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# Resistant Use of Project Management Methodologies – Using Psychology to Rethink the Influence of Methodology Attributes

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# Resistant Use of Project Management Methodologies – Using Psychology to Rethink the Influence of Methodology Attributes

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**Abstract.** Even though practitioners and researchers generally agree that project management methodologies are very useful in managing IT-related projects, organizations are rarely able to motivate their staff to use them. Even when employees use these methodologies, the question of how they are being used still remains. To better understand the way in which employees use project management methodologies, we develop the construct "resistant use." Applying a diffusion of innovations perspective, we develop a conceptual model to examine how methodology attributes interact with users psychological needs to influence a user's resistant use behavior. Based on a sample size of 2645 participants, and using the structural equation modeling technique, we find that a user's need for achievement and need for cognition moderate the impact of project management methodologies' attributes (relative advantage, complexity, and compatibility) on their resistant usage behavior.

**Keywords:** Project management, Resistant use, Behavioral science

## 1 Introduction

In the search for systematic and predictable ways to find replicable, pragmatic, cost-effective, and timely solutions to IT development problems, organizations either adopt or customize and adaptively apply project management methodologies (PMMs), which consist of tested bodies of methods, rules, and procedures. Despite the overwhelming advantages of using a PMM, organizations are often unable to compel their staff to use such methodologies. For example, a software development project survey conducted by Russo et al. [1] shows that only 6% of organizations claim that their methodologies are always used as specified. Cicmil et al. [2] found that resistance to the acceptance of project management methodologies is high because users do not have faith in the concept, fear a loss of power, or lack adequate training and support from upper management. In light of this evidence it is clear that methodologies' potential benefits cannot be realized if organizational members who can benefit from their use resist using them. Moreover, even when employees use these methodologies, the question regarding the nature of their use remains, i.e. *how*



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*are they using them?* This question is critical because *use* alone does not mean that employees are dedicated to using a PMM. Because the use of organization specific PMM is not volitional i.e. employees have no choice regarding the use of a PMM, their act of using a PMM might be superficial. Deep within they might be actually using the PMM in a resistant, counterproductive manner. Understanding employees resistant usage behavior is critical, because although a particular methodology is developed, implemented, and forced upon employees by an organization, the way in which it is used is only determined by the methodology's users. Reasons why PMM usage might be challenging, causing resistance, derive from the tacit, organizational, and individual problems caused by the introduction of a new methodology. The stress associated with learning a new methodology, fear, the impact on self-esteem and identity associated with an organizational restructuring, the emotional costs of role conflict, ambiguity, and workplace transformation might be serious inhibitors of commitment motivations [3]. Based on existing literature, we therefore attempt to capture the impervious, non-compliant, unwilling nature of PMM usage behavior by conceptualizing it as *resistant use*. As discussed in a later section, this specific construct captures the negative, destructive, and counterproductive character of "use", the mysteries of which both organizations and researchers are constantly trying to unearth and prevent. This approach might help organizations to not simply make employees use a PMM but also to reduce the often passive and covert resistant use behavior.

The second issue concerning the methodology adoption and use domain pertains to the study of usage antecedents from singular perspectives. Some of these studies have attempted to examine individual usage behavior regarding IS methodologies from a technology adoption perspective (e.g., [4-5]), while others apply sociological models, such as the theory of planned behavior (TPB) [6] to examine the development of individuals' intention to use methodologies (e.g., [7-8]). Unfortunately, the various disciplines, generally concentrating on their individual variables, have neglected to incorporate methodology and personality attributes into their understanding of the methodology use problem. Little is known about the interactive effects of methodologies' attributes and non-technical, psychological personality characteristics, and it seems reasonable to consider variables from both sets important in explaining the problem at hand [9].

Applying a *methodology-centric* perspective, based upon the diffusions of innovation theory (DOI) [10], we develop and test a conceptual model to examine how methodology attributes (technical perspective) interact with users' psychological needs (psychological perspective) thereby influencing their resistant use behavior. The integration of human needs is important because, even though past research has shown that IT artifacts have certain technical attributes and influence a person's usage behavior, the results across different domains and contexts have been inconsistent and sometime contradictory (e.g. effects are found to be insignificant or to have a negligible effect [4-5]. Human needs might be able to explain this variation and show us that, based upon an individual's intrinsic psychological characteristics, different methodology attributes influence a person's usage behavior in different ways. Murray's [11] theory of psychogenic needs provides a comprehensive theoretical basis to help us

understand how, when, and which specific needs are more important to what type of people.

