insert Table 5 about here

Step 4. To a particular conceptualized resource identified in Step 2, make the judgement about which constraints may influence it.

A challenge of applying the theory of constraints to the POC is how to know that one constraint is influential to a process of certain resource development. To deal with this challenge, a solution is trying to link the identified constraints and the conceptualized resources one by one; Then in each pair, a question—whether the former influences the latter in some way—is asked for making the judgement. To reduce individual bias, this analysis is suggested to be conducted by multiple people. Here, the researcher and one research assistant, who did not participate in the action research of the park but learnt about the process afterwards, independently conducted the analysis of Step 4. The analysis results of the two were then compared and discussed until reaching an agreement.

Step 5. Analyze the properties of the constraints identified in Step 3.

Again, multiple evaluators are needed to reduce the cognition biases in evaluating the scaled values of the constraint properties—the hierarchical level, strength, and perceptibility that matter according to Proposition 1 to 3. 5-point Likert scales are taken in analyzing these constraint properties. For each of the three properties, 5 stands for the highest level and 1 for the lowest. The result of Step 5 for the simulation is shown in the Table 6.

Insert Table 6 about here

Step 6. Do the simulation by applying the proposed rules (Proposition 1* to *5 and the core equation) to quantify the probabilities of the impacts of the constraints through their

properties and calculate the corresponding probabilities of acquiring the needed resources for realizing relevant planned change goals.

Step 6 is aimed to see whether the conceptualized resources can be developed, telling from the probabilities that are shaped by the system constraints at the time. Guided in Scenario A, it is intended to first study each constraint's impact of its static state. For each constraint, as stated in *Proposition 4*, the most impactful property of the constraint matter. For their coefficients, since the action research of the park was embedded in China, here in this simulation use *values of China from Hofstede's cultural dimensions* as a simplified estimation.[7] According to the definition of the constraint properties, the coefficient of the hierarchical level (β_1) is calculated with the value of power distance; The coefficient of the perceptibility property (β_2), which refers to the degree that one constraint can be explicitly observed and dealt with, is related to the value of uncertainty avoidance; The coefficient (β_3) of the strength property is related to the value of pragmatic problem-solving orientation (i.e., long-term orientation). In line with the full probability 100%, here regard 1 as the full value of the coefficients. Accordingly, the values based on 100 referred from the Hofstede's cultural dimensions in a particular country, in this case China, were divided by 100 to serve as the values of the coefficients. Probabilities of the impacts of these properties were then calculated by multiplying corresponding coefficients' values with the scaled values measured in Step 5, which were also standardized, divided by their full score 5 before the multiplication. Table 7 shows the estimated results of each constraint of Scenario A. The most impactful property of each constraint is highlighted

with the bolder number in Table 7, representing the boundary condition of the impact of the corresponding constraint.

Insert Table 7 about here

With Scenario B, it is aimed to identify the most influential constraint among the multiple constraints that simultaneously exist at the same point of time. A brief timeline construction helps this comparison analysis (Figure 5). Learning from Table 7 and Figure 5, it is found that constraint ③ (*uncertain strategy of local development*) and ④ (*little support and investment from the government that are necessary for the park's large-scale development*) are the most impactful when comparing with other constraints at each time point throughout the action research. Following *Proposition 5*, it is concluded that constraint ③ and ④ (marked with the underlines in Table 7) set the boundary condition of change at each point of time in the action research, and the change goals with conceptualized resources beyond the scope allowed by constraint ③ and ④ had very little probability to be achieved during that period.

Insert Figure 5 about here

Next, the probability of obtaining each needed resource can be calculated according to the core equation of the theory (Table 8).

Step 7. Identify the developed resources that were perceived in the action research.

Toward each change goal, the resources obtained during the action research were recorded.

Step 8. Compare the results of Step 6 and Step 7 to see whether the simulated results based on the theory of constraints to POC coincide with those perceived as happened in the reality.

As shown in Table 8, the estimated results of the resource development, represented by the probabilities, are consistent with the findings of developed resources in the action research.

Insert Table 8 about here

As stated above, the simulation of the case shows that the theory is workable to provide a forward-looking guidance and help learning in the process of POC.

DISCUSSION AND IMPLICATIONS FOR RESEARCH AND PRACTICE

The theoretical approach to understand quantum POC in this paper follows the literature that applies the quantum mechanics as a metaphor to explain the POC process of human science. Specifically, the paper stands upon the uncertainty principle from the quantum theory, for the change and development in the human society also has the uncertainty nature. In terms of this new species, people may feel inconceivable with various questions emerged. Some questions that may be most concerned of this paper in terms of its implications on research and practice are discussed as follows.

Whether the future is predictable? People may doubt whether the future can be really predicted. It is considered that the near future such as three-year POC is more meaningful to be prepared for, whereas the long-term POC such as a twenty-year plan is difficult to be estimated. The paper also takes this standpoint. The basic analysis units of the theory are the constraint and its properties, which requires to identify the constraints beforehand. The constraints as resisting forces toward POC are imposed by the factors, or say, the conditions of the organizational system. Since only the conditions at the present or in the near future can be reasonably observed and evaluated, the estimated probability of POC makes sense in such a

limited length of time accordingly. In line with this concern, the predictions of the theory only work for a point of time, which captures the constrained factors at the very current moment and ignores any further interferences and covariance in the organizational system. The park's action research that illustrates the use of the theory also shows how the estimated result fits the perceived reality, based on a fact that the action research lasted within less than one year, a rather short term relative to the history of the system that the park is embedded in. On the other side, because a large proportion of the conditions in the long-term future cannot be known in advance, the estimation of POC probability for the long-term future only make sense for what-if analysis that concerns multiple potentialities as advocated by Lord, Dinh, and Hoffman (2015).

Which value of the estimated probabilities matters? Another question is about what value of the estimated probabilities can be the criterion to tell the POC happens or not. Does it indicate that the POC will happen when the estimated probability is higher than 50%, and vice versa? For this question, we have two concerns back to the assumptions of this theory—the uncertainty principle and the individual's micro-foundational features. Although 50% may be simply considered as a general line to distinguish yes or no, there is no certainty in terms of which value of the estimated probability definitely indicates the temporal success or failure of POC. On the one side, the estimation is based on the uncertainty nature of the quantum world. Therefore, it does not exclude the possibility that some unexpected issues happen beyond the original perception and estimation effort. On the other side, the judgement about which level of the estimated probability is taken seriously is also dependent on the individual's

characteristics such as belief, will, and managerial cognitive capabilities in sensing, seizing, and reconfiguring for the POC. For example, 55% may be considered as promising for some optimistic and action-oriented reformers to initiate POC, while the same number may be regarded as little hope for some others who are more pessimistic and passive. Nevertheless, the estimation process generally serves to guide the individual reformers for a detailed assessment of the organizational system before taking actions, which helps to realize the POC at a right time.

