Conceptual determinants of construction project management competence: A Chinese perspective

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Abstract
In recent years Western project management theories and practices have become increasingly recognized and dispersed in China, particularly in construction-related work. The assessment and development of project management competence in China are driven by attempts to follow the Western standards-based competence certification programmes. Yet little is known about whether and how the predefined set of knowledge embodied in the Western standards are used by Chinese project managers in their workplace. In this paper we report an empirical exploration of Chinese construction project managers' ways of conceiving and accomplishing their work. We replicate in the Chinese context the previous UK-based phenomenographic study of construction project management competence, which revealed three different conceptions arranged in a hierarchy of performance. The results of this China-based study confirm the conceptual determinants of construction project management competence first revealed in the UK, and provide practical implications for effective training and professional certification of project management competence in China. Meanwhile, the replication of the phenomenographic approach to understanding project management competence in China enhances the cross-cultural validity of the approach and highlights its potential for explorative management research.

Keywords: Competence; Conceptions; Phenomenography; China

1. Introduction

Modern forms of project management originated in the Western aerospace and defence sectors in the late 1950s and 1960s, and became more dispersed in the 1970s most notably in construction-related work. Since then the discipline has grown in refinement and recognition, to the extent that most large Western organizations now regard project management as an important organizational capability. There are now a number of well-established project management standards that define the scope of the discipline and describe its theories, processes, tools, and techniques. These standards are now widely used as the basis for assessing, developing and certifying project management competence [1].

Although China started to import the concepts and skills of project management from the West in the 1960s, these were narrowly confined to major national defence research projects such as the strategic missile system [2]. However, since the Chinese economic reforms of the 1980s, project management theories and practices have become increasingly recognized in China, particularly in construction-related work. Now, the assessment and development of project management competence in China are driven by attempts to follow the widespread Western standards-based professional competence certification programmes. Prominent recent examples of this trend include the launch of PMI's PMP examination and certification programme in 2000, and the IPMA's programme in 2001 [3].

The use of project management standards for professional competence assessment and development in the West and their transposition into the Chinese context are based on the assumption that management practices are context-independent and universal. This premise may be questioned, since the pre-defined context-free knowledge and principles embodied in the standards specify only what competent project managers should know and do rather than whether and how project managers use these knowledge and principles in accomplishing their work. There is a clear opportunity and need to understand Chinese practicing project managers' ways of conceiving and experiencing Western originated project management work within the Chinese context.

In a previous study, Chen and Partington [4] took an interpretive approach based on the principles of phenomenography [5,6] to explore project managers' ways of experiencing and accomplishing their work, thereby understanding the determinants of their performance in the workplace. From their interviews with 30 project managers in UK construction firms, Chen and Partington [4] identified three different basic conceptions of project management work, reflecting a hierarchy of three forms of construction project management competence in the UK.

This paper reports a replication of Chen and Partington's [4] UK-based phenomenographic study through a matched sample of project managers from Chinese construction firms. In the next section, we first discuss the determinants of project management competence and give a brief summary of Chen and Partington's [4] previous study. We then review the conception-based approach to understanding competence, known as phenomenography, and describe the methods and results of this study in China. We conclude with a discussion of the implications of our findings for practice and future research.

2. The determinants of project management competence

Taylor [7] was one of the first to address the question of what constitutes competence at work, and his well-known 'time and motion studies' were based on scientific principles. Although later authors [8,9] used 'job analysis' instead of 'time and motion studies' to identify competence at work, the dominant approach follows essentially the same scientific attribute-based tradition. Two principal traditional approaches to competence at work can be distinguished: worker-oriented and work-oriented. The former emphasizes workers' attributes, such as knowledge, skills and abilities, and personal traits [10], whilst the latter treats work as existing independently of the worker, definable in terms of the technical requirements of work tasks [11]. Nevertheless, both traditions view competence as an attribute-based phenomenon, constituted by a specific set of generic and context-independent attributes, which do not determine practical competence in experiencing and accomplishing work [4].

