

A Study on Factors Related to the Conflict in IT Project Teams*

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ABSTRACT

IT projects need engineers with various backgrounds to cooperate to build an IT system that satisfy the requirements of users given a limited expense and time. Such diversity of team members and the complexity of task naturally involve considerable amount of conflict among team members. High level of conflict among team members is known to be detrimental to the performance of the team. The purpose of this study is to examine the reasons for conflicts among team members in IT projects and to check how the level of conflict affects the performance of a project and the satisfaction of the members of the project team.

To test the relationship, a survey on 166 participants in IT projects was conducted. The reasons for conflicts in IT projects were categorized into five types. The level of ambiguity was found to have a significant correlation with the level of conflict. And the level of conflict, in turn, is found to have a significant effect on the degree of satisfaction among team members and the project results. Based on the research results, it is suggested that a clear definition of tasks and their boundaries is required to reduce ambiguity and thus, the level of conflict and improve the level of satisfaction of IT project team members.

Key words : project team, conflict, IT project, satisfaction, project performance

1. Introduction

Information systems play an important role in virtually every industry and every business organization. Companies continue to devote enormous amount of

investment into information systems[5]. Despite such an extensive investment the success of an IT project is not a mission easy to accomplish.

Various factors affect the success and failure of an IT project. However, according to existing research, the dominant reason for the failure of an IT project is an organizational problem rather than a technological one. Among all organizational issues, one important issue of interest is the problem of conflict among team members in an IT project. Especially since IT projects involve developers with various backgrounds and a complex series of activities, the issue of member conflict is of special importance. The diversity of team members and

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the complexity of task tend to lead a high level of conflict among team members. High level of conflict among team members is known to be detrimental to the level of performance of a team and the satisfaction of team members.

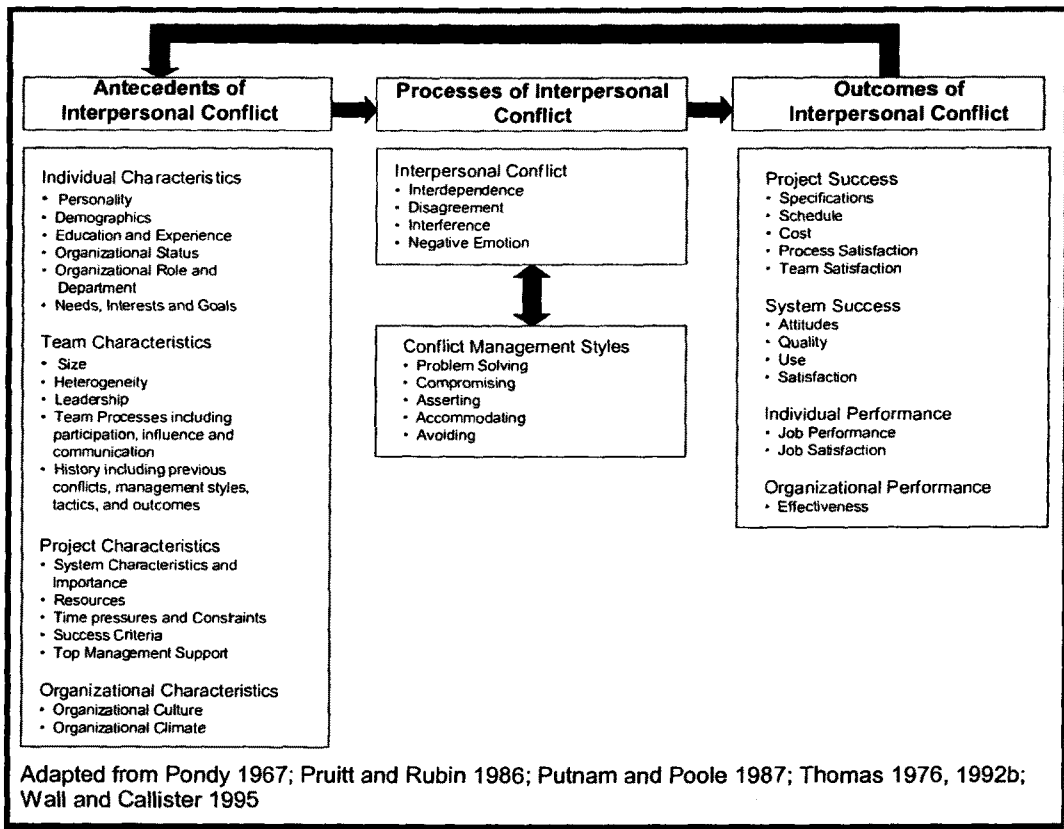
Interpersonal conflict is a dynamic process that occurs between individuals and/or groups who are in interdependent relationships, and is more likely to occur when a variety of background situational(e.g., zero-sum reward structures, scarce resources, etc.) and personal(e.g., previous history of conflicts, interpersonal diversity, etc.) conditions exist[3][8][13][15]. While conflict has been defined in many different ways, three general themes of properties are through to underlie descriptions of what conflict is: disagreement, interference, and negative emotion[2][8][10][13][14][15].

