# The effect of transactive memory systems on job stress of new product development teams: Moderating effects of project complexity and technological turbulence

## Abstract

Despite significant evidence that NPD project teams self-destruct in stressful situations, empirical research on stress interventions is notable sparse. The current study extends research on stress reduction strategies in the context of NPD teams by considering the role of TMS in lowering job stress. Drawing on the job demand-control-support theory, we argue that NPD teams with a strong TMS regulate and address job demands more effectively, have greater control over critical team tasks, and enjoy a supportive team's environment and thus, experience less stress. The study also investigates the moderating effects of project complexity and technological turbulence on the relationship between TMS and job stress. The results, based on data from 140 NPD projects, reveal that a TMS can lower job stress which, in turn, decreases team learning and job satisfaction. Also, TMS appears more effective to reduce stress in situations of high and moderate project complexity and low and medium technological turbulence.

## Managerial Relevance Statement

Workplace stress is among the top concerns for organizations of all sizes. The pervasiveness of job stress and its negative consequences on NPD team members suggest a strong need for firms to come up with effective strategies to reduce and manage job stress. To this effect, findings from this study indicate that a developed TMS is an effective strategy that can be enacted by NPD teams to lower job stress. Also, a strong TMS can enhance team learning and job satisfaction. Accordingly, it is highly recommended that NPD managers promote the development of a TMS within the team; particularly in the context of complex NPD projects for which job demands can be very high. Further, our results show that a TMS can become obsolete and lose its relevance to reduce stress under technologically turbulent environments. To this effect, regular interactions and frequent sharing of new knowledge and experiences among team members can help maintain a team's TMS up to date.

**The effect of transactive memory systems on job stress of new product development teams: Moderating effects of project complexity and technological turbulence**

## 1. Introduction

Bringing new products successfully to market requires, among other things, effective team working. However, teams in new product development (NPD) face significant challenges to success, including high levels of ambiguity and uncertainty, a need to integrate different opinions and sources of expertise, demanding schedules and high deliverable expectations [1], [2]. It is then not surprising that NPD teams experience high levels of stress [3]. In fact, a number of studies have found that job stress in NPD teams is not only common but also extremely problematic. For example, Barczak and Wilemon's [3] study of job stress in NPD teams indicate that stress has physical and psychological effects on team members such as loss of sleep, frustration, grumpiness and even depression, and results in poor job performance. Similarly, Lee and Sukoco [4] found that stress can lessen a NPD team's ability to learn and to develop innovative products.

Despite the detrimental effects of stress on NPD project teams, empirical evidence on stress reduction strategies has remained sparse. Three notable exceptions are Barczak and Wilemon [3], Akgün et al. [5] and Chong et al. [2] which report a number of organizational- and team-level interventions to reduce stress. The current study extends this body of research by examining the role of a transactive memory system (TMS) in relation to job stress in NPD teams. A TMS is a shared system that members of a group develop to collectively encode, store and retrieve information in different domains [6]. Some scholars refer to it as the knowledge of 'who knows what' in a team [7]. According to TMS theory, specialization of knowledge, credibility and task coordination are manifestations of a well-developed TMS [8]. In teams with a strong TMS, members take responsibility for learning, remembering and communicating different knowledge. Through knowledge specialization, members establish credibility and status in their respective areas of expertise [6]. Thus, other members come to trust their expertise. Further, the meta-knowledge of 'who knows what' allow members to know whom to consult for expertise and whom to count on when performing project tasks, which improves task coordination [6]. The job demand-control-support (JDCS) model [9] provides support for the effect of TMS on job stress. This model posits that individuals in workplace contexts characterized by low job demands, high job control and high workplace support experience the least stress [8]. Drawing on this model, the current study argues that a strong TMS can reduce job stress by helping NPD teams lower job demands, have greater control over critical team tasks, and enjoy a supportive team's environment. Lower job stress, in turn, is expected to lead to higher team performance. In this study, team performance is measured in terms of affective (i.e., job satisfaction) and learning outcomes [10].

Research in TMS suggests that the returns of TMS can vary with the characteristics of the NPD project and the external environment in which a project team operates [11]. Accordingly, a second objective of the current study is to investigate how project complexity and technological turbulence impact the relationship between TMS and job stress. Regarding project complexity, we contend that NPD teams dealing with highly complex projects experience greater job demands during the development process due to the higher information-processing and coordination needs of these projects [12]. As such, a well-developed TMS can be more useful to lower stress when the level of NPD project complexity is high than when it is low. Pertaining to technological turbulence, it has been noted that changes in the external environment disrupt the working of an existing TMS and prompt team members to re-examine or renegotiate their roles, responsibilities or assumed expertise in the team [7], suggesting that TMS may be less effective to decrease stress under highly turbulent environments.

This study makes several contributions to the literature. First, the study extends research on stress reduction strategies in the context of NPD teams by considering the role of TMS in lowering job stress.