There have been many studies of project management competence aiming at identifying determinant factors and/or criteria for a successful project or a competent project manager [12–15]. Most of these studies accord with attribute-based approaches, focusing on either the project work activities (work-oriented) or the personal characteristics of project managers (worker-oriented). Project management competence is described as a specific set of attributes, either 'hard' components of a standard or 'soft' characteristics hidden in personal qualities [4]. Such lists of attributes described in project management standards and the predefined sets of generic performance criteria are necessary for defining the scope of the discipline and providing foundations to further develop the profession. However, being independent of the context of project management work and independent of individual project managers, they cannot capture project management competence in the workplace.

In order to overcome the criticisms of the current attribute-based studies of project management competence, Chen and Partington [4] followed the phenomenographic approach focusing on the relation between the work and the worker, namely, worker's conceptions of work, to understand project management competence from a conception-based perspective. From their workplace interviews with 30 construction project managers in the UK, those authors identified three different basic conceptions of construction project management work, namely project management as: (1) planning and controlling; (2) organizing and coordinating; and (3) predicting and managing potential problems. Each conception includes a different main focus and key attributes that appeared when project managers experienced and accomplished their work. Differences in conception reflect a hierarchy of three forms of conception-based construction project management competence in the UK [4, p. 420]. By taking project management work and project managers as a unified entity, their study revealed the conceptual determinants of construction project management competence in the UK.

3. The conception-based approach to competence – phenomenography

Originally developed by an educational research group at the University of Goteborg in Sweden in the 1 970s, phenomenography is a research approach 'for mapping the qualitatively different ways in which people experience, conceptualize, perceive, and understand various aspects of, and phenomena in, the world around them' [16, p. 31]. Being different from the traditional attribute-based approaches, the main feature of the phenomenographic approach is its basis on phenomenology, which assumes that 'person and world are inextricably related through people's lived experiences of the world' [6, p. 11]. In phenomenography, knowledge is neither subjective nor objective but both, namely, the subject and the object are internally related [17]. When people experience something, they do it on a social, intellectual and emotional level simultaneously. Knowledge is therefore regarded as context dependent. Experience of the surrounding world is a base for understanding; people are consequently involved at all times in an interaction with their world. Learning occurs when people understand and experience something in a way different from their previous understanding and experience. In this sense, in phenomenography, where conception means 'a specific aspect of people's ways of experiencing, or making sense of, their world' [5, p. 47], learning represents a qualitative change from one conception to another.

Fundamental to the phenomenographic approach is the idea that people experience and understand various aspects of, and the phenomena in, the world around them in qualitatively different ways. Instead of focusing separately on the phenomenon being investigated and the people who are experiencing the phenomenon, phenomenography is concerned with the relation between the two, namely, people's conceptions of the phenomenon. The outcome of a phenomenographic study is a set of categories of conceptions that describe a certain phenomenon. These conceptions are drawn from the analysis of empirical data and based on the most distinctive features that differentiate one conception from another. They are presented in the form of a hierarchy that reflects increasing levels of understanding and provides a basis for decisions about teaching and assessment.

A large number of phenomenographic studies in educational learning [18,19] and teaching [20,21] have now been conducted and the identified categories of conceptions are usually linked in a hierarchical relationship. In recent years, the phenomenographic approach has been increasingly applied outside the educational context in fields such as health care, academic freedom, leadership, and competence. Notable examples include Sandberg's [5,6] study of competence at work that revealed three hierarchical conceptions of engine optimization work, Partington, Pellegrinelli and Young's [22] research into programme management competence, and Chen and Partington's [4] study of construction project management competence in the UK introduced above.

4. Method

The sample of this study consisted of 30 project managers selected from 10 construction firms in the Beijing area of China. In order to provide a matched stable context for capturing project managers' conceptions of their work, the sample selection criteria set out in Chen and Partington's [4] previous study in the UK were closely followed in this study. For example, all the samples were from Chinese construction contractor companies that undertake projects for customers; they were working on the construction site together with a project team, with subcontractors and suppliers usually employed for accomplishing the project; the projects they were working on were mainly of building or road/bridge construction works without high technology being involved. Table 1 lists a summary of the samples' demographic information of this study in China.