Our study contributes to filling the gap in the methodology development, adoption, and implementation literature, which, until now, has neither developed a theoretically and practically complete nor relevant taxonomy of potential methodology characteristics. Moreover, no prior studies have investigated the way in which these characteristics interact with people's need to affect their methodology usage behavior. This leads to fundamental questions regarding the nature of employees' methodology use: a) How do PMM attributes affect an individual's resistant usage behavior?; b) How do human needs interact with the PMM attributes to explain resistant use? The remainder of the paper is organized as follows: Section 2 provides an overview of the theoretical foundations that provide the framework for our conceptual model. In Section 3, we present our research model and hypotheses. In Section 4 we discuss the methodology and results, while we discuss the study's implications and contributions in Section 5.

## 2 Theoretical Background

A PMM is viewed as a framework that is used to structure, plan, and control the process of developing or managing IS artifacts (e.g. software, hardware, infrastructure, processes etc.). The main idea behind PMMs is to facilitate the management of projects in a very deliberate, structured, and methodical way, requiring each stage of the project life cycle – from the inception of the idea to the handover of the final deliverables – to be carried out rigidly and sequentially. Some of the most fundamental characteristics and advantages that justify the use of such structured PMMs, as identified by Fitzgerald, (1998) are the following: i) They reduce complexity by subdividing the project development and management process into plausible and coherent steps; ii) They increase transparency and therefore facilitate control over the activities, thus reducing the risk and uncertainty of projects; iii) They provide a goal-oriented framework that helps to direct the application of techniques and resources at appropriate times during the project.

### 2.1 Nature of Use

**Resistant Use (RU).** The resistance concept has been a core focus of the management science and organizational behavior literature with regard to employees' resistance to accepting management-initiated changes. This resistance is generally negatively viewed as an obstacle or barrier to change and progress. In short, resistance is something to be resisted. Long before management sciences discovered "resistance" as a potent construct, it had already had a long history, characterized by rich theoretical developments, in the psychology literature. From psychology we learn that resistant behavior is a means by which the subject of the resistance attempts to acquire external and/or internal benefits. According to research conducted in the domain of cognitive-affective psychology, resistant behavior could be driven, consciously or unconsciously, by either a) cognitive or b) affective processes. For example, in case of *cognitively*

driven resistant behavior, a person would rationally analyze a task at hand and conclude that it would take too long to master it and was not worth the effort, consequently reject it. With regard to *affectively* driven resistant behavior, the task at hand might unconsciously generate intolerable emotions of anxiety, anger, fear, etc. (e.g. based upon past failures, experiences, phobias, etc.) due to which the person might automatically avoid the task without any cognitive deliberation or logic.

Based upon psychoanalytic theory, especially the work of Freud [12], resistant behavior is considered to be also driven by desires and emotions that occur without an individual being consciously aware of them i.e. through unconscious processes such as defense mechanisms that emerge involuntarily whenever an individual perceives psychic danger. In Freudian psychoanalytic theory, these defense mechanisms are psychological strategies to protect an individual's mind from anxiety, which is an aversive psychological inner state. Anxiety is a core concept in psychoanalytic theory and, when experienced in an intense or acute form, is the most unpleasant feeling an individual can experience. It arises from internal conflicts between one's primitive desires, from the constraints of reality, and from one's values and beliefs, or when an external threat is perceived. Consequently, when anxiety becomes too overwhelming, individuals deploy defense mechanisms that distort, transform, or falsify reality is some way, to protect themselves from unpleasant feelings. Resistant behavior allows individuals to eliminate psychological threats by avoiding actions or blaming the object of behavior that could be contributing to anxiety.

Following the discussion above, we propose that *resistant use* occurs when an individual is consciously or unconsciously opposed to the usage behavior, which is either based on a rational cost-benefits analysis or on feelings of anxiety, and actively, passively and overtly or covertly tries to avoid *usage* by, for example, refusing, arguing, delaying, or seeking to have the request or order to use the methodology nullified.

### 2.2 Diffusion of Innovations Theory

Research in an array of academic disciplines, such as anthropology, communication, geography, sociology, marketing, political science, public health, economics, social psychology, sociology, and political science, has applied DOI to understand the effect that new ideas, processes, and technologies have on people's adoption and usage decisions. Over the past five decades, DOI theory has been used to study how innovations diffuse into and are adopted by wider social networks [10]. While early research employing DOI theory concentrated on the diffusion and acceptance of products, the research community has recently reached consensus that *ideas* and *practices,* such as methodologies, can also be regarded as innovations if the potential adopter perceives them to be new [10]. According to Rogers [10], one of the most influential factors determining an innovation's adoption rate is the innovation itself, i.e. its *characteristics*. Based on the DOI theory, a methodology's characteristics play a crucial role in how potential users use it. The more attractive the attributes of a methodology are perceived to be, the more readily potential users accept that methodology, and the more dedicated they are when using it. Extensive empirical research has found that some of the attributes are more important than others. After conducting a meta-