What's the role of cognition in the quantum POC? The bounded rationality and limited cognition of human beings are one aspect of the assumptions of this theory. The role of cognition is exposed throughout the analysis procedure. As shown from Step 2 to Step 4 in the case's simulation, managers need to ask themselves the following questions: What resources are necessary for realizing a specific goal? What conditions at the moment may become constraints to the POC? Which constraints and which resources are related? How are the constraint's hierarchical level, perceptibility, and strength properties valued? Different perceptions lead to different answers to these questions, which finally results in distinctive estimated results. Therefore, the theory further implies the importance of listening to others' opinions in carrying forward the POC process.

LIMITATIONS

Limited by the discussion scope, this paper only analyzes the static state of the constraint, with the concern of limited power from the reformers' side. The focus on constraints only is the second major limitation. Along the timeline, the individual reformers may change the

temporal situation of the system constraints and strengthen the supportive force on their side. The interactivity and duration properties of the constraint are supposed to indicate relevant analysis of system coevolution, which requires a thought of time-dependent variance in the follow-up research. Another limitation resides in the present use of the theory. In specific, some people may feel confused about whether this is a conceptual paper or an empirical paper. The paper develops a theory that continues the discussion of Lord, Dinh, and Hoffman (2015) of the quantum approach to change by looking into the concept of constraint and its properties. Following the notion that "nothing is quite so practical as a good theory" (Van de Ven, 1989), the theory proposed in this paper enables provable analyses of the uncertain prospect in the POC process, and the estimation procedure with eight steps in the case illustration part is stated as one possible way to use the theory for the practitioners. The estimation of the case is based on a simple simulation. For example, the values of β_1, β_2, and β_3 are simply adopted from corresponding cultural values of Hofstede. In practice, the coefficients' values are supposed to be measured in the specific situation that the POC is embedded in. Moreover, it is limited in terms of how the constraints are identified in the case, since the action research was past experience. For an ongoing POC process, what constraints may exist may rely on the cognitive distinction of individuals. Other possibilities of using the theory empirically are supposed to be further explored in the future.

CONCLUSION

This paper extends the discussion of Lord, Dinh, and Hoffman's (2015) quantum approach to change that applies the quantum theory in the field of OC. This novel perspective contributes

with a future-oriented framework in business by looking from the future to the present, instead of making decisions based on the past performance, which is important for the change leaders. However, how the present can be projected onto from the future by experiencing system constraints remains as a mystery in that pioneering work. It is curious how the quantum approach can be used in practice. Started from the properties of constraints, this theoretical paper provides a solution focusing on the key concept of "constraint" to specify why and how the probabilities work at each temporal moment in the quantum approach. The basic thought of the theory is that the organizational change process is quantum deterministic and can be illuminated by examining constraints and corresponding available resources. The quantum approach offers a worldview that embraces the uncertainty nature of the social change, which opens a window for the decision makers to understand the process of POC from the quantum probability. Rather than philosophical discussions or tautology, this paper offers a set of future-oriented guidelines from the standpoint of the reformers to assess their uncertain prospects in detail, understand what, why, where, when, and how much constraints matter at a point of time, recognize the timing issue for actions, and do better preparations accordingly.

Footnotes

1. Similar expression in Chinese also appears in *The Romance of the Three Kingdoms,* one of the Four Great Chinese Classical Works by Guanzhong Luo.

2. Quantum theory is "a theory of matter and energy based on the concept of quanta", started from Planck's paper in 1990 and Einstein's of 1905, extended by Bohr in 1913, and later evolved into quantum mechanics and quantum field theory (*The Oxford English Dictionary*, 1989: 982). The quantum theory's essential feature is the existence of a universal constant, named as *the quantum of action*, or, *Planck's constant*, h= $6.6260695729 \times 10^{-34}$ kg m^2/s. It represents that the total energy is quantized in units of a new fundamental constant of Nature, which controls energy exchanges in some way. The popularity of quantum theory may be due to its basic philosophy about how the world operates—human experiences are regarded as various energy events in general, together of which form many discrete and patterned quanta. "All experiments performed, books written, thoughts expressed, and structures completed, are finite energy events. Together they form a totality, a cornucopia of patterned quanta" (*The Oxford English Dictionary, 1989*: 981).

3. According to the pioneering work of Lord, Dinh, and Hoffman (2015), the dynamism of OC also indicates a quantum nature, and different paths of OC underpinned by the quantum approach result in different outcomes. Particularly, the probability of arriving at a certain OC outcome is controlled by some discrete and patterned quanta, which is conceptualized as the *constraints* in this paper. In this article, we aim to uncover the paths and give a quantitative description of the mechanism between discrete quanta (constraints) and varied change outcomes.

4. Relevant with the assumption of uncertainty principle and that of an individual's bounded rationality and distinctive cognition, Einstein and Bohr had a 30-year-long debate (Bohr, 1996). Einstein believed that the probabilities came from incomplete knowledge. "In any case, I'm convinced that He doesn't throw dice", stated in his letter to Bohr in 1926. On the contrary, Bohr believed that the act of observation had a role based on probabilities in producing a single definite reality out of indefinite ones. To the letter of Einstein, Bohr replied that "Einstein, don't tell God what to do". In this paper, the quantum deterministic nature of the broad world and the individual's bounded rationality and different cognition of the human society are both recognized as the basic assumptions to understand the nature of POC.

5. The use of this symbol implies that the equation also includes a possible situation—the temporal outcome exceeds the planned goal. Generally, the full probability is represented as 1 (100%) for two reasons. First, the space for the potentialities of the organizational system is captured at a point of time. This time setting depicts a static status of the entity. Second, if the overall probability of the time-dependent space exceeds 1 (100%), it may be a situation that the future energy is consumed in advance. According to the conservation of energy (Appendix), the fundamental rule of the world, this situation is hardly sustained, taking the Great Leap Forward in the recent history of China as one example.

6. For business confidentiality of the organization client, the names used in the case description, including the park's name and those of relevant participants, are fictitious.

7. https://www.hofstede-insights.com/country-comparison/china/ (last accessed April 8, 2018) The values of China in Hofstede's dimensions of culture for power distance, long-term orientation, and uncertainty avoidance are 80, 87, and 30 respectively.

APPENDIX

In classical mechanics, everything is determined if initial condition is given. Some events seem like probability events, say which side is up when the coin is tossed. However, in principle, the behavior of coin can be totally calculated and predicted as the motion follows Newtonian second law. Such calculation is short of consideration of perturbation terms such as the change of airflow, the angle of coin tossing, the temperature and so on, which mislead people the behavior of coin is probability event.