Second, the current study provides new insights into the benefits of TMS. Indeed, extant research reveals that a strong TMS can improve several performance outcomes, including speed-to-market, team innovation, team learning, and team effectiveness [13], [14], [15], [16]. In addition to the above, findings from this study reveal that a well-developed TMS is also an effective mechanism to reduce job stress in NPD teams. Third, by positing TMS as a stress-reduction strategy, the current study offers a novel view of the relationship between TMS and stress. A review of the literature reveals that prior studies investigating the relationship between TMS and stress (i.e., Ellis [17], Pearsall et al. [18]) have depicted TMS as an outcome of stress rather than an antecedent. Notwithstanding prior research, our theoretical stance of TMS as a stress-reduction strategy is in keeping with our guiding theory (JDCS model) as well as prior studies in the field of workplace stress (e.g., Chen et al. [19]; Ellis and Pearsall [20]). Fourth, despite recent proliferation of research in TMS, there has been relative inattention to context-related factors explaining variation in the strength of the TMS-team performance relationship [11]. The current study adds new empirical evidence to this field by investigating the moderating effects of project complexity and technological turbulence on the relationship between TMS and job stress. Lastly, findings from this study improve our understanding of the effects of team stress on team learning and job satisfaction. Thus, a review of the literature reveals inconsistent findings in relation to the effect of team stress on team learning. In particular, whereas some studies report a positive effect (e.g., Akgün et al. [21]), others find team stress to be unrelated to team learning (e.g., Akgün et al. [5]) or to have a negative effect (e.g., Lee and Sukoco [4]). Regarding job satisfaction, most of studies to date have examined this relationship at the individual level rather than at the team level (for an exception see [22]). This is an important limitation since when stress affects collective structures, such as teams, interaction and team-internal process are pivotal to understanding its effect on performance [23].

## 2. Job stress and theoretical framework

Stress is a broad concept that conveys a variety of meanings. At the most general level, research differentiates between two stress concepts: the stimulus concept and the response concept. The stimulus concept, or stressor, focuses on situational conditions or events that evoke stress. The response concept focuses on the physiological and/or psychological reactions of individuals to job stressors as the critical constituents of stress [24], [25]. The current study focuses on the response concept of stress. In particular, we use the term job stress to describe an uncomfortable, undesirable feeling (e.g., hopelessness, tension, pressure, frustration) that often arises when there is a misfit between the work demands placed on the individuals and their abilities to fulfil those demands [26]. The characterisation of job stress as a negative emotional feeling is important as ‘it helps to distinguish it from the positive motivational feelings of arousal that result from the challenge of a difficult but attainable goal” [21, p. 165]. In this study job stress is examined at the team level. This is in keeping with prior research suggesting that members of the same team can experience stress collectively [2], [4], [5], [21]. For example, it has been noted that team members collectively feel crisis and anxiety during NPD projects [5], [21].

Figure 1 shows our theoretical model which outlines a negative effect of TMS on job stress, which, in turn, exerts a negative effect of team performance. The JDCS model [9] provide support for the negative effect of TMS on job stress. This model differentiates among three basic dimensions of workplace factors – namely, job demands, job control and job support. Job demands are the workplace demands put on the individuals and are typically operationalized in terms of role overload, role ambiguity, role conflict and time pressure [27]. Job control refers to an individual’s belief in his/her ability to affect a desire change on their work environment [28]. Control allows employees to influence or affect a particular job-related situation in order to reduce the perception of insufficient resources that lead to feelings of stress [28]. Job support alludes to helpful workplace relationships regarding job-related matters [29]. Research has suggested that helpful relationships with others can reduce stress, anxiety and tension in the workplace [30]. According to the JDCS model, teams experience low levels of stress when job demands are low, and control and support are high. Drawing on the JDCS model, we argue that a strong TMS is expected to decrease the level of stress experienced by the team on the basis that teams with a strong TMS can reduce job demands, have greater control over critical team tasks, and enjoy a supportive team's environment. Lower levels of job stress, in turn, lead to higher job satisfaction and greater team learning. Job satisfaction is defined as the team's shared attitude toward its task and its work environment [31]. Team learning refers to a relatively permanent change in the team's collective level of knowledge produced by the shared experience of the team members [32].

Furthermore, as shown in Figure 1, project complexity and technological turbulence are expected to moderate the relationship between TMS and job stress. These moderating effects are supported by research suggesting that both product complexity and technological turbulence can influence the processes linking TMS to job stress, mainly job demands, control and support. Project complexity refers to the difficulties and uncertainties posed by the number of technologies, number of components or number of functions designed into the project [33]. Technological turbulence pertains to the degree of change associated with product and process technologies in the industry in which a firm operates [34].

Finally, without presenting formal hypotheses, we expect TMS to have a positive and direct effect on team learning [12], [13] and job satisfaction [35], [36]. Thus, it has been noted that a well-developed TMS facilitates access to a greater amount of knowledge and encourages knowledge sharing, and thereby leads to higher team learning [13]. Furthermore, a strong TMS affords team members with opportunities to cultivate and contribute unique knowledge to the team's task [8], increasing team members' perceptions that their job is satisfying.

