

User Participation and User Satisfaction in Information Systems Development: The Moderating Roles of User Developer Communication, Task Complexity, and System Complexity

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ABSTRACT: *This study examines the effect of user participation on user satisfaction in information systems development, with user developer communication, task complexity, and system complexity tested as moderating variables, at PT. Petrosida Gresik, following the company's replacement of its Foxpro based finance system with a MySQL based system. Primary data were collected through a questionnaire administered to 32 employees selected through purposive sampling, and analyzed using simple linear regression and interaction regression, following procedures used in prior information systems research (Ives & Olson, 1984; Lau & Ghazali, 2003). All instruments were valid and reliable. The results show that user participation has a significant positive effect on user satisfaction, supporting the hypothesis that participation improves satisfaction. None of the three interaction hypotheses was supported: the interactions of user participation with user developer communication and with task complexity produced neither a significant overall model nor a significant coefficient, and the interaction of user participation with system complexity produced a significant overall model without a significant individual coefficient. These findings suggest that direct user participation, rather than the moderating conditions examined, is the more reliable lever for improving user satisfaction in this setting.*

Keywords: *User Participation, User Satisfaction, User Developer Communication, Task Complexity, System Complexity.*

INTRODUCTION

Rapid change in the business environment continually reshapes managerial needs, organizational conditions, and information technology, and the resulting competition requires organizations to develop reliable information systems to remain viable (Ives & Olson, 1984). Every company faces recurring decisions that require adequate information, and adequate information can only be produced by an information system capable of capturing and processing internal and external data effectively. For this reason, the factors that determine the success of information systems development deserve careful attention.

Information produced by an information system is widely regarded as a strategic resource, on a par with physical resources such as raw materials and labor, because it underlies the decisions on which a company's goals depend. Among the systems that play a central role in a company's operations is the accounting information system, which records every transaction as data and processes that data into accounting information used for decision making. As computer use in business operations has become close to a necessity, accounting information systems are increasingly run on computerized platforms rather than manual ones.

A central premise in information systems research is that user participation in the development process improves the likelihood that the resulting system will be accepted and used. Testing user participation in information systems development means examining whether users possess adequate

information and understanding of the dynamics of their own work environment, and whether they convey that understanding accurately and completely to the developers who then formulate it into a working system. User participation refers to the actual personal intervention or activity of users during information systems development, and is expected to improve the quality of the resulting system because user information requirements are captured more completely and accurately. Where user participation is inadequate, the developed system is more likely to be rejected by its intended users, so the extent of user participation at each stage of development can be expected to influence developers' and users' satisfaction with the resulting system.

PT. Petrosida Gresik is a company engaged in industry, services, and trade, producing and selling pesticide active ingredients, pesticide and agrochemical formulations, and distributing fertilizer and other agrochemical products. In the course of developing its information system, the company encountered an obstacle when management judged that Foxpro, the program used in the finance department, was no longer adequate for the tasks the department needed to perform, and replaced it with a MySQL based program intended to simplify finance department work. This change generated dissatisfaction among finance department employees, who had to alter behavior built around long familiarity with Foxpro. This experience is consistent with Bodnar and Hopwood's observation, cited in Lau and Ghazali (2003), that a change from a manual to a computerized system involves not only a change in technology but also a change in behavior and organizational practice, and that such change requires careful planning and implementation to avoid rejection of the system being developed.

Based on this background and the phenomenon observed within the company, this study examines the effect of user participation on user satisfaction in information systems development, with user developer communication, task complexity, and system complexity as moderating variables, at PT. Petrosida Gresik. Specifically, the study addresses four research questions: whether user participation affects user satisfaction in the process of information systems development; whether the interaction between user developer communication and user participation significantly affects user satisfaction; whether the interaction between task complexity and user participation significantly affects user satisfaction; and whether the interaction between system complexity and user participation significantly affects user satisfaction. Corresponding to these questions, the study proposes four hypotheses. H1 states that user participation affects user satisfaction in information systems development. H2 states that the interaction between user developer communication and user participation significantly affects user satisfaction. H3 states that the interaction between task complexity and user participation significantly affects user satisfaction. H4 states that the interaction between system complexity and user participation significantly affects user satisfaction.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Accounting Information Systems

