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A STUDY OF CROSS-LEVEL FACTORS IN MOTIVATING TEAM CREATIVITY: IN TAIWAN'S UNIVERSITIES

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ABSTRACT

Team creativity is the result of collective interaction and cooperation. It is not only enhancing team learning effect, but also facilitates future team work achievements. Strengthening the team creativity of technical and vocational universities' student teams from designing teaching courses is currently a critical research topic. In this study, we used creative marketing tasks to foster team creativity in educational contexts. We focused on how cooperation among team members during the implementation of team cognitive processes, including team creative efficacy, team work efficacy, and climate context, generates team creativity. We administered questionnaires to 338 students enrolled in 85 creative marketing task teams. We used HLM analysis to discover that relationships among team innovative climate, team work efficacy, and team creativity were more positive when team innovative climate was high than when team work efficacy or team creativity was high. We also discussed the implications of these results for research and practice.

KEYWORDS

team creative efficacy, team work efficacy, team innovative climate, team creativity.

INTRODUCTION

Innovation emerges when the creativity of a team in adding value continually increases. Following trends in innovation development, a new direction in creativity research emerged, through which the creativity that occurs in collaborations and team or group dynamics is explored (Bechtoldt, Choi, & Nijstad, 2012; Sawyer, 2012) to understand how creativity is embedded in teams and how creative products are inspired through networks of cooperation. Although previous studies have explained the importance of teamwork to creativity, research on how creative products are produced through team mechanisms and the relationship between the emergence of team creativity (TC) and the creative practice of individual team members remains lacking (Sawyer, 2012).

Creativity is associated with team mechanisms because the creativity that occurs in rapidly changing environments typically transpires through numerous complex and intractable problems or challenges. When the complexity of the challenges involved in problems or tasks increases, the diverse knowledge, efforts, and skills of multiple people are required to identify solutions (Brown, Ganesan, & Challagalla, 2001). Therefore, a high level of creativity is associated with complex collaborative results (Sawyer, 2012). If creative achievements are desired, the dynamic energy exhibited during the process of collective creativity is necessary. However, based on previous empirical studies, research on the team level as the basis for creativity is lacking (Nilniyom, 2007). Most studies on TC have adopted the social psychology perspective (Bechtoldt et al., 2012), focusing on individual creativity and groups' ability to apply individual creative resources. Few studies have addressed the factors that promote the creativity of teams comprising ordinary members (Shin & Zhou, 2007). In addition, no studies have comprehensively analyzed the interaction and collaboration processes that occur within teams (Sawyer, 2012). This indicates that additional studies on TC should involve the use of these processes as a foundation for investigation (Shin & Zhou, 2007), thereby studying and elucidating the complex relationships among task characteristics (such as problem solving and teamwork), environmental factors, creativity, and other functions associated with creativity (Fabricatore & López, 2013). Therefore, to bridge these research gaps, we explored the collective beliefs of team members toward team interaction and cooperation, elucidating how TC can be promoted through interactions with contextual environments.

TC is the result of collective interaction and cooperation; it is generally applied in learning processes and professional fields (Nilniyom, 2007). If people can recognize and effectively use collective dynamics to display TC before entering the workplace, this would improve learning effectiveness and facilitate the attainment of future work achievements. Therefore, increasing the TC of student groups is a critical research topic. However, scant studies have addressed TC among student groups (Sawyer, 2012; Shin & Zhou, 2007). In the present study, this study used students from science and technology universities, which focus on vocational education, as the research subjects for exploring TC to understand how university students in Taiwan promote TC through the process of collective interaction and cooperation.

This study explored TC based on the process of collective interaction and cooperation. Collective beliefs and contexts of teams are indispensable dimensions. The assessments on the beliefs of creativity should be superior to those on general beliefs to yield beneficial and essential results. Team creative efficacy (TCE) is related to the ability of team members to work together and form common beliefs and expectations regarding creative achievements. When environmental contexts, involving limiting factors such as social integration, dysfunctional conflicts and policies, team commitments, and reduced team climates, affect a team, the team's confidence and expectations toward its collective creativity are extremely critical for promoting the team's creative achievements (Shin & Zhou, 2007). In addition, because TC and collective effort are closely related, all team members must learn and engage in team cooperation and possess a positive team spirit if team effectiveness is to be optimized (Mohammed & Dumville, 2001). Therefore, we argue that teamwork efficacy (TWE) must be included in the discussion on the process of promoting TC.