In quantum physics, everything is uncertain. Any measurement effort to identify a particle's position or velocity actually interferes with the observed particle and results in changes. Due to Heisenberg's uncertainty principle, which states that the position and momentum or velocity can NOT be exactly observed at the same time no matter the adopted experimental techniques, the route of microscopic particle could NOT be predicted at all. In other words, "the more accurately we identify the location of a particle, the less well we can know its momentum, and vice versa" (Cox & Forshaw, 2011: 56). Thus, the uncertainty of the position (Δx) and the corresponding uncertainty of the momentum (Δp) is related in such a manner that their product is similar in size to ($\sim$) the Planck's constant ($\hbar$), as interpreted in the formula.

$$\Delta x \, \Delta p \sim \hbar$$

The probability occurring somewhere of a particle can be expressed by the modulus squared of wave-function ψ which is the solution to Schrodinger Equation:

$$\left[-\frac{\hbar^2}{2m}\nabla^2 + V(r)\right]\psi(r) = E\psi(r)$$

In the quantum mechanism, every system is defined as the above wave function in the space and time. In this equation, the overall energy is conserved, as a sum of the energy of motion ($-\frac{\hbar^2}{2m}\nabla^2$) and the energy of potential ($\mathrm{V(r)}$).

Accordingly, the quantum world is described as *probability-deterministic*, which means that only the probability of particle at particular time could be predicted from previous information.

The formula of the uncertainty principle can be transformed as follows.

$$\Delta \mathrm{x} \sim \frac{\hbar}{\Delta \mathrm{p}}$$

The key equation proposed in this paper is in line with the definition of probability and uncertainty rule above for two reasons. Logically, the proposed equation of the theoretical approach to quantum POC measures the relationship between the momentum of the system constraints and the position of the planned organizational state based on the constant 1. Mathematically, the subtraction fundamentally coincides with the division method in calculation, for the latter can be transformed as continuously deducing the same number of the divisor.

REFERENCES

Bargh, J. A., Chen, M., & Burrows, L. 1996. Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. ***Journal of Personality and Social Psychology*****,** 71(2): 230–244.

Barney, J. 1991. Firm resources and sustained competitive advantage. ***Journal of Management*****,** 17(1): 99-120.

Barney, J. 2001. Is the resource-based "view" a useful perspective for strategic management research? Yes. ***Academy of Management Review*****,** 26(1): 41- 56.

Barney, J., Ketchen Jr, D. J., & Wright, M. 2011. The future of resource-based theory: revitalization or decline? ***Journal of Management*****,** 37(5): 1299-1315.

Battilana, J., Gilmartin, M., Sengul, M., Pache, A. C., & Alexander, J. A. 2010. Leadership competencies for implementing planned organizational change. ***The Leadership Quarterly,*** 21(3): 422-438.

Boeker, W., & Goodstein, J. 1991. Organizational performance and adaptation: Effects of environment and performance on changes in board composition. ***Academy of Management Journal*****,** 34(4): 805-826.

Bohr, N. 1996. Discussion with Einstein on epistemological problems in atomic physics. In ***Niels Bohr Collected Works***. 7: 339-381. Elsevier.

Bommer, W. H., Rich, G. A., & Rubin, R. S. 2005. Changing attitudes about change: Longitudinal effects of transformational leader behavior on employee cynicism about organizational change. ***Journal of Organizational Behavior*****,** 26(7): 733-753.

Bruza, Wang, & Busemeyer. 2015. Quantum cognition: A new theoretical approach to psychology. ***Trends in Cognitive Sciences*****,** 19(7): 383-393.

Burnes, B. 2004. Kurt Lewin and the planned approach to change: A re-appraisal. ***Journal of Management Studies*****,** 41(6): 977-1002.

Burt, R. S. 2000. The network structure of social capital. ***Research in Organizational Behaviour*****,** 22: 345-423.

Coghlan, D. 2011. Action research: Exploring perspectives on a philosophy of practical knowing. ***The Academy of Management Annals*****,** 5(1): 53-87.

Connelly, B. L., Shi, W., & Zyung, J. 2017. Managerial response to constitutional constraints on shareholder power. ***Strategic Management Journal*****,** 38: 1499-1517.

Corley, K. G. 2004. Defined by our strategy or our culture? Hierarchical differences in perceptions of organizational identity and change. ***Human Relations*****,** 57(9): 1145-1177.

Cox, B., & Forshaw, J. 2011. ***The Quantum Universe*****.** DaCapo Press.

Crossland, C., & Hambrick, D. C. 2007. How national systems differ in their constraints on corporate executives: A study of CEO effects in three countries. ***Strategic Management Journal*****,** 28(8): 767–789.

Day, D., & Lord, R. 1990. Expertise and problem categorization: The role of expert processing in organizational sense-making. ***Journal of Management Studies*****,** 29(1): 35-47.

Diestre, L., Rajagopalan, N., & Dutta, S. 2015. Constraints in acquiring and utilizing directors' experience: An empirical study of new-market entry in the pharmaceutical industry. ***Strategic Management Journal*****,** 36(3): 339-359.

Dionysiou, D. D., & Tsoukas, H. 2013. Understanding the (re)creation of routines from within: A symbolic interactionist perspective. ***Academy of Management Review*****,** 38(2): 181–205.

Fern, M. J., Cardinal, L. B., & O'Neill, H. M. 2012. The genesis of strategy in new ventures: Escaping the constraints of founder and team knowledge. ***Strategic Management Journal*****,** 33(4): 427–447.

Ford, J. D. 1981. Departmental context and formal structure as constraints on leader behavior. ***Academy of Management Journal*****,** 24(2): 274-288.

Franke, R. H., Hofstede, G., & Bond, M. H. 2010. Cultural roots of economic performance: A research note. ***Strategic Management Journal*****,**12(S1): 165-173.

Frazier, G. L. 1983. Interorganizational exchange behavior in marketing channels: A broadened perspective. ***the Journal of Marketing***: 68-78.

Freeman, J. B., & Ambady, N. 2011. A dynamic interactive theory of person construal. ***Psychological Review*****,** 118(2): 247–279.

Fugate, M., Kinicki, A. J., & Prussia, G. E. 2010. Employee coping with organizational change: An examination of alternative theoretical perspectives and models. ***Personnel Psychology*****,** 61(1): 1-36.

Garriga, H., Krogh, G. V., & Spaeth, S. 2013. How constraints and knowledge impact open innovation. ***Strategic Management Journal*****,** 34(9): 1134-1144.

