

User-IS Conflicts, User-IS Interaction Quality, and Project Performance: An Empirical Study

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Abstract

Conflict has been defined as an important risk factor during information systems development. Its negative effect on project performance has been argued in the IS field. Wang et al. (2005) proposed the mediating variable between conflicts and project performance, instead of identifying means to alleviate the negative effect of conflicts on project performance. The purpose of this study is to examine the magnitude of the impact of conflict on software project and user-IS interaction quality on IS project implementation in a culture more emphasized “harmony”. The study is conducted through surveying IS professionals in Taiwan. Our results show that conflict has a stronger effect in Taiwan setting, compared to Wang et al. (2005), and interaction quality is a critical mediator between conflict and project performance for IS implementation. Theoretical and managerial implications for conflict management and information systems development are discussed.

Key words: Conflicts, user-IS interaction quality, project performance, project management



資訊系統使用者與開發人員之衝突、互動品質 與專案績效關係之實證研究

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摘要

使用者與開發人員之間的衝突已被認定為資訊系統開發過程中一個重要的風險因子。其對專案績效的負面影響在資管領域已被討論。Wang等學者(2005)提出了在衝突與專案績效間之中介變數，而並非尋找減輕衝突對於專案績效所造成負面衝擊之方法。本研究之目的乃根據Wang等學者(2005)探討在台灣這種強調「以和為貴」的文化，衝突之影響程度及使用者與開發人員之間的互動品質。結果顯示，在台灣文化中的衝突比在美國文化中的衝突(Wang et al. 2005) 有更大的影響，而使用者與資訊系統開發人員間的互動品質是衝突與專案績效間關鍵的中介變數。文中並討論本研究對於衝突管理與資訊系統開發理論與管理實務上之意涵。

關鍵字：衝突、互動品質、專案績效、專案管理



1. INTRODUCTION

Conflicts between users and information systems development (ISD) staffs have often been regarded as an inevitable phenomenon of user participation (Barki & Harwick 1994a, 1994b, 2001; Barki et al. 1993; Howcroft & Wilson 2003; Sherif et al. 2006; Wang et al. 2005). Negative effects of user-IS conflict on project performance were identified by IS researchers (Barki & Harwick 1994b; Fagan 2004; Majchrzak et al. 2005; Robey et al. 1993). Although studies from other disciplines suggest that conflict is by itself neither good nor bad, Barki and Hartwick (2001) challenged this view. They conceptualize the negative emotion as a definitional property of the conflict. They found that negative emotion is an integral component of individuals' perceptions of conflict. That is, conflict is negative experientially. Their empirical findings indicated that conflict consistently and negatively affected ISD outcomes. The significant negative effects of conflicts remained, even after controlling for the effects of conflict management and resolution, and for respondents reporting high satisfaction level of conflict resolution. They stated that "conflict is not only a negative experience, but also that it negatively affects ISD outcomes, even when managed well" (Barki & Hartwick 2001). Although the empirical evidence was compelling, the explanatory power of conflicts on project development success (in terms of adherence to budget, schedule, and specification) was not impressive (R-Square values: 15.4 percent, 12.6 percent, and 5.9 percent, respectively) (p.215). A similar pattern was found in Robey et al. (1993) study with an R-square of .19.

Interestingly, Barki and Hartwick (1994a, 1994b, 2001) also suggested two other dimensions of conflict: disagreement and interference. They defined conflict as "an expressed struggle between at least two interdependent parties who perceive incompatible goals, scarce rewards, and interferences from the other party in achieving their goals" (Barki & Hartwick 1994a). Most ISD cases involve multiple interdependent parties including users, IS staffs, project managers, and vendors. Different interests and goals of those parties often exist (Levina 2005; Smith & McKeen 1992). As long as a diversity of interests and goals exists during ISD, each party is taking action to carry out his goals. Such action often causes interference with each other. Meanwhile, requirements analysis and user participation are inevitable activities in the progress of ISD. It needs IS staff and users to communicate with each other, to interact frequently, and to work together harmonious. In fact, users-IS interaction has long been regarded as one of the most important issues in software development projects (Fazlollahi & Tanniru 1991; Olla et al. 2003; Saarinen & Vepsalainen 1993; Siau & Tan 2005). Based upon the conceptual characteristics of conflict, one would suspect that conflicts among IS stakeholders will lead to low levels of user-IS interaction quality during the system development process. Unfortunately, the relationship between conflicts and user-IS interaction quality has

only received limited attention in the IS project management literature (Wang et al. 2005). We believe that a research model that incorporates this potential consequence of conflict will enhance the explaining power of conflict and provide an additional insight into the impact of conflict on ISD outcomes.

