

# The Relationship among Creative Development Activities, Mentoring and Knowledge Management and Technical knowledge Transfer Effectiveness : An Empirical Study

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**Abstract.** The proposed research takes the actual operation of Creative Development Activity, Mentoring System and Knowledge Management in China Steel Corporation (CSC) as a research sample to probe the relation between applied methodologies and industrial skill-transfer efficacy.

According to the experimental results, we classified the characteristics shown as following: 1. CDA is positively correlated to mentorship. 2. CDA is positively correlated to knowledge management. 3. CDA is positively correlated to efficacy of technical knowledge impartation. 4. Mentorship is positively correlated to knowledge management. 5. Mentorship is positively correlated to efficacy of technical knowledge transfer. 6. Knowledge management is positively correlated to efficacy of technical knowledge transfer. The limitations and suggestions of the proposed research are presented with conclusion for reference of relevant units.

**Keywords:** Transfer of technical knowledge, Mentorship, CDA, knowledge management, knowledge share, experience transfer.

## 1. INTRODUCTION

This study aims to explain how the success of “industrial technical knowledge transfer” and corporate profits are topics highly worth studying. The reasons are as follows:

From the standpoint of large steel companies which pursue sustainable development and hope to demonstrate their corporate social responsibility, recycling, reconstructing and renovating equipment to encompass multiple generations is indeed important for increasing the capability of developing new steel type production lines. It also has a fairly positive impact on the conversion rate and energy-saving potential of company products.

Another truly groundbreaking issue to discuss concerning business management is the transferring of legacies. Related subjects worth studying include how to deal with the problem of aging base employees and updating different generations of steel factory equipment, as well as how new-generation workers can use the organization’s existing Quality Control Circle (QCC) activities and the mentoring system to learn from their seniors and continue to develop ways to improve factory productions.

As the technology of steel production continues to become even more developed and complicated, expertise in various fields must become linked to production results so that the results and value gained from investment in improving equipment can be shown, and also to ensure that the organization’s core strengths are retained even if older

generations eventually retire. China Steel Co. (CSC), ranked 23rd in the world in 2014, for example, continues to make benefits because of its high-quality human assets, sophisticated equipment and flexible development and production. This company will be the main subject of study in this research. Current studies are more focused on “Knowledge Management and innovation capacity” and “innovative strategies”, while putting into good use techniques and experience of different types of professional personnel is a subject that has not yet been studied in an in-depth way.

To sum up, the CSC faces not only price competition from international steel companies and unfair regional tariffs, but also the challenge of the imbalance that the incoming influx of retirements could bring to its human resources structure. Thus, it is important to focus on the “transfer”, the passing-down of techniques from highly experienced staff members to newcomers.

Therefore, the purpose of this study is to explore the existing Creative Development Activities (CDA) in the CSC organization, as well as how activities such as mentoring systems and Knowledge Management activities may correlate with industrial technical knowledge transfer. This study aims to, through statistical analysis, discuss the CDA, the mentoring system, Knowledge Management and other key items that influence the effectiveness of technical knowledge transfer, so as to find a concrete conclusion and offer

companies suggestions from the research results.

## 2. Literature review

### 2.1 Creative Development Activities (CDA)

CDA is defined by some as a voluntary meeting between the leader and workers from the same group in a company unit that is held outside of normal work time to improve the quality problems of the department (Juran, 1967).

A Quality Control Circle (QCC), on the other hand, is defined by many as a group of four to twelve people, formed by members who are from the same company unit and do the same type of work. The members voluntarily hold regular meetings to seek or analyze the crux of the problems they face, and search for a method to deal with the problem. The methods they come up with will be turned in to the management for assessment and approval (Stebbing, 1990).

With the above in mind, this study defines CDA as: a team voluntarily formed by members from the same job unit, to seek improvement in their work and participate in activities related to Quality Control. Such teams are also part of the Company Wide Quality Control (CWQC). This study will then discuss the impact such a CDA system has on a company's "mentoring system", "Knowledge Management" and "effectiveness of industrial technical knowledge transfer".

### 2.2 Mentoring

As Kram (1985) defines it, the "mentoring system" can be a relationship between a senior and a junior in the same organization, or a relationship between peers. This is a relationship that would offer lots of different functions of different features, and could help the less experienced in an organization to improve. The "master" role would help the "apprentice" role to develop his abilities in his work, and thus increasing the possibility of career advancement for the "apprentice", while also offering him mental support. The "master" is often defined as an individual who must promise to do all in his power to support the less experienced, and by this way help the "apprentice" overcome obstacles he may come across in the organization as well as increase his motivation to strive for a better position (Hunt & Michael, 1983; Kram, 1985). One benefit of the mentoring system that is often easily overlooked is that it could strengthen and ensure the transferring of the organization's culture, and also lessen the rate of staff turnover in the organization (Zey, 1995).

