USER PARTICIPATION IN INFORMATION SYSTEMS PROJECTS: NECESSARY BUT NOT SUFFICIENT

Research paper

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Abstract

The information systems literature frequently models project performance of information systems projects as a function of user participation. Markus and Mao (2004) consolidate the literature on user participation in a theoretical framework and call for its instantiation and empirical investigation. In this study, we answer this call by using meta-analytic structural equation modeling to fit the framework to a meta-analytic sample of 226 studies with a total of 42,330 information systems projects. We instantiate the original framework in three important ways. First, we differentiate between capacities and capabilities of project stakeholders to include users. Second, we differentiate between formal and informal mode of user participation. Third, we include residual risk as an important factor in the relationship between user participation and project performance. Our results offer support but also a nuanced perspective on the theoretical framework by Markus and Mao (2004) of user participation and suggest new directions for future research. User participation is necessary to improve project outcomes but not sufficient to ensure project outcomes.

Keywords: User participation, project performance, information systems projects, meta-analysis, meta-analytic structural equation modeling.

1 Introduction

The relationship between modes of user participation and project performance is a frequent unit of analysis in the information systems literature. Early research explores antecedents of user participation and its relationship to the intention to use and the actual use of information systems (See, for instance, Hartwick and Barki, 1994, Barki and Hartwick, 1994). Later research conceptualizes the *lack* of user participation as user risk and investigates its impact on project management practices and project performance (Hung et al., 2014, Liu and Wang, 2014, Wallace et al., 2004). A large body of research investigates contingencies such as task complexity, different modes of user participation, and even negative consequences of user participation (McKeen et al., 1994, Saleem, 1996, Heinbokel et al., 1996). In their seminal paper, Markus and Mao (2004) consolidate this diverse and complex body of knowledge on user participation in a theoretical framework and call for its instantiation and empirical examination.

While individual constructs and relationships of the theoretical framework by Markus and Mao (2004) have been adopted, questioned, or substantiated in the information systems literature, an empirical examination of the overall framework is still missing. Markus and Mao (2004) develop their framework in the "spirit [of a] complex adaptive systems theory" (p. 538) and argue that the relationships between the constructs should not necessarily be interpreted as representation of variance or processes but rather as "merely influential" (p. 538). An empirical examination of the overall framework would enable us to augment this systems perspective with a variance perspective.

Other studies offer critical perspective on the role of user participation in information systems projects (e.g., Heinbokel et al., 1996). In particular, meta-analytic results by He and King (2008) suggest a weak to moderate effect of user participation on project outcomes. However, these studies investigate direct effects and do not consider the complex interactions proposed by Markus and Mao (2004). An empirical aggregation of the literature on user participation would enable us to offer direction for future research on the role of user participation.

We adopt meta-analytic structural equation modeling to explore the theoretical framework of user participation by Markus and Mao (2004) in the context of information systems projects. Meta-analytic techniques allow us to review the empirical literature and estimate effect sizes by aggregating quantitative empirical results across individual studies (Wowak et al., 2013). Building on the results by He and King (2008), meta-analytic structural equation modeling allows us to treat individual studies on user participation as empirical manifestations of the complex adaptive system of user participation proposed by Markus and Mao (2004). Following Burton-Jones et al. (2015), this would allow us to assess the ecological validity of the theoretical framework, which means in the context of this study, assessing the extent to which the complex adaptive systems theory of user participation by Markus and Mao (2004) can be generalized to the empirical settings investigated by information systems researchers.

Meta-analysis is a well-established research methodology in information systems discipline's reference disciplines, including management science, marketing, and finance (Filippin and Crosetto, 2016, Fernandes et al., 2014). Increasingly, meta-analysis is also adopted in the information systems (See, for example, Sharma and Yetton, 2007, He and King, 2008, Schermann et al., 2016). Thus, we extend this research and explore whether the theoretical framework of user participation by Markus and Mao (2004) is a "coherent and useful form" (Hunter and Schmidt, 2004, xxvii) to capture the complex nature of user participation in information systems projects.

Our results from instantiating the theoretical framework by Markus and Mao (2004) and fitting it to a meta-analytic sample of 226 empirical research studies with a total sample size of 42,330 information systems projects support the fundamental structure and logic of the theoretical framework by Markus and Mao (2004). Furthermore, our results also offer support for the critical perspective on user participation in information systems projects by He and King (2008). User participation has a weak to moderate relationship on project performance. More specifically, user participation is independent of propensities to design, offer, and execute opportunities for user participation. User participation appears to be a necessary but not sufficient project management practice.

We organized the remainder of the paper as follows. In the next section, we introduce and review the theoretical framework by Markus and Mao (2004). Additionally, we propose adaptation to the framework, which we derive from the literature. Then, we introduce and justify our approach to locating, coding, and aggregating empirical data from individual studies. Next, we present the result the meta-analytic structural equation modeling. Subsequently, we discuss implications for theory and practice. We close with an assessment of limitations and outline potentially fruitful avenues for future research.

2 Theoretical Background

The information systems literature offers heterogeneous perspectives on a variety of modes of user participation in a broad range of contexts. For instance, early research on user participation focuses on the relationship of user participation and adoption of information systems (See for example, Hartwick and Barki, 1994). Other studies investigate the role of user participation in the context of information security risk management (See for example, Spears and Barki, 2010). However, the predominant stream of research investigates user participation in information systems projects. This literature investigates the role of user participation in a variety of project tasks such as requirements engineering, testing, user training, and system adoption (Hsu et al., 2008, Gouchlan and Macredie, 2002, Nidumolu, 1996).