analysis of 75 articles pertaining to innovation characteristics, Tornatzky and Klein [13] found that relative advantage, complexity, and compatibility are the only innovation characteristics consistently related to innovation adoption and implementation. Although extensive empirical evidence in various fields suggests that these influences are applicable in the context of methodology use – except for relative advantage – they have either been neglected or have been considered insignificant. Applying a least-square regression analysis, Riemenschneider et al. [5] individually tested five theoretical models regarding individuals' intention to accept information technology tools. Their aim was to understand why software developers accept or resist methodologies. They came to the following conclusions: *Perceived usefulness* was the only significant variable across all five models ($p < 0.001$), *voluntariness* was found to be not significant (or was not included) in three models, *compatibility* was found to be not significant (or was not included) in four models, and result *demonstrability*, *complexity*, *observability*, and *image* were found to be not significant (or were not included) in all five models. Hardgrave et al. [4] also investigate software developers' intentions to use methodologies, and find *usefulness* to be significant (although comparatively weaker), *complexity* to be not significant, and *voluntariness* and *compatibility* to be significant, but weak.

Recognizing the large gap in the innovation attributes proposed by the DOI theory and those studied in the context of methodology use, we identify two areas that require further attention: Future research needs to examine a) which of the wide range of innovation characteristics apply to the methodology domain, and b) how these different attributes affect resistant behaviors. As mentioned earlier, while the DOI theory provides a comprehensive list of attributes with which to examine the former issue, the latter problem is virgin territory.

### 2.3 Psychogenic Human Needs

Following Murray's [11] theory of psychogenic needs in humanistic psychology, individuals are expected to use a PPM based on their perceptions that it will enable them to fulfill their specific needs. Of the many definitions of basic needs that have been proposed, the one by Ryan and Deci [14] is the most applicable to this study. They indicate that "a basic need, whether it be a physiological need or a psychological need, is an energizing state that, if satisfied, conduces toward health and well-being but, if not satisfied, contributes to pathology and ill-being". As such, "what a person does" is determined by "what a person needs," i.e. people's behavior is determined by the needs they attempt to examine/fulfill either consciously or subconsciously. This implies that the factors that will be most influential in inducing resistance against PMM use are those that fail to satisfy people's basic needs. The inability to satisfy psychological needs results in serious discomfort. Moreover, this dissatisfaction might lead to the individual's rejection of the particular methodology. An individual's needs are thus expected to play a *moderating* role and influence the explanatory power of the determinants of resistant PMM use.

## 3 Conceptual Framework

Based on our discussion above, we hypothesize that a) specific methodology attributes influence employees' resistant PPM usage behavior, and b) employees' individual needs affect the explanatory power of the methodology attributes' effect. As outlined before, we combine both theories towards a comprehensive model explaining resistant behavior based on the insight that decision-making behavior regarding methodology use does not only depend on an assessment of a methodology's attributes but on a person's individual needs. A combination of both theories is useful and appropriate for the following reasons: (1) Both theories relate to the individual as the unit of analysis, (2) all relevant constructs can be measured through a survey, (3) the psychological assumptions underlying both theories are not contradictory, and (4) the philosophical assumptions of both theories are compatible. Moreover, it is to be expected that the explanatory power of the resulting model is significantly higher than that of the isolated theories.

### 3.1 Attributes of a Methodology

*Relative advantage* (RA) is the degree to which potential users perceive a methodology to be superior to its precursor, which is either the previous way of doing things (if there is no current way), the current way of doing things, or doing nothing. A methodology's superiority is not only measured in economic terms, but also in terms of a reduced or increased status and other benefits, for example, an increase in productivity and efficiency. Relative advantage is always measured in terms that matter to methodology users. Here, relative advantage mainly pertains to the workplace where the methodology is used. For example, a relative advantage may be perceived when the user can plan his project faster, he can make better decisions or he is able to steer his team in a more efficient way. All other factors being equal, the higher the relative advantage, the lower the resistance. Consequently, we propose that relative advantage will have a negative effect on resistant PPM use.

*Complexity* (CL) is the degree to which a methodology is perceived as difficult to understand and use. Complexity can e.g. be the result of a methodology's high number of procedural steps, the diversity of the activities included, the comprehensibility of its documentation, or the cognitive abilities required to master it. Complexity can result in a significant effort required to learn and master a methodology. Complexity may also increase the likelihood of mistakes when applying the methodology. E.g. a project management methodology may be error-prone because of highly complex business case documents or scheduling approaches. The more complex a methodology is perceived to be, the more resistance it is expected to generate. The more complex a methodology is perceived to be, the more an individual doubts his or her own ability to use a methodology properly. Complexity has been addressed in the technology adoption literature by the *ease of use* construct (which is also based on the concept of self-efficacy), which refers to the degree to which a person believes that using a particular methodology would be a) free of physical and mental effort, and b) easy to learn. Numerous empirical evaluations of *self-efficacy* and *ease of use* consider

these constructs an important predictor of human behavior and therefore provide substantial justification for including the *complexity* construct in our model. As such, we propose that complexity will have a positive impact on resistant PPM use.