An IS development project lasts from few months to several years. In the course of such an extended

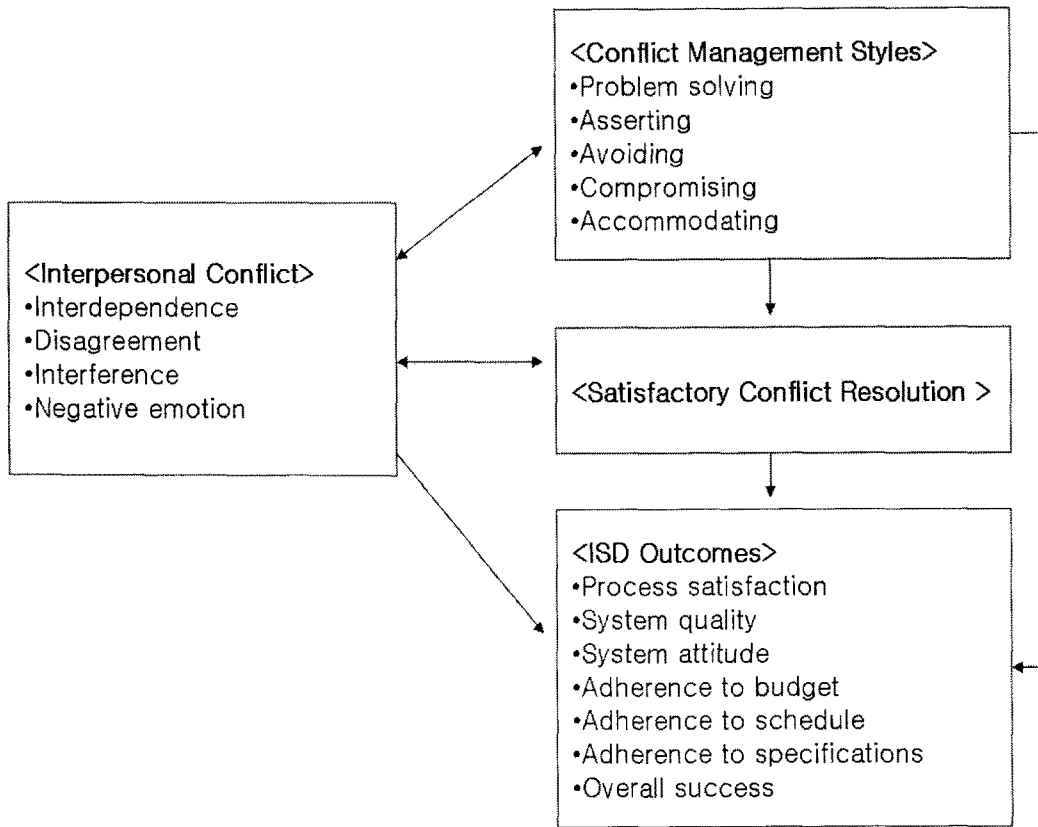
commitment, members of the project team face various types of conflict situation, which is harmful to the success of the project. The purpose of this study is to examine the reasons for conflicts among team members in IT projects. We further aim to check how the level of conflict affects the performance of a project team and the satisfaction of its members.

2. Theoretical Background: Conflict and IT Projects

Conflict within an organization is a complex phenomenon. Individuals may experience a psychological conflict when they have competitive desires. Though individual conflict is an importance issue, in this research we focus on interpersonal conflict among members of an organization for the purpose of this



<Figure 1> Interpersonal conflict in development teams (Barki & Hartwick, 2001)



<Figure 2> Interpersonal conflict, conflict management styles, satisfactory conflict resolution, and project outcomes (Barki & Hartwick, 2001)[2]

research.