Following the phenomenographic approach [6,16,23], data were collected by in-depth interviews. The interview questions were 'as open-ended as possible in order to let the respondents choose the dimensions of the question they want to answer' [16, p. 42]. Throughout the interview process, respondents were encouraged to describe and explain their experience and ideas as fully as possible. We used the same interview protocol as developed in the previous study in the UK [4], listed in Table 2. All the project managers were interviewed on the job site of their current project. All interviews were recorded and transcribed word-for-word. Notes were made both during and after each interview.

Table 1 - A summary of samples' demographic information

		Sample ($n = 30$)
Age	20s	1
	30s	19
	40s	10
Types of projects	Buildings	23
	Road/bridges	3
	Utilities/facilities	4
Education	Degree	18
	No degree	12

Table 2 - Interview guide

Warm-up questions:
- Could you please talk me through your career to date?
- Could you tell me a little further about your work on this project?

Principal questions:
- What does project management work mean to you?
- What is a competent project manager to you?

Follow-up questions:
- Could you give me an example?
- What do you mean by that?
- Could you explain that further?
- How did you deal with that?

Alternative questions:
- What are the most important aspects of project management work?
- What is the most important task of a project manager?
- Could you describe to me a good project manager you know?
- If you are now involved in recruiting a new project manager for your company,
- What are the most important criteria you will look at?
- What aspects of the project have been successful? What made them successful?

End questions:
- What do you enjoy most about your work? Why? Example?
- What do you enjoy least about your work? Why? Example?
- Is there anything else you would like to say about your work?

The process of phenomenographic analysis is often described as a 'discovery' [24]. Despite the claim that there can be no algorithms for a process of discovery, there are clear guiding principles that lead to a certain commonality in approach [16]. Some important interpretive guidelines include: (1) an orientation towards the phenomenon and how it appears throughout the research process; (2) seeking to describe the experience under investigation, rather than trying to explain it; (3) horizontalizing the material being analysed – treating everything which is said as being of equal importance; (4) seeking structural features in the experience under investigation; (5) using intentionality as a correlational rule (looking at what is focused on and how it is represented [25, p. 210]. Meanwhile, the emphasis on an iterative process involving looking at the data from different perspectives or foci at different times is the most common method [16]. The various foci can include focusing on the how and what aspects of the phenomenon under investigation and similarities and differences within and between categories and transcripts associated with particular categories, and so on [23].

Following the above guidelines, the analysis of the interview transcripts in this study involved an ongoing iterative process alternating between what the project managers conceived of their work and how they conceived of that work, described briefly below.

First, we read each transcript several times to get familiar with the transcript and try to grasp each project manager's general conception. According to their general conceptions we grouped initially the project managers. In this phase, two general conceptions emerged, one focusing on dealing with resources on site, another focusing on relationships with parties and

people involved in their work. Second, we read all the transcripts again to systematically search for what each project manager conceived of their work focusing not only on the statements concerning essential aspects of their work but also on the meaning of a particular statement in relation to its embedded context. Following this initial interpretation of each transcript, we shifted the analysis from individual project managers and compared conceptions across project managers, first within and then between the groups established in the first phase of the analysis. This process led to some regrouping. In particular, the comparison within the group focusing on relationships led to its division into two new groups, one focusing on coordinating relationships, the other on both coordinating and developing new relationships. Third, we analysed all the transcripts again, but in terms of how each project manager conceived of their work. After we had analysed each transcript, we compared the project managers with each other, first within and then between groups. The individuals were grouped and regrouped by progressively identifying their main focus and how they utilized what they conceived as important in accomplishing their work. Finally, to cross-check and further stabilize the identified conceptions, we analysed all the transcripts once again, focusing simultaneously on what each project manager conceived of and how they conceived of their work.