An information system is a set of interrelated components that function to collect, process, store, and distribute information to support decision making and oversight within an organization (Husein & Wibowo, 2002, as cited in the underlying thesis). Beyond supporting decision making, coordination, and oversight, an information system helps managers analyze problems and develop new products. An accounting information system, more specifically, is the organizational component that collects, classifies, processes, analyzes, and communicates financial information to relevant external parties, such as tax authorities, investors, and creditors, and to internal parties, particularly management. Accounting information systems develop over the life of a company, so that a new system, or one whose quality is substantially upgraded, will typically replace an existing system once that system is no longer adequate. Both internal users, such as company managers, and external users, such as owners, employees, investors, creditors, and government agencies, rely on the information such systems produce, which underlines the practical importance of the systems development process examined in this study.

User Participation

User participation refers to the behavior, work, and activity that users contribute during information systems development, so that the resulting system can be accepted and used by the people who work with it (Ives & Olson, 1984). The instrument used to measure user participation in this study was developed by Ives and

Olson (1984) and covers the extent to which users are involved in feasibility studies, funding decisions, evaluation and approval of funding policy, interviews to determine information needs, file design and coding responsibilities, control and security procedures, input and output format decisions, system installation and testing, and specification testing. Where a system is developed without involving its users, the resulting system is more likely to be rejected because it does not match what users actually need, so meaningful participation is expected to reduce that risk and support the eventual achievement of user satisfaction.

The theory underlying the expected effect of user participation on user satisfaction is Vroom's (1964) expectancy theory, which holds that the strength of the motivation that drives a person to work diligently depends on the reciprocal relationship between what that person wants and needs from the outcome of the work, and on how strongly the person believes the organization will reward that effort with a satisfying outcome. Applied to information systems development, user participation is a form of behavior through which users seek to ensure that the resulting system will meet their needs, so that when participation is genuine, users are more likely to accept and use the resulting system and to report satisfaction with it. On this basis, the study proposes:

H1: User participation affects user satisfaction in information systems development.

User Developer Communication

User developer communication is the ability of users to communicate effectively with system developers during the development process. The theory underlying the expected interaction between user developer communication and user participation is Newcomb's (1953) balance theory, which holds that people are drawn to one another on the basis of similar attitudes toward objects and goals that are generally relevant to both parties, and that a group tends to be more productive when its members possess good skills and personal qualities and receive support from management. Effective communication between users and developers is a channel through which the ideas, concepts, and information users contribute during participation can actually reach developers and be reflected in the finished system; where that communication is poor, even substantial user participation may fail to produce a system users accept, so communication is expected to strengthen the positive effect of participation on satisfaction. On this basis, the study proposes:

H2: The interaction between user developer communication and user participation significantly affects user satisfaction.

Task Complexity

Task complexity refers to an individual's perception of how difficult a task is within the process of information systems development, encompassing the clarity with which system requirements are specified, the complexity of the operational requirements the system must satisfy, and the complexity of the overall design task. Cognitive theory suggests that perception is formed through selective attention, encoding and simplification, and retrieval and response, and that behavior is shaped by how a person interprets a situation in relation to the goal being pursued, a process best understood as a whole rather than in isolated pieces (Rakhmat, 1993, as cited in the underlying thesis). An organization also needs more effective tools for communication, coordination, and control as it becomes more complex, and correspondingly more attention is required to manage the resulting communication, coordination, and control problems (Robbins, 1994). Applied to task complexity, when the tasks associated with a project are more complex, effective user participation becomes more important for producing a system that fits organizational needs, so the interaction between task complexity and user participation is expected to shape user satisfaction. On this basis, the study proposes:

H3: The interaction between task complexity and user participation significantly affects user satisfaction.