Members of an organization experience interpersonal conflict when they face differences in the interpretation of roles, tasks, and goals in the course of accomplishing organizational mission. It sometimes even happens when they face different personality and personal style.

Barki & Hartwick (2001) presents a framework on interpersonal conflict under the context of an IS Development project <Figure 1>[2].

Individual characteristics, team characteristics, project characteristics, organizational characteristics are preconditions to conflict, which has influence on interpersonal conflict and style of conflict management. Dimension of interpersonal conflict and the style of conflict management are also inter-related. The process of interpersonal conflict again affects a variety of conflict outcomes such as the performance and success

of individuals, teams, projects, and organizations. Barki & Hartwick further suggested a revised model summarized in <Figure 2> based on their previous research framework[2].

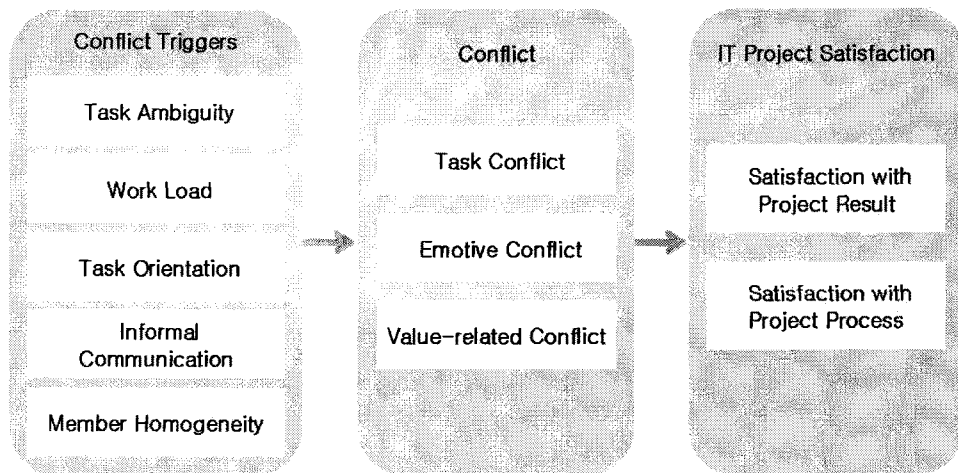
According to the revised model, dimensions of interpersonal conflict such as interdependence, opinions discrepancy, intervention and interference, and negative emotions interact with the type of conflict management styles such as problem solving, compromising, argument, acceptance, and avoidance. These two variables and their interaction further affect the outcomes of information systems development projects.

Interpersonal conflict has a negative effect on IS development outcomes in general. However, an effective choice and use of conflict management style can lead a satisfactory resolution of conflict, which, in turn, can have a positive effect on project outcomes.

3. Research Model and Hypotheses

The research model of the research model include factors that affect conflict among IT project team members and the relationship between the level of conflict IT people experienced and the level of satisfaction with the IT project experience. The model is summarized in <Figure 3>. This research model is a modification of Barki & Hartwick (2001)[2]. Factors that trigger high level of conflict include both factors related to tasks and work environment and factors

related to the members of the project team. The construct conflict is composed of three different types of conflict: task-related conflict, emotive conflict toward another member, and conflict centered around differences in personal values and world view. The satisfaction is composed of the satisfaction with the outcome and performance of the project and the satisfaction with other members of the project team. For former one is rather result-oriented and the latter one is process-related conflict.



<Figure 3> Research Model

4. Research Methodology

4.1 Preliminary research - Interview

As a preliminary research on conflict experienced by IT project team members in practice, we performed a

series of in-depth interviews. The interview was performed with three experienced managers in the field of IT systems development. In the interview, a probing was attempted to list up factors that trigger conflict within the IT project team. <Table 1> shows the profile of interviewee.

<Table 1> Profile of Interviewee

	Interviewee 1	Interviewee 2	Interviewee 3
Age	46	37	34
Gender	Male	Female	Male
Experience	15 years	10 years	7 years
Role	Application Project Manager	Application Project Leader	Application Development

4.2 Research Variables

4.2.1 Factors that affect conflict among project team members

A list of factors that cause conflict among project members was drawn partly from existing research and literature on IT projects and the interview of IT project participants who had experienced conflict situations through a IT project.

