INTERPERSONAL TRUST AND WILLINGNESS OF KNOWLEDGE SHARING AMONG ARCHITECTS -----AN APPLICATION OF PERSONAL CONSTRUCT THEORY IN KNOWLEDGE MANAGEMENT

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ABSTRACT

Based on in-depth interviews and the personal construct theory, this paper explores the constructs that affect interpersonal trust and willingness of knowledge sharing among architects in Mainland, China. The process of the interviews will be described to illustrate how personal construct theory is applied. A triangulation method is then used to analyze the interview data: cluster analysis for testing the validity of those constructs; principle component analysis for finding the underlying dimensions of the interview data; and content analysis for cross-checking of the results from the principle component analysis. The final results suggest that interpersonal trust may be only a mediating variable for willingness of knowledge sharing. Further research and development is also discussed.

KEY WORDS

interpersonal trust, willingness of knowledge sharing, architect, interview, personal construct theory

INTRODUCTION

The importance of knowledge management (KM) is increasingly appreciated over past several years (e.g., Wiig 1997). The intensive interest in competitive advantages motivates managers and researchers to focus on how to manage knowledge effectively and make full use of knowledge. Knowledge here is defined as justified belief by practice. The process of justification is test and evaluation, or trial and error in practice (e.g., FiresTone 2001, Popper 2002). Generally, knowledge management process involves knowledge sharing, knowledge storage, knowledge creation and knowledge application. Trust is considered to be an important factor for successful knowledge management in the literature. Based on Mayer and Davis (1995), we define interpersonal trust as "the willingness of one party, under the risk awareness of greater negative outcomes than favorable expectations, to be vulnerable to the actions of the other party in an environment of mutuality". An environment of mutuality means situation and person specific (Bhattacharya et al. 1998). Some researchers have done some empirical studies about the role of trust in the field of knowledge management (e.g.,

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Choi 2000, Holste 2003). The preliminary findings argue that trust is important for knowledge management, particularly for willingness of knowledge sharing (e.g., Holste 2003). In terms of social psychology, willingness of knowledge sharing is defined as the intention for people to share their knowledge.

In the field of trust, some researchers try to identify factors that could affect trust. Peng (1998) summarizes the factors in different contexts. As those studies suggest, different factors will affect trust in different contexts. So the authors raise the following questions: what factors will affect interpersonal trust in the context of construction industry? Besides trust, what other factors will affect willingness of knowledge sharing in construction industry? To establish a specific research focus, the authors put the interviews in the context of a project design team.

To find the answers for the above questions, several in-depth interviews were conducted in the Mainland China. This paper describes the design and the results of the interviews. In the following sections, firstly the theory underlying the interviews will be described. Then the background information of the interviews will be given. Thirdly, the design or guideline of the interviews will be explained. Finally, the interview data analysis method as well as results and their interpretation will be presented. Limitations of current research and suggestions for future research will also be discussed.

AN INTRODUCTION OF PERSONAL CONSTRUCT THEORY AND ITS IMPLICATION

The theory of personal construct is proposed by George Kelly, a psychologist and clinician. Kelly (1991) assumes that “every man is, in his own particular way, a scientist.” Based on this assumption, he tries to explain how people become who they are. One point to note is that Kelly focuses on individuals or a single person rather than masses of people.

Personal construct theory argues that individuals have their own mental maps called personal constructs by which they view the world. This map is made up of a system of dichotomous constructs. For example, if you judge a person as good, you must refer to some people as bad. Otherwise it is meaningless to say somebody is good. In terms of personal construct theory, *good-bad* is a dichotomous construct. This dichotomous characteristic of constructs has got some support from Osgood (1957) and Pratkanis (1989). Kelly regards the individual’s list of constructs as a set of reference axes and establishes the term “psychological space”. This psychological space is person dependent. In other words, this psychological space is not applicable to masses of people.

On the other hand, Osgood (1957) postulates a “semantic space” for masses of people. He assumes that in this space there are some unknown dimensionalities. Each dimensionality is composed of a semantic scale. Based on his empirical research, Osgood finds that this kind of semantic scale is defined by a pair of polar (opposite-in-meaning) adjectives, called semantic differential. For example, three common dimensionalities of masses of people have been discovered--evaluation, potency, and activity-- in Osgood’s research (1957).