*Compatibility (CA)* is the degree to which a methodology is perceived to be consistent with potential adopters' existing social cultural values and past experiences [15]. DOI's assumption is that any innovation may also be perceived as a risk. A high degree of compatibility with what is already known and mastered reduces an individual's risk to experience adverse effects. Adverse effects may be increased learning effort or frustration. Thus, the lower the compatibility, the higher the resistance to use the methodology. The roots of this lie in assumption that individuals in organizations might be reluctant to change their habits, which they have learned unconsciously through past repetitions, and might therefore be unwilling to adopt new methodologies that may cause radical change. In matters of radical change, such as new methodology adoption (see Section 2), the methodology might not be compatible with potential users' habits and could therefore evoke negative feelings and emotions and, consequently, resistance.

***H1:*** *Relative advantage (RA) is negatively associated with the resistant use of a PMM*
***H2:*** *Complexity (CL) will be positively associated with the resistant use of a PMM*
***H3:*** *Compatibility (CA) will be negatively associated with the resistant use of a PMM*

### 3.2 Personal Needs

*Need for achievement (nAch)* refers to an individual's desire to do things better, accomplish difficult tasks, overcome obstacles, become an expert, achieve high performance standards, or need for a significant task-related accomplishment [11]. Such individuals are focused on internal motivation and personal achievement rather than external rewards and recognition. People with a high nAch aspire to accomplish difficult tasks in which success depends primarily on their efforts. Individuals with a high nAch are driven by their desire to have their success attributed to internal factors, i.e. their skills and competencies, rather than external factors such as luck or outside support, since attributions to internal factors produce stronger self-esteem related affective reactions than attributions to external factors. Such individuals are most satisfied when they know that they alone are responsible for a successful outcome. Empirical evidence confirms this.

However, according to the DOI perspective, relative usefulness is a characteristic of the methodology. Therefore, successful outcomes of a job that were achieved using a highly beneficial methodology are directly attributed to the methodology's usefulness (i.e. is external) rather than to the skills of the person who applied it. It generates the impression that anyone can be successful if they use that particular methodology. Therefore, psychologically, high achievers are dismayed by the notion that, even after putting in all the hard work, they might not get credit for the success. They would thus be more inclined to use a less useful methodology, because success in such a case might be directly attributed to their own abilities and contributions, giving them a heightened sense of achievement and pride (e.g. "even though the methodology was useless, I still got the job done"). We therefore propose that:

**H4**: The negative influence of *relative advantage (RA)* on resistant use will be moderated by *need for achievement (nAch)* such that the effect will be weaker for individuals with high nAch.

The more complex a methodology is perceived to be, the more gratification/satisfaction people with a high *nAch* are expected to feel, since being successful at using methodologies, which others fail to master, symbolizes and communicates personal competence. Studies have also shown that individuals with a high nAch are more committed to achieving difficult goals [16]. Individuals with a high *nAch* are expected to put *more effort* into tasks, *persevere longer* when confronted with obstacles, and show *resilience* in the face of complex methodology use. On the other hand, individuals with a low nAch avoid difficult tasks characterized by a high level of complexity, because their fear of failure greatly outweighs their expectation of success. We therefore propose that:

**H5**: The positive influence of *complexity (CL)* on resistant use will be moderated by *need for achievement (nAch)* such that the effect will be weaker for individuals with nCog.

*Need for cognition (nCog)* represents a desire for knowledge and reasoning [11], as well as the need to explore and discover. It represents the extent to which people engage in and enjoy *effortful* cognitive activities. Individuals with a high *nCog* tend to naturally seek, acquire, think about, and reflect on information by experimenting and exploring, to make sense of a problem at hand. Empirical studies have shown that people with a high nCog are generally more intelligent, conscientious, and open-minded, and therefore actively seek out challenging tasks. Consequently, people with a high *nCog* are more likely to want to use new and complex methodologies, as they would find it intellectually stimulating.

**H6**: The positive influence of *complexity (CL)* on resistant use will be moderated by *need for cognition (nCog)* such that the effect will be weaker for individuals with high nCog.

## 4 Research Methodology

**Data Collection.** The entire development process, leading to the final survey instrument, was conducted according to Straub's [17] recommendations. An initial pool of reflective measures was selected, based on their empirical validation in prior research. Instrument refinement was conducted based on interviews with 2 subject matter experts, Q-sorting exercise in 2 rounds with 7 and 8 participants respectively, and a web-based pre-test with 65 participants. Finally, all items were embedded in survey questions using a 7-point Likert scale anchored at *strongly disagree* (1) and *strongly agree* (7). Throughout the entire instrument development process, three researchers from different disciplines, nationalities, and institutions were always involved, discussing every issue and formulating improvements. Data was collected via an online survey for a period of four months. Participants for the study were collected through two approaches (personalized and anonymous): 1) They were randomly chosen utilizing databases of professionals (e.g. XING, Viadeo, CompetenceSite), with keyword