Thamhain & Welemon(1995) showed that high level of ambiguity in the definition of roles cause high level of conflict in R&D project organizations[11]. Information systems development projects have a lot of similarity to R&D projects. In both projects task complexity is very high and many changes can happen in the course of project completion. Due do such nature, differences in role interpretation and overlaps of responsibility can easily be observed[1]. A successful project team requires transparent, fair, and active communication. A high level of information sharing among team members through such communication practice helps minimize the conflict within a project team (Luthans, 1992).

Review of the literature led us to include such variables that may cause team conflict as work load, task ambiguity, frequency of communication, and the homogeneity of team members.

4.2.2 Level of conflict among IT project team members

The level of conflict among the members of an IT project is the intensity of emotional frustration or the subjective perception on the amount of conflict the members face during the course of performing an IS project. The conflict can be explicit or latent. Since different types of conflict exist, it seems reasonable to measure the level of conflict separately across different types. According to existing literature on job-related conflict, three different types of conflict exist:

Task Conflict : conflict caused by the task itself in the process of accomplishing the mission

Emotive Conflict : conflict related to the emotional reactions among IT project members

Value-related Conflict : conflict caused by different view, opinion, and value system

4.2.3 Satisfaction with the result and process of IT projects

It is very difficult, if not possible, to evaluate and measure the success of an IT project. Measuring the total costs and its utility is not easy to define and measure. Nidumolu(1996b) separates the success of software development projects into two parts: the success related to the project process and the success as the software result of the project[7]. In a similar vein, IT project success is the combination of system performance and project performance. Evaluation of system performance is a holistic post-hoc evaluation toward the completed information systems based on such dimensions as success in the implementation of the system, effectiveness and quality of the system, use of the system, and the quality of information provided by the system[16]. On the other hand, the evaluation of project success tends to focus on the degree by which the project goal is achieved at each stage of the development process[4]. Satisfaction with the project serves as a surrogate measure for the success of an IT project and is a construct most studied and verified.

In this vein, we use the level of satisfaction as the surrogate of project success and performance. We further separate the satisfaction into the satisfaction with the project process and the satisfaction with the project results.

4.3 Structure of the Questionnaire and Data Collection

Questionnaire included 63 items classified into 5 categories as shown in <Table 2>. The 5 categories are nature of the project, factors that cause conflict, the level of conflict, satisfaction with the project, and demographic characteristics of the respondents. All items except some items related to project characteristics, which are based on PMBOK(Project Management Bill of Knowledge) guideline, and respondent demographics were measured using Likert-type 5-point scale.

<Table 2> Structure of Questionnaire Items

category	contents	No. of items
Characteristics of Project	Duration, size, Area of application Contractor	6
Conflict Triggers	Work Load	3
	Task Ambiguity	5
	Communication Freq.	6
	Member Homogeneity	3
	Task Orientation	4
Conflict	Task Conflict	6
	Emotive Conflict	8
	Value Conflict	5
IT Project Satisfaction	Satisfaction with Project Result	7
	Satisfaction with Project Process	5
Respondents	Position, role, experience	5
Total number of items		63

<Table 3> Characteristics of the respondents

Category		Percentage (%)
The age of the respondents	21~25	2
	26~30	22
	31~35	34
	36~40	34
	41~45	4
	Over 45	4
The gender of the respondents	Male	74
	Female	26
The career experience of the respondents	Under 1 year	3
	1~3 years	17
	3~5 years	14
	5~10 years	41
	Over 10 years	25
The field experience of the respondents	Under 1 year	8
	1~3 years	23
	3~5 years	17
	5~10 years	39
	Over 10 years	13

Respondents are the members IT project teams of large IT service providers in Korea such as LG CNS and Samsung SDS as well as medium-size system developers. We asked them to pick-up a project where they experienced certain level of conflict and respond the questionnaire with the project in mind. 166 responses were collected through direct contact and e-mailing.