A broad range of methodological approaches combined with mixed results on the effect of user participation impede the ability of the information systems discipline to offer sound guidance on whether and how to include users in information systems projects. He and King (2008) argue that this becomes particularly problematic as “[m]any academics and consultants recommend user participation […] as an effective practice to achieve various favorable outcomes” (p. 302).

Two studies are particularly important to consider for advancing the understanding of the role of user participation in information systems projects. One, Markus and Mao (2004), develop a theoretical framework of user participation, which describes core concepts and relationships among the concepts. The authors position the theoretical framework as a complex adaptive systems theory and posit a set of propositions on the relationship of user participation and project performance.

The other study by He and King (2008), a meta-analysis, offers a more critical perspective on user participation. By estimating the effect of user participation on a set of outcome measures, He and King (2008) conclude that user participation has a weak to moderate effect of user participation on project performance. However, the study only measures the direct effects of user participation on outcome measures and thus (by design) ignores the complex relationship between antecedents of user participation, different modes of user participation, and project performance suggested by Markus and Mao (2004).

Here, we attempt to apply the meta-analytic perspective adopted by He and King (2008) to the theoretical framework of user participation developed by Markus and Mao (2004) using a meta-analytic structural equation modeling approach. We develop our structural equation model in three steps. First, we define the independent and dependent concepts in our model. Here, we extend the theoretical framework by Markus and Mao (2004) and include important elements discussed by He and King (2008). Second, we review the literature to understand important modes of user participation not explicitly covered by either of the two studies. Third, we develop the relationships between the concepts as hypotheses by interpreting the propositions offered by Markus and Mao (2004).

2.1 Independent and Dependent Concepts

In line with Markus and Mao (2004), we differentiate between two set of actors that are relevant in the context of user participation. Stakeholders are organizational members, who are either directly or indirectly affected by information systems projects. Markus and Mao (2004) assign the label *stakeholder* instead of *user* to highlight the fact that not just the intended users of the information system should or could participate but also other actors such as executives or consultants. In line with the literature, we posit that user participation activities require effort, time, and commitment from stakeholders, which may not be available to the extent required by information systems projects (Markus and Mao, 2004). Thus, we conceptualize the role of stakeholders as **stakeholder capacity**, which combines the psychological and practical ability to contribute to the success of an information system project.

The other set of actors are change agents. Change agents are actors, who are responsible for the progress and outcomes of information systems projects. Similar to the broad definition of stakeholders, this group not only includes the technical specialists that develop the information system but also consultants and IT vendors (Markus and Mao, 2004). We capture the role of change agents in two concepts. One concept captures the change agent capabilities. **Change agent capabilities** refer to the knowledge and experience of the change agents to conduct information systems projects. The change agent capabilities include the ability of change agents to design, offer, and execute opportunities for user participation. The other concept captures critical perspectives on user participation, which suggest that user participation should be used only selectively to improve outcomes (Heinbokel et al., 1996, He and King, 2008). We capture such perspectives using the concept of **change agent propensity**.

We conceptualize the consequences of user participation with two concepts: residual risk and project performance. Residual risk refers to the perceived risk “remaining in the project” (Nidumolu, 1995, p. 195) despite interventions including functional and managerial user participation. While neither Markus and Mao (2004) nor He and King (2008) introduce residual risk as a consequence of user participation, our review of the project literature indicates that the lack of user participation is frequently used as control variable (Liu and Wang, 2014). Furthermore, a dominant objective of user participation is to mitigate requirements uncertainty (Gouchlan and Macredie, 2002, Hsu et al., 2008). Thus, we follow Nidumolu (1995) and include **residual risk** as consequence of user participation.

Finally, we conceptualize the functional outcomes of information system projects using the concept of **project performance**. Although Markus and Mao (2004) offer a more fine-grained conceptualization of project performance, we adopt a broader perspective for two reasons. One is that the information systems literature offers a plethora of definitions for project performance, which are frequently used interchangeably across studies. The other reason is that Markus and Mao (2004) suggest emergent relationships between concepts of project performance. Initial explorations of our meta-analytic sample indicated that the information systems literature does not provide enough empirical data to investigate such relationships. Thus, we opted for a composite measurement of project performance.

2.2 Modes of User Participation

The concept of user participation refers to activities designed by change agents to include stakeholders in specific tasks of information systems projects (Barki and Hartwick, 1994). We differentiate between functional and managerial participation as two important modes of user participation. Predominantly, the literature on user participation investigates functional modes of user participation. For instance, stakeholders provide domain knowledge to improve requirements engineering phases during the project (Gouchlan and Macredie, 2002). The literature on functional modes of user participation frequently differentiates between a psychological perspective of user involvement and behavioral perspective of user participation, with user involvement as an antecedent to user participation (Hartwick and Barki, 1994, Barki and Hartwick, 1994). In line with He and King (2008), our empirical data suggests that both perspectives are used interchangeably in the information systems literature. Thus, we conceptualize both perspectives as **functional user participation**.