This study suggests that a mentoring relationship can also be interpreted as a form of communication and interaction mechanism, which enables both sides to, through teaching and learning, improve in their own ways and obtain qualities necessary for their company. This kind of relationship will also help in the development and growth of the organization. Therefore, this study will focus on discussing the mentorship system in the CSC, and the impact this system has on the effectiveness of the transfer of industrial technical knowledge.

### 2.3 Knowledge Management (KM)

As Petrash (1996) points out, "Knowledge Management" means to transfer the "Right Information" at the "Right Time" to the "Right Person", so that the information could be effectively used to perform the "Right Action".

Meanwhile, O'Dell and Grayson (1998) believe that "Knowledge Management" is a strategy that ensures that the right knowledge can be delivered to the right person at the right time, so that people could share knowledge and put what they know into action to improve the performance of the organization as a whole. Harem, Krogh and Roos (1996), on the other hand, state that successful transferring of knowledge means that the recipient of the knowledge would have the same understanding toward the same piece of knowledge as the deliverer of the knowledge. On yet another hand, Bushnell (1990) defines training performance as consisting of short-term output and long-term outcomes.

This study integrates the essence of Knowledge Management, and through focusing on the concepts and functions of Knowledge Management, discusses the current practical methods used by the CSC and its relationship with and impact on facets such as "CDA", "the mentorship system" and "effectiveness of technical knowledge transfer".

## 3. Research Framework

This study will, based on literature review, summarize the degree of correlation between "effectiveness of technical knowledge transfer", "Knowledge Management", and "industrial activity tools: CDA and the mentoring system", as well as the impact they have on each other.

Based on a literature review, this study conceptualizes the relationships as Fig.1

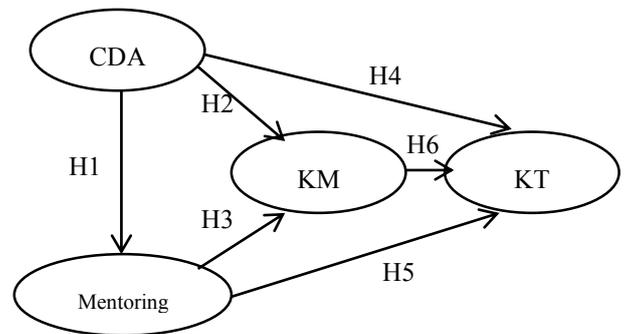


Fig.1

### 3.1 Research Hypotheses

According to the abovementioned research framework, the following hypothesis is put forward:

H1: Creative Development Activities (CDA) have a significant positive correlation with mentoring systems

H2: CDAs have a significant positive correlation with Knowledge Management

H3: CDAs have a significant positive correlation with the

effectiveness of technical knowledge transfer

H4: Mentoring systems have a significant positive correlation with Knowledge Management

H5: Mentoring systems have a significant positive correlation with the effectiveness of technical knowledge transfer

H6: Knowledge Management has a significant positive correlation with the effectiveness of technical knowledge transfer

### 3.2 Research setting and participants

Six demographic variables are included in this study, such as (1) Whether the subject has been involved in CDA or not; (2) Age; (3) Department the subject works in; (4) Education level, and more. In the 359 questionnaires turned in, 14 invalid ones were excluded, and the 345 valid questionnaires were collected for Descriptive Statistical analysis as a whole.

Table 1. Respondent characteristics

Category	Item	Number	%	Cumulative Percent
CDA	Yes	317	91.88%	91.88
	No	28	8.12%	100.0
Age	20-29	23	6.67%	6.67
	30~39	109	31.59%	38.26
	40~49	44	12.75%	51.01
	50~59	112	32.46%	83.47
	60 and over	57	16.53%	100
Service Department	Production department	122	28.05%	28.05
	Mechanical Maintenance	184	42.30%	70.35
	Electrical Maintenance	97	22.30%	92.65
	Quality inspection	29	6.67%	99.32
	other	3	0.68%	100.0
	Education	Junior high school	7	2.03%
Senior high school		138	40.00%	42.03

Bachelor's degree	143	41.45%	83.48
Master's or doctoral degree	57	16.52%	100

### 4. Analyses

The hypotheses afore-stated were examined respectively, in which independent variables and dependent variables were analyzed with a regression analysis. The results are shown in Table 3:

	$\beta$	R <sup>2</sup>	F	Result
H1	0.603	0.361	195.577***	Supported
H2	0.616	0.379	208.394***	Supported
H3	0.535	0.284	144.68***	Supported
H4	0.776	0.603	513.034***	Supported
H5	0.638	0.407	232.18***	Supported
H6	0.761	0.579	461.473***	Supported

### 5. Discussion

#### 5.1. Conclusion

345 valid samples were analyzed in this study, and the results are detailed as follows:

#### 5.1.1 Correlation between CDAs and Knowledge Management activities

According to the Descriptive Statistical analysis of this study, CSC workers generally agree that CDAs do indeed have the function of encouraging sharing and exchanging techniques, experiences, and knowledge. Through voluntary participation of all employees, it has indeed become a way to achieve the goal of technical exchanges and experience sharing.