5. Result

5.1 Characteristics of respondents and projects involved in this research

The age, gender, career experience, role of the

respondents of the research is summarized in <Table 3>. 66% of the respondents had more than 5 years of field experience, implying that the data represents sufficient reality with actual project experiences. In addition over 69% of the respondents said that they had more than 3 years of experience as developers. <Table 4> summarizes the characteristics of projects used to respond for the questionnaire. The figure include the duration, number of manpower involved, size by budget, number of companies involved in the development project consortium, size of major contractor, type of industry of the projects. 60% of the projects involved in this research are completed within a year, and 73% of the projects were within the budget

of 5 billion KRW. Most of the major contractors were the three largest IT service providers and over 50% of

the project referred in this research was public sector projects.

<Table 4> Characteristics of the project involved in the research

Category	Percentage (%)	
The duration of the project consortium	Under 3 months	3
	Under 6 months	11
	Under 1 year	46
	Under 1 & a half years	16
	Under 2 years	11
	Over 2 years	13
The number of manpower involved in the project consortium	Under 10 persons	25
	Under 20 persons	20
	Under 30 persons	13
	Under 50 persons	14
	Under 100 persons	11
	Over 100 persons	17
The size by budget in the project consortium	Under 1 hundred million KRW	7
	Under 5 hundred million KRW	18
	Under 1 billion KRW	17
	Under 5 billion KRW	31
	Under 10 billion KRW	8
	Over 10 billion KRW	19
The number of companies involved in the project consortium	Under 1	9
	Under 3	32
	Under 5	32
	Under 10	20
	Over 10	7
Major contractor of the project	Large foreign companies	2
	large IT Service providers	57
	Foreign SME companies	1
	Domestic IT SME companies	40
The type of industry of the project	Public sector	53
	Financial sector	7
	Manufacturing sector	7
	Distribution sector	2
	Other service sector	16
	etc.	15

5.2 Reliability and Validity of the Variables

5.2.1 Factor Analysis

In extracting factors we used Principal Component Analysis and used factors with Eigen Value over 1.0. We used Varimax rotation to ensure as much independence as possible among factor. <Table 5> shows the result of factor analysis.

Task orientation variable incorporated one item from communication. On the other hand, one item on communication did not belong to any construct, and thus eliminated. The remaining 4 items of

communication were divided into two construct. After reviewing the contents of the items, we decided to name them as formal communication and informal communication. In total the structure of the independent variables is composed of 6 constructs. As shown in <Table 6> the concept of conflict is composed of 3 constructs. Although 2 items of emotive conflict measure were separated out, after reviewing the contents we could not find a consistent meaning from these items and thus decided to discard them.

<Table 7> shows the structure of the measure of satisfaction. Two items from the result satisfaction

<Table 5> Result of factor analysis on conflict triggers

Item	1	2	3	4	5	6
Task Orientation 1	0.8128	-0.0766	-0.0992	0.1181	0.1018	0.0032
Task Orientation 2	0.7313	-0.2243	-0.2019	0.0546	0.1776	0.0838
Task Orientation 3	0.7312	-0.1427	-0.0578	0.1246	0.1002	0.0088
Task Orientation 4	0.6388	-0.1849	-0.2055	0.3156	0.0111	-0.0854
Communication 5	0.5116	-0.4158	0.1056	0.2368	-0.1322	0.2473
Task Ambiguity 1	-0.1613	0.8143	0.1448	-0.0056	-0.0018	0.0484
Task Ambiguity 2	-0.2539	0.7949	0.2473	-0.0928	-0.0925	0.0161
Task Ambiguity 3	-0.2373	0.5952	-0.0719	0.0488	-0.0015	-0.3028
Task Ambiguity 4	0.1409	0.5111	0.2916	-0.1931	-0.2652	0.3446
Task Ambiguity 5	-0.2668	0.3875	0.1316	-0.3080	-0.0404	0.2928
Communication 6	0.3801	-0.3823	0.0012	0.2777	0.1430	-0.0371
Work Load 1	-0.0574	-0.0332	0.8191	-0.1301	0.1436	-0.0290
Work Load 2	-0.1606	0.1587	0.7494	0.1589	-0.1333	0.0991
Work Load 3	-0.1758	0.3225	0.6042	-0.0599	0.0048	0.2026
Communication 4 (informal)	0.1701	-0.0622	0.0057	0.7995	-0.0575	-0.0064
Communication 3 (informal)	0.3104	-0.0704	-0.0055	0.7985	0.1516	0.0473
Member Homogeneity 1	0.0389	0.0705	-0.0861	-0.0213	0.8447	0.0242
Member Homogeneity 2	0.4314	-0.1359	0.1758	0.0674	0.6041	0.0398
Member Homogeneity 3	0.1526	-0.2888	0.0644	0.1443	0.4595	-0.2519
Communication 1 (formal)	0.0762	-0.0230	0.2289	-0.0615	-0.1097	0.7614
Communication 2 (formal)	-0.0104	-0.0375	-0.1600	0.4468	0.3126	0.6413