Additionally, the literature on project control suggests managerial modes of user participation (Wiener et al., 2016). Stakeholders, particularly when following the broad definition of Markus and Mao (2004), participate in the design, operation, and evaluation of project control systems. The purpose of project control is to regulate the behavior of stakeholders and change agents and to align potentially incongruent objectives of stakeholders and change agents (Ouchi, 1979). For instance, stakeholders may use outcome control modes to specify and control the attainment of desired target states of projects (Eisenhardt, 1985, Gopal and Gosain, 2010). Alternatively, the literature on behavior control investigates control modes where the change agents define desired behavior with stakeholder participation (Henderson and Lee, 1992, Kirsch, 1997). We conceptualize such forms of user participation as **managerial user participation**.

2.3 Hypotheses

We develop hypotheses by instantiating propositions offered by Markus and Mao (2004). It is important to note that it is not our intent to test the theoretical framework by Markus and Mao (2004). Instead, we opt for an exploratory approach to investigate a broad set of hypotheses and their manifestations in the empirical literature. We explore three independent concepts: stakeholder capacity, change agent capacity, and change agent propensity. Figure 1 summarizes our hypotheses as a conceptual model of user participation in information systems projects.

Markus and Mao (2004) propose that stakeholders “differ in their ability to contribute by their participation” (p. 530). Higher limits to stakeholders’ effort, time, and commitment offer more opportunities for change agents to include stakeholders in functional and managerial modes of user participation. More formally:

H1: Stakeholder capacity is positively related to functional user participation.

H2: Stakeholder capacity is positively related to managerial user participation.

Similarly, Markus and Mao (2004) propose that "the quality of change agents' efforts in designing and executing participating activities is related to (…) success" (p. 530). The capabilities of change agents and their organizations limit their ability to include stakeholders. More formally:

H3: Change agent capabilities are positively related to functional user participation.

H4: Change agent capabilities are positively related to managerial user participation.

The change agent propensity captures the inclination of the change agent to offer opportunities for user participation. While Markus and Mao (2004) do not offer specific propositions, we include the change agent propensity to capture important beneficial or detrimental antecedents to user participation. More formally:

H5: Change agent propensity is positively related to functional user participation.

H6: Change agent propensity is positively related to managerial user participation.

Furthermore, Markus and Mao (2004) state that the actors should focus on developing "effective relationships" and "work effectively together to design opportunities" (p. 531). We hypothesize that managerial user participation aligns the objectives of the involved actors and thus increase the likelihood for opportunities of functional user participation. More formally:

H7: Managerial user participation is positively related to functional user participation.

The fundamental assumption of the user participation literature is that user participation improves project outcomes (He and King, 2008). An important objective of functional user participation is to reduce uncertainty about the desired target of the information systems projects.

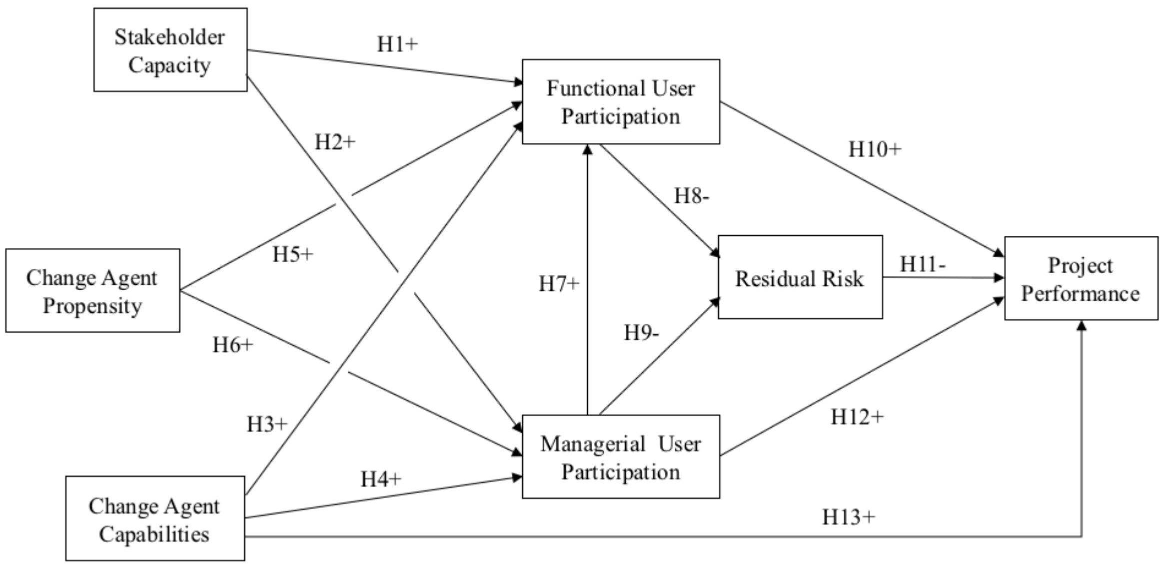

Figure 1. Conceptual Model of User Participation in Information Systems Projects

Similarly, managerial user participation reduces the likelihood of actors pursuing egocentric objectives (Kirsch, 1997). Additionally, Nidumolu (1995) shows that higher levels of residual risk are associated with lower levels of project performance. More formally:

H8: Functional user participation is negatively related to residual risk.

H9: Managerial user participation is negatively related to residual risk.

H10: Functional user participation is positively related to project performance.

H11: Managerial user participation is positively related to project performance.