(Insert Figure 1 here)

## 3. Hypothesis development

### *3.1. Transactive memory system and job stress*

In this study, we propose that NPD project teams with a heightened TMS will experience lower levels of stress. Our proposition draws on the JDCS model and is based on the following three arguments. First, a TMS is likely to generate a reduction in job demands. For example, as demonstrated by Akgün et al. [13], a TMS can allow NPD project teams to complete their tasks faster. Thus, Akgün et al. [13] pointed out that a TMS lets teams synthesize, analyze and disseminate new knowledge quickly, make decisions on NPD-related issues faster, and solve product and process-related problems in a timely manner. Also, when new information is encountered, members of a team that has a well-developed TMS allocate this information to member-experts most able to store it [37]. This reduces the risk that critical information is ignored or forgotten [38], which would significantly increase job demands as members are left to perform their tasks with incomplete information or to address and correct their mistakes [19].

Second, a developed TMS can offer the NPD team a stronger sense of control over the team's tasks. Thus, it has been noted that reliance on others for complementary expertise enables team members to develop deeper and more relevant expertise in their respective knowledge domains and thus become experts in their fields [8], [38]. Also, a well-functioning TMS allows for more knowledge to be brought to bear on the NPD project [12]. Such enhanced individual and collective capabilities are likely to provide team members with a sense of agency and influence over their work [39], [40].

Finally, teams with greater TMS display heightened levels of interpersonal help and support [41], [42]. Because team members have a good understanding of who has what knowledge and how that knowledge fits together, they can better anticipate when peers need assistance and the precise type of assistance required [8]. Also, high credibility on each other's knowledge is likely to result in more cooperative behaviors among team members. According to Guinot et al. [43], people who trust each other are more willing to synchronize, help each other, and work together constructively. In keeping with this idea, Fan et al. [44] noted that the fact that members of teams with a well-developed TMS trust each other knowledge explains their greater willingness to provide task-related assistance, such as necessary resources and emotional support.

In summary, because a strong TMS can decrease job demands and increase job control and support among team members, in keeping with the JDCS model, NPD project teams with a strong TMS are likely to experience lower levels of job stress. Thus, we propose that:

H1: There is a negative relationship between TMS and job stress.

*3.2. The effect of job stress on team learning and job satisfaction*

In general, high levels of work stress have been found to be associated with low levels of job satisfaction [43], [45]. When individuals experience stress, they are more likely to become disillusioned and dissatisfied with their jobs [46]. Research in the area of NPD project teams has found that stress is most likely to have negative impact on team members both personally and professionally and to negatively influence team member satisfaction [3]. Drawing on this research we expect job stress to relate negatively to job satisfaction. Thus, we propose that:

H2: There is a negative relationship between job stress and job satisfaction.

A review of the NPD literature reveals contradictory arguments and findings in relation to the effect of team stress on team learning. On one hand, it has been contended that NPD teams’ experience of stress can trigger them to adjust and adapt their current beliefs and routines as a way to cope with the reasons of their stress [21]. In support of this view, Akgün et al. [21] found that team stress results in greater implementation of new information and knowledge during the NPD project. On the other hand, it has been argued that stress impairs a team’s capacity for learning, remembering and communicating relevant team knowledge. Stress negatively affects learning by narrowing the cognitive processes of individuals and hindering their ability to plan, reason and understand the situation effectively [4]. The current study expects team stress to be negatively associated with team learning based on our definition of team stress as a negative team emotion. This hypothesis is supported by research on the impact of emotions on learning behaviours which suggests that negative emotions such as the ones associated with team stress (e.g., frustration, hopelessness, tension) can cause a narrowing of people's mind sets and actions, thereby blocking a team's desire to engage in learning behaviours [47]. In keeping with this notion, findings of Savelsbergh et al. [48] reveal a negative association between team stress and several learning behaviours including exploring different perspectives, co-constructing meaning, reflecting, communicating and analyzing errors, and experimenting with new ideas. Drawing on this discussion, we propose that:

H3: There is a negative relationship between job stress and team learning.

*3.3. Moderating effects of product complexity and technological turbulence*

Research in NPD suggests that project complexity adds to the demands that NPD project teams experience in their work [12], [49]. Thus, Akgün et al. [12] noted that in complex NPD projects, the elements of the project and their interrelations are uncertain or ill-structured and thus it is difficult to define clear and precise means-to-end relations. Accordingly, individuals working on these more complex projects need to process more information to identify, understand and resolve task dependency issues [49], [50]. Additionally, the high learning requirements that accompany NPD complex projects can slow down the speed of the NPD process [33], a situation which can create substantial time pressure for the NPD team. Lastly, highly complex projects can create additional challenges regarding communication and cooperation among team members. For example, misunderstanding can develop because the complexity of the project is not well understood [33].

In this study, we argue that a strong TMS can be useful in decreasing the higher job demands that teams experience with highly complex projects. For example, as discussed in H1, a well-functioning TMS can help teams complete their tasks faster [13] and thus, it could decrease the risk of highly complex projects being late to market. Moreover, by allowing for more knowledge to be brought to bear on the NPD project [12], a well-developed TMS can satisfy the higher information needs of highly complex projects. Lastly, as noted in H1, a TMS can enhance the level of support among team members [41] which, in turn, could prove useful in coping with the communication and cooperation challenges that often arise during the development of highly complex NPD projects. Based on the previous discussion, we expect TMS to be more effective to reduce stress when project complexity is high than when it is low. Thus, we propose that:

H4: TMS will have a stronger negative effect on job stress for high levels of project complexity than for low levels of project complexity.