System Complexity

System complexity refers to the complexity of the technology used by an organization, on the understanding that complexity is relative to each organization rather than an absolute property of a system. The instrument used to measure system complexity in this study, developed by McFarlan (1981), covers the extent to which environmental uncertainty, the choice of technology platform, and the design technique and computer language used affect the complexity of the system in place. The theory underlying the expected interaction between system complexity and user participation is Triandis's (1980) theory of attitude and behavior, which holds that the use of a personal computer by a user who has relevant knowledge in a setting where use is

optional is influenced by that user's affect toward using the computer. Robbins's (1994) view of organizations as composed of subsystems that require coordination, communication, and control to function effectively is also relevant here: a person in a position requiring more complex information needs a system that matches that complexity, and without adequate participation from users in shaping that system, the resulting information system may not support accurate decision making. On this basis, the study proposes:
H4: The interaction between system complexity and user participation significantly affects user satisfaction.

User Satisfaction

User satisfaction is the favorable or unfavorable feeling users hold toward the system provided to meet their information needs, and toward the quality of the information system available to support decision making. In this study, user satisfaction is measured using an instrument developed by Ives, Olson, and Baroudi (1983), covering satisfaction with participation and involvement in system operation and development, with the support and services provided by the information systems division, with the information produced together with its equipment and documentation, and with the overall information system and its supporting environment. User satisfaction is regarded in the information systems literature as one indicator of successful systems development, and user involvement and participation in system planning and design are consistently identified as factors that can influence it (McKeen, Guimaraes, & Wetherbe, 1994).

Previous Research

The most directly relevant precedent for this study is Lau and Ghazali (2003), who examined the effect of user participation on user satisfaction in information systems development, with top management support, user developer communication, task complexity, system complexity, and user influence as moderating variables. Lau and Ghazali (2003) conclude that user participation has a positive effect on user satisfaction, and that top management support has a significant effect on both participation and user satisfaction. The present study adopts the same core relationship between user participation and user satisfaction and the same three moderating variables of user developer communication, task complexity, and system complexity used in that precedent study, applying the design to a single manufacturing company, PT. Petrosida Gresik, following the change in accounting software described in the Introduction.

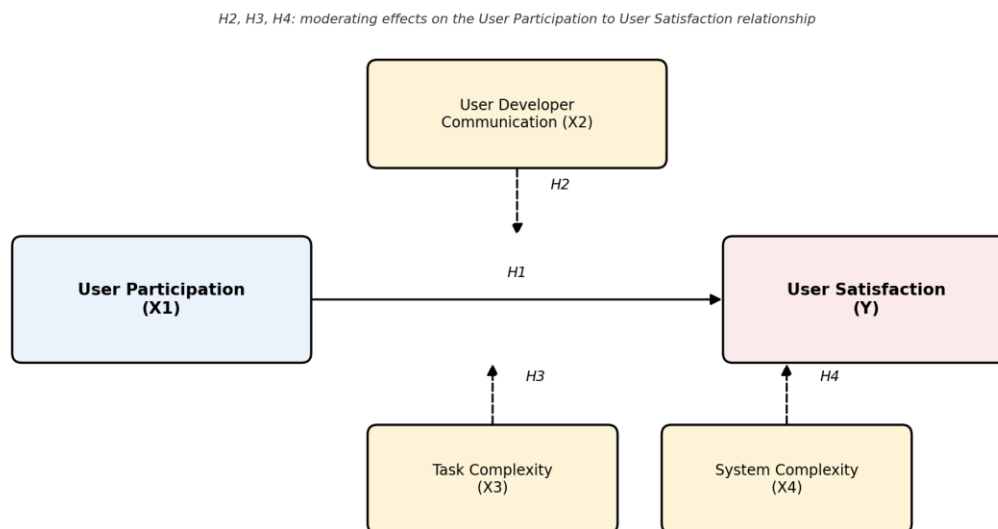


Figure 1. Conceptual Framework

METHOD

Variables and Measurement

The dependent variable in this study is user satisfaction (Y). The independent variable is user participation (X1), and three moderating variables are examined: user developer communication (X2), task complexity (X3), and system complexity (X4). User satisfaction was measured with four items adapted from the instrument developed by Ives et al. (1983); user participation was measured with ten items adapted from the instrument developed by Ives and Olson (1984); user developer communication was measured with ten items adapted from the instrument developed by McKeen et al. (1994); task complexity was measured with three items adapted from the instrument developed by Rizzo, House, and Lirtzman (1970); and system complexity was measured with three items adapted from the instrument developed by McFarlan (1981). All items used a seven point semantic differential scale, on which respondents rated each statement from 1 (strongly disagree, or strongly unclear) to 7 (strongly agree, or strongly clear).