H12: Residual risk is negatively related to project performance.

The core argument of He and King (2008) is that user participation is just one of the measures to improve project performance. Following this argument would indicate that the change agent capabilities should not just affect modes of user participation but also project performance. As we do not investigate measures other than user participation in our model, we state more formally:

H13: Change agent capabilities are positively related to project performance.

3 Method

We adopt meta-analytic structural equation modeling to review the literature on user participation. Meta-analytic structural equation modeling enables us to investigate structural relationships using effect sizes synthesized from literature. In their meta-analysis, He and King (2008) suggest marginal to moderate direct relationships between user participation and project performance. Markus and Mao (2004), however, suggest more complex relationships between antecedents, modes, and consequences of user participation. Combining meta-analysis and structural equation modeling allows us to investigate both arguments relationships simultaneously.

We follow established guidelines to locate, code, and aggregate empirical findings in a structural equation model (Lipsey and Wilson, 2001, Cheung and Chan, 2005a, Jak, 2015). A robust literature search protocol guides the process of locating and selecting empirical studies. Given the diverse nature of the information systems literature, a coding protocol ensures a systematic categorization of empirical findings. Finally, we use two-stage structural equation modeling to aggregate the empirical findings and fit them to the model developed above (Cheung and Chan, 2005a).

3.1 Literature Search Protocol

The objective of the literature search protocol is to locate, assess, and select robust empirical findings for inclusion in the meta-analytic sample. We adopt an exhaustive literature search strategy to mitigate the threat of publication bias (Rosenthal, 1979). Thus, the literature search protocol consists of two phases: an initial systematic keyword search in databases, an initial search for unpublished studies. Both phases follow a backward and forward search strategy (Webster and Watson, 2002).

The systematic keyword search used the following databases: ScienceDirect, EBSCOhost, Institute of Electrical and Electronics Engineers (IEEE) Xplore, The Association for Information System Electronic Library (AISeL), and the Association for Computing Machinery (ACM) Digital Library. We located studies published in conference proceedings and journals that examined factors of performance or success in IS projects using one or more of the following keywords: “information system”, “information technology”, “software”, “project*”, “performance”, “success”, “outcome”, “qualit*”, and “risk*”. We did not specifically search for user participation to ensure a broad perspective of potentially interesting modes of user participation. Additionally, user participation is often measures in control variables (e.g., Liu and Wang, 2014). We complemented this search with a search for unpublished studies in Google, Google Scholar, dissertation repositories, and the Social Science Research Network (SSRN). Using backward and forward search strategies, our initial meta-analytic sample includes 421 publications. We collected quantitative empirical studies only.

Each study must pass the following checks to be included in the final meta-analytic sample. First, the study must investigate constructs at the project level. Second, the study must provide Pearson product-moment correlation coefficients. Third, the study must not raise any quality concerns. Fourth, and most importantly, each study must report on a unique empirical sample. Including studies that report on various perspective on the same empirical sample would introduce a bias toward this sample. For instance, the search protocol yielded working papers, conference publications, journal publications using the same samples. In such cases, we selected either the publication with the most reputation (e.g., the journal publication over the conference proceeding) or the most recent publication. The final meta-analytic sample includes 226 studies with a total sample size of 42,330 information systems projects.

3.2 Coding Protocol

The objective of the coding protocol is to ensure a systematic allocation of study variables to the concepts developed above. The meta-analytic sample includes 2,058 variables. Thus, the coding protocol mitigates the risk of “comparing apples and oranges” (He and King, 2008, p. 310). The coding protocol consists of three steps: study coding, concept coding, and coding validation.

Study coding involved the extraction of the variables including the definition provided by the authors of the study. Each variable was coded to reflect the authors’ definition as close as possible. We coded independently, compared the results, and resolved inconsistencies. In the concept coding, we grouped study codes. Not all codes were grouped. Where appropriate, we reversed codes. For instance, effort overrun was coded as reversed project performance. We ensured high levels of consistency in the groups by visually inspecting forest plots and analyzing sources for heterogeneity in each concept. We resolved inconsistencies by iterating between grouping and forest plot inspections.

Concept	Codes	Reversed codes
Functional User Participation	Vertical Coordination, Horizontal Coordination, Integrative Coordination, User Participation, User Involvement, Informal Control, Clan Control	
Managerial User Participation	Administrative Coordination, Internal Coordination, Project Control, Formal Control, Behavior Control, Outcome Control	Autonomy, Self-control
Stakeholder Capacity	User Experience, User Capabilities, Top Management Support, Strategic Importance, Relational Capital	Governance Volatility, Environment Risk, User Risk, Social Subsystem Risk, Organizational Complexity
Change Agent Propensity	Task Complexity, Asset Specificity, Customization, Contract Type (Time and Materials), Reversed Experience with Client	Reversed Asset Specificity, Reversed Task Complexity, Contract Type (Fixed Price), Experience with Client, Knowledge about Client's Industry
Change Agent Capabilities	Project Management Practices, Commitment, Team Familiarity, Project Manager Experience, Project Manager Capabilities, Team Experience, Team Capabilities, Reversed Technical Complexity	Technical Complexity, Technological Uncertainty, Knowledge Resources Risk, Team Risk, Technical Subsystem Risk
Residual Risk	Residual Risk, Requirements Uncertainty, Estimation Uncertainty, Planning & Control Risk, Perceived Performance Risk, Requirement Risk, Target Volatility	Internal Coordination Quality, External Coordination Quality, Teamwork, Learning, Certainty, Conflicts Resolved, Reversed Estimation Uncertainty
Project Performance	Project Performance, Process Performance, System Performance, Team Performance, Time and Budget, User Satisfaction, Profitability	Effort Overrun, Number of Defects, Realized Performance Risk, Conflicts Existing