Gigerenzer, G., & Goldstein, D. G. 1996. Reasoning the fast and frugal way: Models of bounded rationality. ***Psychological Review*****,** 103(4): 650-669.

Gilbert, D. T., & Wilson, T. D. 2007. Prospection: Experiencing the future. ***Science*****,** 317(5843): 1351–1354.

Greenwood, R., & Hinings, C. R. 1996. Understanding radical organizational change: Bringing together the old and the new institutionalism. ***Academy of Management Review*****,** 21(4): 1022-1054.

Griffiths, D. J. 2016. ***Introduction to Quantum Mechanics.*** Cambridge University Press.

Gruca, T. S., & Nath, D. 1994. Regulatory change, constraints on adaptation and organizational failure: An empirical analysis of acute care hospitals. ***Strategic Management Journal*****,** 15(5): 345-363.

Gulati, R., Nohria, N., & Zaheer, A. 2000. Strategic networks. ***Strategic Management Journal*****,** 21(3): 203-215.

Hallam, S. F. 1975. An empirical investigation of the objectives and constraints of electronic data processing departments. ***Academy of Management Journal*****,** 18(1): 55-62.

Hambrick, D. C., & Finkelstein, S. 1987. Managerial discretion: A bridge between polar views of organizational outcomes. ***Research in Organizational Behavior,*** 9: 369-406.

Hannan, M. T., & Freeman, J. 1984. Structural inertia and organizational change. ***American Sociological Review***, 49(2): 149-164.

Haveman, H. A. 1992. Between a rock and a hard place: Organizational change and performance under conditions of fundamental environmental transformation. ***Administrative Science Quarterly,*** 37: 48-75.

Helfat, C. E., & Peteraf, M. A. 2015. Managerial cognitive capabilities and the microfoundations of dynamic capabilities. ***Strategic Management Journal*****,** 36(6): 831-850.

Hempel, P., & Martinsons, M. G. 2009. Developing international organizational change theory using cases from China. ***Human Relations*****,** 62(4): 459-499.

Hirsch, F. 1976. ***Social Limitation to Growth*****.** Harvard University Press.

Ingram, P., & Baum, J. A.C. 1997. Opportunity and constraint: Organizations' learning from the operating and competitive experience of industries. ***Strategic Management Journal*****,** 18(S!): 75-98.

Jones, C., Hesterly, W. S., & Borgatti, S. P. 1997. A general theory of network governance: Exchange conditions and social mechanisms. ***Academy of Management Review*****,** 22(4): 911-945.

Keim, G. D. 1978. Managerial behavior and the social responsibility debate: Goals versus constraints. ***Academy of Management Journal*****,** 21(1): 57-68.

Koza, M. P., & Lewin, A. Y. 1998. The co-evolution of strategic alliances. ***Organization Science*****,** 9(3): 255-264.

Kozlowski, S. W. J., & Klein, K. J. 2000. A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J.

Kozlowski (Eds.), ***Multilevel theory, research, and methods in organizations***: 3–90. San Francisco: Jossey- Bass.

Kozlowski, S. W. J., Chao, G. T., Grand, J. A., Braun, M. T., & Kuljanin, G. 2013. Advancing multilevel research design: Capturing the dynamics of emergence. ***Organizational Research Methods*****,** 16(4): 581-615.

Kumar, M. V. S. 2009. The relationship between product and international diversification: The effects of short-run constraints and endogeneity. ***Strategic Management Journal*****,** 30(1): 99–116.

Kunc, M. H., & Morecroft, J. W. 2010. Managerial decision making and firm performance under a resource-based paradigm. ***Strategic Management Journal*****,** 31(11): 1164-1182.

Lewis, L. K. 1999. Disseminating information and soliciting input during planned organizational change: Implementers' targets, sources, and channels for communicating. ***Management Communication Quarterly,*** 13(1): 43-75.

Lord, R. G., Dinh J. E., & Hoffman E. L. 2015. A quantum approach to time and organizational change. ***Academy of Management Review*****,** 40 (2): 263–290.

Maitlis, S. 2012. Narrative analysis. In Symon, G., & Cassell, C. (Eds.), ***Qualitative Organizational Research: Core Methods and Current Challenges*****:** 492-508. SAGE Publications Ltd.

Martinsons, M. G. 2008. Relationship-based e-commerce: Theory and evidence from China. ***Information Systems Journal*****,** 18(4): 331-356.

Morand, D. A. 1995. The role of behavioral formality and informality in the enactment of bureaucratic versus organic organizations. ***Academy of Management Review*****,** 20(4): 831-872.

Morgeson, F. P., Mitchell, T. R., & Liu, D. 2015. Event system theory: An event-oriented approach to the organizational sciences. ***Academy of Management Review*****,** 40(4): 515–537.

Peng, M. W., Sun, S. L., Pinkham, B., & Chen, H. 2009. The institution-based view as a third leg for a strategy tripod. ***Academy of Management Perspectives*****,** 23(3): 63-81.

Peters, L. H., & O'Connor, E. J. 1980. Situational constraints and work outcomes: The influences of a frequently overlooked construct. ***Academy of Management Review*****,** 5(3): 391-397.

Peters, L. H., Chassie, M. B., Lindholm, H. R., O'Connor, E. J., & Kline, C. R. 1982. The joint influence of situational constraints and goal setting on performance and affective outcomes. ***Journal of Management*****,** 8(2): 7-20.

Pettigrew, A. M., Woodman, R. W., & Cameron, K. S. 2001. Studying organizational change and development: Challenges for future research. ***Academy of Management Journal*****,** 44(4): 697-713.

Plowman, D. A., Baker, L. T., Beck, T. E., Kulkarni, M., Solansky, S. T., and Travis, D. V. 2007. Radical change accidentally: The emergence and amplification of small change. ***Academy of Management Journal*****,** 50(3): 515-543.

Randel, A. E., & Earley, P. C. 2010. Organizational culture and similarity among team members' salience of multiple diversity characteristics. ***Journal of Applied Social Psychology*****,** 39(4): 804-833.

Rao, H., & Drazin, R. 2002. Overcoming resource constraints on product innovation by recruiting talent from rivals: A study of the mutual fund industry, 1986-1994. ***Academy of Management Journal*****,** 45(3): 491-507.

Rao, R. S., Chandy, R. K., & Prabhu, J. C. 2008. The fruits of legitimacy: Why some new ventures gain more from innovation than others. ***Journal of Marketing*****,** 72(4): 58-75.

Ravasi, D., & Schultz, M. 2006. Responding to organizational identity threats: Exploring the role of organizational culture. ***Academy of Management Journal*****,** 49(3): 433-458.

Ring, P. S., & Perry, J. L. 1985. Strategic management in public and private organizations: Implications of distinctive contexts and constraints. ***Academy of Management Review*****,** 10(2): 276-286.