Regarding technological turbulence, we argue that TMS will be less effective in decreasing job stress when technological turbulence is high than when it is low, according to the following reasons. First, because of the high pace of change in turbulent environments, it is common for NPD project teams operating in such as environments to engage in continuous learning and unlearning [51], [52], [53]. For instance, Akgün et al. [5] noted that quick depreciation of technology know-how in turbulent environments forces NPD project teams to search for new knowledge, and Brown [54] stated that unlearning is critical in turbulent environments because so much of an organization’s knowledge depends on assumptions that are no longer true. Unfortunately, the need for continuous learning can have negative consequences on the value of TMS for mitigating job demands. Thus, research in TMS has noted that individuals’ transactive memories (i.e., knowledge of ‘who knows what’) may become obsolete when team members change their areas of expertise [7]. For example, a team member may acquire new knowledge and skills of which other team members are not aware [7]. In a scenario such as this, where team members' expertise changes frequently, coordination problems regarding locating, retrieving or applying expertise towards the task are likely to arise [38]; also retrieving and assigning information from others can take longer; both of which would add to the demands of the NPD team.

Second, under technologically turbulent environments, a TMS becomes less effective in providing teams with a supportive work environment and an enhanced sense of job control. Since technology is changing rapidly, team members may find it difficult to develop expertise in specific domains [55]. In the absence of knowledge specialization, members would be less likely to have confidence in others' expertise –a condition that may reduce the incidence of helping-seeking behaviors among team members [38]. Also, a lack of knowledge specialization may detract from a NPD team's ability to address the NPD project in the most efficient and effective manner possible, thereby reducing their perception of job control. Based on the previous discussion, we propose that:

H5: TMS will have a weaker negative effect on job stress when technological turbulence is high than when it is low.

## 4. Methodology

### *4.1. Sample and data collection*

Data for this study were collected from Spanish manufacturing firms. The companies listed in the Amadeus database provided the sampling frame for the study. For the most part, we focused on industrial sectors classified as high technology and medium technology by EUROSTAT. The food and beverages manufacturing sector, although classified as low-technology, was also included in the sampling frame because of its high values of R&D spending [56]. We randomly selected 25 percent of the firms in each of the industry groups, which resulted in a sample 946 manufacturing firms.

A questionnaire accompanied by a hand signed cover letter and a postage paid return envelope was mailed to the person in charge of NPD activities at each company. The unit of analysis for this study is a NPD project developed and launched by the company during the last three years. Survey respondents were the project managers who led or were in charged of the projects from beginning to end. We obtained a total of 140 completed surveys (one survey per company). Of the key informants responding to the survey, 45.2% were R&D managers, 34.1% were technical managers, 13.3% were general managers and 7.4% were managers of other departments. Informants' average work experience in NPD was 12.7 years.

Table 1 shows the population and the sample for each industry group. To check for response bias by industry, we applied a two-proportion test to compare the proportions of firms in the same and the population for each industry group. The results reveal significant differences for the industry group 'computer, electronic product and electrical manufacturing' (334, 335 NAICS codes). Specifically, firms in this group are over-represented in the sample, which is reasonable to expect given that these are high-tech firms with higher than average R&D spending. Additionally, non-response bias was tested by comparing the responses of early (first third) and late (last third) respondents. No statistically significant differences were found in the mean scores of the main constructs used in this study.

(Insert Table 1 here)

*4.2. Variable measurement and scale validation*

Established multi-item scales were used to measure the study's main constructs. Measures and descriptives of all variables are shown in Table 2. TMS was measured using nine items from Lewis's [8], [57] TMS scale. The measure captures the three dimensions considered to be manifestations of a well-developed TMS, namely specialization, credibility, and coordination. Specialization refers to the differentiated structure of members' knowledge, credibility refers to team members' trust in others' knowledge, and coordination refers to the ability of the team to coordinate knowledge [8], [58]. We measured job stress with a five-item scale from Dayan and Di Benedetto [15]. Team learning was measured with four items from Sarin and McDermott [59]. Job satisfaction was measured with a four-item scale which captured the team's level of satisfaction with coworkers and the opportunities for growth in their job [60]. Project complexity was assessed with two items from Sarin and Mahajan [61] and we measured technological turbulence with three items from Jaworski and Kohli [34].

(Insert Table 2 here)