5. Findings

We identified three different conceptions of project management work in China, which were project management as: (C1) planning and controlling, (C2) coordinating relationships, and (C3) developing relationships. The project managers expressing each conception differed from each other through their ways of experiencing and accomplishing their work. They delimited and organized project management work in terms of certain essential attributes, but with a different focus, forming different characteristic features of each conception. Further, within different conceptions, attributes represented different meanings and approaches. We describe each conception, its main focus, and the meaning of its key attributes, respectively, below, supported by typical examples of statements in the data.

5.1. Conception C1: project management as planning and controlling

The most characteristic feature of this conception was that individuals expressing it delimited and organized project management work in terms of essential attributes focusing on the construction work process. This focus implied that all these project managers' key attributes were centred around the details of work on site. The key attributes constituting this conception included: ability to plan, knowledge of construction work, knowledge of commercial management, ability to communicate, and ability to manage team.

5.1.1. Ability to plan
Within C1, this attribute meant the ability to plan the construction work sequence, including the procurement and delivery of resources to site, such as labour, materials and equipments, so that the progress and the cost of the project could be controlled. This was one of the most fundamental attributes of this conception.

> I think the most important thing is to plan and then to ensure the implementation of the plan on site. Without a good plan, the project manager would be blind, and it is therefore impossible for him to manage the project properly. (Q: Could you explain that a little further?) Well, for example, the first thing I did here for this project was to produce an overall plan, which must be done as early as possible. You need to know the kinds of people and other resources needed, then you can plan the procurement of these resources and the subcontracting of certain tasks. For example, how many tower cranes are needed? One or two? For how long? And from when? These may look trivial, but you must understand the fact that if they are not planned and organized properly, any of these small things could cause a big delay to the work progress and could cost a lot more money in the end. (ZXL)

5.1.2. Knowledge of construction work
In order to plan the construction work and control the whole process well, project managers expressing conception C1 considered it essential for them to have good knowledge of construction work. By this they meant being familiar with the construction work process and being aware of the technical requirements of the work task on site.

> ..actually a project manager's management competence depends very much on his technical knowledge of the construction work. (Q: Can you give an example?) For instance, with concreting, it is not enough to just know whether and when there is a concreting job on site. First, you need to be aware of the relevant technical specifications, and at the same time you need to consider the transportation distance, the concreting speed, the slump, and so on. With all this knowledge, you can negotiate and sign a proper contract with the supplier, and you can be there to control the concreting process on site. (ZBH)

5.1.3. Knowledge of commercial management
For C1 project managers, this attribute meant understanding the fundamental business rules and practices in contract

negotiation and signature, so as to procure the necessary resources at a lower price and get them delivered to the construction site as scheduled.

> It is all about getting the right things at the right time at a lower price. So first you have to plan very carefully, plan the whole work and plan how to procure and when to deliver the required resources to the construction site. Thus you must also have good knowledge about how to negotiate and sign a contract. You need to understand the fundamental rules and practices in business. So I always say the project manager should have both technical knowledge and commercial knowledge. (WKL)

5.1.4. Ability to communicate
C1 project managers considered the ability to communicate to be another key attribute. They communicated with people working on site by holding regular meetings so that they could check and control the planned work tasks. They emphasized personal communication with people, so that they could work closely as a 'team family'.

> It is a hard job. But the project manager is not a decoration to the office. You need to go out to communicate with your people, with subcontractors, and work together with them . . . Whenever I have time I like to go out to have a look at the job site, to check the progress and say hello to people, not always going with a clear purpose, but always coming back with valuable information. We also hold regular meetings to check the progress, and to discuss and find solutions to problems. (LYL)

5.1.5. Ability to manage team
Within conception C1, this attribute meant to manage the relationships within the team on site, to get the team united and integrated as a big family. They considered themselves to be like the father.

> Well, people are the most important. In the past, in the 'Maoist era', we always said 'if united, people can overturn the heaven and the earth'. Now we do not say such slogans, we follow the West and use the term 'teamwork', but to me, they mean more or less the same, that is to unite and work together towards a goal everyone desires. So the project manager needs to be able to get people united and integrated as a team. The team is like a big family on site, and you are like the father of the family. So you need the kind of personal traits to integrate people. You need to care about their worries and thoughts, and be able to manage the relationships between people within the team. (ZXL)

5.2. Conception C2: project management as coordinating relationships

> Project managers holding this conception focused on the relationships of all people relevant to the project, particularly those who were carrying out different types and parts of the work on site. Compared with C1, these project managers expressed another new attribute: ability to coordinate. At the same time, although these project managers still agreed with the importance of planning for good project management, it was not a central attribute. The key attributes constituting this conception included: knowledge of construction work, knowledge of commercial management, ability to communicate, ability to manage team, and ability to coordinate.