Arguably, there should be some differences in individual’s personal construct systems since people have different experiences. However, people can not communicate with each other unless there are some overlaps between their systems of personal constructs. We could

find those overlaps under the awareness of differences by applying Kelly and Osgood's theories.

By applying the personal construct theory in this research, interviews are carried out to explore the overlaps in a real setting environment, i.e. a project design team in architectural design institutions. Besides open questions, Full Grid Technique (FGT), which is a method used by previous researchers (e.g., Stewart et al. 1981) in eliciting personal constructs, will be used in the interviews. Each person in a project design team would have his/her understanding of what constructs would influence trust and what constructs would influence willingness of knowledge sharing. By analyzing the results of interviews, we could understand their personal constructs and also the consensus among them. We could find the key constructs influencing interpersonal trust and willingness of knowledge sharing through a grounded approach.

AN INTRODUCTION ON THE CONTEXT OF THE INTERVIEWS

Within the time and resource constraints, we have conducted nine in-depth interviews in July 2005. The interviews were conducted in three different cities of Mainland, China—Beijing, Shanghai and Qingdao. Each interview lasted from more than one hour to over two hours. The nine interviewees are architects in seven different architectural design institutions. Their working experiences range from two to seventeen years. Three of them are registered architects in the Ministry of construction, P.R.China.

Among the nine interviews, seven interviews focus on interpersonal trust. The purpose is to find what constructs affect interpersonal trust among architects. The remaining two interviews focus on willingness of knowledge sharing. The purpose is to find what constructs affect architect's willingness of knowledge sharing. Both kinds of interview are in the context of a project design team.

DESIGN OF THE INTERVIEWS

The whole interview is divided into two sections. The first section is a semi-structured interview which focuses on open-ended questions. The second section is to collect the personal constructs by the application of FGT. Between and within each section, transition statements are prepared to help interviewees focus on different types of question.

FIRST SECTION

In the first section, an outline of relevant open-ended questions is prepared. This outline will help the interviewer focus on the current interview topic without losing any flexibility of probing any unexpected findings during the interview. There are three main parts in this section. The first part is to warm up the interviewee and build rapport. For most interviewees, this is the first time for them to be interviewed by someone. In order to reduce their concern on the interview, the confidentiality is assured at the beginning. The nature of the research topic is also explained in general. Permission of sound recording is granted by all interviewees.

In the second part, general background information about the architect's daily work is collected. This kind of question is much easier for the interviewees to answer. The questions are related to personal experience, project teams as well as organizations.

The third part is designed to overcome some limitations of FGT. The elements of FGT will set a boundary on what constructs would be elicited. Beyond those elements, even some constructs are relevant to the interview topic, they could not be discovered. So this part aims at finding out those constructs that are outside the boundary.

SECOND SECTION

In this section FGT is applied which is developed according to the personal construct theory. FGT is a modified version of Kelly's original Repertory Test. It regards each construct as a scale—five or seven point scale is commonly used. Respondents rate each element on the scale defined by the two poles of each construct. FGT enables researchers to see not only the constructs, but also how those constructs are used (e.g., Stewart et al. 1981).

The FGT table used in the interviews is presented in Table 1. The numbers 1 to 8 on the top row of the table represent the eight elements selected by interviewees. In all interviews, the eight elements are eight project team members with whom the interviewees worked before. For the seven interviews focusing on interpersonal trust four elements represent those team members trusted by the interviewee. The other four elements are those team members not trusted by the interviewee. For the two interviews focusing on willingness of knowledge sharing, four elements represent those team members with whom the interviewee is willing to share his/her knowledge. The other four elements are the team members with whom the interviewee is not willing to share his/her knowledge. Whether interviewees could find eight elements or less is case-dependent.

The emergent pole and contrast pole columns are constructs elicited with triadic method. The "honest-dishonest" and "lazy-diligent" are examples of constructs. The middle cells are respondent's ratings on the elements opposed to the bipolar construct scale.

Table 1: FGT Table Used in Interviews

Emergent Pole	1	2	3	4	5	6	7	8	Contrast Pole
Honest									Dishonest
Lazy									Diligent
...									...
...									...
...									...