Population and Sample

The population consisted of the 156 employees of PT. Petrosida Gresik. The sample was drawn using nonprobability, purposive sampling, targeting employees substantially involved in using the company's information system, specifically staff in the Internal Audit Unit, Finance Bureau, General Affairs, Personnel, Marketing Department, Active Ingredients Department, Production Department, and Quality Assurance Development Bureau. Three employees in this group hold a master's degree, nineteen hold a bachelor's degree, and ten hold a diploma degree, for a total sample of 32 employees.

Data Collection

Primary data were collected directly from respondents through a questionnaire distributed to the 32 sampled employees at PT. Petrosida Gresik. Data collection also involved direct observation, to confirm the accuracy of information obtained through other methods, and interviews with both management and staff, to obtain supporting information relevant to the research problem.

Data Analysis Technique

Instrument validity was assessed by correlating each item's score with the total score for its variable; an item was considered valid where this correlation was significant at the 0.05 level. Instrument reliability was assessed using Cronbach's Alpha, with a value above 0.60 taken as the threshold for a reliable instrument. Normality was assessed using the Kolmogorov Smirnov test, and classical assumption testing covered autocorrelation, assessed with the Durbin Watson statistic, multicollinearity, assessed using the variance inflation factor and tolerance value, and heteroscedasticity, assessed using Rank Spearman correlation between the regression residuals and each independent variable.

Hypothesis 1 was tested using simple linear regression, following the equation $Y = a + b_1X_1 + e$, where Y is user satisfaction, a is the constant, b_1 is the regression coefficient, X_1 is user participation, and e is the error term. Hypotheses 2 through 4 were each tested using an interaction regression equation of the form $Y = a + b_1X_i + b_2X_j + b_3X_iX_j + e$, where X_i is user participation and X_j is, in turn, user developer communication, task complexity, or system complexity, so that the coefficient b_3 captures the interaction term relevant to each hypothesis. Model fit was assessed with the F test at a 0.05 significance level, and the effect of each individual predictor was assessed with the partial t test, also at a 0.05 significance level, with a hypothesis considered supported only where both the overall model and the relevant individual coefficient reached significance.

RESULTS AND DISCUSSION

Company Profile

PT. Petrosida Gresik was established to serve as a domestic producer of pesticide active ingredients, reducing the country's dependence on imported active ingredients, conserving foreign exchange, and building domestic technological capability in the pesticide industry. The company operates in industry, producing pesticide and agrochemical active ingredients and formulations; in services, providing research, development, maintenance, and technical support related to those products; and in trade, distributing its

own products domestically and internationally and, since 2000, also acting as a distributor for fertilizer produced by its parent company, PT. Petrokimia Gresik.

Descriptive Statistics

Responses from the 32 sampled employees indicate favorable perceptions across all five variables, with weighted mean scores toward the upper end of the seven-point scale, as summarized in Table 1.

Table 1. Descriptive Statistics of Study Variables

Variable	Number of Items	Weighted Mean (1-7 scale)	General Interpretation
User Participation (X1)	10	5.83	Respondents generally agree that they were involved across the stages of systems development, from feasibility study through installation and testing.
User Developer Communication (X2)	10	5.98	Respondents generally agree that system developers communicated clearly, listened attentively, and related effectively to users.
Task Complexity (X3)	3	5.86	Respondents generally agree that system requirements and the overall design task were clearly specified yet substantively complex.
System Complexity (X4)	3	6.09	Respondents generally agree that environmental uncertainty, technology platform choice, and design technique all shape the system's complexity.
User Satisfaction (Y)	4	6.05	Respondents generally report satisfaction with their participation, with the support provided, and with the resulting information system.

Source: Processed primary data, 2026.