Few studies have addressed the contextual processes of TC, such as team interaction, external communication, and social integration (Shin, Kim, Lee, & Bian, 2012). The support, vision, task orientation, and communication included in an environmental context are often associated with creativity and innovation (Anderson & West, 1998; Hülsheger, Salgado, & Anderson, 2009). This is because a team that follows a well-designed contextual process can still display TC despite the

weak creative skills of the team members. By contrast, although the team members possess strong creative talent, if the team's contextual process is ineffective, the team will struggle to attain collective creative achievements (Bissola & Imperatori, 2011). The contextual process is associated with the support of innovation, vision, task orientation, and external communication, which are emphasized in a team innovative climate (TIC; Anderson & West, 1998; Hülsheger et al., 2009). This indicates that, in addition to exploring the collective efficacy and context of the TIC must also be included when investigating TC to increasingly perfect the research framework of this study.

THEORY DEVELOPMENT AND HYPOTHESES

The Relationship Between Team Creative Efficacy (TCE) and Team Work Efficacy (TWE). TCE refers to the collective beliefs of team members in their ability to produce creative ideas. In other words, it is the team's belief in its novel and useful creativity when performing specific tasks (Shin & Zhou, 2007). TWE is a concept that integrates the common mentality of team members and the team process. It comprises four combinations of the following elements: (a) the team's commitment to completing a task; (b) team members' commitment to assisting each other to maximize team performance; (c) the active participation, communication, and interaction of all team members; and (d) the ability of the team to effectively utilize time, resources, and the professional knowledge of its members to complete a variety of team tasks (Hirschfeld et al., 2006).

In addition to motivating people to excel in their work, team efficacy motivates team members to produce diverse new ideas and effective methods, thereby inspiring creativity within teams (Hirschfeld & Bernerth, 2008). Simultaneously, team efficacy increases the motivation to achieve a mutual understanding among members, and encourages members to improve the communication and assimilation of complex affairs, thus stimulating constructive efforts among team members. During the process of learning and formulating solutions together, team members create, transmit, and integrate diverse information and creative ideas (Hirschfeld & Bernerth, 2008). This process enhances their understanding of each other, improves the commitment and interactions among members, and prompts them to devote cooperative efforts to achieving task goals (Hirschfeld et al., 2006). This shows that team efficacy can stimulate members' beliefs in their collective creativity and collaboration, and these two types of beliefs are also complementary concepts. Therefore, this study proposes **Hypothesis 1. TCE is positively related to TWE in student internship teams.**

In the context of team objectives, TC is team members' production of novel and suitable ideas, solutions, or processes (Amabile, 1996). Regardless of whether team members work together to produce new and useful ideas for products, services, processes, and procedures (Shin & Zhou, 2007); use novel and feasible ideas to solve problems and easily develop new methods or procedures; or produce creative solutions to problems, these scenarios all involve TC (Zhou & George, 2001). If team members believe that creative efforts are meaningful or trust that their own creativity can lead to success, they may display creative behavior in specific contexts (Drazin, Glynn, & Kazanjian, 1999). At the individual level of TCE, the motivations of team members are closely linked to the creativity process (Shin & Zhou, 2007). This is because the generation of creativity in team members requires effective interaction among them, suggesting that members must be highly motivated to exchange their ideas and perspectives. Thus, this study proposes **Hypothesis 2. TCE is positively related to TC in student internship teams.**

The Relationship Between TWE and TC. One of the reasons that teams are able to achieve distinct benefits is that members of such teams possess the mental foundation for teamwork (Mohammed & Dumville, 2001). The effective promotion of establishing relationships among team members, strengthening team knowledge, and understanding the concept of cooperation during the team process can improve team performance (Smith-Jentsch et al., 2001). The core mental concept of teamwork is the integration of the common mentality and team processes of team members. Focusing on mutual commitment, active participation, communication, and interaction among team members and being able to effectively use time, resources, and the professional knowledge of members can maximize team performance. In addition, these factors can improve aspects of collaboration when team tasks are executed and facilitate the integration of creativity among team members to attain various team tasks (Hirschfeld et al., 2006). The creative actions involved in the interactions between individuals and teams are beneficial for inducing creativity (Drazin et al., 1999). Therefore, this study proposes **Hypothesis 3. TWE is positively related to TC in student internship teams.**

The Moderating Role of Team Innovative Climate (TIC). According to the interactionist theory of team innovation, TIC is a variable in the team process (West & Anderson, 1996). Hülsheger et al. (2009) adopted the definition of team climate presented by Anderson and West and tested 15 team-level variables proposed for creativity or innovation over the previous 30 years. They determined that the support of innovation, vision, task orientation, and external communication were most strongly associated with creativity and innovation.