5.2.1. Knowledge of construction work
For C2 project managers, this attribute meant understanding not only the work process and technical requirements, as in C1, but also how different types and parts of the work interfaced and how every subcontractor's work related to each other. Thus, they could see the big picture and coordinate the relationships between people carrying out the different tasks without interfering with the technical requirements and the progress of the overall project.

> A good project manager needs to have technical knowledge of the construction work. Most project managers nowadays have got formal education from universities. They may start from working as an engineer or assistant project manager . . . They can understand every aspect of the construction work, and how different types and parts of the work interface and relate to each other . . . Thus, they can see the big picture, organize the work on site and coordinate relationships of all parties involved. (ZTO)

5.2.2. Knowledge of commercial management
In conception C2, this attribute meant understanding not only the fundamentals of business administration as in C1, but also the commercial side of the project and the relevant commercial constraints in the contract.

> Well, quality, time, and cost are the three aspects that project manager needs to control. So you must know both the technical requirements and the commercial constraints. Most importantly, you need to be able to coordinate relationships of people involved in the project, so that cash flows efficiently between the client, the company and the subcontractors without delay, and every party works well without delay. It is not an easy job, so you need to

study the contract, being fully aware of the commercial side of the project... It depends very much on the project manager's knowledge of and experience in business administration, and his social skills in coordination. (ZLQ)

5.2.3. Ability to communicate
C2 project managers communicated with people by all possible means. They stressed gaining mutual understanding and building trust, in order to manage and coordinate relationships.

> In most cases, all people on site work under pressure, such as time constraints. As a consequence, misunderstandings and conflicts are unavoidable. So the project manager needs to take all possible opportunities to communicate with people, to build trust with each other, and to coordinate relationships. Very often, you are misunderstood, but you cannot complain, although everyone can come and complain to you. Now, it is popular to say 'long live understanding'. I would say 'long live understanding our project managers'. (WAP)

5.2.4. Ability to manage team
C2 project managers considered teamwork essential to their work, including the ability to build a team and create a team spirit on site. For them, teamwork was not only about getting people work together as a close family as that in C1, but also creating a spirit of mutual support, trust, and openness.

> We are a team, and we have been working together for many projects. To me, we are like a big family and they are my people, my own family members... The company may make some adjustments when organizing the team for a new project... You need to create a kind of spirit of mutual support, trust and openness in your team, so that the new members can join and unite into the team quickly. (CLY)

5.2.5. Ability to coordinate
Within conception C2, this attribute meant the ability to coordinate relationships of everyone relevant to the project. C2 project managers understood people and could communicate with different people. They tried to manage and coordinate relationships so that the project could progress without delay and be accomplished in a good environment.

> Basically most of my time is spent on coordinating relationships, both internal and external relationships. The control of the work on site depends mainly on my team... (Q: What do you mean by 'internal' and 'external' here?) 'Internal' usually refers to our own company and site team, and 'external' may refer to the client, subcontractors, suppliers, as well as the relevant local authorities. So, I mean all those involved in the project. The project manager must be able to communicate with them, manage and coordinate relationships with them, and try to maintain a good environment for the project to be accomplished without delay. (ZZL)

5.3. Conception C3: project management as developing relationships

As with C2, the main focus of conception C3 was also relationships, but in a way that was more future-oriented. The most essential aspect of C3 project managers' work was being able to build and develop new relationships, reflected by a new attribute in this conception, the ability to build new relationships. The key attributes constituting this conception included: knowledge of construction work, knowledge of commercial management, ability to communicate, ability to manage team, ability to coordinate, and ability to build new relationships.

