

# Alternative Models of the Relationships among Team Stressor, Team Creativity and New Product Development Performance

Cheng-Ling Tai<sup>1+</sup>

<sup>1</sup> Department of Industrial Engineering and Management Information, Huaan University, Taiwan

**Abstract.** Of particular interest in this study is the important psychological variable—team stressor and test whether team stressor acts as an antecedent, a moderator or a mediator between team creativity and new product development (NPD) performance. Data for this study are obtained from NPD team members of Taiwanese semi-conductor industry. Regression analyses are used for the tests of alignment hypotheses. Our finding contributes new evidence to dispute views in previous studies, while at the same time offering important implications for both research and practice.

**Keywords:** team stressor, team creativity, NPD performance.

## 1. Introduction

A number of researchers think that creativity is one of the premises most crucial and related to creative activity. This implies that the creativity of organization, team and individual decides the success or failure of innovative activities. Among many topics related to team creativity, of particular interest in this study is the important psychological variable—team stressor. According to Akgün, Lynn, and Byrne (2007), team stressor is defined as the feeling of crisis and anxiety as a whole, where team crisis refers to a sense of urgency and team anxiety indicates the fear. As NPD is a high-risk, extremely challenging work, members of NPD teams face gradually increasing stressor. Arranged through psychological studies and those on teamwork, existing perspectives of the impacts of stressor at least suggest several possible scenarios. One perspective holds team stressor can be regarded as an antecedent for team creativity. Another view considers team stressor as factors relative to team context. The effects of team creativity on NPD performance are moderated by team stressor. Still another proposes that team creativity impacts on the stressors of NPD team so that NPD performance is affected indirectly. In order to understand which perspective is proper to describe the relationships among team creativity, team stressor and NPD performance, the study uses three hypotheses to differentiate various roles of team stressor so that they form a base for comparison. Furthermore, by combining different views, it seems possible to predict that an inverted-U shape relationship exists between team stressor and NPD performance. This hypothesis has also been examined in the study.

## 2. Literature Review

Sethi, Smith and Park (2001) contend that a study of teams may be carried out by looking into their physical composition and psychological characteristics. Team members, under the influence of team emotions and atmosphere, may either stimulate or retard group creativity and potential, thus leading to different group behavior and performance. Among the various emotional and psychological variables, stressor and its possible effects serve as the focal point of this study. Because NPD team members face a complex array of stressor sources, all these stressors would affect team member's **psychophysical** conditions,

---

<sup>+</sup> Corresponding author. Tel.: (011-886-2)26632102 ext 4314; fax: (011-886-2)26633981.  
E-mail address: [adeline5268@yahoo.com.tw](mailto:adeline5268@yahoo.com.tw) and [taichlin@cc.hfu.edu.tw](mailto:taichlin@cc.hfu.edu.tw).

as well as influence the overall performance of the team. This situation makes the importance of this issue become more.

### **2.1. Antecedent role**

In terms of group psychology and social psychology, group environment and psychology are considered as important antecedents to creativity formation. On the group level, needs of the plan, team goals, control activities and other organizational internal activities become sources of team member stressor. To relieve this stressor, team members have to lower down emotional imbalance by way of creative activities and actual R&D work. Thus, team stressor becomes an important premise that drives member innovativeness. Team creativity refers to the capabilities of the product development team; the more creative a team is, the more capable it is in creating products that are relatively more competitive. Thus, we propose that: H1: team stressor plays an antecedent role in the relationship of team creativity and NPD performance.

### **2.2. Moderating role**

Stressor can be also viewed as an environmental factor. Facing stressor, team members feel the interference, resulting in a change in the relationship between creativity and performance. In a stressor environment, creativity is restricted, stimulated or promoted in actual practice or during the process of implementation, thus leading to a change in the relationship between creativity and performance. Thus, we propose that H2: The effects of team creativity on NPD performance are moderated by team stressor.

### **2.3. Mediating role**

NPD team is an organic body whose characteristics such as capabilities, creativity and other potentials significantly affect its performance. Because NPD activities are full of risks, difficulties, and complication, the ability of NPD team will influence the pressure which weighs on team members. According to several psychology researches, team stressor is one of the determinants which impact on the whole performance. Thus, we propose that H3: Team stressor is a mediator between team creativity and NPD performance.

### **2.4. Other considerations on team stressor**

In practice, while organizations stress innovation, they exist in an era where productive stressor is increasing gradually. This has led to contradictions in management innovation. The management must allow time for members to think for them to become innovative. Yet in conditions where there is no time or performance stressor, enhancement of creativity may not be observed. Instead, it leads to situations in which employees become inefficient. This view, together with previous debates on stressor jointly point to an important deduction: There exists a curvilinear relationship between team stressor and NPD performance. Thus, we propose that H4: Moderate levels of team stressor produce the highest levels of NPD performance, and high and low levels of team stressor result in lower levels of NPD performance.

## **3. Methodology**

In this study, our focus will be Taiwanese semiconductor industry. Average education level of NPD team members is also included as control variables. We use descriptive statistics for understanding the characteristics of the collected sample. This is later followed by reliability analysis and confirmatory factor analysis (CFA). This study further verifies distinct roles of team stressor using regression analyses. The authors gratefully acknowledge the financial support from the National Science Council in Taiwan (NSC 99-2410-H-211-001).

## **4. Results of the Study**

The authors gratefully acknowledge the financial support from the National Science Council in Taiwan (NSC 99-2410-H-211-001).