Given the low R-square value between conflict and project performance, Wang et al. (2005) has suggested a mediating variable (i.e., user-IS interaction quality) to further explain the impacts of user-IS conflict on IS project development. Following Wang et al. (2005) research model, we propose that there is 1) a negative relationship between conflict and user-IS interaction quality; 2) a positive relationship between user-IS interaction quality and project performance; and 3) a negative relationship between conflict and project performance. In other words, we suspect that conflict not only negatively and directly influence project performance (as suggested by the IS literature) but also indirectly influence project performance through its direct impact on the user-IS interaction quality. The results of this study suggest that when conflicts occurred during system development projects, IS management must not only focus on the conflict-resolution management and conflict resolution satisfaction, but also its negative impact on user-IS interaction quality. Results also might provide an alternative reason to explain why significant negative effects of conflicts on ISD performance remained, even after controlling for the effects of conflict management, conflict resolution, and high satisfaction level of conflict resolution founded in the IS literature. Another purpose of this study is to examine the magnitudes of the impact of conflict on IS project performance in Taiwan's software development environment comparing to other countries (i.e., U.S) studied by Wang et al. (2005). We suspected that conflict occurred in the "harmony" emphasized culture rooted in Taiwan may have a even stronger negative impact on IS project implementation outcome than that in U.S.

2. CONCEPTUAL DEVELOPMENT

Information system development projects suffer from cost overrun, budget overruns, and unmet user requirements. There are evidences showing such a problem which bother the project leaders. For example, according to a recent study of 100 companies, only 37% of IS projects were completed on time and only 42% were finished within budget (Gordon 1999). Furthermore, the relationship between users and IS staffs is typically seen as a central issue to the success of systems development projects (Beath & Orlikowski 1994). During the ISD process, IS staffs and users have to work closely and harmoniously; however, different stakeholders have different goals toward the ISD. Though the relationship between users and IS staffs can be problematic, it is critically important in the development of an information system (Beath 1987; Newman & Robey 1992; Robey & Newman 1996).

Meanwhile, the topics of conflict and its resolution have been studied in communication

and organization behavior literatures. There are four kinds of propositions about the effects of conflicts. First, conflict was viewed as damage to the organization, and should be removed. Second, conflict was perceived to be neither good nor bad (Deutsch 1973). Third, conflict was regarded as a dynamic process, and needed to be managed (Kolb & Sheppard 1985; Leung 2001, 2002; Oz & Sosik 2000). Finally, conflict was seen as a chance to change, if well managed, and will result in positive outcomes. In contrast, conflicts, if poor managed, will result in destructive and uncomfortable outcomes (Filley 1975; Pruitt & Rubin 1986). Thus, in management and organizational literature, there is no congruent opinion about the effects of conflicts.

Based upon the IS context, Barki and Hartwick (1994a, 1994b) examined the conflicts in ISD. They argued that user-IS conflict is a multidimensional construct: disagreement, interference, and negative emotion. Barki and Hartwick's (2001) empirical results indicated that while conflict management styles have positive effects on ISD outcomes, the negative effects of interpersonal conflicts on ISD outcomes could not be effectively mitigated by those conflict management styles. Another important finding was that the negative effects of interpersonal conflict were revealed even after the effects of satisfactory conflict resolution was accounted for. In other words, evidences were shown in their study to demonstrate a negative relationship between conflict and project outcomes. However, the R-square values of project outcomes accounted by the combinations of conflicts, conflict management style, and conflict resolution satisfaction were low. It indicated that there may exist some mediating variables between conflict and project success (Wang et al. 2005).