search (e.g. 'project manager'), and 2) International project management organizations (e.g. PMI, IPMA) sent out open invitations to all their members. 30 cases were excluded, because during data cleaning we noticed that the participants had responded in a similar manner for all questions (e.g. all questions answered with the same liker scale value). Personalized survey URLs were administered to a total of 7982 individuals, of whom 1246 completed the survey, representing a 16% response rate. In total, 1399 individuals responded anonymously, bringing the total number of participants to 2645. After the survey, we contacted all individuals who had been invited but had not participated in the personalized survey via email to inquire about their reason for nonparticipation. Overall, we received feedback from 613 *nonparticipants* and the most cited reasons for nonparticipation were: 1) the individual was the wrong contact person for the survey (45.68%). 2) a lack of time (39.8%). 3) no interest in topic (3.42%). 4) no interest in participation (2.28%). 5) the questionnaire was too long (2.21%). and 6) data confidentiality concerns (1.14%).

**Data Analysis and Results.** The research model was tested and the psychometric properties of the scales were assessed using the software SmartPLS (version 2.0 M3), which is based on partial least squares (PLS). We used PLS because, compared to covariance-based approaches, it is beneficial when the research model is relatively complex with a large numbers of indicators and multiple moderation effects, and the data is not normally distributed (Chin et al. 1996, 2003; Fornell and Bookstein 1982). Additionally, it has been argued that our chosen approach to analyze the moderation effects is far more difficult to implement in a covariance-based SEM context than in PLS path modeling [18]. The statistical significance of the parameter estimates was assessed using a bootstrapping procedure with 1000 resamples. In order to provide an overview of the survey instrument, detailed demographics, and additional statistical analysis results, which cannot be reported here due to limited space, we have compiled a document, which is available at *http://tinyurl.com/WII2013*.

*Validation of the measurement model.* We used reflective indicators for all the constructs. The adequacy of the measurement model was assessed by means of the individual items' reliability, the internal consistency between items, and the model's convergent and discriminant validity (see additional information file). Cronbach's alpha (CAP) and Dillon-Goldstein's rho (D.G.) were used to measure the internal consistency reliability. However, according to Chin [19], Dillon-Goldstein's rho is a much better indicator of reliability than Cronbach's alpha, since D.G. is derived directly from the model (i.e. the loading) instead of the correlations observed between the manifest variables in the dataset. In this study, the CAP and D.G. of each construct are greater than the recommended respective values of 0.50, and 0.70, which indicate the strong reliability of all the constructs in our model. Moreover, we followed Chin's [20] suggestion and calculated the composite reliability (CR) as an alternative to CAP. All the constructs' CR values are higher than 0.90, which is above the recommended minimum of 0.70. Convergent validity is demonstrated as a) the AVE (average variance extracted) values of all the constructs are higher than the suggested threshold value of 0.50, and b) all item-loadings are higher than the 0.70 guideline and statistically significant at the 0.001 level. Evidence of discriminant validity was found, since a) the

square root of all the AVEs was larger than the interconstruct correlations, and b) all the construct indicators loaded on their corresponding construct more strongly than on other constructs (see additional information file). Moreover, and the cross-loading differences were much higher than the suggested threshold of 0.1. For a variable to be a moderator, the variable should preferably have a low correlation with the predictor (independent) variable, since multicollinearity ($r_{XZ}$) can lead to researchers falsely concluding that a moderation effect is present, when a nonlinear effect in disguise is actually present (Baron & Kenny 1986). Carte and Russell [21] consider $r_{XZ}$ ranging from 0.008 to 0.05 very low. In our study, the inter-correlations between CL and nCog, as well as CL and nAch are only 0.01 and 0.02 respectively (i.e. practically absent). This suggests that this error and result contamination are unlikely.

We evaluated the common method bias (CMB) using the exploratory method of Harman's one-factor test. The results from this test show that five factors are present, which explains 76.5% of the variance, while the most variance explained by one factor is only 37.7%, indicating that common method biases most likely did not contaminate the results. Furthermore, we applied a confirmatory method to analyze CMB using SmartPLS, as explained by Liang et al. [22]. We added a common method factor to the PLS model. The indicators of all the constructs were reflectively associated with the method factor. Thereafter, each indicator variance was computed to explain the principle construct and the method factor. The results (see additional information file) show that, while the indicators' average substantively explained variance is 0.818, common method-based variance is only 0.005. The ratio of substantive variance to method variance is about 167:1. Owing to the above evidence and the method variance's small size, we maintain that common method bias is unlikely to be a significant concern for this study.

