

Exploration of the Relationship among Cohesion, Knowledge Sharing, and Team Performance of Design Students during Graduation Project

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Abstract

College students participating in a graduation project inevitably encounter teamwork communication problems. Their performance depends on good team interaction, which can be promoted by knowledge sharing among team members. Hence, this study focused on exploring the relationship among cohesion, knowledge sharing, and team performance regarding their influence on student teams. A questionnaire survey investigated 92 college design students. Analytical results showed that knowledge sharing in teams with greater cohesion positively influenced students' team performance, which was particularly evident in the three winning teams. More frequent but shorter team meetings could improve the project production's efficiency.

Key words: cohesion, knowledge sharing, team performance, graduation project, design college

Introduction

The evolution of development teams has received much attention in the context of modern global industrial growth. Among Fortune 1000 companies, 68% have adopted a teamwork approach [1]. The quality of interactions between team members and their abilities to get along with one another affect overall team performance [2]. Thus, an important topic is establishing ways by which team members use knowledge sharing to achieve the best results from teamwork [3]. When team members hold discussions, they share knowledge that is new or based on past experiences to seek a good solution [4][5]. Doing so creates a sense of team identity and cohesion [6], which is conducive to the achievement of good results [7].

This study aimed to determine whether the teamwork approach adopted by corporations is applicable to college students undertaking thematic production as their graduation project. This is a compulsory course for all college students in Taiwan who pursue design-related courses. If the success (or lack thereof) of corporate projects depends on factors such as mutual support, cohesion, and knowledge sharing among team members, are students in design schools undertaking their graduation projects affected by similar factors?

Pfaff and Huddleston [8] and Chiang [9] found that students faced many problems or had commonalities during team formation. For example, most members consisted of acquaintances. When disagreements happened, oppositions and cold relationships would spring up among members, sometimes teams even disbanded. Thus, the issue of mutual trust exists when members of student teams interact. This study observed the cohesion, knowledge sharing, and team

performance of students in design schools after forming project teams, examining the following main research topics:

1. Impact of team cohesion on knowledge sharing;
2. Impact of knowledge sharing on team performance; and
3. Impact of team cohesion on team performance.

Literature Review

Thematic production is also known as special studies, and it is problem oriented by nature [9]. Through the thematic production course, students learn problem-solving skills, teamwork, and interpersonal relationships and skills [8][10].

Widmeyer, Brawley, and Carron [11] and Carron, Bray, and Eys [12] interpreted cohesion as a dynamic process in which team members become closely integrated through their interactions to achieve common values and work goals. Fan and Lu [13] found that in a team with high cohesion, all members have a sense of trust in one another in all aspects. Davenport and Prusak [14] pointed out that knowledge sharing is the use of one's own experiences, insights, and professional understanding to analyze information and grasp opportunities. In a team with high cohesion, members have intense contacts and resource sharing with one another, leading to a stronger sense of bonding [13].

This being the case, if students involved in graduation projects were able to enhance the cohesion of their teams, there would be team harmony and trust, which would in turn promote greater knowledge sharing and communication among members. Therefore, this study proposed Hypothesis 1.

H1: Cohesion significantly impacts knowledge sharing

Nieva, Fleishman, and Rieck [15] and Chen, Chen, and Wang [16] defined team performance as goal-oriented behavior demonstrated by members to complete a task. Chen and Liu [17] noted that if organizations use team performance as the basis for rewards, there is cohesion in the team atmosphere and more knowledge sharing behaviors. The willingness of team members to engage in knowledge sharing improves the overall knowledge level and leads to better innovation performance.

There are two types of knowledge sharing: personal (individuals who are willing to pass on their knowledge without reservation to other people in general) and team (those who are willing to share their knowledge unreservedly with fellow team members on their own initiative) [5]. Lan and Liu [18] found that when employees were willing to mutually share what they had learned and put in effort toward knowledge sharing, their degree of exposure to new knowledge would increase, thereby improving their job performances and benefiting the company. Therefore, if students involved in graduation projects were engaged in knowledge sharing and transfer, there would be

good team interactions, leading to better cohesion and information sharing; all members would benefit from the better performance. This led to Hypothesis 2.