THE IMPLEMENTATION OF FGT

To carry out the FGT, five steps are generally followed. They are:

1. Demonstrate the example of "train, car and donkey" (e.g., Stewart et al. 1981) to show respondents how to implement FGT.

2. State the interview topic clearly.
3. Ask the interviewees to select elements and write down on the prepared cards.
4. Use triadic method to elicit constructs: take three elements and ask the question—what are the similarities between the two as opposed to or different from the third?
5. Ask interviewees to rate each element on a five point scale.

When some constructs are not clear, the interviewer will further probe on them.

INTERVIEW DATA ANALYSIS METHODS, PROCESS AND RESULTS

DATA ANALYSIS METHODS

After the data collection, the authors put all the nine interview data into transcript and SPSS data format. A triangulation method is used to analyze the data. The quantitative methods include cluster analysis and principal component analysis. The qualitative method is content analysis.

The rational to select those methods for the interview data is as following:

- Cluster analysis: The collected constructs should be tested on their validity. In other words, whether these constructs are the ones we want to collect. One evidence to support validity is the differentiation of two clusters in elements. As described before, interviewees are required to select two different kinds of elements—trusted elements vs. not trusted elements; elements with whom the interviewee is willing to share his/her knowledge vs. elements with whom the interviewee is not willing to share his/her knowledge. So logically, if the constructs are valid, these two clusters should be clearly separated from each other.
- Principal component analysis: This method helps us find the underlying dimensions behind the collected constructs. Since the constructs are based on interview, it is possible that interviewees may refer to the same concept by different constructs. It is also likely that some constructs share a common dimension. So this method can reduce the initial data dimensions. In addition, the principal components discovered could be used in future model building (e.g., Dunteman 1989).
- Content analysis: This method provides a comparison between the interviewee's perspective and the researcher's perspective. In other words, the results of content analysis can cross-check the results of principal component analysis to verify whether they are consistent.

DATA ANALYSIS PROCESS

Cluster analysis

SPSS is used for cluster analysis and principal component analysis. Hierarchical cluster analysis is adopted to check whether constructs are valid or not. Although we impose the two clusters as a priori in the data structure, the separation of the two clusters can not absolutely ensure that those constructs are valid. It may due to other unknown reasons that the two clusters are differentiated. However, since we intentionally imposed this two-cluster

structure, the separation of the two clusters at least gives us some confidence on the validity of those constructs.

Principal component analysis

In principal component analysis, five steps are followed:

1. Check construct correlation matrix: The purpose of principal component analysis is to reduce original data dimensions i.e. to transform initial correlated constructs into fewer principal components. If those constructs are not correlated with each other, it is not meaningful to apply principal component analysis. A check of the nine interview data correlation matrix shows that many constructs are reasonably correlated with each other.
2. Check output tables and diagrams: This step helps us to make sense of the overall data analysis results.
3. Check Eigenvalue and Scree Plot: The purpose of this step is to determine how many principal components to retain. Usually researchers agree that principal components should be retained if their Eigenvalues are bigger than 1.0. However, some researchers argue that an Eigenvalue of 0.7 may be more appropriate (e.g., Dunteman 1989, Jolliffe 1986). Scree Plot is the other way to decide how many principal components should be retained. In scree plot, Eigenvalue is plotted against component number. The elbow of the diagram determines the number of principal components to retain. However, both methods are subjective. Researchers need to make decisions case-by-case.
4. Interpretation of principal components: For ease of interpretation, varimax rotation is applied. Rotation makes different groups of constructs have high loadings on different principal components so that it is much easier to interpret the meaning of those principal components.
5. Check correlation between constructs which have high loadings on the same principal component: Sometimes researchers are fooled by the statistical tools if they overlook some assumptions behind those tools. This step is important as argued by James (2002).

Content analysis

In content analysis, a coding manual is prepared for the coders. This manual provides detailed information about interview context, research questions, coding rules and steps, coding categories, and decision schemes. Deductive coding method is adopted by the coders (e.g., Bill 2000). The definitions of categories are based on the principal component analysis results. The aim of deductive coding method is to compare the results from principal component analysis and content analysis. Two peer researchers and two architects are invited to code the interview data. These two different groups of coders can provide a contrast between two perspectives. Coding reliability is assessed by Krippendorff's α (e.g., Krippendorff 2004).