Table 1. Result of the Coding Protocol

In a third step, we fitted partial relationships between the groups to available structural equation models (e.g., Nidumolu, 1995) to detect potential inconsistencies in our coding and code grouping. Again, identified inconsistencies were resolved in an iterative process. Finally, we combined the groups to match the concepts developed above. Again, to ensure a systematic match, we developed several matches to detect and resolve inconsistencies.

3.3 Meta-analytic Structural Equation Modeling

We adopted two-stage structural equation modeling to fit the meta-analytic sample to the conceptual model developed above (Cheung and Chan, 2005a, Jak, 2015). Two-stage structural equation modeling enables us to synthesize effect sizes into a pooled correlation matrix. More importantly, two-stage structural equation modeling uses the full sample size for fitting the model (Cheung and Chan, 2005b). Given the heterogeneity in research interests in the information systems discipline, this is a critical property to integrate a diverse set of studies. The pooled correlation matrix is then used to fit the meta-analytic sample to the specified (Cheung and Chan, 2005b, Jak, 2015).

We used the zero-order Pearson product-moment-correlation coefficients between concepts to estimate effect sizes. We did not apply Fisher's z transformation to avoid an upwards bias (Hunter and Schmidt, 2004, Hall and Brannik, 2002). We corrected the correlation coefficients for measurement errors using the reliability coefficients provided in the empirical studies (Hunter and Schmidt, 2004). If a study does not provide reliability coefficients, we adopted a conservative reliability coefficient of 0.8 (Bommer et al., 1995, Dalton et al., 2003, Jiang et al., 2012).

Additionally, we used the formula for individually corrected correlation coefficients by Hunter and Schmidt (2004) to calculate the standard error of the estimated average correlations. We follow the recommendations by Hunter and Schmidt (2004) to estimate the zero-order Pearson product moment correlation coefficients. This procedure is consistent with recent meta-analyses in the IS literature. In cases, where a study provides two variables for the same concept (e.g., two variables were coded as project performance), we averaged the effect sizes (Hunter and Schmidt, 2004).

The corrected correlation coefficients are the input to the stage one of the two-stage structural equation modeling. We pool the corrected correlation coefficients using a random effects model (Cheung and Chan, 2005b, Jak, 2015). Random effects models assume that the effect sizes vary across studies. Given the diversity and heterogeneity in the information systems literature, random effects models offer conservative estimates because they assume that the effect size is a function of multiple causes including sampling error, variable operationalization, or respondent characteristics. We assess the heterogeneity in the pooled correlation matrix using the Q statistic (Hunter and Schmidt, 2004). A significant Q statistic indicates substantial heterogeneity in the meta-analytic sample.

In the second stage, we fit the pooled correlation matrix to the conceptual model developed above. Following the guidelines by Jak (2015), we additionally included relationships between the three independent concepts (i.e., stakeholder capacity, change agent capacity, and change agent intent) to control for co-variance between independent variables.

We use the following goodness-of-fit criteria to assess the fit of the model and the data: The chi-square measure of fit assesses the homogeneity of the meta-analytic sample beyond sampling. A significant chi-square measure of fit indicates that the model does not exactly fit the meta-analytic sample. We do not assume that our model will exactly fit the data. Thus, we also include measures of fit. In particular, we assess the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), and the comparative fit index (CFI) (Schumacker and Lomax, 2009, Hooper et al., 2008, Hu and Bentler, 1998).

A RMSEA value of less than 0.05 indicates close fit. The confidence interval of the RMSEA should be less than 0.05 for the lower bound and less than 0.08 for the upper bound. A SRMR value of less than 0.08 indicates a good fit (Browne and Cudeck, 1992, Hu and Bentler, 1998, Schreiber et al., 2006, Schumacker and Lomax, 2009). A CFI of more than 0.95 indicates a good fit (Bentler and Bonett, 1980, Schreiber et al., 2006).

4 Results

The two-stage structural equation modeling approach produces two main results. One result is the pooled correlation matrix (See Table 2). The Q statistic for the pooled correlation matrix is highly significant

($Q(556) = 8893$, $p < 0.001$), which suggest significant heterogeneity in the meta-analytic sample. Table 2 reports the pooled correlation matrix.