H2: Knowledge sharing significantly impacts team performance

In post office management, the cognition of employees wearing a uniform has a significantly positive impact on cohesion, which in turn has a significantly positive impact on the employees' self-efficacy [6]. The donning of company uniforms motivate employees to have a sense of identity toward the organization, which creates a strong centripetal force and cohesion among them. The same effect was achieved when students wore team uniforms during exhibitions.

Team cohesion is formed by two important factors: social cohesion and task cohesion. Through the latter, the former can affect members' intention to leave the team. On the other hand, task cohesion is enhanced when team members are able to establish mutual relationships through the team's social cohesion. When members have mutual recognition, task cohesion is similarly enhanced [19]. Jarvenpaa, Shaw, and Staples [20] found that when a team established good communication and team identity at an early stage, trust, cohesion, and team performance increased. It was thus inferred that if students of a graduation project team had good interactions built upon the team's sense of identity, team cohesion would be affected. This would inevitably affect team performance. Therefore, this study proposed Hypothesis 3.

H3: Cohesion significantly impacts team performance

Methodology

This study first explored the impact of cohesion on knowledge sharing, followed by the impact of knowledge sharing on team performance and the impact of cohesion on team performance. The research framework (Fig. 1) was thus established; the research findings are discussed next.

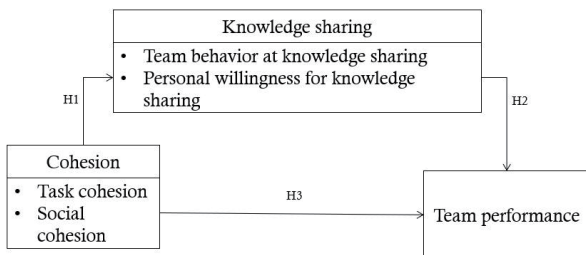


Fig. 1 Research framework

The observation participants were selected from graduating students of a particular college's design school. Online and paper questionnaires were used for sample collection, followed by on-site observations of interactive behaviors among team students. During the campus exhibition period, the researcher distributed questionnaires for completion or used PAD for participants to complete the questionnaire online. One hundred questionnaires were retrieved, of which eight were incomplete or not suitable and were removed, leaving 92 valid questionnaires. The questionnaire was divided into two parts. The first part focused on knowledge sharing [5], cohesion [6], and team performance [16], with 28 questions and an aim to understand members' interactions. The second part regarded demographic variables and related factors. These included five question topics: gender, total number of meetings per month, average duration of each meeting, completion status of the

graduation project, and discussion methods. A 7-point Likert scale was used for the first part, and the details are described below.

Results

A. Analysis of the Demographic Variables

SPSS 20 and Smart PLS 2 were used for data analysis. The questionnaires were first sorted and categorized before the data were subjected to various statistical analyses. The significant level of testing was set to $\alpha \leq .05$. Of all the valid samples, 59.8% were submitted by female participants, indicating a prevalence of females in the study sample. This was consistent with the actual situation of design schools in Taiwan, where there is a higher proportion of females than males [21].

In terms of the total number of meetings per month, the most popular response was seven times or more. The average meeting duration with the most responses was 1–2 hours (38.0% of valid samples). The most common discussion method was meeting in person (54.6% of valid samples). Most respondents had already completed 90% or more of their graduation project, accounting for 65% of the valid samples.