*Structural model results.* After the validation of the measurement model, the structural model was independently analyzed and the proposed relationships between the constructs were tested. Using a blindfolding approach, we measured the cross-validated communality and redundancy using a Stone and Geisser test. The $Q^2$ results of both cross-validated communality and redundancy were greater than 0, which suggests that the model has good predictive validity. A *post-hoc* power analysis using the software G*Power 2 resulted in a value greater than .80, which implies that our model can detect small effect sizes. Finally, we calculated our model's goodness of fit (GoF) as proposed by Tenenhaus et al. [23] and emphasized by Wetzels et al.[24], who define GoF as the square root of the product of AVE and $R^2$. The application of this formula leads to a GoF of 0.48, which exceeds the cut-off value of 0.36 for the large effect size of the squared multiple correlations ($R^2$), as proposed by Cohen [25] and allows us to conclude that our model performs well. In assessing the PLS model, we examined the squared multiple correlations ($R^2$) for the endogenous latent variable. The structural paths were evaluated for their significance. Proposed relationships were considered supported if the corresponding path coefficients ($\beta$) had the proposed sign and were significant.

**Table 1.** PLS path analysis results' endogenous variable: resistant use

| **LV** | **PLS (Stage I)** Main Effects | **PLS (Stage II)** Individual analysis of Moderation effects | | | **PLS (Stage III)** Total variance explained |
|---|---|---|---|---|---|
| | | **Model 1:** *nAch*RA* | **Model 2:** *LC*nCog* | **Model 3:** *nCog*CL* | |
| RA | -.28*(.07) | -.25* | -.26* | -.26* | -.26*(.06) |
| CL | .15*(.03) | .15* | .16* | .16* | .16*(.04) |
| CA | -.29*(.08) | -.28* | -.29* | -.30* | -.28*(.08) |
| nAch*RA | | .19* (.05) | | | .14*(.02) |
| nAch*CL | | | -.16* (.04) | | -.07**(.01) |
| nCog*CL | | | | -.14* (.03) | -.05***(.003) |
| **$R^2$ of RU** | **0.31** | **0.34** | **0.34** | **0.33** | **0.35** |

*Path coefficients with Effect size:($f^2$) in parentheses; ***p < 0.05; **p < 0.01, *p < 0.001; Effect size ($f^2$) using the F-test* [25]

*Results in the grey cells are used for evaluation and interpretation*

To provide a deeper analysis, we calculated the effect size using the F-test, since this is the most common and widely accepted measure of effect size in tests of moderation. We used the difference between the squared multiple correlations to assess the overall effect size $f^2$ for the variables. Cohen [25] classifies effect sizes of 0.02, 0.5, and 0.35 as *small*, *medium*, and *large*.

We applied a three-stage approach based upon Chin et al.'s [26], as well as Carte and Russell`s [21] guidelines and recommendations to estimate the model. In the first stage, we entered the main effects. The results indicate that, for the first stage model hypotheses, H1 ($\beta = .28$, $p < .001$), H2 ($\beta = .15$, $p < .001$), and H3 ($\beta = 0.29$, $p < .001$) meet the criteria of both statistical, as well as practical significance and explain 31% of the variance in the dependent variable RU. Amongst the three variables, compatibility is found to have the strongest effect size with $f^2 = .08$, followed by relative advantage ($f^2 = .07$), and complexity ($f^2 = .03$). In the second stage, for each moderation effect we estimate stand-alone models in the presence of the main effects. As hypothesized, the need for achievement positively moderates ($\beta = 0.19$, $p < .001$, $f^2 = .05$) the relationship between relative advantage and resistant use (H4). The need for achievement negatively moderates ($\beta = 0.16$, $p < .001$, $f^2 = .04$) the relationship between complexity and resistant use, thus weakening its effect on individuals with a high need for achievement (H5). Furthermore, the need for cognition negatively moderates ($\beta = 0.14$, $p < .001$, $f^2 = .03$) the relationship between complexity and resistant use, thus weakening its effects on individuals with a high need for cognition (H6). In the third stage, we included all the moderation effects in addition to the main effects, and find that, compared to Stage I, the overall $R^2$ increased by 4% from 31% to 35%, which is attributed to the moderation effects. Figure 1 shows the results of the PLS stage III structural model. This three-staged approach is more appropriate when the goal is to understand the impact of each moderation effect. When estimating all the

effects in a single model containing highly complex multiple two/three-way moderation effects, the path coefficients and the effect sizes become contaminated and uninterpretable at even with the slightest degree of multicollinearity, which is caused by the underlying product-indicator approach [21]. However, when the goal is the evaluation of the model's overall performance via $R^2$, the inclusion of all the main and moderating effects, as done in the stage III, does not distort the interpretation.

To facilitate a better understanding of the moderation effects, we drew up an appropriate visualization of the results, following Cohen et al.'s [27] recommendation, and calculated a simple regression equations for the RU and CL at low (-1 SD) and high (1 SD) levels of the moderator variables nAch and nCog. The obtained regression lines for high, and low values of the moderator variable are then plotted to determine whether there is an effect. We find that, compared to people who have a low nAch, i) an increase in the PMM's relative advantage has a weaker effect on suppressing the resistant usage behavior of people who have a high nAch, and ii) an increase in the PMM's complexity has a weaker effect on suppressing the resistant usage behavior of individuals who have high nAch and nCog.