The study includes six control variables: team reflexivity, a firm's external orientation, team size, project newness, project importance and technological intensity. Team reflexivity refers to the extent to which group members overtly reflect upon the group's objectives, strategies and processes, and adapt them to current and anticipated circumstances [62]. Team reflexivity has been identified as an inhibiting factor of employee burnout [19], and a facilitator of team learning and job satisfaction [63]. Team reflexivity was measured with a 5-item scale from Tjosvold et al. [64]. Firm's external orientation captures the firm's perception of the value of cooperating with and acquiring knowledge from external parties, to the company's innovation activities. Existing research has linked a firm's external focus to job stress [65], team learning [66] and job satisfaction [67]. Firm's external orientation was measured using a 3-item scale adapted from Marrone et al. [65]. Team size refers to the number of people on the team who were full-time involved in the project [41]. Evidence from prior studies suggests that team size can have a positive effect on team learning [12] and job satisfaction [68]. Moreover, extant studies allude to an inverted U-shaped relationship between team size and job stress whereby small and large teams tend to experience higher levels of stress than medium-size teams. Small teams show higher levels of stress because they have fewer members amongst whom to distribute the work, whereas for larger teams, stress is likely to arise as a result of the greater communication and coordination problems that take place in these teams [69]. Project newness refers to the potential discontinuity that a new product can generate in a firm's technological and marketing processes [70]. Research in NPD suggests a potential impact of project newness on job stress, job satisfaction and team learning. Thus, highly innovative products force organizations to draw on new technical and commercial skills and to employ new problem-solving approaches [71], resulting in greater team learning [72]. Project newness has also been identified as an important source of stress in NPD teams and thus a cause of lower job satisfaction [3]. Project newness was measured with 3-item scale adapted from [70]. Project importance refers to the project criticality for the firm's performance [73]. Awareness of a project's importance for organizational health can add to the stress felt by NPD teams [1] and thus, reduce job satisfaction. Regarding its effect on team learning, it has been noted that NPD teams feel a greater need to use cognitive skills when making important NPD decisions [74], suggesting a positive effect of project importance on team learning.

Because NPD projects in our sample come from industries with different levels of technological intensity, the study also controls for the effect of technological intensity. To this effect, we re-classified the seven industrial sectors represented in the sample into three different levels of technological intensity, mainly high, medium, and low technology, following EUROSTAT classification of the manufacturing industry according to technological intensity. Overall, our sample includes 34 NPD projects in high technology industries, 83 NPD projects in medium technology industries and 23 NPD projects in low technology industries. Subsequently, we created two dummy variables; one variable for industries characterized as 'low technology' and a second variable for industries characterized as 'high technology'. The excluded category 'medium technology' served as the reference group.

*4.3. Scale validation*

To assess the reliability and internal consistency of the study's measures we computed Cronbach's alpha and composite reliability estimates. With the exception of team learning, all Cronbach alphas' and composite reliability coefficients exceeded the standard of 0.70. The average variance extracted ranged from 0.50 to 0.89, suggesting that the measures were internally consistent.

TMS was conceptualized as a "reflective-formative" second-order construct, which means that specialization, credibility and coordination formatively constitute TMS. That is, each of the three dimensions captures a specific aspect of the construct domain and do not necessarily co-vary with each other [75]. To statistically validate the formative character of TMS, we checked for multicollinearity among its dimensions using the variance-inflation factor (VIF). VIF values of the three dimensions were well below the cut-off value of 5. Thus, there were no concerns about collinearity issues. Next, we examined the significance of the contribution of each dimension to the main construct using the repeated indicator approach. Fit of the formative measurement model was good as evidenced by the fact that the weights of the three dimensions were significant in the explanation of the TMS construct (weights: specialization 0.301, $p<0.01$; credibility 0.612, $p<0.01$; coordination 0.364, $p<0.01$).

Discriminant validity is evidenced when the square root of the AVE of each construct is larger than the correlation of the specific construct with any of the other constructs in the model. As shown in Table 3, all pairs of constructs passed this test, suggesting the discriminant validity of the study's variables. The heterotrait-monotrait ratio of correlations (HTMT) proposed by Henseler et al. [76] also indicated discriminant validity, as all HTMT ratios were clearly below the conservative threshold of 0.85.

(Insert Table 3 here)

*4.4. Common method bias*

Given that our study follows a single-informant approach, we tested for the presence of common method bias using the following post-hoc analyses. First, we conducted Harman's single-factor test. Results from this analysis showed ten factors in the unrotated factor structure, explaining 69.9% of total variance, with the first factor accounting for only 17.4%. Second, we employed Lindell and Whitney's

[77] marker variable technique. Using the smallest positive correlation (r=.006) as an indicator of common method variance, we computed common-method variance adjusted correlations among the research constructs [78] and found that the adjusted correlations were not significantly different from the pre-adjustment correlations. Taken together, results from these two tests suggest that common method variance was not a serious threat.

## 5. Results

### *5.1. Analysis technique*

The proposed model was tested using Partial Least Squares Structural Equation Modeling (PLS-SEM) (Smart PLS 3.1.5). PLS-SEM was chosen over traditional Covariance-Based Structural Equation Modeling (CB-SEM) because of its ability to handle reflective and formative measures in a single model [78]. Bootstrapping (1,000 sub-samples) was used to generate the standard error and t-values of the parameters. Sign changes in the resamples were permitted during bootstrapping iterations as this approach results in the most conservative estimation [78].

To test the proposed hypotheses, we used two models. Model 1 included the main effects of TMS and job stress and the control variables. Model 2 added the moderating effects of project complexity and technological turbulence. Given that TMS was measured formatively, a two-stage approach was used to model the interaction effects [78]. Overall model fit in PLS-SEM can be assessed using the variance explained ($R^2$) of the endogenous constructs or dependent variables [78]. In this study, $R^2$ values for job stress, job satisfaction and team learning are 31%, 42% and 44%, respectively, suggesting good model fit.

