

## **Impact of Teamwork on Organisational Innovation Ability and Development**

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This study constructs an integrated model explaining the behaviours of teams within organisations that enable innovations. It likewise delineates the psychological factors that determine those behaviours and the resulting team and individual ability development. The study then verifies the model by analysing data from both the clerical staff and the production process. Each chapter's outline is briefly explained below.

Chapter 1 explains that the abilities possessed by teams in organisations are the source of innovations. These innovations are essential for a company's survival and development. Moreover, they are crucial for the manufacturing industry's international competitiveness. This chapter shows this study's significance in clarifying the mechanism. Previous studies were organised based on the learning activities and achievements of teams in organisational psychology, social psychology, and educational psychology. Thereafter, we pointed out the gap and clarified the need for an integrated model.

The Research Question (RQ) of this study is 'What aspect of teamwork leads to organisational results?' Our literature review shows that innovation consists of two aspects: organisational management and technological aspects. Thus, we expanded the RQ into two sub-RQs (RQ1: 'How does it work in clerical work?' and RQ2: 'How does it work in manufacturing?'). Our analysis used data from both manufacturing and non-manufacturing industries. Furthermore, we presented the IPC hypothesis model's framework showing that 'teamwork (input and process) forms the ability (competency) of teams and individuals'. We then decided to verify the framework at both the team and individual levels.

Chapter 2 examines the psychological factors that determine 'team learning activities' in clerical occupations. We first examined previous research on social identity theory and constructed a theoretical hypothesis. We then verified the hypothesis with data (43 teams, 154 people) obtained from a research company in Tokyo and 11 cooperating companies. A multi-level correlation analysis showed a strong positive correlation between exploratory learning activity and team innovation. Additionally, the coefficients of age, years of service (company), years of service (department), learning activities, and innovation ability were all negative. Thus, the results showed that the team's social identity had different influences on exploitative learning activities at the individual and group levels.

In Chapter 3, we constructed a hypothetical model that explains the teamwork formation

process in the production process. This has not yet been studied in previous research. Data were collected from 13 university students who experienced project-based learning (PBL) for one year (54 credits, 972 hours) at six engineering colleges in each region. We constructed two hypotheses as a result of the analysis, which used the modified grounded theory approach. The first hypothesis is that working as a team leads to the development of members' abilities. The second hypothesis states that there is a difference in satisfaction due to the difference in individual ability.

In Chapter 4, we tested the hypothesis presented in Chapter 3 at the team level. In manufacturing PBL, we examined whether 'working as a team' gives members the abilities necessary for work. If so, we then explored how team activities' elements influence the results in different ways. Factor analysis and structural equation modelling were performed using the data collected from 157 fourth-year students who finished the division-of-labour style PBL (972 hours) of industry-academia collaboration at three polytechnic colleges. As a result: (a) teamwork's psychological and behavioural elements had a positive effect on students' perceived vocational ability development; (b) teamwork's psychological elements (5 subscales) had influenced students' behavioural factors differently (3 subscales).

In Chapter 5, we tested the hypothesis presented in Chapter 3 at the individual level. In Study 1, we examined the effect of the experience working as a team on individual-level ability building. We did this by developing a PBL version of the individual-level teamwork ability measurement scale. We then performed factor analysis and one-factor ANOVA on the data obtained from grades 1 to 4 (N = 214). As a result, the 4<sup>th</sup> grade group's average value was significantly higher than that of the 3<sup>rd</sup> and 2<sup>nd</sup> grade groups for all items. Similarly, in terms of 'schedule and cost management', the 4<sup>th</sup> grade group's average value was also higher than that of the 3<sup>rd</sup>, 2<sup>nd</sup>, and 1<sup>st</sup> grade groups. The 4<sup>th</sup> grade group's average value was the highest in all items except for 'symbolisation of thought and feeling' and 'independence-orientation'. Thus, Hypothesis 1 (students who have experience in manufacturing PBL have higher teamwork abilities than inexperienced students) was partially supported.

In Study 2, we examined whether the satisfaction level of manufacturing PBL differs depending on the skill level of students who have completed manufacturing PBL (N = 46). As a result of the correlation analysis, a partial correlation, or tendency, was found between technical skill and personal satisfaction (negative coefficient) and between intellectual/interpersonal skill and personal satisfaction (positive coefficient). The correlation coefficient between each skill and collective satisfaction was negative (some relationships had significant relationships). Thus, Hypothesis 2 (the satisfaction level of manufacturing PBL differs depending on individual skill level) is partially supported.

In Chapter 6, we first summarised Chapters 1 to 5. Next, we explained the findings from

the sub-RQs' viewpoints and the comprehensive conclusions derived from this research. We then considered this study's theoretical contributions to each area reviewed in Chapter 1. Finally, we organised recommendations and practical implications of the study.