Beath and Orlikowski (1994) stated that despite an emphasis on user-IS interaction, the role played by users is relatively passive. IS staffs try to select suitable users, train them, manipulate them, force them to accept the product, and let them take the responsibility (Beath & Orlikowski 1994; Zhong & Majchrzak 2004). Several conflict symptoms have been identified by researchers, including hostility and jealousy (e.g., Smith & McKeen 1992), frustration and low morale (e.g., Glasser 1981), a proliferation of technical rules, norms, and regulations (e.g., Franz & Robey 1984), and poor communication (e.g., Franz & Robey 1984; Oz & Sosik 2000). Once such symptoms exist, the interaction between users and IS staffs will not be that harmonious. IS staffs will tend to be reluctant to keep users informed, communicate with users, and let them evaluate their works. IS users, on the other hand, will tend to be reluctant to participate, to accept the system, to help system implementation, and to use the system. Thus, following Wang et al.'s (2005) suggestion, we propose that user-IS interaction quality plays an important mediating role between user-IS conflicts and project performance. Our research model is proposed as follows (Figure 1):



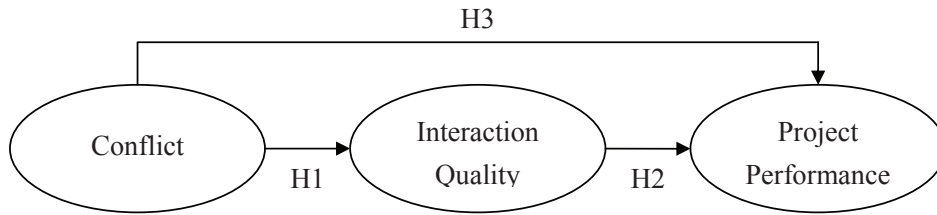


Figure 1: Proposed Research Model

Generally, an information system development team is composed of multiple interdependent parties (e.g., users, IS staff, management, and vendors). It is impossible for a party to conduct their own task without other parties' assistance. Interaction is inevitable due to task interdependence. However, those interdependent parties' interests, opinions, or goals regarding to the developing information system are divergence. Those goal incongruence leads to interfering with the attainment of the other party's goals. Therefore, interaction cannot be conducted in an effective manner. The symptoms of conflicts have been identified by researchers, including jealousy, anger, anxiety, frustration (Amason 1996; Jehn 1995; Pinkley 1990; Pondy 1967), and poor communications (Franz & Robey 1984). And such symptoms are obstacles to interaction among team members. Thus, we propose that:

H1: Conflicts is negatively associated with user-IS interaction quality.

Researchers of project management have long suggested the importance of communications between IS project team and users in defining the project scope and controlling the project changes (Boehm 1989; Majchrzak et al. 2005). The inherence of team-based working style during ISD requires team members to communicate, work closely, and interact with others. Researchers have described ISD as a social interaction process among different stakeholders (Hirschheim et al. 1991; Jiang & Klein 2002; Newman & Robey 1992). And these social interactions shape how the individual stakeholders perceive the final outcome of the development process. Therefore, the better of the extent of the interaction process is, the more successful implementation of an information system can be achieved. Thus, we propose:

H2: User-IS interaction quality is positively associated with project performance.

Information system development process requires users to provide domain knowledge and work with IS staff in order to articulate requirement specifications, project scope, and their expectations. If conflict between user and IS staff arises, communication between IS staff and users may be blocked. In this case, more time would be consumed on communication, and the process of working together will not be effective. IS researchers (e.g., Robey & Markus 1984; Barki & Hartwick 2001) stated that conflict has a negative effect on project outcomes. Generally, IS staff and users must engage in the development of information system; unfortunately, their interests, goal, and intention toward the development of information system are often different (Jiang & Klein 2002). If conflict caused from important issues and the intensity is large,

individuals may act for what they want to achieve rather than act for the shared goal (Barki & Hartwick 1994a, 1994b). In this case, the performance of such project will suffer. Thus, it is proposed that:

H3: Conflict is negatively associated with project performance.

3. RESEARCH METHOD

3.1 Sample

Questionnaires were mailed to two separate groups: (1) 400 randomly selected Information Service Industry Association (CISA) members and (2) 250 randomly selected Information Management Association (IMA) members. CISA currently has more than 800 members including government supported IT organizations, and domestic software companies. IMA has over 500 members including IS managers and IS professionals. These samples were chosen because the members of CISA and IMA represent a cross section of managerial positions extensively involved with project management and have been widely used in past IS personal management research in Taiwan. Postage-paid envelopes for each questionnaire were enclosed. All respondents were assured that their responses would be kept confidential.