In order to examine the heterogeneity in the data, we conducted *expost* a permutation-based multigroup comparison in the framework of PLS path modeling. This approach is better suited to the PLS technique, since, in contrast to bootstrapping (t-test), permutation is non-parametric, i.e. it does not require the two samples to be normally distributed. The test was conducted for the variable "gender," which comprises the categories male and female. The results of the permutation test (see additional information file) show that, regarding Hypothesis 2 (CL → RU), there is a significant difference between the path coefficients for males and females (Difference = .13, t-value = 2.83, $p < 0.01$). This implies that PPM complexity has a stronger effect on increasing resistant use in women (ß = 0.26, $p < .001$), than in men (ß = 0.13, $p < .001$).

## 5 Discussion and Conclusion

Our work seeks to further research on individuals' acceptance and use of PMMs by unifying the theoretical perspectives on the intrinsic *needs of individuals* and the *methodology attributes* within a single model. Based on validated theories, we develop a conceptual model, which maintains that individuals' psychological needs determine how a methodology's attributes impact their usage behavior.

This study's contributions and their implications lie in that, first, our use of the newly developed *resistant use* construct is a departure from traditional operationalization of the usage construct. It reveals more complex and still unknown interaction effects on human behavior, especially with regard to the use of new methodologies. Since researchers have generally relied on rather simple and straightforward ways to operationalize the use of IS artifacts and have linked it to a number of desirable outcomes, such as user satisfaction and productivity, the construct and the relationships have remained a black box. We still know very little about how IS artifacts are used and whether the differences in their usage style might be a better predictor of the nu-

merous proposed positive/negative effects of IS use. It is thus becoming important to understand resistant employee behavior because, if people do not use methodologies in an appropriate, committed manner, related benefits might not be realized. This lack of understanding might unjustifiably lead to IT becoming the "scapegoat" for organizational failures – for example, a lack of IT system effectiveness could be attributed to the bad system rather than employees' counterproductive resistant system usage behavior – casting doubt on the contribution of the MIS domain in question. By adopting a methodology-centric perspective, our findings suggest that, while a methodology's *relative advantageousness* and its *compatibility* reduce resistant use, its *complexity* induces resistance. It is interesting to see that compatibility has a stronger resistance curbing effect than relative advantageousness as past research, driven largely by the use of the theory of planned behavior and the technology acceptance model (TAM), has mostly shown RA to be, by far, the most dominant predictor of general usage behavior.

Our study's second contribution lies in the development of a deeper, context-specific, and relevant understanding of the role of employees' deep rooted psychological needs play is determining the effect that methodology attributes have on resistant usage behavior. While past research has repeatedly discovered and discussed the harmful nature of complexity in various contexts and domains (e.g. information complexity, system complexity, website complexity, innovation complexity, job/task complexity, etc.), our study provides a different perspective. Our findings suggest that, while employees generally resist using complex methodologies, this is not true for everyone. Employees who are driven by a strong need for achievement and need for cognition are found to be positively motivated by the inherent complex characteristic of a methodology. For individuals with a high *nAch*, complexity fulfills their preference for success under conditions of competition. Complex methodologies allow high achievers to satisfying a need for self-actualization through accomplishments that others in their social environment find difficult to achieve, because, to them, easily attained success is not a genuine achievement. Similarly, individuals with a high need for cognition find complex methodologies to be an intellectual challenge. Complexity in methodology provides such employees with a platform to engage in effortful cognitive activities, evaluate ideas, and analyze problems and their solutions. It forces individuals to "think out of the box," be open to experiences associated with unconventional thoughts, as well as to consider solving problems and thinking an end in itself. These results might prove to be instrumental for management in ensuring that employees use PMMs in the proper manner – in particular, with regard to staffing issues. It is plausible that employees with a *high* nAch and nCog will be less resistant to using a PMM when assigned to large projects, since such projects, involving a multitude of stakeholders, goals, deadlines, and deliverables are generally governed by comprehensive and complex methodologies. On the other hand, it would be advisable to assign smaller projects that are usually managed with simple, less complex methodologies to employees with a *low* nAch and nCog.

In general, our findings might not only have important implications for the MIS research community, but also for related fields. Human needs have always played a key role in organizational development, and the study is an attempt to "humanize" organi-

zational methodologies; that is, to enable organizations to be more responsive to human concerns when developing and implementing new methodologies. Only when we understand and acknowledge that a diverse list of actions and feelings are typical of human behavior, do we view the acceptance and use of methodologies as a complex process and realize that research needs a fresh perspective to understand the *nature* of use and its antecedents.