SUMMARY OF DATA ANALYSIS RESULTS

Cluster analysis

Cluster analysis results show that in four interview data, the two clusters could be definitely differentiated while in other five interview data the two clusters could not be clearly differentiated. The results suggest that most constructs are valid but some are not. However, as one interviewee told us, sometimes the boundary between the two clusters are not so clear-cut. In a summary, the cluster analysis makes us aware the limited validity of some constructs.

Principal component analysis

For the seven interviews focusing on interpersonal trust, four principal components are discovered. They are "team member's attitude on work", "team member's ability on work", "team member's personality", and "team member's social interaction". For the two interviews focusing on willingness of knowledge sharing, two principal components are found—"team member's ability on work" and "team member's personality". As the results suggest, there are some overlaps between the principal components affecting interpersonal trust and the ones affecting willingness of knowledge sharing.

The hypothesized relationships among trust, willingness of knowledge sharing and underlying principal components are shown in Figure1:

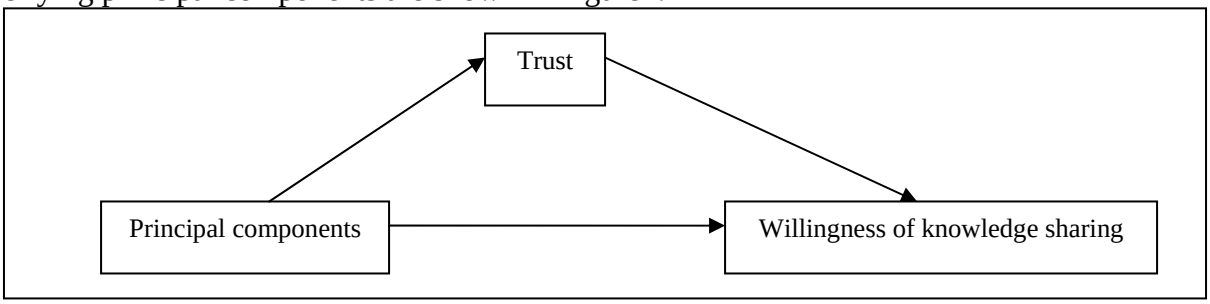

Figure 1: Hypothesized Relationships among Trust, Willingness of Knowledge Sharing, and Principal Components

The role of trust is similar to the mediating variable argued by Baron and Kenny (1986). So it is speculated that trust may be a mediator variable between the collected principal components and willingness of knowledge sharing. Further data collection is required to test this hypothesis.

Content analysis

Coding reliability is evaluated with Krippendorff's α which is calculated according to the following formula:

$$\alpha = 1 - \frac{D_O}{D_E}$$

D_O --observed disagreement; D_E --expected disagreement.

The Krippendorff's α of two peer researchers' coding result is 0.89 while two architects' Krippendorff's α is 0.92. Generally speaking, Krippendorff's α suggests that the coding results are reliable.

CONCLUSIONGS AND DISCUSSION

The paper discusses the detail of how personal construct theory could be applied in interviews concerning interpersonal trust and willingness of knowledge sharing. The strength of personal construct theory is the reduction of observer bias (e.g., Stewart et al. 1981). Through this theory and FGT, we can see the world from the interviewee's perspective and reduce the input from observer to minimum. The triangulation method is used to analyze interview data. The four principal components affecting interpersonal trust are "team member's attitude on work", "team member's ability on work", "team member's personality", and "team member's social interaction". The two principal components affecting willingness of knowledge sharing are "team member's ability on work" and "team member's personality". The results show that there are some overlaps between the principal components affecting interpersonal trust and the ones affecting willingness of knowledge sharing. It is speculated that interpersonal trust may be a mediating variable for willingness of knowledge sharing. Further data collection is necessary to test this hypothesis. Last but not least the principal components discovered could be the variables for future model building.

There are some limitations for current research. Because the number of interviews is limited, the current research is treated as exploratory study at best. The research results can not be generalized to the whole architect population in Mainland, China. Rather, the results can only tentatively apply to the architects in Beijing, Shanghai and Qingdao. To generalize the current findings, more interviews and subsequent questionnaires to collect more data are required.

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