	SC	CAP	CAC	RR	FUP	MUP	PP
SC							
CAP	-0.07						
CAC	0.243	-0.098					
RR	-0.236	0.062	-0.221				
FUP	0.302	0.0158	0.194	-0.285			
MUP	0.246	-0.00072	0.166	-0.270	0.303		
PP	0.350	-0.068	0.354	-0.309	0.329	0.235	

Legend: SC = Stakeholder Capacity, CAP = Change Agent Propensity, CAC = Change Agent Capabilities, RR = Residual Risk, FUP = Functional User Participation, MUP = Managerial User Participation, PP = Project Performance

Table 2. Pooled Correlation Matrix

The second result is the estimated structural equation model. Before interpreting the parameters, Jak (2015) recommends to assess the fit between the model and the data. Table 3 reports the goodness-of-fit measures. The chi-square measure is highly significant (Chi-square = 23.68 (5), p = 0.00025), which indicates that the models has to be interpreted as an approximation of the data. The RMSEA value is lower than 0.05, the lower boundary of the confidence interval is less than 0.05 and the upper boundary is less than 0.08, which indicates a good fit (RMSEA = 0.009 [0.006:0.013]). Furthermore, the SRMR value is less than 0.08, which again indicates good fit (SRMR = 0.054). The CFI value is only marginally larger than 0.95, which indicate a satisfactory fit (CFI = 0.957). All goodness-of-fit measures are within the acceptable ranges, which allows us to interpret the parameters of the model.

Chi-square (DF), p-value	RMSEA	CI 95% RMSEA	SRMR	CFI
23.68 (5), p = 0.00025	0.009	0.006:0.013	0.054	0.957

Table 3. Goodness-of-fit Measures

Figure 2 reports the parameter estimates in the context of the hypotheses established above (Viechtbauer, 2010). Confidence intervals that include zero indicate non-significant parameters. The parameters for significant relationships range from -0.27 to 0.27.

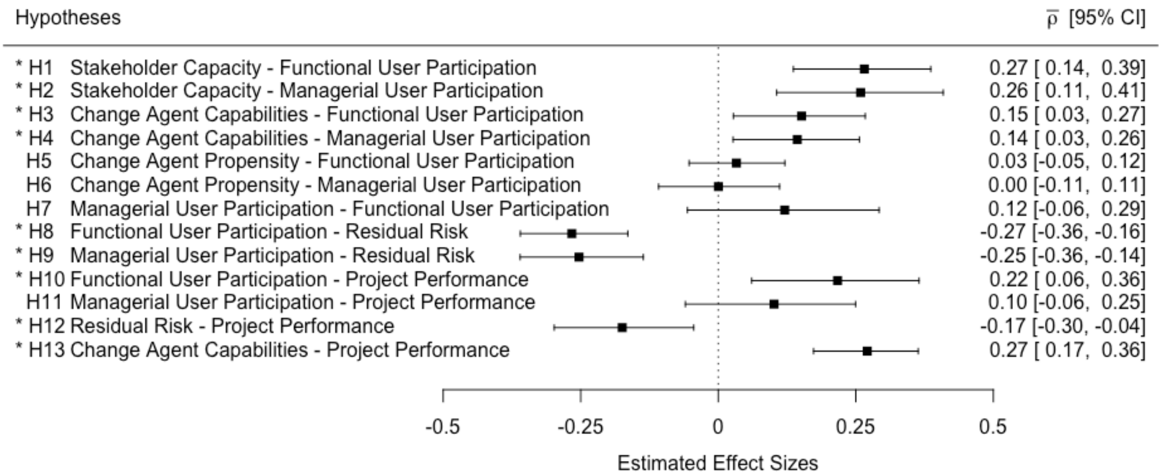

Figure 2. Parameters Estimates for the Hypotheses

Hypothesis H1 posits a positive relationship between stakeholder capacity and functional user participation. Our results support H1 and indicate a positive, significant, but weak relationship between stakeholder capacity and functional user participation ($\overline{\rho}$ = 0.265, CI = [0.136: 0.386]). Hypothesis H2 posits a positive relationship between stakeholder capacity and managerial user participation. Our results support H2 and indicate a positive, significant, but weak relationship between stakeholder capacity and managerial user participation ($\overline{\rho}$ = 0.259, CI = [0.106: 0.409]).

Hypothesis H3 posits a positive relationship between change agent capabilities and functional user participation. Our results support H3 and indicate a positive, significant, but trivial relationship between change agent capabilities and functional user participation ($\overline{\rho}$ = 0.151, CI = [0.027: 0.267]). Hypothesis H4 posits a positive relationship between change agent capabilities and managerial user participation. Our results support H4 and indicate a positive, significant, but trivial relationship between change agent capabilities and managerial user participation ($\overline{\rho}$ = 0.144, CI = [0.027: 0.256]).

Hypothesis H5 posits a positive relationship between change agent propensity and functional user participation. Our results do not support H5 and indicate a positive, trivial, but non-significant relationship between change agent propensity and functional user participation ($\overline{\rho}$ = 0.033, CI = [-0.053: 0.121]). Hypothesis H6 posits a positive relationship between change agent propensity and managerial user participation. Our results do not support H6 and indicate a positive, trivial, but non-significant relationship between change agent propensity and managerial user participation ($\overline{\rho}$ = 0, CI = [-0.108: 0.111]).

Hypothesis H7 posits a positive relationship between managerial user participation and functional user participation. Our results do not support H7 and indicate a positive, trivial, but non-significant relationship between managerial user participation and functional user participation ($\overline{\rho}$ = 0.121, CI = [-0.056: 0.292]).

Hypothesis H8 posits a negative relationship between functional user participation and residual risk. Our results support H8 and indicate a negative, weak, but significant relationship between functional user participation and residual risk ($\overline{\rho}$ = -0.266, CI = [-0.36: -0.164]). Hypothesis H9 posits a negative relationship between managerial user participation and residual risk. Our results support H9 and indicate a negative, weak, but significant relationship between change agent propensity and managerial user participation ($\overline{\rho}$ = -0.253, CI = [-0.36: -0.136]).