Robertson, P. J., & Seneviratne, S. J. 1995. Outcomes of planned organizational change in the public sector: A meta-analytic comparison to the private sector. ***Public Administration Review,*** 55(6): 547-558.

Robertson, P. J., Roberts, D. R., & Porras, J. I. 1993. Dynamics of planned organizational change: Assessing empirical support for a theoretical model. ***Academy of Management Journal,*** 36(3): 619-634.

Shani, A. B., & Coghlan, D. 2014. Collaborate with practitioners: An alternative perspective a rejoinder to Kieser and Leiner. ***Journal of Management Inquiry*****,** 23(4): 433-437.

Sirmon, D. G., Hitt, M. A., Ireland, R. D., & Gilbert, B. A. 2011. Resource orchestration to create competitive advantage: Breadth, depth, and life cycle effects. ***Journal of Management*****,** 37(5): 1390-1412.

Souder, D., & Shaver, J. M. 2010. Constraints and incentives for making long horizon corporate investments. ***Strategic Management Journal*****,** 31(12): 1316-1336.

Teece, D. J. 2007. Explicating dynamic capabilities: The nature and microfoundations of sustainable enterprise performance. ***Strategic Management Journal*****,** 28(13): 1319-1350.

The Oxford English Dictionary. 1989. Oxford: Clarendon Press.

Van de Ven, A. H. 1989. Nothing is quite so practical as a good theory. ***Academy of Management Review,*** 14(4): 486-489.

Van de Ven, A. H., & Poole, M. S. 1995. Explaining development and change in organizations. ***Academy of Management Review*****,** 20(3): 510-540.

Van de Ven, A. H., & Poole, M. S. 2005. Alternative approaches for studying organizational change. ***Organization Studies*****,** 26(9): 1377-1404.

Wang, Z., Solloway, T., Shiffrin, R. M., & Busemeyer, J. R. 2014. Context effects produced by question orders reveal quantum nature of human judgments. ***Proceedings of The National Academy of Sciences of the United States of America*****,** 111(26): 9431-9436.

TABLE 1
Specific Constraints and Their Roles Discussed in Main Stream Journals

Reference of the Article	Specific Constraints	Predictions in the Article
Connelly, Shi, and Zyung (2017)	constitutional constraints	Shareholders' behaviors toward constitutional constraints on their power affect managers' behaviors.
Diestre, Rajagopalan, and Dutta (2015)	constraints in acquiring experienced directors and utilizing their experience	Two contingencies resulting in experienced directors less likely to join firms and another two contingencies causing interlocking directors' experience less likely to lead to new-market entry are examined.
Garriga, Krogh, and Spaeth (2013)	constraints on applying firm resources	Constraints on the application of firm resources lead to a broader but shallower search for external knowledge of a firm.
Fern, Cardinal, and O'Neill (2012)	experience-based constraints	A founder's experience constrains his strategic choices.
Souder and Shaver (2010)	conditions under which firms make long horizon investments	When short-term performance is poor, firms are constrained from making long horizon investments. When managers hold high levels of exercisable stock options, their firms are less likely to make long-term investments.
Kumar (2009)	various short-run constraints	Firms are limited in the number of opportunities they can exploit in the short run by various constraints.
Crossland and Hambrick (2007)	constraints of national systems	CEOs in different countries face systematically different degrees of constraint on their latitudes of actions.
Rao and Drazin (2002)	resource constraints	Recruitment from competitors as a solution overcomes resource constraints on product innovation in new and poorly connected firms.

Ingram and Baum (1997)	organizational learning from own experience	Learning from own experience can constrain the organization.
Ring and Perry (1985)	contextual constraints	Distinctive contextual constraints influence public and private sectors differently.
Peters and O'Connor (1980), Peters, Chassie, Lindholm, O'Connor, & Kline (1982)	situational constraints	Situational constraints are associated with the work performance and affective outcomes.
Ford (1981)	departmental context and formal structure	Departmental context and formal structure constrain leader behavior.
Hallam (1975)	constraints to realize the goals of electronic data processing departments	Three levels of operational factors are identified as constraints to realize the goals of electronic data processing departments.

TABLE 2
Constraint Properties and Their Effects on Changes

Properties of the Constraints	Description	Effects of the Properties [a]
Hierarchical level	Higher-level vs. lower-level constraints	Higher-level constraints generally channel lower-level processes. However, the lower-level constraints can also influence the higher-level processes if the former accumulate to a certain extent.
Interactivity	Linkages across levels and time	Constraints in a multi-level system interact with each other and with inputs to create phased outputs.
Perceptibility	Explicit vs. implicit constraints	Some constraints are explicitly perceived, while others operate automatically and implicitly.
Duration	Transitory vs. enduring constraints	Some constraints are transitory, and others are more enduring.
Strength	Weak vs. strong constraints	Weak constraints allow incremental changes, whereas strong constraints correlate with stability and periodic changes.

[a] Summarized from Lord, Dinh, and Hoffman (2015) and Kozlowski et al. (2013)

TABLE 3

Change Goals of the Action Research in the Park

- Create and link to the park's MSN account for international customers
- Create and link to the park's weibo account for domestic customers
- Chinese version of the web pages
- English version of the web pages
- Automatic display of "Date & Weather"
- Develop "Special Exhibition" (SE)
- Launch Hero Annual Pass (HAP, the ticket can be used at any time in one year)
- Introduce and sell local products online
- Publish contact information and company information of the park
- Publish job openings of the park
- Publish company policy online
- Publish sustainability (development plan for the near future) online
- Advertise attractions and shows (Show schedule and calendar)
- Strengthen and advertise dining and shopping zones of the park
- Launch "Unique Experiences" (UE) programs and provide reservations for UE
- Publish "How to Get Here" (transportation information)
- Develop Park Map (how to best visit the park)
- Inform "Guest Services" (what facilities are available for guests)
- Provide useful information and links in the city
- Educate history of the park (Stories of Heroes)
- Publish news of the park
- Organize "National Defense Lectures" (NDL)
- Sell tickets online
- Launch group packages (for travel agencies)
- Provide hotel reservation
- The Town's Attractions Fun Deals (A discount offer, based on collaboration, can be used in various attractions of the town)