5.3.1. Knowledge of construction work
For C3 project managers, this attribute meant having knowledge of not only the construction process on site but also the development of the industry, in particular the availability of new technology and materials. They could give suggestions to the client to utilize new technology and methods in the work, so as to build good client relationships.

> As a project manager, you must be more experienced than others.... You must be aware of the development of the industry such as the availability of any new technology and advanced methods. Thus you are able to give the client good suggestions. The client would appreciate it very much if they get good suggestions from the contractor, and they would come back to you for new projects. That's what we hope to gain from this project. (XSG)

5.3.2. Knowledge of commercial management
Compared with the previous two conceptions, these C3 project managers had a broad vision and better knowledge of the market. They were concerned not only with making profit from the current project, but also with the future development of the company.

> The competition for new projects is fierce... In most cases, the final contract price is lower than the reasonable one. So project managers usually work under great tension to accomplish the work as required in the contract and to

make profit for the company. (Q: How do you deal with this then?) I expend a lot of energy and time on the commercial management of the project. From planning, subcontracting, to detailed methods, I have to control the financial aspect of the work and coordinate among different parties to achieve more with less cost and making sure it is within the budget. (SWH)

5.3.3. Ability to communicate
Apart from those aspects of communication mentioned by C1 and C2 project managers, C3 project managers emphasized the ability to communicate with all kinds and levels of people, particularly with those they did not know before.

The most successful aspect up to now would be the good relationships we have built with the client. Although this is the first project we have done together, and I did not know anyone in the client's company before the project, we found a way to communicate with each other and build trust with each other . . . You need to possess the kinds of personalities and skills to talk with people, to convince them and to build good relationships. (CMF)

5.3.4. Ability to manage team
In addition to the team management activities mentioned by C1 and C2 project managers, C3 project managers attended also to team development. They motivated team members and encouraged them to keep studying and improving themselves.

Another task of the project manager is to keep the team motivated, to ensure that people work on their own initiative . . . There are so many temptations outside the project site, so you cannot simply tell people what they should or should not do, particularly the young generation. But you can influence them. For example, I organize regular meetings and studying workshops . . . I also encourage my team to attend training courses organized by the company. (XSG)

5.3.5. Ability to coordinate
Within conception C3, this meant the ability to coordinate relationships of all people relevant to the project. Compared with C2, C3 project managers were more future-oriented in that they tried to coordinate before problems and conflicts occurred.

For example for this project, I spent a lot of time and put a lot of effort into coordinating relationships with local residents . . . If they were against you and this project, the site work could hardly proceed peacefully as scheduled. So you need to understand and foresee problems and be able to coordinate relationships to avoid problems and conflicts occurring . . . The client appreciated very much our efforts and we are building a very good relationship with our client as well. (CMF)

5.3.6. Ability to build new relationships
C3 project managers considered building and maintaining good relationships to be essential for accomplishing the current project and gaining resources and advantages for the company to win more projects in the future.

. . . you can learn from those training courses [to be certified as a Class I project manager] the techniques and methods of how to manage a project, but you cannot learn how to be a good project manager. Because being a good project manager, you need the kind of skills and ability to build and maintain good relationships with the client, the local authorities and so forth. (FFZ)

5.4. Summary
As demonstrated above, within each conception, the meanings of all its key attributes were internally related to each other and centered around its main focus, forming a specific structure of competence in project management with these key attributes being the essential aspects of competence. The way each conception and its key attributes formed a distinctive structure of project management competence is shown in Table 3 and illustrated below taking conception C1 as an example.

C1 was characterized by its main focus on the construction process and work details on site. Project managers expressing this conception planned the work sequence and produced a master plan showing all the important milestones. They then prepared detailed monthly and weekly plans, according to which they organized the work on site and controlled the progress and cost of the project.