### *5.2. Hypotheses testing*

Table 4 reports the results for Models 1 and 2. Results for Model 1 show that the effect of TMS on job stress in negative and significant ($\beta$= -.24, t= -2.803, p< .01), thus supporting H1. Job stress, in turn, has negative and significant effects on job satisfaction (β= -.21, t =-2.283, p< .01) and team learning (β= -.13, t= -1.635 p< .05), which provide support for H2 and H3, respectively[1]. In keeping with previous studies, our results also show positive and significant effects of a TMS on job satisfaction (β= .35, t= 3.874, p< .01) and team learning (β= .31, t= 3.586, p< .01).

Concerning the moderating effects of product complexity and technological turbulence, results in Model 2 (Table 4) support H4 which posits that project complexity positively moderates the negative effect of TMS on job stress. The interaction effect of project complexity on the relationship between TMS and job stress was negative and significant (β= -.18, t= -2.979, p< .05). Also, as predicted, the interaction effect of technological turbulence on the relationship between TMS and job stress was positive and significant (β= .17, t= 1.931, p< .05), providing support for H5. To better comprehend the moderating impacts of project complexity and technological turbulence, Figures 2 and 3 illustrate the simple slope plots for the effect of TMS (x-axis) on job stress (y-axis) at high, medium and low levels of project complexity (Figure 2) and at high, medium and low levels of technological turbulence (Figure 3). As shown in Figure 2, when project complexity is high, higher levels of TMS go hand in hand with lower levels of job stress (β= -.40, t= -3.447, p< .01). In contrast, the relationship between TMS and job stress is not significant when project complexity is low (β= -.09, t=-0.784, n.s.). With regard to technological turbulence, Figure 3 depicts a strong negative association between TMS and job stress at low levels of technological turbulence (β= -.45, t= -3.261, p< .01); this relationship however, becomes insignificant when technological turbulence is high (β= -.10, t= -0.676, n.s.).

(Insert Figures 2 and 3)

[1] Based on the suggestion of one of the reviewers, we tested for a non-linear effect of job stress on job satisfaction and team learning. The results from this analysis revealed non-significant quadratic effects of job stress on job satisfaction and team learning, suggesting that these relationships are linear.

## 6. Discussion

Despite significant evidence that NPD project teams self-destruct in stressful situations [3], [4], empirical research on stress interventions in NPD teams is notable sparse. In this study, we examine the effect of TMS on job stress and the moderating effects of project complexity and turbulence on this relationship. The study also investigates the effect of job stress on two measures of team performance, mainly team learning and job satisfaction.

In keeping with our prediction, the results reveal that a well-developed TMS is an effective mechanism to reduce stress in NPD project teams. A well-functioning TMS helps reduce job stress by allowing team members to work more effectively and efficiently. Thus, it has been reported that a strong TMS helps NPD project teams complete their tasks faster [13] and lowers the risk of forgetting or overlooking task-critical information [11], [38]. Moreover, a strong TMS increases the amount and quality of information available to the team [8], [38], reducing the perception of insufficient resources that can lead to feelings of stress. Lastly, teams with a strong TMS experience lower stress as team members are more willing to help and support each other [43]. The study's results show that job stress, in turn, has a negative effect on team learning and job satisfaction. These results are in keeping with prior research suggesting that job stress can diminish a team's capability to interpret and process new information and its desire to engage in learning behaviors [48], [79]. Also, team members that experience stress are more likely to become dissatisfied with their jobs [46].

Regarding the moderating effect of project complexity, the study's findings suggest that a well-functioning TMS is an effective mechanism to reduce stress in situations of high and medium project complexity. Project complexity adds to the demands that NPD project teams experience in their work [12], [49] and therefore a TMS is more beneficial to reduce stress when project complexity is medium and high. As noted above, a well-functioning TMS allows NPD project teams to complete their tasks faster, decreasing the risk of being late to market [13], a key concern during the development of complex NPD projects [33], [50]. Also, a strong TMS can help teams process more information [80], which can prove beneficial for complex NPD projects for which information-processing requirements are very high [49], [50]. Further, teams with a well-developed TMS enjoy a supportive team's environment [41], which can help mitigate the communication and cooperation challenges that often arise during the development of NPD projects of high complexity. For contexts of low project complexity, the study's results reveal a still negative but non-significant relationship between TMS and job stress. An explanation for the non-significant result might be that in NPD projects of low complexity, teams experience low job demands, thus making TMS less relevant to decrease job stress. For instance, low-complex projects have lower information-processing requirements. Since these projects have lower numbers of technologies, components and/or functions designed into them, less information needs to be processed during task performance [33] [81]. Also, low-complex projects are generally easier to understand by team members, and thus require less time and effort to complete. Further, in NPD projects of low complexity, the project parameters can be more easily defined, reducing the need for cooperation and communication among team members [49]. Accordingly, taken as a whole, our findings indicate that TMS has more beneficial stress-reduction consequences in situations of medium and high project complexity.