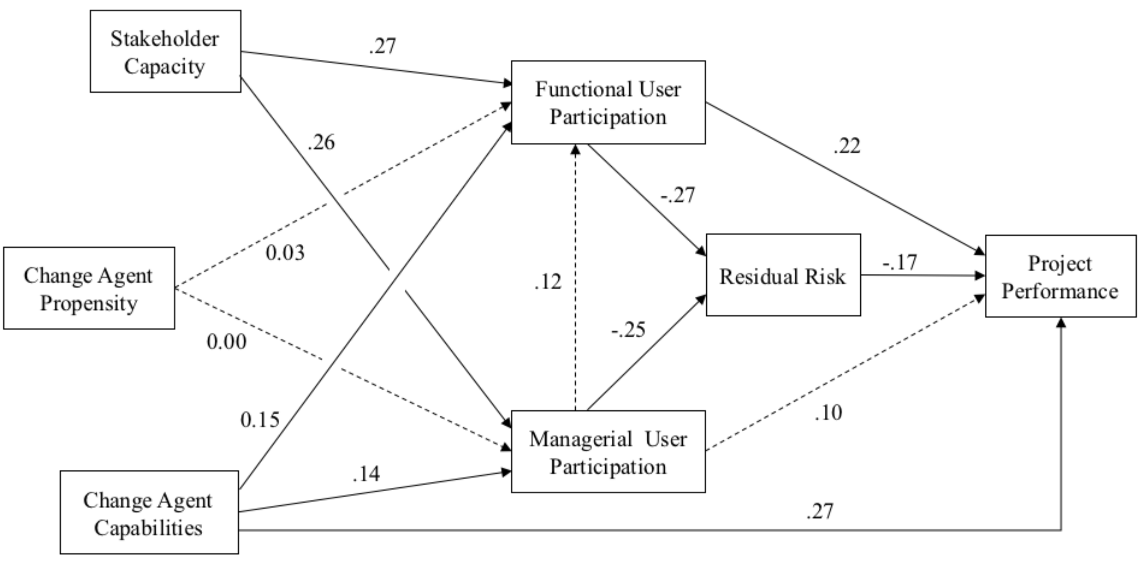

Figure 3. Parameterized Conceptual Model for User Participation in Information Systems Projects

Hypothesis H10 posits a positive relationship between functional user participation and project performance. Our results support H10 and indicate a positive, weak, but significant relationship between functional user participation and project performance ($\overline{\rho}$ = 0.217, CI = [0.061: 0.365]). Hypothesis H11 posits a positive relationship between managerial user participation and project performance. Our results do not support H11 and indicate a positive, trivial, but non-significant relationship between managerial user participation and project performance ($\overline{\rho}$ = 0.101, CI = [-0.06: 0.25]). Hypothesis H12 posits a negative relationship between residual risk and project performance. Our results support H12 and indicate a negative, trivial, but significant relationship between residual risk and project performance ($\overline{\rho}$ = -0.175, CI = [-0.298: -0.045]).

Finally, hypothesis H13 posits a positive relationship between change agent capabilities and project performance. Our results support H13 and indicate a positive, weak, but significant relationship between change agent capabilities and project performance ($\overline{\rho}$ = 0.271, CI = [0.173: 0.363]).

The meta-analytic structural equation model explains 25.8 percent of the variance of project performance. Figure 3 shows the parameterized conceptual model. Solid edges represent significant relationships and dashed edges represent non-significant relationships.

5 Discussion

We discuss the results in two steps. First, we discuss implications for research in the context of the theoretical framework by Markus and Mao (2004). Second, we review limitations that may impact the validity of our results. These limitations represent implications for future research.

5.1 Implications for Research

The objective of this research was to instantiate and empirically investigate the theoretical framework by Markus and Mao (2004) using a meta-analytic structural equation modeling approach. Markus and Mao (2004) argue that inconsistent and even conflicting results on the role of user participation are the result of too simple explanations that "leave important conceptual issues unresolved" (p. 514). Thus, they develop a theoretical framework to guide research towards resolving these conceptual issues.

Our results support the fundamental structure and logic of the theoretical framework by Markus and Mao (2004). Stakeholder capacity and change agent capabilities are significant antecedents of user participation. In turn, two modes of user participation activities, functional user participation and managerial user participation, reduce the residual risk in information systems projects. Additionally, functional user participation has a positive impact on project performance. The residual heterogeneity of our results also substantiate the claim by Markus and Mao (2004) that the project context may introduce important moderators of the relationships between the antecedents, modes, and consequences of user participation.

In contrast to Markus and Mao (2004), He and King (2008) use meta-analysis to show that user participation has a weak to moderate effect on project outcomes. He and King (2008) argue that user participation is not a "panacea to guarantee improved [..] outcomes" (p.324). Our results support the arguments by He and King (2008). The direct effect on project performance is weak for functional user participation and even non-significant for managerial user participation. Overall, our model explains just 25.8 percent of the variance of project performance. Additionally, our results show the strongest effect size for the direct relationship between change agent capabilities and project performance. This indicates that user participation is indeed just one of a variety of strategies to improve project outcomes.