TABLE 4
Conceptualized Resources for the Change Goals

Change Goal	Resource Conceptualization
Link to the park's MSN account	● approval to register the park's MSN account ● the park's MSN account ● staff with service professional, IT and English capabilities to manage it
Link to the park's weibo account	● approval to register the park's weibo account ● the park's weibo account ● staff with service professional and IT capability to manage it
Chinese version of the web pages	● Chinese textual materials ● an implementation team with IT expertise
English version of the web pages	● translated textual materials ● staff with English textual encoding and IT capabilities to update and manage it
"Date & Weather"	● software of automatic display about the "date & weather" in website ● staff with IT capability to maintain it
"Special Exhibition" (SE)	● approval of developing the "SE" ● materials for the "SE" ● relevant organization and administration for the "SE" ● location (space) for the "SE" ● service staff for the "SE" ● security staff
Hero Annual Pass (HAP, the ticket can be	● approval for developing the HAP ● design and manufacturing of the HAP ● staff to be in charge of the HAP

used at any time in one year)	● supportive system (such as accounting)
Local Products	● textual materials of introducing the local products ● collaboration with and linkage to the product distributors
Contact information and company Information of the park	● approval for releasing the park's contact information and company information online ● textual materials of the park's contact information and company information ● staff with IT capability to maintain and update it
Job openings	● approval for releasing the park's job openings online ● support from the administrative and HR system ● staff with IT capability to maintain and update it
Company policy	● clear and systematic establishment of the company policy ● approval for releasing the company policy online ● staff with IT capability to maintain and update it
Sustainability (Looking to the Future)	● clear plan for sustainable development of the park ● approval for publishing the park's sustainable development plan online ● staff with IT capability to maintain and update it
Attractions & Shows (Show Schedule & Calendar)	● shows that fit with the park's characteristics ● collaboration with the show providers ● location and time for the shows ● supportive administrative and management system ● supportive staff of the events ● textual materials of introducing the attractions and shows ● staff with IT capability to maintain and update it
Dining & Shopping	● rearrangement of product and service of the

	dining zone ● development of product for the souvenir stores
Unique Experiences (UE) and Reservations for Unique Experiences	● repair or construction of the facilities for "UE" ● staff being in charge of the UE programs ● approval for developing the UE ● online reservation systems ● IT staff to maintain the online reservation systems
How to Get Here (transportation information)	● textual materials of the transportation information ● IT staff to maintain and update it
Park Map (how to best visit the park)	● textual materials of the park physical surroundings ● design of the park map ● capable IT staff ● staff to maintain and update it
Guest Services	● facilities of guest services ● textual materials of the guest services that are available ● staff to maintain and update it
Useful Information and links in the city	● textual materials of the important tourism information about the city ● connections to and collaboration with other product or service providers of the city ● staff to maintain and update it
History of the Park (Stories of Heroes)	● textual materials about the history of the park ● video materials about the history of the park ● staff to maintain and update it
News of the Park	● textual materials about news of the park ● video materials about the news of the park ● staff to maintain and update it
National Defense Lectures (NDL)	● approval for organizing the NDL ● professional staff to teach the class ● location and time for the NDL ● supportive staff in charge of the NDL ● online reservation systems for the NDL ● staff with IT capability to maintain and update it ● approval for developing the online ticket

Buy Tickets (online ticket system)	selling system ● collaboration with third-party e-payment providers ● staff with IT capability to maintain it
Group Packages (for travel agencies)	● approval for redeveloping the group packages ● support from and collaboration with the travel agencies ● staff in charge of the group packages
Hotel Reservation	● facilities (e.g., hotels) ● online reservation system ● collaboration with the third-party e-payment providers ● approval for developing the hotel reservation ● staff with IT capability to maintain and update it ● staff in charge of the hotel reservation
Town's Attractions Fun Deals (A discount offer, based on collaboration, can be used in various attractions of the town)	● approval for developing the Fun Deals ● collaboration with other attractions of the region ● staff in charge of the Fun Deals

TABLE 5

Evidence of Constraints to Change in the Action Research of the Park [a]

Coded Number	Exemplary Quotation	Source
	Contextual level	
③	*Uncertain strategy of local development:* We (the park) are not sure about what local government will plan for this area. It is said that they will build up a new airport nearby, but it is uncertain what this airport will be used for at this moment. Using the airport for international passenger transport or for freight transport will have quite different influences on the park.	From the general manager in the interview on Oct 1, 2012
④	*Little support and investment from the government that are necessary for the park's large-scale development:* Now the government does not invest on the park, and the construction of XX Road (outside the park) is taking place until next year.	From the general manager's e-mail on Oct 7, 2012
	Organizational level	
⑪	*Collective knowledge and skills incapable for IT maintenance:* The researcher: Isn't the online system for ticket selling ready to be done this time? The IT engineer: No online ticket selling this time. I feel that their staff are not able to handle the IT issue.	From online conversation with the IT engineer on Dec 18, 2012
⑩	*A lack of external collaboration:* The online system of ticket selling was deleted this time for it needs to collaborate with third-parties such as banks…	From interviews with the park's general manager on April 7, 2013
②	*Newly arrived leadership:*	From online conversation with

	IT engineer: It (the park) costs time to integrate. I feel that they (the park's management team) keep hesitating before taking real action on the project. The researcher: Do you mean that the general manager is hesitating about the website project? IT engineer: Maybe they were too busy. They only thought about this issue when they had free time.	the IT engineer on Dec 18, 2012
⑫	*Inactive attitudes of extant employees to change:* IT engineer: The marketing manager is not able to offer many materials. The other staff in their company are not willing to offer materials.	From online conversation with the IT engineer on Jan 16, 2013
⑨	*Struggling for individual interest (return) in the SOE:* They (the other middle managers) consider whether the others gain any individual interest from the project. Therefore, our solution is to let them get involved in the early stage to select a contractor and to make the decision on project price.	From the general manager in the interview on April 7, 2013
①	*Relationship-based institutional arrangement of SOE:* The park lacks technical staff. So we have to look for technical staff from the market, but a relevant problem is about the institutional arrangement of human resources…According to my previous experience, human resource mobilization process of an SOE is constrained to a large extent.	From the general manager in the interview on April 7, 2013
	Group level	
⑥	*Different schedules and locations of the group members:* I am also wondering whether we could create a better result than the realized one, if I worked closely with the IT engineer in the same city at the implementation stage.	From the researcher's counterfactual thinking on March 15, 2013
	Dyad level	
⑤	*Interpersonal trust of the action research group:* Before we went back home, the general manager asked me to find a person, who is his schoolmate. I wondered why he did not contact this guy by himself. It was considered as a task to test individual capability of solving problems before collaboration.	From the researcher's research diary on Oct 21, 2012
	Individual level	

⑦ ⑧	*Experience and cognitive biases of the action research group members:* Few managers in real companies, especially in China where internal business information is extremely treasured, welcome outsiders especially a PhD candidate to really get involved into their internal business.	From the researcher's research diary on Oct 1, 2012

[a] The numbers in circles represent chronological order of factors or events that identified as constraints in the process of action research. The cycled numbers, representing the coded constraints, are also used in Figure 5 and Table 6, 7, and 8.