Bissola and Imperatori (2001) examined six beliefs toward creativity and suggested that a positive climate is one of the most crucial factors in the support of innovation. Despite that team members possess low creative skills, a positive climate design can stimulate individual and overall creative potential. By contrast, creative talent cannot provide a high degree of collective creativity. Even if the members of a team are highly creative, if their team exhibits destructive social dynamics, such as communication problems, or lacks group coordination, creative outcomes are unlikely. When dysfunctional conflicts occur within a team, members are less likely to establish relationships with others, experiment, and develop ideas (Shin et al., 2012). Although low TCE is not conducive to TC, the introduction of a TIC can improve the positive effects of TCE on TC. Therefore, this study proposes **Hypothesis 4. TIC moderates the positive relationship between TCE and TC, such that the positive relationship is enhanced when TIC is high in the student internship teams.**

Past studies have indicated that the crucial influence of supportive climates and team communication (Hülsheger et al., 2009) on TC is frequently manifested when crises occur within a team or during team cooperation. Heterogeneous member relationships provide teams with diverse information and knowledge and promote the effective flow and exchange of information and knowledge during team processes (Hülsheger et al., 2009). In addition, TC requires the use of the team convergence, which includes the effective processing of critical creative thinking in each member and the disposal of useless ideas (Shin et al., 2012), the provision and positioning of tasks (Tierney & Farmer, 2011), the promotion of interaction and communication that facilitate creative development, and the provision of encouragement and resources. These all facilitate the formation of ideas, thus enabling the realization of TC (Shin et al., 2012). TIC can not only improve conflicts and interaction and communication problems encountered during the process of team cooperation, but also increases the effectiveness of teamwork, thereby improving TC. Hence, this study proposes **Hypothesis 5. TIC moderates the positive relationship between TWE and TC, such that the positive relationship is enhanced when TIC is high in the student internship teams.**

METHODOLOGY

Sample and Procedures. This study examined 85 teams comprising a total of 338 students from universities of science and technology in Taiwan. These universities focus on cultivating the professional functions required of talented personnel in service industries (such as retail and wholesale, franchising, information services, and tourism and leisure). The research subjects of this study were creative marketing task teams that are led by the teachers of these universities; the members of the teams are third-year university students. This study randomly selected 10 universities of science and technology and then faculties (of business administration, information management and communication, and tourism and hospitality) within these universities, from which five teachers who guided student projects were also randomly selected. This study discussed the research purposes and design of the students' creative marketing projects with these teachers in advance. Figure 1 shows that each team was required to devise a procedural design for creative marketing tasks. Subsequently, this study personally distributed questionnaires and explained the research process to the teachers. Before the semester ended and after the creative marketing task was completed, the teachers distributed the questionnaires to the members of the student teams. The teachers and external collaborative industry supervisors assessed the creativity of each team, the results of which this study personally retrieved to reduce evaluation apprehension among the subjects and avoid social desirability bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Each team comprised three to five members. A total of 346 questionnaires from 85 teams were recovered among which eight were invalid questionnaires, yielding 338 valid questionnaires, with a valid recovery rate of 34%.

Measurement. To avoid ambiguity and uncertainty in the respondents' answers, this study used a 6-point Likert-type scale for all of our measurements, with 1 representing "*strongly disagree*" (or extremely low) and 6 representing "*strongly agree*" (or extremely high). This study designed two questionnaires, one for the teachers and the collaborative industry supervisors (the external experts) and one for the students. All of the students were required to complete TCE, TWE, and TIC scales, and the teachers and the external experts completed a TC scale. The raw data on the variables of this study were obtained from a variety of sources to

reduce common method variance (Podsakoff et al., 2003). This study employed the adapted translation-back translation procedure for all of the scales, and three scholars subsequently reviewed the translations and revisions to ensure that the items are suitable for our subjects and ensure the content validity of the scales.

TC: This study adopted three items developed by Zhou and George (2001) and applied by Sung and Choi (2012), and added three items that we developed. This study summed the averages of the scores for the six assessment items for each team, which were provided by the team teachers and the collaborative industry supervisors, to measure TC. High scores indicated a high level of TC. The coefficient alpha was.847, and the sample included items such as "This team used novel and feasible ideas to solve team problems", "This team easily developed new methods or procedures and work-related tasks", "When faced with a problem, this team produced creative solutions", etc.