Table 3 - The way each conception and its key attributes formed a distinctive structure of project management competence in China

			Key attributes of conception and aspects of competence					
Conception	**Main focus**	**Ability to plan**	**Knowledge of construction work**	**Knowledge of commercial management**	**Ability to communicate**	**Ability to manage team**	**Ability to coordinate**	**Ability to build new relationships**
C1: Project management as planning and controlling	Construction process and work details	Plan the work; Control the work process and cost of the project	Understand the construction process and technical requirements for the work task	Understand fundamental rules and practice in business negotiation and administration	By regular meetings; Have personal talks with people and care about people	Maintain good relationships within team; Get the team united and work closely like a family		
C2: Project management as coordinating relationships	Relationships		C1+ Understand the work interfaces; Be aware of people's relationships.	C1+ Be aware of the contract; Understand commercial implications of coordination	C1+ By all possible approaches; Gain mutual understanding and trust	Create a team spirit; Coordinate relationships between new and old team members	Coordinate relationships of all people; Ensure work progress well	
C3: Project management as developing relationships	New relationship Future-oriented		C2+ Know the construction industry; Be aware of the history and future development of the industry	C2+ Be aware of the market and potential opportunities for the future development of the company	C2+ Communicate with all kinds and levels of people, with people unknown before	C2+ Motivate the team to learn and to improve themselves; Be more competitive	C2+ Coordinate before problems and conflicts occur	Think forward; Build new relationships; Contribute to the future development of the company

This was the fundamental aspect that also required and depended on the other aspects of this conception. In order to plan the work and ensure the implementation of the work without delay, they needed to understand the construction process and to be aware of the technical requirements for each work task. They also understood the fundamental business rules and practices, so that they could arrange the procurement of resources and get the required resources delivered to site as planned. In order to check and control the work progress, they communicated with people by regular meetings on site. Meanwhile, they cared about people working with them on site, and tried to keep up personal communication to get people united and work closely as a team. Therefore, it can been seen that the meanings of the five key attributes within this conception were internally related to each other and centered around planning and controlling the work on site forming a distinctive structure of competence in construction project management work in China.

Further, the variation in meaning from C1 to C2 to C3 can be arranged as a hierarchy of competence in terms of increasingly comprehensive forms of conception. From C1 to C2 and C3 the work was expanded cumulatively which suggested that C1 was least comprehensive, C2 more comprehensive than C1, and C3 the most comprehensive. This was more evident through the key attributes of each conception, namely the essential aspects of each form of competence. As illustrated in Table 3, each conception consisted of a different set of attributes, and the same attribute meant different things to the project managers holding different conceptions. A variation of meanings of same attributes in different conceptions demonstrated a cumulative and hierarchical relationship.

6. Discussion and conclusions

With the increasingly spread of Western standards-based project management professional competence certification programmes in China, it is worth exploring Chinese project managers' ways of experiencing and accomplishing their work, and thus to understand their competence at work. By replicating Chen and Partington's [4] previous UK-based phenomenographic study of construction project management competence, this study demonstrates how Chinese construction project managers' ways of experiencing their work, namely, their conceptions of their work, determine their competence at work. The research findings suggest that whether and how the predefined set of knowledge embodied in the Western standards are used by Chinese construction project managers in their workplace are preceded and determined by their conceptions of that work. With different conceptions, Chinese project managers attach different meanings to the attributes and organize the attributes into a distinctive competence in performing their work.

Thus, the findings of this study in China confirm the conceptual determinants of construction project management competence in the workplace first revealed in Chen and Partington's [4] previous study in the UK. Further, the replication of the phenomenographic approach to understanding project management competence in China enhances the cross-cultural validity of the approach and highlights its potential for explorative management research. Meanwhile, the research findings reported here provide practical implications for effective training and professional certification of project management competence within the Chinese context. It is our hope that the findings of this study will provide fresh insight for Chinese government and professional organizations to develop and update project management competence assessment and development programmes relevant to construction project management work within the Chinese context. This may also have implications for designing and conducting effective training courses on construction project management in China. Moreover, variations in the forms of conceptions and meanings attached to each conception in the two nations highlight the cultural impacts on project management work performance that has implications for further in-depth research.

The findings of this research are, of course, based on data from a single industry in China, and caution should be exercised in generalizing the findings to contexts other than construction projects in China.

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