## References


1. Russo, N.L., Hightower, R., Pearson, J.M.: The Failure of Methodologies to Meet the Needs of Current Development Environments. In: Proceedings of the British Computer Society's Annual Conference on Information System Methodologies, pp. 387–393. (1996)
2. Cicmil, S., Đorđević, Z., Zivanovic, S.: Understanding the adoption of project management in Serbian organizations: Insights from an exploratory study. Project Management Journal 40 (1), 88–98 (2009)
3. Vickers, M.H.: Information technology development methodologies. Journal of Management Development 18 (3), 255 (1999)
4. Hardgrave, B.C., Davis, F.D., Riemenschneider, C.K.: Investigating Determinants of Software Developers' Intentions to Follow Methodologies. Journal of Management Information Systems 20 (1), 123–151 (2003)
5. Riemenschneider, C.K., Hardgrave, B.C., Davis, F.D.: Explaining Software Developer Acceptance of Methodologies: A Comparison of Five Theoretical Models. IEEE Transactions on Software Engineering 28 (12), 1135–1145 (2002)
6. Ajzen, I.: The theory of planned behavior. Organizational Behavior and Human Decision Processes 50 (2), 179–211 (1991)
7. Hardgrave, B.C., Johnson, R.A.: Toward an information systems development acceptance model: the case of object-oriented systems development. IEEE Transactions on Engineering Management 50 (3), 322–336 (2003)
8. Khalifa, M., Verner, J.M.: Drivers for Software Development Method Usage. IEEE Transactions on Engineering Management 47 (3), 360-369 (2000)
9. Warner, K.E.: The Need for Some Innovative Concepts of Innovation: An Examination of Research on the Diffusion of Innovations. Policy Sciences 5 (4), 433–451 (1974)
10. Rogers, E.M.: Diffusion of Innovations 5th Edition. Free Press (2003)
11. Murray, H.A.: Explorations in Personality. John Wiley & Sons Inc (1938)
12. Freud, S.: The Psychopathology of Everyday Life. W. W. Norton & Company (1990)
13. Tornatzky, L.G., Klein, K.J.: Innovation Characteristics and Innovation Adoption-Implementation: A Meta-Analysis of Findings. IEEE Transactions on Engineering Management EM-29 (1), 28–45 (1982)
14. Ryan, R.M., Deci, E.L.: Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. American Psychologist 55 (1), 68-78 (2000)
15. Chigona, W., Licker, P.: Using Diffusion of Innovations Framework to Explain Communal Computing Facilities Adoption Among the Urban Poor. Information Technologies & International Development 4 (3), 57–73 (2008)
16. Hollenback, J.R., Williams, C.R., Klein, H.J.: An Empirical Examination of the Antecedents of Commitment to Difficult Goals. Journal of Applied Psychology 74 (1), 18-23 (1989)
17. Straub, D.W.: Validating Instruments in MIS Research. MIS Quarterly 13 (2), 147–169 (1989)

18. Henseler, J., Chin, W.W.: A Comparison of Approaches for the Analysis of Interaction Effects Between Latent Variables Using Partial Least Squares Path Modeling. Structural Equation Modeling: A Multidisciplinary Journal 17 (1), 82–109 (2010)
19. Chin, W.W.: The Partial Least Squares Approach for Structural Equation Modeling. In: Marcoulides, G.A. (ed.): Modern Methods for Business Research. Lawrence Erlbaum Associates (1998)
20. Chin, W.W.: Issues and Opinion on Structural Equation Modeling. MIS Quarterly 22 (1), vii-xvi (1998)
21. Carte, T.A., Russell, C.J.: In Pursuit of Moderation: Nine Common Errors and Their Solutions. MIS Quarterly 27 (3), 479–501 (2003)
22. Liang, H., Saraf, N., Hu, Q., Xue, Y.: Assimilation of Enterprise Systems: The Effect of Institutional Pressures and the Mediating Role of Top Management. MIS Quarterly 31 (1), 59–87 (2007)
23. Tenenhaus, M., Amato, S., Esposito Vinzi, V.: A global goodness-of-fit index for PLS structural equation modelling. In: Proceedings of the XLII SIS Scientific Meeting, pp. 739–742. CLEUP (2004)
24. Wetzels, M., Odekerken-Schroder, G., van Oppen, C.: Using PLS Path Modeling for Assessing Hierarchical Construct Models: Guidelines and Empirical Illustration. MIS Quarterly 33 (1), 177–195 (2009)
25. Cohen, J.: Statistical Power Analysis for the Behavioral Sciences, 2nd ed. Routledge Academic (1988)
26. Chin, W.W., Marcolin, B.L., Newsted, P.R.: A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study. Information Systems Research 14 (2), 189–217 (2003)
27. Cohen, J., Cohen, P., West, S.G.: Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences. Lawrence Erlbaum Assoc Inc (2002)