TCE: This study adopted seven items from the team mental efficacy scale developed by Hirschfeld and Bernerth (2008) and three items for the TCE scale revised by Shin and Zhou (2007). To ensure that the questionnaires would enable the students to assess themselves, academic experts revised the two scales and removed six items; thus, a total of four items on TCE scale were used. The sample included questions such as "Does my team have strong confidence in its ability to creatively solve problems and complete tasks?" This study referenced studies (Hirschfeld & Bernerth, 2008; Shin & Zhou, 2007) in which multiple methods have been used for assessing team efficacy, and the sum of individual-level perception scores have been used as team-level perception scores. First, each member's scores on the four items were averaged as the TCE score for each member, which was then summed to produce the overall TCE score. The coefficient alpha was.858.

TWE: The 4-item scale developed by Hirschfeld et al. (2006) was employed in this study. Three experts revised the scale to facilitate students' self-assessment. This study calculated the average of the four items for each member to measure TWE, where high scores represented high TWE. The sample included questions such as "In my team, am I able to work together with the other members to complete tasks?" The coefficient alpha of this scale was.877.

TIC: This study applied the 20-item scale developed by Hülsheger et al. (2009), which was revised by three academic experts to facilitate students' self-assessment. For this scale, three items were removed, yielding a total of 17 items. This study calculated the average of the 17 items for each member to measure TIC, where high scores represented high TIC. The sample included items such as "The members of my team can develop new and novel methods to resolve problems." The coefficient alpha was.964.

Background Variables: Teams of university students were the subjects of this study. Such teams differ from professional teams in external organizations. Previous studies have performed team-level analysis, determining that team size and characteristics influence team efficacy and TC (Bechtoldt et al., 2012; Tierney & Farmer, 2011). This study used a limited design involving the analysis of university characteristics (universities of science and technology), student year (third-year students), team size (3-5 members per team), team task content (creative marketing planning and implementation), and team grouping (members drew lots to form groups) to address the interactions among the four variables. The background variables were faculty and team sex composition (all men, all women, or a mix of both).

Analyses. This study performed confirmatory factor analyses (CFAs) to investigate the discriminant validity of the factor structures of TCE, TWE, TIC, and TC. Overall model fit was assessed using the comparative fit index (CFI), the incremental fit index (TLI), and the root mean square error of approximation (RMSEA; Arbuckle, 2003). In addition, because this study measured four variables at the team level, this study conducted an analysis of the level of agreement among team members for each construct. When interrater agreement (r_{wg}) was greater than.70, this study analyzed the sum of the individual data (James, Demaree, & Wolf, 1993). To test intergroup variability, this study compared median r_{wg} scores and intraclass correlation coefficients (ICC[1] and ICC[2]). ICC[1] values near or exceeding.12 indicated a desirable level, and ICC[2] values near or exceeding.60 confirmed the validity of hierarchical constructs (James et al., 1993).

RESULTS

To assess discriminant validity, this study first conducted CFA on the items comprising the contextual variables TCE, TWE, TIC, and TC. This study also calculated full model fit (N_1=338 students; N_2=36 teachers, N_3=36 supervisors). The results indicated good fit for the two-factor model, in which all items were loaded on their intended constructs (χ^2=156.407, *df*=129, *p*<.01; CFI=.970; TLI=.964, RMSEA=.050). The two-factor model exhibited more satisfactory fit than did the one-factor model (χ^2=570.356, *df*=91, *p*<.01; CFI=.844; TLI=.872, RMSEA=.108). These results supported the discriminant validity of the TCE, TWE, TIC, and TC scales. Table 1 presents the means, standard deviations, and correlations of the four variables at the team level. Perceived TCE (*r*=.67, *p*<.01) and TWE (*r*=.59, *p*<.01) were positively correlated with TC, and TIC was positively correlated with creativity (*r*=.79, *p*<.01).

Aggregation for Team-Level Analysis. Students were nested within a team and worked with the same team leader in team units; therefore, this study performed hierarchical linear modeling (HLM) analyses by using HLM 7.0 software to test all the hypotheses (Raudenbush, Bryk, Cheong, & Congdon, 2004). The results of the hierarchical analyses indicated significant within-group agreement among TCE, TWE, and TIC. The r_{wg} values (James et al., 1993) for the team-level variables TCE (r_{wg}=.858), TWE (r_{wg}=.877), and TIC (r_{wg}=.78) indicated high interrater agreement. A one-way analysis of variance (ANOVA) performed for each of these variables indicated that the between-group mean square was significantly higher than the within-group mean square. The ICC[1] value was.171 for TCE,.152 for TWE, and.115 for TIC. The test statistics (F-ratios) associated with the ICC[1] values of these variables were statistically significant. The ICC[2] value was.84 for TCE,.76 for TWE, and.96 for TIC. These values supported aggregating TCE, TWE, and TIC to the team level.