In an effort to increase the response rate and avoid the potential non-response bias, a modified version of Dillman's (1978) methodology was followed. All mailings were sent via first class mail. Follow-up phone calls were made two weeks after the initial mailing. For those who did not respond, additional cover letters and surveys were mailed 30 days or 45 days after the initial mailing.

Of the 650 initial surveys mailed, 7 of which were returned undelivered. From the remaining 643 surveys mailed, a total of 127 responses were received. In order to increase the sample size, a second mailing was conducted. Respondents from both samples totaled 209, for a response rate of 32.5%. Thirteen questionnaires were eliminated due to missing data, leaving a final sample of 196 used in the data analysis.

The respondent profiles by industry sector are summarized in Table 4. Sixty percent of the respondents are in the manufacturing industry, 34.7 percent are in service industry, and 3 percent are education related organizations. As for the number of employees, 17.4 percent of the firms has 51 or fewer employees, 5.6 percent of the firms has 51 to 100 employees, 31.5 percent of the firms has 101 to 500 employees, and 37.2 percent of the firms has more than 500 employees.



Table 4: Profile of Responded Organizations

Company Characteristics	Category	Frequency	Percentage
Industry	Service	118	60.2%
	Manufacturing	68	34.7%
	Education	3	1.5%
	No response	7	3.6%
Number of Employees	10 or less	9	4.6%
	11 - 50	25	12.8%
	51 - 100	11	5.6%
	101 - 300	38	19.3%
	301 - 500	24	12.2%
	501 or more	73	37.2%
	No response	10	5.1%

Table 5 summaries the basic demographic information with respect to the size of project team and project life cycle. Almost half of the project team sizes were under 7 people. Around three-fourths of the projects were lasted less than 2 years. All data showed that the responded firms had a diversity of characteristics during their project development periods.

Table 5: Profile of Project Characteristics

Project Characteristics	Category	Frequency	Percentage
Size of IS Project Teams	Less than 7	97	49.5%
	7 - 15	59	30.1%
	16 - 25	14	7.1%
	26 or over	16	8.2%
	No response	10	5.1%
IS Project Duration	<1 year	60	30.6%
	1 - < 2 years	92	46.9%
	2 - < 3 years	24	12.2%
	3 - < 5 years	9	4.6%
	5 or more years	1	0.5%
	No response	10	5.1%

Table 6 is the demographic information of respondents. About half of the respondents are thirty to forty years old. And about 70% of respondents have worked in information related department more than five years. All participants are shown to be well trained in IS management.

Table 6: Demographic Statistics of Responded Organizations

Respondents Characteristics	Category	Frequency	Percentage
Gender	Male	146	74.5%
	Female	44	22.4%
	No response	6	3.1%
Age	30 or under	49	25.0%
	31 – 35	71	35.2%
	36 – 40	26	13.3%
	41 – 45	24	12.2%
	46 – 50	9	4.6%
	51 or over	1	0.5%
	No response	16	8.2%
Years of Working Experience in IS Department	1 - 5 years or under	61	31.1%
	6 - 10 years	75	38.3%
	11 - 15 years	28	14.3%
	16 - 20 years	10	5.1%
	21 - 25 years	7	3.6%
	26 or above	4	2.0%
	No response	11	5.6%

3.2 Constructs

Conflict: In this study, conflict measurement is adopted from Barki and Hartwick (2001) and was identical to Wang et al. (2005). It refers to frequency, intensity, and importance of conflict arise from the interaction between IS staff and users, and among team members. The questionnaire asks respondents to identify the extent to which each of the three activities occurred in their most recently completed IS project. Each item was scored using a five-point Likert scale ranging from disagree (1) to agree (5).

User-IS Interaction Quality: In this study, Nidumolu's (1995) four-item measurement of user-IS interaction quality was adopted. The measurement describes the interaction quality between IS staff and users during the IS development process. Each question asks respondents to identify the extent of interaction occurred in their most recently completed IS project. Each item was scored using a five-point Likert scale ranging from disagree (1) to agree (5).