B. Analysis of Model Validity

(1) Convergent validity

According to Fornell and Larcker [22] and Nunnally [23], both the factor loading and composite reliability (CR) must be greater than .7. Fornell et al. [22] noted that the average of variance extracted (AVE) and Cronbach's α must be greater than .5 and .7, respectively. PLS-SEM statistical software was used to calculate the results. The factor loading of the questions on cohesion was .76–.93. For the dimensions of knowledge sharing and team performance, the factor loadings were .79–.96 and .92–.94, respectively. Four questions did not achieve a factor loading of 0.7 and were deleted [24].

The CR of the various dimensions was .92–.94, and that of all the aforementioned data was greater than .7. The AVE was .53–.76, and that of the data was greater than .5. Cronbach's α of the dimensions was .90–.92, and that of the data was greater than .7. The contents of these statistical data indicate that the study had good convergent validity.

(2) Determining the model's discriminant validity

The AVE method, a reflective indicator, was used to analyze the discriminant validity. Fornell et al. [22] pointed out that the root number of each dimension's AVE must be greater than the correlation coefficient between each pair of variables for there to be discriminant validity between the various dimensions. Table I shows that the AVEs of all the variables were greater than the square of the correlation coefficient. These results indicate that the study had discriminant validity.

TABLE I
 ANALYSIS OF DISCRIMINANT VALIDITY

	AVE	Cohesion	Team performance	Knowledge sharing
Cohesion	.61	.78		
Team performance	.76	.66	.87	
Knowledge sharing	.53	.65	.67	.73

C. Inner Model

(1) Analysis of the model's predictive ability

For the analysis of the structural model, PLS-SEM emphasizes the ability to construct formative indicators. It is different from methods that estimate the covariates between samples, in which all constructed dimensions are reflective indicators. The numerical value of the goodness of fit index (GFI) is not provided, while the values of R^2 and the path coefficients are the main references for determining the pros and cons of the model [25]. The explanatory powers of the endogenous potential variables are high, moderate, or low when R^2 is greater than .67, .33, and .19, respectively [26][27]. The results of the analysis show that R^2 of knowledge sharing and team performance was .42 and .53, respectively. Thus, both dimensions had moderate explanatory powers, indicating that the explanatory power of the proposed model was fairly good.

Significance testing was determined by the t -value. This indicator examines the suitability of the potential variables using the t -value: the larger the t -value, the greater the suitability [28]. PLS uses the resample procedure to determine whether the path coefficients are significant. In this study, the significance of the path coefficients was analyzed using the bootstrapping method [26]. The results of the analysis could be determined by the t -values shown in Table II. The standard value had been exceeded, all three hypotheses were significant and were therefore valid.

TABLE II
 SIGNIFICANCE TESTING VIA THE BOOTSTRAPPING METHOD

Research hypotheses	Sample Mean (M)	Standard Error (STERR)	T Statistics (O/STERR)	supported
H1: Cohesion → Knowledge sharing	.65	.06	10.50	Yes
H2: Knowledge sharing → Team performance	.42	.11	3.81	Yes
H3: Cohesion → Team performance	.39	.11	3.45	Yes

(2) Determining the structural model's validity

According to Cohen [29], effect size (ES) is low, moderate, or high when $f^2 = .02-.15$, $.15-.35$, and $> .35$, respectively. The results show that the ES of cohesion on team performance, and of knowledge sharing on team performance, was both moderate ($f^2 = .19$ and $.22$, respectively). However, the ES of cohesion on knowledge sharing was high, with $f^2 = .73$. Overall, the ES of this study's three hypotheses was moderate-high.

Discussion

A. Verifying the Hypotheses' Results

The results show that all three hypotheses had discriminant validity. It could also be seen from Table II that all three hypotheses and the structural model were valid. Overall, the proposed model had good explanatory powers. Thus, the samples could explain the actual situations in which cohesion and knowledge sharing and transfer affect team performance.