TABLE 6
Evaluation of the Properties of the Constraints

		Properties of the constraints		
Coded Number	**Constraint**	***Hierarchical Level***	***Strength***	***Perceptible***
③	*Uncertain strategy of local development*	5	2	3
④	*Support from the government for large-scale development*	5	3	5
⑪	*Collective knowledge and skills incapable for IT maintenance*	4	4	5
⑩	*A lack of external collaboration*	4	3	4
②	*Newly arrived leadership*	4	3	5

⑫	*Inactive attitudes of extant employees toward change*	4	3	4
①	*Relationship-based institutional arrangement of SOE*	4	4	4
⑥	*Different schedules and locations of the group members*	3	2	5
⑤	*Interpersonal trust of the group members*	2	3	2
⑨	*Struggling for individual interest in the SOE*	4	4	4
⑦	*Limited individual experience*	1	3	2
⑧	*Cognitive biases*	1	3	2

TABLE 7
Analysis Result for Scenario A:
One Constraint at One Point of Time

Coded Number	Constraint	Probability of Impact of the Hierarchical Level Property ($\beta_1 = 0.8$)	Probability of Impact of the Strength Property ($\beta_3 = 0.87$)	Probability of Impact of the Perceptible Property ($\beta_2 = 0.3$)
③	*Uncertain strategy of local development*	**0.8**	0.348	0.18
④	*Little support and investment from the government that are necessary for the park's large-scale development*	**0.8**	0.522	0.3
⑪	*Collective knowledge and skills incapable for IT maintenance*	0.64	**0.696**	0.3
⑩	*A lack of external collaboration*	**0.64**	0.522	0.24
②	*Newly arrived leadership*	**0.64**	0.522	0.3
⑫	*Inactive attitudes of extant*	**0.64**	0.522	0.24

	employees toward change			
①	*Relationship-based institutional arrangement of SOE*	0.64	**0.696**	0.24
⑥	*Different schedules and locations of the group members*	**0.48**	0.348	0.3
⑤	*Interpersonal trust*	0.32	**0.522**	0.12
⑨	*Struggling for individual interest (return) in the SOE (climate)*	0.64	**0.696**	0.24
⑦	*Limited individual experience*	0.16	**0.522**	0.12
⑧	*Cognitive biases*	0.16	**0.522**	0.12

TABLE 8

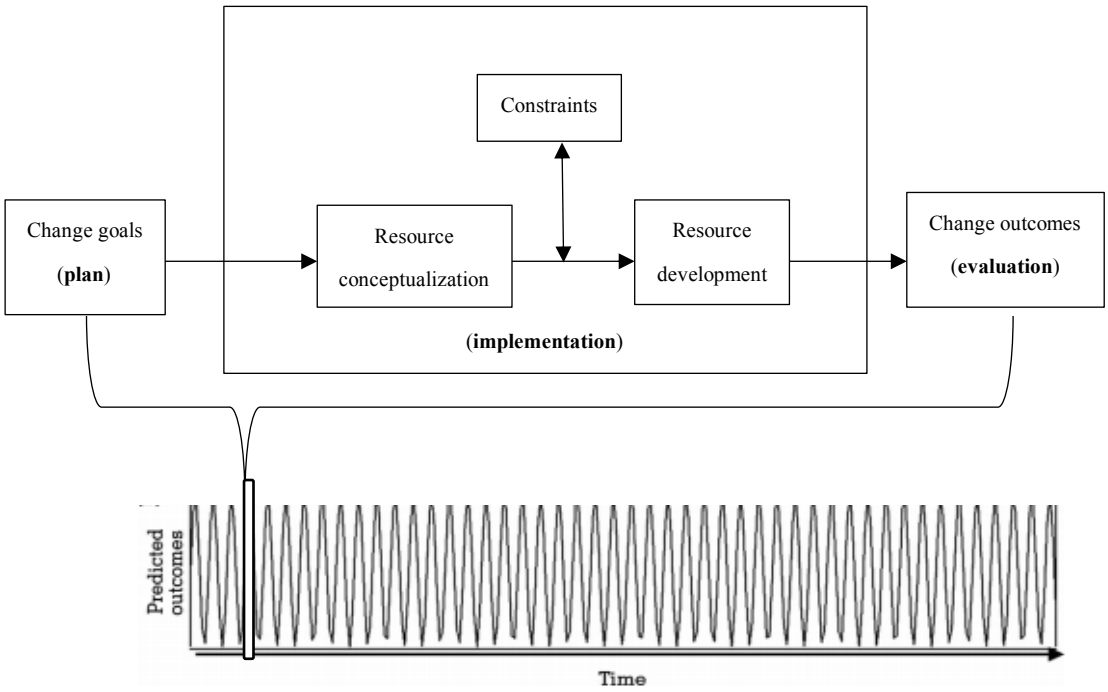
Comparing the Estimated Results of Resource Development and the Developed Resources in the Action Research (Exemplary Evidence) [a]

Change Goal	Conceptualized Resources →	Relevant Constraints →	Probability Boundary of the Impact of the Constraints →	Estimated Probability of Resource Development ↔	Developed Resources	Change Outcome
Establish an official website for information presentation in Chinese	An implementation team with IT expertise	⑥	0.48	0.52	Yes	Realized，though only displaying basic information
	Chinese textual materials	⑫	0.64	0.36	No	
Provide hotel reservation	facilities (e.g., hotels)	②, ③, ④, ⑩	0.8	0.2	No	Suspended
	online reservation system	⑪	0.696	0.304	No	
	collaboration with the third-party e-payment providers	⑩	0.64	0.36	No	

	approval of the decision makers for developing the hotel reservation	③, ④	0.8	0.2 ◄⟷►	No
	staff with IT capability to maintain and update it	⑪, ①, ②	0.696	0.304 ◄⟷►	No
	staff in charge of the hotel reservation	⑫, ②, ①, ⑪	0.696	0.304 ◄⟷►	No

[a] Values in the column of "estimated probability of impact of the system constraints" are corresponding with the values of the highest probability of the impact of relevant constraints from Table 7.

FIGURE 1
A Quantum Approach to the POC Process under the Resourced-Based Paradigm [a]



[a] The second half of the figure is adapted from Lord, Dinh, and Hoffman (2015: 267). In their work, the change process proceeds in a wavering path as a metaphor, influencing and being influenced by time-dependent system constraints. To facilitate understanding, this paper divides this time-dependent wavering path of change into several time slices, and each slice of time in the POC process is composed of the key elements—the change goals as planned, the constraints to the resource management process in implementation, and the change outcomes

as evaluated. Therefore, each slice of time in the change process is associated with its own probability of realizing the POC.