In line with Markus and Mao (2004) and He and King (2008), our results indicate that different modes of user participation have differential effects. Functional user participation provides means to reduce risks perceived by stakeholders and change agents during the process of projects. Furthermore, functional user participation improves project performance. Furthermore, our results indicate a role for managerial user participation that is consistent with the original literature on project control (Ouchi, 1979, Eisenhardt, 1985). Managerial user participation reduces risks perceived by stakeholders and change agents but has a non-significant impact on the outcomes of projects. Finally, the non-significant effect between functional user participation and managerial participation suggest that change agents use different modes of user participation independently.

Beyond the arguments by Markus and Mao (2004) and He and King (2008), our results further indicate that user participation is a necessary but not sufficient strategy to achieve desired project outcomes. More specifically, our results indicate that user participation is independent of the change agents' propensity to design, offer, and execute opportunities for user participation. This suggests that change agents engage in user participation independent of whether they develop a particular propensity for user participation (e.g., due to significant customization efforts). Furthermore, our results indicate that managerial user participation is as important as functional user participation to reduce residual risks in projects.

Our results indicate that practitioners should perceive user participation as a necessary but not sufficient strategy in the set of project management practices. Both modes of user participation help to reduce risks and guide projects toward desired outcomes. In particular, user participation reduces risks in projects. However, the weak effects on residual risk and project performance indicate that user participation is associated with costs that dampen the effect of user participation (He and King, 2008). Also, the heterogeneity in stage one of our meta-analysis suggest that the effect of user participation is a function of multiple factors such as the project context or the maturity of the industry. In sum, our results suggest that practitioners should adopt a mindful approach to design, offer, and execute opportunities for users to participate.

5.2 Limitations

The results of this study are subject to several potential limitations, which originate from the methodological choices outlined above. First, we may have missed empirical studies during our literature search protocol. We are confident that we have not missed a substantial number of studies as our search results are consistent with published meta-analyses (Dongus et al., 2015, He and King, 2008).

Second, all literature reviews and meta-analyses are subject to the file drawer problem indicating that unpublished results would differ from the published results (Rosenthal, 1979). We mitigated this potential limitation by including a wide variety of publication types including unpublished material, dissertations, and working paper.

Third, our instantiation of the theoretical framework by Markus and Mao (2004) is necessarily subjective. For instance, Markus and Mao (2004) did not conceptualize important characteristics of stakeholders and change agents. Our conceptualization of stakeholder capacity, change agent capabilities, and change agent propensity are an attempt to stay as close to the proposition by Markus and Mao (2004) as possible.

Furthermore, we had to abandon the idea of differentiation categories of project outcome due to heterogeneity in the literature. While previous studies investigate different categories of project outcomes (Basten and Pankratz, 2015, He and King, 2008, McKeen et al., 1994, Wang et al., 2014), our focus was to fit the full theoretical framework by Markus and Mao (2004) to the data. Similarly, we could not address all propositions by Markus and Mao (2004) due to a lack of empirical studies. While future research should investigate whether including different categories of project performance or additional concepts significantly changes the results.

Fourth, our coding of the empirical studies is necessarily subjective, too. Although, we followed systematic procedures, our interpretation of empirical studies may have an impact on the results. We are, however, confident that this impact is not substantial as our results are consistent previous studies (He and King, 2008). Furthermore, our meta-analytic sample produces results that are consistent with existing structural equation models (Nidumolu, 1995).

Fifth, the stage one of the meta-analytic structural equation modeling process reveals significant heterogeneity in the meta-analytic sample. This could be an indicator for moderators that could affect the results. Our results should be interpreted as a first attempt to instantiate the theoretical framework by Markus and Mao (2004). In line with the call by Markus and Mao (2004), future research should investigate potential moderators such as the project context (e.g., difference in the role of user participation in internal and outsourced projects).

6 Conclusion

In this study, we quantitatively explore the theoretical framework for user participation proposed by Markus and Mao (2004). Based on a meta-analytic structural equation model from 226 with a total of 42,330 information systems projects, our results indicate support for the theoretical framework. User participation has a weak but significant effect on two important project outcomes, residual risks and project performance. This effect is independent of a propensity to include users. Overall, our results suggest that user participation is a necessary strategy to *improve* project outcomes but not sufficient to *ensure* them.

Markus and Mao (2004) argue that their theoretical framework is a complex adaptive systems theory. In this study, we show that meta-analytic approaches help to integrate empirical findings in order to advance and extend such complex adaptive systems theories. We instantiate the original framework by Markus and Mao (2004) in three important ways. First, we differentiate between capacities and capabilities of project stakeholders to include users. Second, we differentiate between formal and informal mode of user participation. Third, we include residual risk as an important factor in the relationship between user participation and project performance.

Our results suggest important directions for future research. First, the substantial heterogeneity in the meta-analytic sample suggest other important factors that influence user participation. Thus, our quantitative results substantiate the call by Markus and Mao (2004) to extend and improve the theoretical framework. Second, we introduced residual risk as an important construct to describe the effect of user participation.

Future research could investigate differential effects of user participation on construct other than project outcomes. Third, coding the empirical findings in the information systems literature reveals a diverse set of measurements. For instance, the conceptualization of project outcomes in Markus and Mao (2004) significantly differs from the one used in He and King (2008). Furthermore, both differ from the conceptualizations used in the studies in our meta-analytic sample. Research on consolidating and improving the constructs and measurement items would ensure cumulative research results as the foundation for sound guidance for practitioners.

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