<Table 6> Result of factor analysis on conflict

Item	1	2	3	4
Emotive Conflict 2	0.840325	0.113071	0.052742	0.243729
Emotive Conflict 3	0.789841	0.227672	0.197892	0.133704
Emotive Conflict 4	0.780835	0.300548	0.184745	-0.00615
Emotive Conflict 1	0.764714	0.048056	-0.00236	0.179797
Emotive Conflict 6	0.733206	0.230382	0.344787	-0.01439
Emotive Conflict 5	0.692775	0.391289	0.307674	-0.03252
Value Conflict 3	0.09832	0.723548	0.016018	0.311854
Value Conflict 1	0.190547	0.720095	0.263277	0.029993
Value Conflict 4	0.241109	0.697152	0.32332	0.006172
Value Conflict 2	0.181433	0.691084	-0.02832	0.192286
Value Conflict 5	0.433089	0.638994	0.329252	-0.02688
Emotive Conflict 8	0.232917	0.202634	0.810608	0.08755
Emotive Conflict 7	0.306281	0.137926	0.799778	0.107657
Task Conflict 3	0.030444	0.187827	0.36915	0.348099
Task Conflict 6	0.341759	0.135405	0.083482	0.675245
Task Conflict 5	-0.14644	-0.08557	0.145917	0.644879
Task Conflict 2	0.26812	0.252675	-0.24388	0.527548
Task Conflict 1	0.385919	0.097264	0.012065	0.481678
Task Conflict 4	-0.00629	0.297965	0.293638	0.454763

were assigned as part of process satisfaction. However, the overall structure of the variable is in consistency with our understanding around two dimensions. We used revised item classification for further analysis.

5.2.2 Reliability Analysis

<Table 8> summarizes the result of Cronbach Alpha value for the variables adjusted based on factor analysis.

As for the variables related to the reasons of conflict we originally had 6 variables; work load, task ambiguity, formal and informal communication frequency, homogeneity of members, and team member's task-related characteristics. However, the reliability of formal communication was less than 0.5 and removed. Although member homogeneity had low alpha value, considering its importance in project management, we

decided to maintain the variable for further analyses.

After removing the second group of emotive conflict, the level of conflict is composed of 3 types as planned at the outset of the research: task conflict, emotive

conflict, value conflict. Both the two types of satisfaction variables, i.e. satisfaction with project results and satisfaction with project process satisfy acceptable level of reliability.

<Table 7> Result of factor analysis on satisfaction

Item	1	2
Satisfaction with Project Process 3	0.897589	0.07122
Satisfaction with Project Process 4	0.879244	0.207058
Satisfaction with Project Result 7	0.86819	0.047895
Satisfaction with Project Process 2	0.768003	0.092423
Satisfaction with Project Result 6	0.726415	0.428262
Satisfaction with Project Process 2	0.668846	0.036027
Satisfaction with Project Process 1	0.594831	0.453685
Satisfaction with Project Result 2	0.186505	0.800639
Satisfaction with Project Result 3	0.192531	0.75782
Satisfaction with Project Result 1	0.010068	0.726639
Satisfaction with Project Result 5	0.211113	0.631266
Satisfaction with Project Result 4	-0.00529	0.607016

<Table 8> Result of Reliability Analysis on Revised Items

Construct	Variables	No. of Items	Cronbach's α
Conflict Triggers	Task Orientation	5	.811
	Task ambiguity	5	.742
	Work load	3	.636
	Informal Communication	2	.754
	Member Homogeneity	3	.511
	Formal Communication	2	.402
Conflict	Task Conflict	6	.613
	Emotive Conflict	6	.909
	Value Conflict	5	.827
Project Satisfaction	Satisfaction with Project Result	8	.903
	Satisfaction with Project Process	5	.751

5.3 Test of Hypotheses

5.3.1 Goodness of Fit of the model

<Table 9> summarizes the goodness of fit of the 5 regression models. Three models aim to explain the

variance of the three dimensions of conflict as dependent variables by way of using conflict trigger variables. The rest two models use different levels of conflict as independent variables to explain the variance in the level of satisfaction as dependent variables.