B. Discussion

(1) Cohesion had a significant impact on knowledge sharing

The results were consistent with the findings of Chen & Liu [17] and other researchers. During the production of the

graduation project, when cohesion among team students strengthened, team harmony and trust improved, which facilitated closer knowledge sharing behaviors. The survey found that some student members were actually roommates, and had developed a tacit understanding with one other through living together. They communicated without much of a barrier, which was conducive to the smooth completion of the graduation project.

(2) Knowledge sharing had a significant impact on team performance

The findings were consistent with those of Chen and Liu [17], Huang and Hsu [5], and Lan and Liu [18]. Frequent knowledge sharing and transfer was related to interactions and exchanges between student team members. When there was a certain volume of knowledge sharing, the frequent transmissions of information led to good communication, which in turn led to better team performance and successful outcomes.

In the exhibition hall, student teams whose projects were nearer completion had positive attitudes and a higher degree of enthusiasm and confidence toward their own projects. Taking the "Wonderful Build" team as an example, the members would often discuss with one another about ways to modify the project or incorporate visitors' suggestions into post-event modifications. Their determination to improve the project was obvious. "Wonderful Build" was shortlisted for the 2018 Young Pin Design Award, and it would be within expectations if the team were to win the awards for product and craft designs.

(3) Cohesion had a significant impact on team performance

The results of this study were consistent with those of Jarvenpaa et al. [20], Chen et al. [16], and Hong and Chi [19]. In the process of completing the graduation project, the student teams shared a common goal, wanting to present the best quality work. Enthusiasm for the work created a sense of identity and cohesion, resulting in better quality; it was a positive cycle. This author found that when students treated each other as members of the same team, their attendance frequency at the exhibition was higher. They were more willing to share the production process and project concept with visitors.

The findings based on the hypotheses of this study are consistent with those of past scholars in some of the literature. The students in the teams of this study belonged to the same department. During the semester, they already knew each other through attendance in various courses or participation in activities. As such, there was already a certain level of inherent cohesion among the team members. On the basis of good knowledge sharing, it was easy for them to achieve team harmony and performance.

On the other hand, knowledge sharing in corporations may be more difficult to achieve because members of corporate teams are from different fields and departments. Their mode of existence is also unlike that of the students: most of them likely only spend time together during official meetings. Thus, an important issue is how they can communicate with one another in a mutually understandable way so that new knowledge is learned.

From "Wonderful Build," "Every Day in Huazhai," "Spice Tale," and other award-winning student teams, the researcher

found that each team met more than five times a month. Having spent sufficient time together, the members had developed good interactive relationships and tacit understanding, which enhanced their sense of identity. These allowed them to achieve better team performance. This researcher would suggest that student team members adjust the total number of meetings and the duration of each meeting. Specifically, the total number of meetings could be increased, while the duration of each meeting could be shortened. Each meeting should be concluded within 1–2 hours to improve efficiency. Having multiple short meetings is conducive to the cultivation of teamwork.

For corporations, team members can be motivated with the spirit of teamwork and cooperation through their identification with an employee benefits system, such as rewards for team performance. In the process, employees can cultivate tacit understanding and engage in friendly information exchanges with each other, benefiting the cohesion of the entire company and the achievement of good performance and results [30].

Conclusion

Team development is extremely important in today's work environment. Hence, this study focused on students of a design school who were undertaking graduation projects through teamwork. The aim was to explore the factors affecting team performance for the reference of future researchers. The results show that student teams with high cohesion engaged more frequently in knowledge sharing behaviors, which led to the achievement of good team performance. The suggestions for team development included ways by which teachers could improve the conducting of courses, and by which students could adjust the number and duration of meetings. Relationships within a team could be cultivated through close interactions, mutual discussions, and sharing. These would establish a sense of identity and cohesion in members toward the team. Student teams could consider increasing the total number of meetings but keeping the duration of each meeting short (1–2 hours are recommended) to ensure efficiency and achieve good team performance. For future research directions, it is suggested that the study participants include teams formed with interdisciplinary members. The relationships between the various dimensions can also be examined using additional and different variables.

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