Our findings suggest that technological turbulence also moderates the relationship between TMS and stress. Specifically, when technological turbulence is moderate or low, TMS reduces job stress. However, when technological turbulence is high, TMS has no effect on job stress (i.e., the effect is negative but nonsignificant). As discussed in H5, NPD project teams operating in technologically turbulent environments are exposed to rapid technological changes, short product cycles and quick depreciation of know-how [34]. In such environments, NPD project teams keep up with changing technological requirements through constant learning and unlearning [51]. Unfortunately, the need for continuous learning can have negative consequences on the value of TMS for mitigating job demands. Thus, it has been noted that frequent changes to members' areas of expertise can turn individuals' transactive memory obsolete [7]. Without up-to-date meta-knowledge of other's expertise, team members will be more likely to experience coordination problems regarding locating, retrieving or applying expertise toward the task [38], adding to the demands of the NPD team. Also, since under highly turbulent environments technology is changing rapidly, team members may find it difficult to develop expertise in specific domains [55]. A lack of knowledge specialization may detract from a project team's ability to address the NPD project in the most efficient and effective manner possible, thereby reducing their perception of job control. Also, in the absence of knowledge specialization, the incidence of helping-seeking behaviors among team members is likely to decrease [38]. The obsolescence of individuals' transactive memories and their inability to develop knowledge specialization are less of a concern in environments characterized by low and medium technological turbulence in which NPD teams do not experience as much pressure to acquire new knowledge and unlearn outdated knowledge in order to stay abreast with the changes in the environment [5], [34]. Accordingly, a TMS is more relevant to reduce stress under low and medium technological turbulence than under high technological turbulence.

Lastly, in keeping with prior studies [12], [13], [35], [36], the study's findings show that TMS has a direct influence on team learning and job satisfaction. A well-developed TMS can help NPD project teams access and share information with one another more effectively thus, leading to higher team learning. Furthermore, a TMS affords team members with opportunities to cultivate and contribute unique knowledge to the team's tasks [8], increasing team members' perceptions that their job is satisfying.

## 7. Theoretical implications

The study's findings make four significant theoretical contributions. First, by revealing that a strong TMS can lead to lower levels of job stress in NPD project teams, findings from this study provide new insights into the benefits of a well-developed TMS. Research in NPD projects provide compelling evidence that project teams with a more developed TMS are likely to perform at a higher level than project teams with a less developed TMS [12], [13] [41], [81]. Indeed, studies reveal that a strong TMS improves speed-to-market, team innovation, team learning, team efficiency and team effectiveness [13], [14], [15], [16]. Missing from this research is, however, a focus on examining a TMS's ability to mitigate adverse outcomes or conditions that can hamper project success. A notable exception is the theoretical work of Hood et al. [38] which posited a critical role of TMS in preventing team conflict. The current study advances this line of research by examining the effect of TMS on job stress. Drawing on the JDCS theory [9] -which to date represents the dominant framework in most examinations of stress at work [28]-, we argue that a well-functioning TMS can reduce the levels of stress experienced by NPD project teams.

Second, by positing TMS as an effective mechanism to reduce team stress, the current study offers a novel view of the relationship between TMS and stress. In this respect, a review of the literature reveals that prior studies investigating the relationship between TMS and stress (i.e., Ellis [17]; Pearsall et al. [18]) have depicted TMS as an outcome of stress rather than an antecedent. We, however, reason that the seeming discrepancy between Ellis and colleagues' and our theorization of the relationship between TMS and stress is merely an artifact of a different conceptualization of the term stress and differences in the context in which TMS is measured. Regarding the conceptualization of stress, both Ellis and his colleagues [17], [18] use the term stress to denote the external forces that evoke stress (e.g., time pressure, external threat), rather than felt stress. In contrast, our study defines stress as an outcome, mainly, a negative feeling that often arises when there is a misfit between the work demands placed on team members and their abilities to fulfil those demands [82]. Moreover, whereas Ellis and colleagues measure TMS in the context of a laboratory experiment during which groups of undergraduate students are subject to various stressors while they take part in a simulation game, the current study measures TMS in the context of NPD project teams. Unlike Ellis' experiments which lasted between 30-45 minutes, NPD projects can take months or years to complete and thus members of these teams often work together for extensive periods of time, which opens the possibility to examine whether NPD teams that develop a well-functioning TMS during the lifespan of the NPD project might experience less job stress. Finally, it is worth noting that our theoretical stance of TMS as a stress-reduction strategy is in keeping with prior research in the field of workplace stress. For example, Chen et al. [19] examined the impact of team reflexivity, which has been empirically linked to TMS [83] on the psychological well-being of teams, and Ellis and Pearsall [20] investigated the role of team cross-training, an important antecedent of TMS [84], [85], in reducing the levels of stress felt by teams that experience high levels of job demands.

Third, while it has been noted that project complexity and environmental turbulence have important implications for how effective or even useful a TMS is in contributing to team performance [7], [11], very few studies have examined the moderating effect of these two variables on the relationship between TMS and team performance (for an exception see Akgün et al. [12], [13]). With a focus on furthering understanding of this subject, the current study presents evidence on how TMS relationship to job stress varies depending on the level of project complexity and environmental technological turbulence.

Last, findings from this study provide new insights into stress interventions in the context of NPD project teams. Although practitioners and researchers have recognized the detrimental effect of job stress on the mental health and performance of NPD teams, empirical evidence on stress reduction strategies remains scarce. Three notable exceptions are Barczak and Wilemon [3], Akgün et al. [5] and Chong et al. [2] which reported a number of organizational- and team-level interventions to reduce stress. Results from these studies suggest that to reduce stress, senior management can set and articulate clear goals, provide resources and set reasonable schedules for NPD project teams [3], [5]. Also, a focus on team building and communication [3] and a strong team identification [2] can reduce the negative consequences of job stress. The current study contributes to research in this subject by identifying TMS as an effective mechanism to reduce job stress.