Validity and Reliability

Every item across all five variables correlated significantly with its variable's total score at the 0.05 level, so all items were retained as valid. The lowest item correlation was 0.374, for an item on user participation, and the highest was 0.855, for an item on system complexity, with every item exceeding the standard significance threshold. Reliability, assessed with Cronbach's Alpha, is summarized in Table 2; every variable exceeded the 0.60 threshold conventionally used to indicate a reliable instrument.

Table 2. Validity and Reliability Results

Variable	Item Correlation Range	Cronbach's Alpha	Reliability
User Participation (X1)	0.374 to 0.757	0.763	Reliable
User Developer Communication (X2)	0.402 to 0.566	0.623	Reliable
Task Complexity (X3)	0.682 to 0.808	0.606	Reliable
System Complexity (X4)	0.796 to 0.855	0.753	Reliable
User Satisfaction (Y)	0.582 to 0.780	0.667	Reliable

Source: Processed primary data, 2026.

Classical Assumption and Normality Tests

The Kolmogorov Smirnov test produced a significance level above 0.05 for every variable, indicating that the data for each variable are normally distributed and that parametric regression is appropriate. The Durbin Watson statistic for the regression model was 1.823, which, compared against the Durbin Watson table for four independent variables and 32 observations (dl equals 1.177, du equals 1.732), falls in a region that supports concluding the model is free of autocorrelation. The variance inflation factor for every independent variable was close to 1 and the corresponding tolerance value close to 1, indicating the model is free of multicollinearity. Rank Spearman correlations between the regression residuals and each independent variable all produced significance levels above 0.05 (ranging from 0.228 to 0.913), indicating the model is free of heteroscedasticity. The classical assumption tests, taken together, indicate that the data support multiple linear regression analysis.

Hypothesis Testing Results

Table 3 summarizes the results of the four hypothesis tests. Hypothesis 1 was tested with simple linear regression; Hypotheses 2 through 4 were each tested with an interaction regression that first assesses overall model fit through the F test and then assesses each individual coefficient through the partial t test.

Table 3. Hypothesis Testing Results

Hypothesis	Model	F (sig.)	Relevant Coefficient	t (sig.)	Conclusion
H1: X1 to Y	$Y = 9.928 + 0.194 X1$	n/a (simple regression)	$b1 = 0.194$	2.573 (0.015)	Supported
H2: X1, X2, X1X2 to Y	$Y = -73.380 + 1.495 X1 + 1.406 X2 - 0.022 X1X2$	2.640 (0.069)	$b3 (X1X2) = -0.022$	-0.676 (0.504)	Not supported
H3: X1, X3, X1X3 to Y	$Y = -33.230 + 0.921 X1 + 2.499 X3 - 0.042 X1X3$	2.330 (0.096)	$b3 (X1X3) = -0.042$	-0.759 (0.454)	Not supported
H4: X1, X4, X1X4 to Y	$Y = 84.019 - 1.059 X1 - 5.058 X4 + 0.085 X1X4$	3.245 (0.037)	$b3 (X1X4) = 0.085$	1.704 (0.099)	Not supported

Source: Processed primary data, 2026 (SPSS 12.0 output).

Hypothesis 1, that user participation affects user satisfaction, is supported. The regression coefficient for user participation is positive at 0.194, and the correlation between user participation and user satisfaction is 0.425, indicating a relationship of moderate strength that explains about 18 percent of the variance in user satisfaction (0.425 squared equals 0.18). The t test for this coefficient produced a significance level of 0.015, below the 0.05 threshold, so the result supports the hypothesis that greater participation by users during systems development is associated with greater satisfaction with the resulting system. This finding is consistent with Vroom's (1964) expectancy theory, in which motivated behavior, here reflected in active user participation, is directed toward achieving a valued outcome, here a system that meets user needs and thereby generates satisfaction.