Hierarchical Linear Modeling Results*. Null model.* Before examining any cross-level or team-level effects, confirming that significant between-group variance in the dependent variable occurred was necessary. This study examined a null model with no Level-1 or Level-2 predictors for creativity (γ_{00}=4.40, *t*=91.92, *p*<.001). The significant effect justified the examination of team-level effects for creativity. In addition, ICC[1] values indicated that between-team variance accounted for 11.5% of the variance in creative performance (χ^2=125.52, *p*<.005). This study then evaluated a series of hierarchical linear models to test the team-level hypotheses.

Two predictors—TCE and TWE. Hypothesis 1 predicted that students' perceived TCE is positively related to TWE. This study developed a Level-1 model for the dependent variable, with no Level-2 predictors. Consistent with Hypothesis 1, the results displayed in Table 2 (Model 1) revealed that perceived TCE was positively related to TWE (γ=.84, *p*<.001), indicating that TWE increased when students perceived an increase in TCE. Hypothesis 2 stated that students' perceived TCE is positively related to TC. This study developed a Level-1 model for the dependent variable with no Level-2 predictors. Consistent with Hypothesis 2, the results displayed in Table 2 (Model 2) revealed that perceived TCE was positively related to TC (γ=.78, *p*<.001), indicating that TC increased when students perceived an increase in TCE. Hypothesis 3 predicted that students' perceived TWE is positively related to TC. This study developed a Level-1 model for dependent variable with no Level-2 predictors. Consistent with Hypothesis 3, the results displayed in Table 2 (Model 3) revealed that perceived TWE was positively related to TC (γ=.17, *p*<.01), indicating that TC increased when students perceived an increase in TWE. ***In Innovative climate of a team.*** This study developed a set of intercepts-as-outcomes models to test the main effects of the four innovative climates. Students' perceived TCE and TWE were considered as Level-1 predictors and the intercept coefficients obtained from Level 1 were regressed onto the four innovative climates. Table 2 shows that our data yielded main effects for each of the innovative climates: support of innovation (Model 4: γ=.28, *p*<.05), vision (Model 4: γ=.11, *p*<.05), task orientation (Model 4: γ=.22, *p*<.05), and external communication (Model 4: γ=.16, *p*<.05) were significantly and positively correlated with TC. TIC accounted for 13.7% of between-team variance in creative performance.

Moderating interaction effects. This study examined a set of slopes-as-outcomes models to evaluate team-level interactions. Hypothesis 4 predicted that TIC enhances the positive relationship between TCE and TC. Perceived TCE was a significant Level-1 predictor, and the four team-level climate variables were significant Level-2 predictors; therefore, this study tested the interactions between TIC and TCE, and TIC and TC. The results displayed in Table 2 (Model 4) revealed that TIC initiated by team leaders and members moderated the effects of perceived TCE on TC. Consistent with Hypothesis 4, the Level-2 predictor for the effects of TIC on the slope of TCE was significant for TC (Model 4: γ=.15, *p*<.05). TIC accounted for 10.8% of between-team variance in the effects of perceived TCE on TC. Figure 2 illustrates this moderating effect, and indicates that when the TIC initiated by team leaders and members was high (one standard deviation above the mean), perceived TCE was more positively correlated with TC, whereas when the TIC was low (one standard deviation below the mean), creative efficacy was positively correlated with students' creativity, thus supporting Hypothesis 4. Hypothesis 5 predicted that TIC initiated by team leaders and members enhances the positive relationship between students' perceived TWE and TC. The results displayed in Table 2 (Model 5) are consistent with Hypothesis 5: the coefficient for TIC as a Level-2 predictor of the slope of perceived TWE was significant when TC was the dependent variable (Model 5: γ=.13, *p*<.05). TIC accounted for 9.6% of the between-team variance in the effects of perceived TWE on TC. Figure 3 shows this moderating effect, in which high and low levels are depicted as one standard

deviation above and below the mean, respectively. The positive relationship between perceived TWE and TC became stronger when the TIC initiated by team leaders and members was high (Fig. 4), which supports Hypothesis 5.