Project Performance: Project performance scale was adopted from Henderson and Lee (1992). The following indexes were used in measuring the project performance: operation efficiency, amount of work produced, the quality of work produced and ability to meet project goals. This construct has been widely used in the IS literature (Deephhouse et al.1995; Jones & Harrison 1996). Each item was measured using a five-point Likert scale ranging from disagree (1) to agree (5).

Confirmatory factor analysis (CFA) was conducted to examine the validity of all constructs used in this study. The SAS CALIS procedure was adopted in this study to examine both the

measurement and structural models. Table 7 showed the results of CFA. Convergent validity is demonstrated when different instruments are used to measure the same construct, and scores from these different instruments are strongly correlated. Convergent validity can be assessed through t-tests on the factor loadings, such that the loadings are greater than twice their standard error. The t-tests for the loadings of each variable are shown in Table 7. The results showed that the constructs demonstrated a high convergent validity since all t-values were significant at the .05 level. In addition, the reliability of each construct was examined by the Cronbach alpha value and composite reliability. All the Cronbach alpha values and composite reliability exceeded the recommend level of .70 (Nunnally 1978). Discriminant validity is demonstrated when different instruments are used to measure different constructs, and the correlations between the measures of those different constructs are relatively weak. Discriminant validity was assessed through confidence interval test. A confidence interval test involves calculating the confidence interval of plus or minus two standard errors around the correlation between factors. If the confidence interval includes 1.0, discriminant validity is demonstrated (Fornell & Larcker 1981). The results of the confidence interval tests supported the discriminant validity of the factors in this study. Means, standard deviations, and correlations of all constructs are presented in Table 8.

Table 7 : Measurement Model - Confirmatory Factor Analysis Results

Construct Indicators	Standardized Loadings	t-value	Alpha
Conflicts			.90
Conflicts among team members are frequent	0.70	10.73*	
Conflicts among team members are serious	0.79	12.65*	
Conflicts among team members concern unimportant matters	0.73	11.23*	
Conflicts arise between users and team members	0.87	14.81*	
Conflicts between users and team members are serious	0.82	13.29*	
Conflicts between users and team members concern unimportant matters	0.75	11.83*	
Quality of Interaction			.89
Complete training provided to users	0.70	10.62*	
Quality of communication between IS unit and users	0.83	13.60*	
Users' feelings of participation	0.88	14.78*	
Overall high quality of interactions with IS users	0.90	15.32*	
Project Performance			.92
Ability to meet project goals	0.80	12.00*	
Expected amount of work completed	0.77	11.42*	
High quality of work completed	0.86	13.18*	
Adherence to schedule	0.82	12.20*	
Adherence to budget	0.73	10.97*	
Efficient task operations	0.83	12.58*	
Maintain high work morale	0.75	11.06*	
Note: * significant at .05 level.			

Table 8 : Descriptive Statistics and Correlations

	Conflicts	User-IS Interaction	Project Performance
Mean Std.	2.60	3.44	3.38
Deviation	1.13	1.01	1.00
Kurtosis	-0.63	-0.49	-0.33
Skewness	0.32	-0.25	-0.31
Conflicts	1.00		
Quality of Interaction	-0.33*	1.00	
Project performance	-0.36*	0.70*	1.00
Note: * significant at .05 level.			

4. DATA ANALYSIS AND HYPOTHESES TESTING

The proposed model in Figure 1 fitted the data reasonably well, with a Root Mean Square Residual of .055, a Chi-square/Degree of Freedom Ratio of 2.48, a Comparative Fit Index of .92, and a Non-Normed Fit Index of .90. Table 9 shows the results of the structural equation modeling analysis. Hypotheses H1, H2, H3 were all supported with respective standardized path coefficients of -.33, .64 and -.15 respectively. The t-statistics for these three hypotheses all exceeded statistical significance at the .05 level. The total R-square explained of the project performance was .43 which is considered to be reasonably high in social science studies.

Table 9 : Summary of Hypotheses Testing

Hypothesis	Coefficient	t-value
H1 : Conflicts→User-IS Interaction Quality	-0.33	-4.06*
H2 : Quality of Interaction→Project Performance	0.64	7.49*
H3 : Conflicts→Project Performance	-0.15	-2.26*
Note: * significant at .05 level.		