<Table 9> Goodness of Fit of the 5 Regression Models

D.V.	R	R Square	Adjusted R Square	Stand Error of Estimation
Task Conflict	0.377	0.142	0.115	0.941
Emotive Conflict	0.542	0.294	0.272	0.853
Value Conflict	0.402	0.161	0.135	0.930
Satisfaction with Project Result	0.325	0.105	0.083	0.957
Satisfaction with Project Process	0.477	0.228	0.208	0.890

5.3.2 Regression on Conflict

three regression analyses on the level of conflict.

<Table 10a to 10c> summarize the result of the

<Table 10a> Result of Regression on Task Conflict

I.V.	Coeff		Beta	T	Sig	VIF
	B	SE				
(Constant)	0.000	0.073		0.000	1.000	
Task Orientation	-0.133	0.073	-0.133	-1.811	0.072	1.000
Task ambiguity	0.310	0.073	0.310	4.228	0.000	1.000
Work load	0.147	0.073	0.147	2.003	0.047	1.000
Informal Communication	0.025	0.073	0.025	0.340	0.734	1.000
Member Homogeneity	-0.082	0.073	-0.082	-1.120	0.264	1.000

<Table 10b> Result of Regression on Emotive Conflict

I.V.	Coeff		Beta	T	Sig	VIF
	B	SE				
(Constant)	0.000	0.066		0.000	1.000	
Task Orientation	-0.484	0.066	-0.484	-7.280	0.000	1.000
Task ambiguity	0.162	0.066	0.162	2.443	0.016	1.000
Work load	0.047	0.066	0.047	0.701	0.484	1.000
Informal Communication	-0.150	0.066	-0.150	-2.257	0.025	1.000
Member Homogeneity	-0.094	0.066	-0.094	-1.408	0.161	1.000

<Table 10c> Result of Regression on Value Conflict

I.V.	Coeff		Beta	T	Sig	VIF
	B	SE				
(Constant)	0.000	0.066		0.000	1.000	
Task Orientation	-0.151	0.072	-0.151	-2.089	0.038	1.000
Task ambiguity	0.277	0.072	0.277	3.828	0.000	1.000
Work load	0.181	0.072	0.181	2.497	0.014	1.000
Informal Communication	-0.082	0.072	-0.082	-1.139	0.256	1.000
Member Homogeneity	-0.151	0.072	-0.151	-2.089	0.038	1.000

5.3.3 Regression on Satisfaction

two aspects of satisfaction (result satisfaction and process

Result of the effect of the three types of conflict on the

satisfaction)are summarized <Table 11a and 11b>.

<Table 11a> Result of Regression on Satisfaction with Project Results

I.V.	Coeff		Beta	T	Sig	VIF
	B	SE				
(Constant)	0.000	0.074		0.000	1.000	
Emotive Conflict	-0.209	0.075	-0.209	-2.802	0.006	1.000
Value Conflict	-0.181	0.075	-0.181	-2.429	0.016	1.000
Task Conflict	-0.170	0.075	-0.170	-2.285	0.024	1.000

<Table 11b> Result of Regression on Satisfaction with Project Process

I.V.	Coeff		Beta	T	Sig	VIF
	B	SE				
(Constant)	0.000	0.074		0.000	1.000	
Emotive Conflict	-0.444	0.069	-0.444	-6.411	0.000	1.000
Value Conflict	-0.163	0.069	-0.163	-2.355	0.020	1.000
Task Conflict	-0.059	0.069	-0.059	-0.851	0.396	1.000