DISCUSSION

TCE, TWE, and TC: The results of this study revealed that at the team level, TCE improved TWE, and both TCE and TWE improved TC. This is because TCE and TWE involve a sense of collective competence, which enables the ideas and knowledge that team members possess to converge through team cooperation. In addition, members are able to view their opinions and ideas as opportunities and are encouraged to integrate diverse perspectives and opinions within the team. This consequently promotes the integration and use of new information (Brown et al., 2001; Drazin et al., 1999) and facilitates the management of risks encountered when creating innovations (Drazin et al., 1999). Therefore, once team members believe in their own creativity, a belief in cooperative effort inspires them to generate problem-solving methods. The results of this study indicate that TCE is more effective than TWE is in promoting TC. This study argued that this is because TCE involves the collective belief in creativity and creative behavior. By contrast, TWE emphasizes general collective beliefs toward the team process and relationships. Although both of these elements concern the team cognitive process, the dimensions of the cognitive process on which they focus differ. TWE focuses on the team's belief in cooperative effort and relationships (Smith-Jentsch et al., 2001), whereas TCE centers on the team's belief in its ability to engage in creative behavior (Drazin et al., 1999). As creative efficacy increases, the construction of meaning for creative behavior is improved. In team creativity, the team is open, flexible and can adapt to continuously changing. Team members must use novel and feasible ideas to solve team problems. And the team can easily develope new methods or procedures and work-related tasks. Team members understand that diverse information, knowledge, and opinions from within their teams are required to create new ideas. By contrast, if team members doubt their own or their teammates' ability, their confidence is lowered and their ability to construct meaning for creative behavior is relatively weak. Consequently, they struggle to identify and integrate various ideas or engage in creative behavior (Shin et al., 2012). Therefore, although TCE and TWE can both induce TC, TCE is more effective than TWE is.

The Moderating Effects Among TCE, TWE, and TC: According to the results, high TIC was associated with a strong positive effect of TCE and TWE on TC. However, TCE and TWE were still able to promote TC when TIC was low. Among the four dimensions of TIC, the support of innovation exerted the strongest moderating effect, followed by task orientation. The extent of the moderating effects of vision and external communication was equal. ***The support of innovation in TIC*** refers to a type of tentative expectation in the work environment, where attempts to introduce new and improved methods have received approval and support (West, 1990, p. 315). The support of innovation can stimulate members with creative potential or weak abilities and the team's overall potential for creativity and cooperation (Bissola & Imperatori, 2011; Hsu & Fan, 2010), which strengthens TC. ***Task orientation in TIC*** is a type of climate for excellence, in which members possess shared concerns about the "excellence of quality of task performance" (West, 1990, p. 313). Task orientation includes the secondary construct of task reflexivity and facilitates the exploration of conflicting opinions and alternative solutions in the process of reflecting on team goals, tactics, procedures, and assessments of members' work. Thus, task orientation can improve the quality of decisions and ideas, thereby enhancing team effectiveness and outcomes (Hülsheger et al., 2009). This type of reflexivity function has a mutual supervision and feedback mechanism that can be used to evaluate creative performance, improve TCE and TWE, and motivate team members to work together to achieve team goals, thereby stimulating TC. ***The vision of TIC*** is a concept related to valuable outcomes that represents high goals and increased motivation (West, 1990, p. 310), clear goals, and commitment toward goals (West & Anderson, 1996). When the extent of a vision is high, team goals become clear, and team members perceive that goals are rich in value and visions can be achieved; therefore, they will strive to realize these goals (Hülsheger et al., 2009; West, 1990, p. 310; West & Anderson, 1996). Consequently, vision can drive the cooperative efforts of team members and their involvement in creativity, and encourage high collective efficacy, thus facilitating TC. ***Regarding the external communication of TIC***, communication is a crucial source of creativity and innovation that can encourage the sharing of information and ideas (Hülsheger et al., 2009). According to the social network perspective, people's interpersonal relationships developed outside of their teams or organizations are essential. Interaction with people in other functional areas can increase the acquisition of new knowledge and concepts, thus enabling the development of new ideas or the adoption of new methods for completing tasks (Perry-Smith & Shalley, 2003). Therefore, external communication improves creative efficacy and cooperation efficacy, through which TC is stimulated. Hence, this study argue that TIC supports the production of novel or improved collective work beliefs, work attitudes, collaborations, and methods for completing tasks, thereby strengthening TC.

IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

The implications of this study for research and practice are discussed. In three research implications, first, this study identified a distinctive team mechanism for promoting TC. This mechanism is one component of the team process and comprises the belief in collective efficacy and climate context. Within this model, improving TC requires strong team building and processes. This team building must integrate two essential characteristics: a strong team belief in creative efficacy and cooperation efficacy, and an innovative context in a team climate comprising support for innovation, task orientation, vision, and external communication. When these two characteristics interact, the resulting effects would motivate or enhance the ability of members to produce creative products. Team leaders should create supportive and open environments, where team members could engage in discussion to generate ideas, quickly experiment, reflect, adjust their ideas, and ultimately integrate various opinions to make decisions. Concurrently, leaders should establish goals and values to be shared by the team and task-oriented rules for facilitating participation. This instills members with the willingness and ability to innovate and generate collective creative achievements, thereby strengthening TC. This study bridges the research gaps in the study conducted by Sawyer (2012), who mentioned that creativity is generated through clear team mechanisms. Second, this study verified the degree to which TCE, TWE, and TIC promoted TC; specifically, TCE was clearly more effective in promoting TC than TWE and TIC were. After TCE, TWE, and TIC interacted, the degree to which they promoted TC was higher than the degree to which the interaction between TWE and TIC did. In the TC model, TCE was considerably more crucial than TWE was. TIC increased the degree to which TCE and TWE enhanced TC. Therefore, this study also reinforced the findings of Shin and Zhou (2007), who addressed the factors that promote the creativity of teams comprising ordinary members. Third, this study identified and demonstrated a variety of collective cooperation processes and creativity combinations at the individual level. Regarding the interpretation of TC, this study suggests that at the team level, team mental processes and team interaction processes, including creative mental processes and creative collaborative processes, should be considered simultaneously. This is consistent with the expectations of previous studies that the assessment of the team process must feature an architecture that contains multiple levels and dimensions in order to propose guidance for the maintenance of superior collective creative performance in teams (Bissola & Imperatori, 2011). In contrast to previous TC studies, this study considered mental processes at the team level instead of the individual level for discussion; this approach is consistent with the new creativity research trend in which the perspective of collective cooperation processes is adopted (Sawyer, 2012).

This study provides two practical implications. First, this study provided a conceptual framework of instructional design, learning culture, and cooperative functions that can enable students to exercise TC in the learning services industry. Application of the business internship learning model continues to be a growing trend in industry-academy cooperation environments. To induce TC in students, instead of focusing on students' skill development, academic performance, and internship feedback, school teachers and corporate internship mentors should use a learning design that involves team grouping, teaching, and an internship structure. By cultivating students' confidence in their creativity and cognitive beliefs regarding their ability to reach a common understanding, and constructing open and purposeful learning climates, visions, and blueprints, students can learn and implement the efficacy and functions related to collective creativity and cooperation in their schools and internship organizations. The results of this study can serve as a crucial reference for schools in creating teaching and learning designs and for enterprises in constructing internship programs. For example, our results can be applied to the promotion of TC, learning outcomes, the design of tasks for improving TC, and innovative teaching. Collective cooperation and climate designs can be based on the characteristics of learning teams to satisfy learning needs, improve learning effectiveness, and enhance students' adaptability and skills for leading the development and implementation of collective creativity when they enter the workforce in the future. These measures can facilitate individual and team work performance. Second, the field of education services is currently focused on the individual level of creativity, such as skills, cognitive psychology, and social psychology. In addition, the majority of studies on TC have investigated business organizations. By contrast, the subjects of this study were student teams, who are associated with the professional and technical education service industry.

Hence, this study supports previous studies in which the discussion of various industries, fields, and cultural contexts has been recommended to improve TC frameworks (Sung & Choi, 2012).

This study had the following limitations and related recommendations for future studies. First, the research subjects were project production teams formed in the undergraduate departments of universities of science and technology that specialize in technical and vocational education services. The purpose of this study was to gain an empirical understanding of the TC performance of university students in the technical and vocational education system. Therefore, the results of this study apply only to current technical and vocational educational services and cannot be extended to other business organizations, nonprofit institutions, or public sector organizations. Thus, future studies can address other emerging and traditional industries, such as the digital convergence industry, the franchising industry, and cultural and creative industries, to conduct a differentiated comparison of creativity at multiple levels and provide an understanding of the operational frameworks and design requirements of creativity for practitioners and teams in various industries. Second, this study selected four variables (TCE, TWE, TIC, and TC) based on the team-level collective cooperation process and the creativity and innovation topics that have been of interest to enterprises and vocational education services, examining the interactions among these variables. However, this study did not include other possible mediating, moderating, or control variables for TC, which was the second limitation of this study. Therefore, future studies can include other process variables, such as school or business environment context variables, variables related to the teaching profession, external or internal motivation variables, and control variables (such as time pressure or creative task features), to improve the comprehensiveness of the TC framework. Third, this study relied on questionnaires in this study to understand the facts at only a specific time. Although this study integrated self-assessments from the members of the student teams with assessments from observers to prevent common method variance, this study did not supplement this method with a qualitative research design, which was the third limitation of this study. Therefore, future studies can adopt a control design involving longitudinal studies and experimental research. By investigating performance variations and changes in the mentality of students regarding TC during various learning phases, the inner thoughts of students toward the modes of operation used in collective collaboration and creation can be understood.