FIGURE 2
A Constraint as a Resisting Force on the Way to Develop a Needed Resource for POC

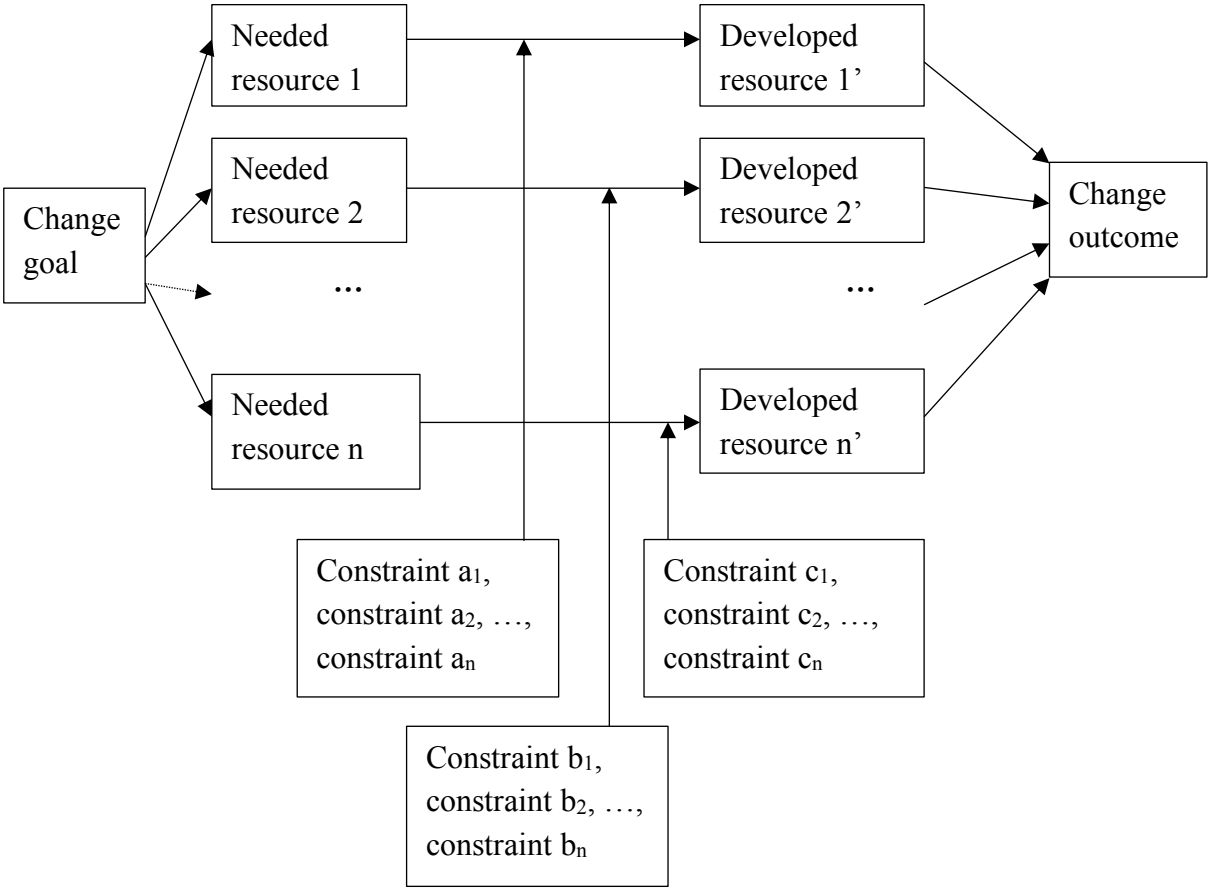


FIGURE 3
A Refined Description of the POC Process Integrating the Quantum Approach and the Resource-based Paradigm across Time

Conceptualized resource set$_a$ corresponding with the planned goal at time a → probability of obtaining the conceptualized resource set$_a$ by experiencing (constraint 1$_a$ | constraint 2$_a$ |...| constraint N$_a$) → developed resource set$_{a'}$ corresponding with the perceived outcome at time a' → conceptualized resource set$_b$ corresponding with the planned goal at time b → probability of obtaining the conceptualized resource set$_b$ by experiencing (constraint 1$_b$ | constraint 2$_b$ |...| constraint N$_b$) → developed resource set$_{b'}$ corresponding with the perceived outcome at time b' →... → conceptualized resource set$_n$ corresponding with the planned goal at time n → probability of obtaining the conceptualized resource set$_n$ by experiencing (constraint 1$_n$ | constraint 2$_n$ |...| constraint N$_n$) → developed resource set$_{n'}$ corresponding with the perceived outcome at time n'

FIGURE 4
Analyzing the System Constraints from the Standpoint of Reformers at a Point of Time

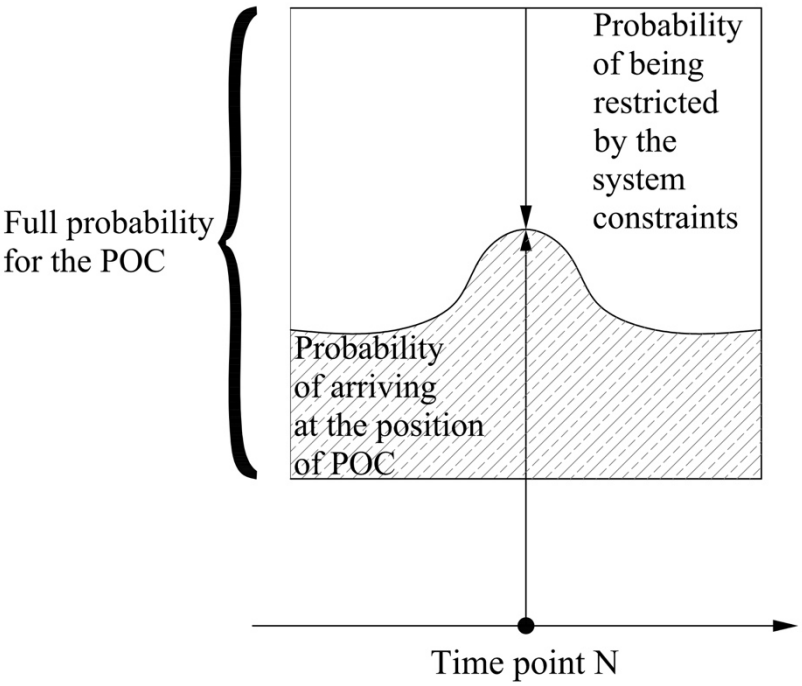


FIGURE 5
Timeline Construction of the Constraints
in the Action Research of the Park