5. CONCLUSIONS AND IMPLICATIONS

Given the relatively low explanatory power of the impact of conflict on project performance, this study, following Wang et al. (2005) suggestion, attempts to examine the user-IS interaction as a mediating variable to explain the variance of IS project development in Taiwan's setting. Specifically, three hypotheses are proposed, which include: 1) a negative relationship between conflict and user-IS interaction; 2) a positive relationship between user-IS interaction quality and project performance; and 3) a negative relationship between conflict and project performance. We propose that conflict not only negatively and directly influences project

performance (as suggested in IS literature) but also has a direct impact on the user-IS interaction quality, which in turn affects IS project outcome as well. The results of this study supported all the proposed hypotheses. The results of this study confirmed Wang et al. proposed research model.

Although the nature of having different goals and objectives from the stakeholders involved in IS projects, IS staffs, team members and users must work together and interact harmoniously. Users and IS staffs have to exchange information and knowledge during the development, and team members have to depend on others to complete certain tasks. Specially, the interaction between users and IS staff is frequent and critical. The result of this study shows that quality of user-IS interaction will go down when conflicts occurred between users and IS staffs. To enhance the probability of system success, IS management not only needs to understand the user expectations, but also needs to be able to reconcile the gaps between users and IS staffs when different perceptions of system requirements, project scopes, and/or success measures arise. Unresolved perception gaps may influence user-IS interaction effectiveness and thus, final project outcomes are being affected. According to Barki and Hartwick (2001), negative effect of conflict on project performance exists even satisfactory conflict resolution was achieved. The result of this study (i.e., the negative relationship between conflict and user-IS interaction) might help explaining why IS empirical studies consistently found a negative relationship between conflict and project outcomes. Unless the user-IS interaction can be effectively managed, when conflicts occurred between users and IS staffs, the project outcomes could be suffered. Furthermore, as suggested by Wang et al. (2005) study, the result of this study also indicated the importance of the inclusion of user-IS interaction quality into the conflict research model. More interestingly, by comparing the results of this study with Wang et al. (2005) study surveying U.S. sample, the magnitudes of the relationship between interaction quality and project performance in this study (coefficient = .64) with that in Wang et al. study (coefficient = .49) and the relationship between conflict and interaction quality (this study coefficient = .33 and Wang et al study's coefficient = .28) indicated that conflicts and user-IS interaction quality may play a more critical role in Taiwan than in U.S. on determining an IS project implementation success.

There are, at least, a couple of critical managerial implications to IS project managers. First, the development of information system is a political process. In an IS project, users and IS staff often have different viewpoints and use different problem-solving approaches. Stakeholders involved in ISD will try to achieve their own goals and the conflicts arise from having different objective could harm the quality of user-IS interaction. IS managers must not lose their focus on the "conflict-resolution management" issue. Since all parties in ISD often have divergent opinions, interest, or goals (Robey et al. 1989; Smith & McKeen 1992), IS management needs to work with stakeholders to resolve the potential conflicts to ensure the success of an IS project. If conflict is a pervasive phenomenon during ISD, project managers should pay attention to the

system objectives, requirements, and project scopes. Second, project managers should take actions to avoid poor quality of interaction due to conflicts. How well does IS team members interact among themselves and users should be emphasized, especially when a large diverse stakeholders involved. Project managers should establish some procedure to maintain the quality of interaction and user participation. For example, whenever each milestone is achieved, users' opinions and perceptions should be fully considered.

Although the results of this study may be encouraging, like any study, there are limitations of this study. For examples, conflict measurement adopted in this study is on the frequency, intensity, and importance of conflicts aroused from the interaction between IS staff and users, and among team members. More specific measurement could be developed in future studies to further examine the specific types of conflicts phenomenon between users and IS staffs, and their impacts on user-IS interactions. Similarly, user-IS interaction construct can be further developed to examine the relationships between various types (activities) of user-IS interactions and conflicts. Besides, IS researchers may consider other mediators (e.g., project controls and coordination) between the relationship of conflict and project performance. Nevertheless, these questions may beyond the scope of this exploratory study, future studies are encouraged on these above mentioned issues.

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