Through correlation analysis, this study confirms that there is indeed a positive correlation between CDAs and Knowledge Management activities. Thus, in conclusion, the better the organization is able to encourage employees to learn through collective intellectual resources, the better it shall be able to stimulate workers to improve in their abilities and learn from observing others as well as experience and technique transfers which can be applied to their own work.

On the whole, CSC employees, in general, agree with the basic idea and function of CDAs.

### **5.1.2 Correlation between CDA and the mentoring**

Through correlation analysis, this study confirms a positive correlation between CSC's CDAs and their mentoring system. The study shows that CDAs increase the sense of participation and accomplishment, satisfaction and self-confidence in employees, and also offer an excellent learning environment that encourages employees to exchange knowledge. This raises the effectiveness of the mentorship and also the competitiveness of the organization.

### **5.1.3 Correlation between the mentoring system and KM**

Through correlation analysis, this study confirms a positive correlation between CSC's mentorship and Knowledge Management. This impact spans across several facets, and CSC has managed to, through their official mentoring system, construct a friendly learning environment in which new employees are able to gain professional techniques and skills.

The results of the study also show that for an organization to effectively accumulate intellectual assets, the "mentoring system" is indeed a way to help newcomers to the company to gather excellent skills necessary for the job through close interaction with others. This has become an important tool for constructing and innovating a "Knowledge Management" interface.

### **5.1.4 Correlation between KM and the effectiveness of KT**

Study results show a significant positive correlation between Knowledge Management and the effectiveness of technical knowledge transfer in the CSC. As a whole, the impact CSC Knowledge Management has on the effectiveness of technical knowledge transfer is something that ensures that CSC employees are able to provide deeper contributions to the field as well as fully grasp the core techniques of the industry. Thus, incorporating the parallel promotion of Knowledge Management and copying the strategy as a group will be a good way to ensure core competitiveness and continual growth of an organization.

### **5.1.5 Correlation between the mentoring, KM, and the effectiveness of KT**

This study confirms a positive correlation between the mentoring system, Knowledge Management and the effectiveness of technical knowledge transfer. Therefore, it can be concluded that "human resources" are indeed the most valuable asset of a company, and it is thus important to conduct "people-oriented" CDAs, mentoring systems and Knowledge Management activities, as well as continue to implement and improve such systems so that they could become better and more innovative.

## **5.2. Managerial implications**

The CSC, by introducing CDAs, the mentoring system, Knowledge Management as well as other activities and tools,

have indeed, as seen in study, successfully raised the effectiveness of industrial technical knowledge transfer and found ways to deal with problems that may arise in on-site factory production, the maintenance of electrical and mechanical equipment, and product quality. It is detailed as follows:

### **5.2.1 Factors that may affect the effectiveness of Knowledge Management activities in an enterprise**

This study finds significant positive correlation between CDAs and Knowledge Management activities. Therefore, it is suggested that when a company hopes to promote Knowledge Management, it should emphasize on the spirit of teamwork and learning together as an organization, as well as make known how employees are able to achieve self-fulfillment and truly get to reach their full potential through CDAs. A significant positive correlation has also been found between the promotion of the mentoring system and Knowledge Management activities. The mentoring system is a good example of interaction in a tight-knit group in which professional techniques are passed down and the cultural spirit of the organization is continued. Employees should be encouraged to use CDAs as a sort of informal mentoring system in conjunction with official mentoring systems, so as to increase exchanges of techniques and experiences between employees.

### **5.2.2 How does a company enhance the effectiveness of KT through KM activities?**

This study finds that the CSC, through Knowledge Management activities, has indeed significantly improved the effectiveness of technical knowledge transfer. A company may use CDAs or a mentoring system to, through Knowledge Management activities; achieve the results it needs for more effective industrial technical knowledge transfer. Therefore, it is suggested that when promoting technical knowledge transfer, companies should take in account the impact of CDAs, mentoring systems and Knowledge Management activities; so as to even more fully increase the effectiveness of the company's technical knowledge transfer.

## **6. Limitation of this study**

### **6.1 Sampling**

On sampling, the questionnaires used in this study were distributed to CSC employees through managers in Plants number one, two and three. The jobs of surveyed employees mostly concern on-site operations and productions, maintenance of machinery, maintenance of electronics, and quality inspection. Other factories, units and levels were not surveyed, and therefore it is possible that the scale of the survey isn't quite on the large side and the samples may not have been evenly distributed. Also, it is assumed that all who filled out the questionnaire are participants of CDAs and part of the mentoring system, as these are both integral parts of the company's culture. This may cause somewhat biased results.

## 6.2 Dimension

The subjects of the study are CSC employees in production-related departments who are either involved in CDAs or in a mentoring system. The results found, therefore, are more relevant to on-site practical production workers, and do not take in consideration the technical knowledge transfer of other units in the company such as finance, sales, general affairs, planning, research and development, information, engineering, human resources and other departments. Therefore, the results found in this study should be considered more relevant to a context of on-site production-related technical knowledge transfer.

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