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ANNEXURE

FIG. 1: THE PROPOSED CREATIVE TASK FRAMEWORK

TABLE 1: MEANS, STANDARD DEVIATIONS, AND CORRELATIONS AT TEAM LEVEL

Team-level variables	Mean	SD	1	2	3	4
1. TCE	4.30	.64	--			
2. TWE	4.45	.72	.75**	--		
3. TIC	4.42	.62	.84**	.78**	--	
4. TC	4.40	.75	.67**	.59**	.79**	--

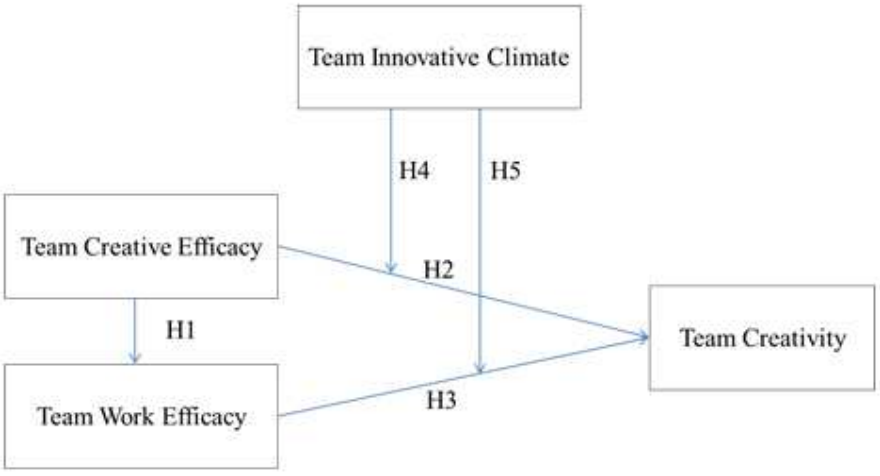
Note. N_1=338 students, N_2=36 teachers, N_3=36 supervisors, N_4=85 teams.
*p<.05; **p<.01

TABLE 2: HLM RESULTS FOR THE MODERATING EFFECTS OF TCE, TWE AND TIC ON CREATIVITY

Variable	TC				
	Model 1	Model 2	Model 3	Model 4	Model 5
Level 1					
Intercept	.84(.18)***	4.40(.03)***	.73(.53)**	4.24(1.82)*	.90(1.25)*
TCE	.84(.04)***	.78(.05)***		.77(.12)***	
TWE			.17(.03)**		.52(.42)***
Level 2					
TIC					
Climate1- Support of innovation				.28(.13)*	.11(.04)*
Climate2- Vision				.11(.04)*	.07(.02)*
Climate3- Task orientation				.22(.09)*	.09(.03)*
Climate4- External communication				.16(.07)*	.07(.02)*
Interactive effects					
TCE x climate				.15(.06)*	
TWE x climate					.13(.04)*
Total R^2	.30	.37		.33	.29

Note. N(individuals)=338. N(teams)=85. The first value in a cell is the parameter estimate, and the value in parentheses is the standard error.
*p<.05 ; **p<.01 ; ***p<.001

FIG. 2: THE PROPOSED TEAM-LEVEL OF CREATIVITY MODEL



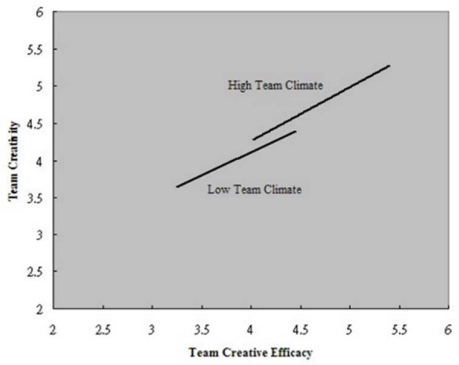


Fig. 3. The moderating effect of team innovative climate

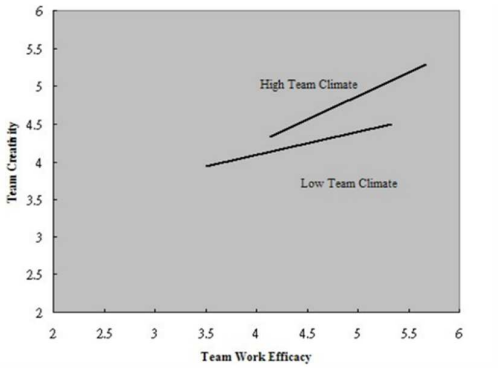


Fig. 4. The moderating effect of team innovative climate

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