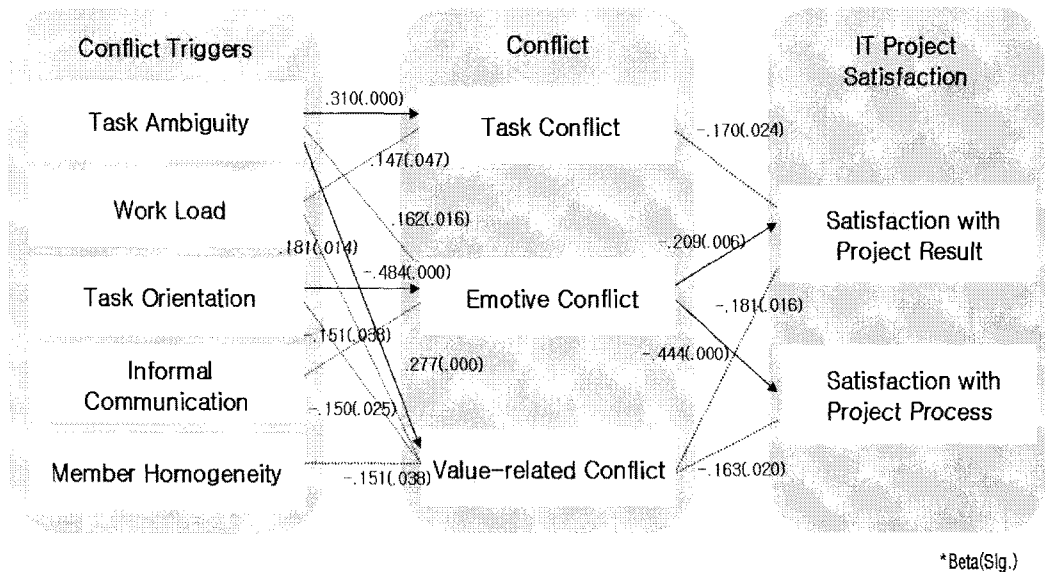
5.4 Summary of Test Results

<Figure 4> summarizes the results of the 5 regression analyses. Task ambiguity affects all the three types of conflict. As can be seen from <Figure 4> task ambiguity is the strongest determinant of task conflict (Beta=0.310, $\alpha < 0.000$). Task ambiguity also strongly affected the level of value-related conflict (Beta=0.277, $\alpha < 0.000$). On the other hand, emotive conflict is most strongly affected by the task orientation of members (Beta=-0.484, $\alpha < 0.000$).

The level of work load affects both the levels of task conflict and value conflict, but not emotive conflict. Task orientation of project team members affects both the levels of emotive conflict and value conflict, but not task conflict. On the other hand, the frequency of

informal communication affects emotive conflict, while it does not affect neither task conflict nor value conflict. The homogeneity of project team members is related to value conflict. However, the homogeneity is not related to task conflict nor emotive conflict.

As can be seen from <Figure 4>, emotive conflict is the strongest determinant of both the level of satisfaction with project results (Beta= -.209, $\alpha < 0.006$) and the level of satisfaction with project process (Beta=-.444, $\alpha < 0.000$). The level of task conflict affects the level of satisfaction with project results, but does not affect satisfaction with project process. The level of value conflict affects both the level of satisfaction with project results and the level of satisfaction with project process.



<Figure 4> Summary of the Results of Regression Analyses

6. Conclusion and Discussion

This research aimed to identify factors that trigger conflict among members of IT project team and empirically test how such factors are actually related to the level of conflict. We further tried to analyze the effects of such conflict on the level of satisfaction that

the members have with the results and process of the IT project.

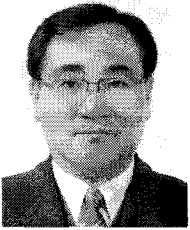
Task ambiguity is found to be the most important variable that triggers conflict among team members. The result shows that an improved task design will decrease all three types of conflict: task, emotive, and value. It will eventually result in heightened

satisfaction among team members. If a more detailed and rational design of the roles and tasks of project team members is prepared, we can avoid a significant amount of unnecessary conflict among IT project team members. As an IT project evolves an unexpected situation can happen such as member turnover and changes of the counterpart managers. If the scope of work is reasonably designed and managed flexible with a given agreed-on boundary, there is an ample possibility to reduce conflict and improve satisfaction of the participants.

Future study can elaborate on the working style of IT project team members. If a better structure and patterns of the task oriented style can be identified, we will better be able to understand the nature of conflict and satisfaction of member across different level of task orientation. Such an improved understanding will help us better prepared to expect and manage potential conflict and lead high level of satisfaction and success from IT projects.

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