Hypothesis 2, concerning the interaction between user developer communication and user participation, is not supported. The overall interaction model produced an F value of 2.640 with a significance level of 0.069, above the 0.05 threshold, indicating the model does not fit well, and the partial test of the interaction term itself produced a t value of -0.676 with a significance level of 0.504. This result does not support Newcomb's (1953) balance theory as applied to this setting, which would predict that shared attitudes and effective communication between users and developers strengthen the translation of participation into satisfaction. A plausible explanation, consistent with the discussion in the underlying thesis, is that communication between users and developers at PT. Petrosida Gresik during this system change was not strong enough to ensure that the ideas and needs users raised through participation were fully reflected in the resulting system, so that the interaction of participation with communication did not add explanatory power beyond participation alone.

Hypothesis 3, concerning the interaction between task complexity and user participation, is likewise not supported. The overall model produced an F value of 2.330 with a significance level of 0.096, and the partial test of the interaction term produced a t value of -0.759 with a significance level of 0.454, both above the 0.05 threshold. This result does not support the expectation, drawn from Robbins's (1994) view of organizational complexity, that more complex tasks would sharpen the relationship between user participation and user satisfaction. One interpretation is that, at PT. Petrosida Gresik, participation levels did not vary enough across employees facing more or less complex tasks for the interaction to register statistically, even though task complexity and user participation were each, individually, rated favorably by respondents.

Hypothesis 4 presents a mixed result. The overall interaction model was statistically significant, with an F value of 3.245 and a significance level of 0.037, below the 0.05 threshold, so the model as a whole fits the data. However, none of the individual coefficients, including the interaction term itself (t equals 1.704, significance 0.099), the coefficient for user participation (t equals -1.431, significance 0.163), or the coefficient for system complexity (t equals -1.707, significance 0.099), reached significance at the 0.05 level. Because the hypothesis testing procedure in this study requires significance at both the overall model level and the individual coefficient level, Hypothesis 4 is treated as not supported, notwithstanding the significant overall model fit. This pattern suggests that system complexity, user participation, and their interaction jointly help explain user satisfaction, without any single one of the three being individually

decisive, a result broadly consistent with Robbins's (1994) view that in a complex organization, coordination, communication, and control operate jointly rather than through any single mechanism.

Taken together, these results echo the pattern reported by Lau and Ghazali (2003) in a comparable Indonesian setting: user participation showed a direct, positive effect on user satisfaction, while the moderating variables examined alongside it did not produce the significant interaction effects the underlying hypotheses anticipated. The consistency of this pattern across two independently sampled organizations suggests that, at least in similarly structured Indonesian companies undergoing an information systems change, the most reliable lever available to management for improving user satisfaction is direct user participation in development, rather than the specific moderating conditions under which that participation occurs.

CONCLUSION

This study examined the effect of user participation on user satisfaction in information systems development at PT. Petrosida Gresik, following the company's replacement of its Foxpro based finance system with a MySQL based system, and tested user developer communication, task complexity, and system complexity as moderating variables. User participation was found to have a significant positive effect on user satisfaction, supporting Hypothesis 1. None of the three interaction hypotheses, Hypotheses 2 through 4, was supported: the interaction between user participation and user developer communication, and the interaction between user participation and task complexity, produced neither a significant overall model nor a significant coefficient, while the interaction between user participation and system complexity produced a significant overall model without a significant individual coefficient for the interaction term itself.

For PT. Petrosida Gresik and organizations facing similar systems changes, these findings suggest that management should prioritize direct and substantive user participation at every stage of information systems development, including feasibility analysis, funding decisions, file and procedure design, and testing, since this participation is the factor most clearly linked to user satisfaction in this study. Strengthening communication between users and developers and accounting for task and system complexity remain reasonable management practices, but this study did not find evidence that they alter the strength of the relationship between participation and satisfaction at this company.

This study has several limitations. The sample of 32 respondents, drawn from a single company using purposive sampling, limits how far the findings can be generalized to other organizations, and satisfaction was measured through respondents' own perceptions, which are necessarily somewhat subjective. The study also examined only five variables, user participation, user developer communication, task complexity, system complexity, and user satisfaction, so other factors relevant to user satisfaction, such as top management support, were not included. Future research could extend this design by adding variables such as top management support, drawing on a larger sample across multiple organizations, and considering alternative analytical techniques capable of testing mediation as well as moderation among these variables.

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