### **4.1. Adequacy of measures**

In this study, relevant research constructs are directly derived from existing studies. As their construct validities have been previously proven by scholars, they are dependable. In terms of reliability testing, the

Cronbach  $\alpha$  for team stressor, team creativity and NPD performance are all over 0.8, indicating excellent reliability. Confirmatory factor analysis all produced acceptable indices, providing an acceptable model fit.

## 4.2. Results of regression analyses

Regression analysis for this study is tabulated in Table 1 (where, TS= team stressor and TC= team creativity). All of the F-statistics are significant at the  $p < 0.001$  level, thus showing good fit of the models to the data.

TABLE I. REGRESSION RESULTS

Independent variable	Dependent variable							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TC	NPD performance				TS	NPD performance	
Education	<b>0.107*</b> (2.068)	<b>0.102*</b> (2.172)	<b>0.176***</b> (3.753)	<b>0.135**</b> (3.153)	<b>0.129**</b> (3,049)	<b>-0.085</b> (-1.638)	<b>0.131**</b> (3.038)	<b>0.120**</b> (2.848)
TS	<b>0.392***</b> (7.598)		<b>0.536***</b> (11.451)	<b>0.387***</b> (8.363)	<b>0.187*</b> (2.424)		<b>0.692***</b> (2.729)	<b>0.667**</b> (2.681)
TC		<b>0.532***</b> (11.303)		<b>0.380***</b> (8.189)	<b>0.215**</b> (3.130)	<b>0.393***</b> (7.598)	<b>0.379***</b> (8.167)	<b>0.189***</b> (2.718)
TS*TC					<b>0.333**</b> (3.219)			<b>0.382***</b> (3.610)
TS <sup>2</sup>							<b>-0.309</b> (-1.223)	<b>-0.516*</b> (-2.029)
Adjusted R <sup>2</sup>	<b>0.153</b>	<b>0.299</b>	<b>0.304</b>	<b>0.424</b>	<b>0.440</b>	<b>0.151</b>	<b>0.425</b>	<b>0.446</b>
F Statistic	<b>30.382***</b>	<b>68.887***</b>	<b>70.604***</b>	<b>79.228***</b>	<b>63.773***</b>	<b>29.347***</b>	<b>59.888***</b>	<b>52.356***</b>

\*  $p < 0.05$ ; \*\*  $p < 0.01$ . \*\*\*  $p < 0.001$ . (t statistics shown in parentheses)

In Table 1, the control variable was significant in regression (1)-(5), (7) and (8); the results of testing H1 involved four regression analyses. Since regression (1)-(4) were supported, it follows that H1 hypothesis-“team stressor plays an antecedent role in the relationship of team creativity and NPD performance” was supported. In regression (5), we see that the coefficients for team stressor, team creativity, and interaction between these two are all significant. Thus, H2-Team stressor exerts moderating effects between creativity and performance-is supported. H3 also involved four regression analyses, including regression (2), (3), (4) and (6); it follows that H3 hypothesis-“H3: Team stressor is a mediator between team creativity and NPD performance” was supported. However, a noticeable finding is that in regression (7) team stressor quadratic is insignificant but in regression (8) the coefficient for team stressor is positive while that of team stressor quadratic is negative and significant. This shows that H4 hypothesis-team stressor has inverted-U shape relationship with NPD performance-is partially supported.

## 5. Discussions and Conclusions

In this study, the antecedent, moderating and mediating effects were used to probe into the relationships among team stressor, team creativity and NPD performance. We have obtained the following results: (1) Team stressor plays an antecedent role in the relationship of team creativity and NPD performance was supported. It implies the higher the stressor is, the higher creativity becomes, and in turn, NPD performance is also enhanced. (2) Team stressor has moderating effects on the relationship between team creativity and performance and indicates that the higher team stressor is, the positive relationship between team creativity and NPD performance becomes stronger. (3) The hypothesis that team stressor is a mediator between team creativity and NPD performance is also supported and implies the higher team creativity is, the higher team stressor becomes, and in turn, NPD performance is also enhanced. These results may be due to that NPD teams always face tremendous pressure and challenge. Team members must have a high level of experience and cognition so they exert even greater effort in the face of stressor, and thus leading to enhancement of performance. (4) The hypothesis that there is inverted-U shape relationship between team stressor and NPD performance is supported only when team stressor plays a moderating role in the relationship of team creativity and NPD performance. To sum up, we find out that team stressor is a complex variable that leads to diverse effects on performance and various pathways. This study contributes to a deeper understanding in the academia of team creativity, stressor and performance. This study not only establishes different

conceptual frameworks among team stressor, team creativity, and NPD performance but also provide a discussion platform in the field of team stressor. In practical terms, this study serves to alert and remind businesses that stressor affects things in a diverse and significant way. Failure to subject it to control will prove detrimental to the psychophysical conditions of employees and their performance.

## **6. Acknowledgements**

The authors gratefully acknowledge the financial support from the National Science Council in Taiwan (NSC 99-2410-H-211-001).

## **7. References**

- [1] Akgün, A. E., Lynn, G. S., and Byrne, J. C. Antecedents and Consequences of Unlearning in New Product Development Teams. *Journal of Product Innovation Management*. 2007, 23: 73-88.
- [2] Sethi, R., Smith, D.C., and Park, C. W. Cross-Functional Product Development Teams, Creativity, and the Innovativeness of New Consumer Products. *Journal of Marketing Research*. 2001, X X X VIII (Feb): 73-85.