## 8. Managerial implications

The study's results have several implications for management. First, workplace stress is among the top concerns for organizations of all sizes. According to a North American study on mental health in the workplace [86], employees report workplace stress as the primary cause of their mental health problems or illness. The pervasiveness of job stress and its negative consequences on NPD team members suggest a strong need for firms to come up with effective strategies to reduce and manage job stress. Findings from this study suggest that a developed TMS is an effective strategy that can be enacted by NPD project teams to lower job stress. Also, a strong TMS can also enhance team learning and satisfaction. Accordingly, it is highly recommended that managers promote the development of a TMS within NPD teams. To this effect, managers could form teams with individuals who are knowledgeable about one another as a result of prior experience working together. Through experience working together team members can learn who is good at what and how to coordinate knowledge effectively [7]. Managers can also promote the development of a TMS by informing team members about 'who knows what' and encouraging team members to communicate and interact with each other frequently so as to learn about each other's expertise, especially in the initial stages of the NPD project [84], [87], [88]. Providing team skills training can also contribute to the formation of a TMS [7]. Prichard and Ashleigh [89] found that teams that receive team skills training in problem solving, interpersonal relationships, goal setting and role allocation are more likely to develop a TMS than non-trained teams. Another mechanism to cultivate a strong TMS is to promote knowledge specialties within the team early in the NPD project. Managers can assign team members responsibility for specific parts of the NPD project based on members' unique expertise [14]. Finally, investing in information technologies tools designed to support team members' collaboration and communication as well as the storage, search and access of information can be useful to seed the formation of a TMS [37].

Secondly, the results imply that TMS is more effective to reduce stress when project complexity is medium and high than when it is low given the higher job demands associated with the development of complex projects. Therefore, it is highly recommended that NPD teams develop and maintain a strong TMS during the development of complex NPD projects in order to reduce job stress. Finally, the results suggest that, under high technological turbulence, a team's TMS becomes obsolete, losing its relevance to reduce stress. In these circumstances, it is important that team members maintain their TMS updated during the lifespan of NPD project. To this point, regular interactions and frequent sharing of new knowledge, experiences and training among team members can help maintain a team's TMS updated.

## 9. Limitations and future research lines

There are some limitations to this study that should be noted. First, because there was a time lag between the time when the NPD projects were completed and the time when data were collected, there might be a recall issue in survey questions. Nonetheless, Miller et al. [90] contended that the use of retrospective data can be an acceptable research methodology, if reported measures are reliable and valid. As discussed earlier, the measures used in our research showed reliability and validity and have also been drawn from existing scales that have been previously validated. Second, the study is prone to common method bias since in the questionnaire, the respondents who answered the dependent variables also answered the independent variables. Although we tested for common method bias and found that it was not a significant issue affecting our results, future research should consider collecting data from multiple informants within each organization. Third, data for this study were provided by managers that led or were in charge of the sampled NPD projects from beginning to end. While one can expect project leaders to have a great deal of knowledge about NPD project teams and their projects [10], their outlook in matters pertaining to TMS and team stress could diverge from that of individual team members. It is thus suggested that future studies include multiple informants within one team for a better assessment of the level of TMS and stress within the team. Fourth, a cross-sectional research design was used to investigate TMS in NPD project teams. Given that past research has shown that TMS is dynamic and evolves as teams spend more time together [75], the method used may not provide objective results about how TMS's impact on team performance changes over time as a team develops. To overcome this limitation, future research should employ a longitudinal research design, in which the development of TMS can be followed over time. Last, this study was conducted in Spain where collectivism is higher than in other European (e.g., Germany) and North American (e.g., USA) countries. We thus suggest that replication of this study in other countries could be undertaken to determine empirically the generalizability of our findings.

This study also points to some avenues for future research. First, we explored the influence of TMS on job stress. Future research could study how TMS impacts other resource depleting conditions such as intra-team conflict [38] and job burnout [91]. Second, the current study does not measure intervening variables responsible for the effect of TMS on job stress, mainly job demands, control and support. These variables should be examined in future research so that the explanatory mechanisms implicated in our study can be tested more stringently. Third, the boundary conditions examined in this study were project complexity and technological turbulence. Beyond these factors, a host of other variables could influence the relationships between TMS and job stress. For example, the effect of group member change or team stability might be of interest. Member turnover has been found to disrupt the operations of TMSs [92]. Consequently, for NPD project teams, for which team membership is often temporary [1], it would be interesting to examine the moderating effect on team member stability on the relationship between TMS and job stress. Finally, our research showed that technological turbulence can diminish the value of TMS to reduce job stress by rendering TMS obsolete. Nonetheless, it might be that the decay and obsolescence of TMS associated with high technological turbulent environments are less of a concern in small and collocated groups where members interact frequently, but may be exacerbated in large groups and groups consisting of demographically dispersed members [7]. Consequently, a fruitful direction for future research is to explore the roles of team size and team collocation in reducing the potential damaging effects of technological turbulence on the relationship between TMS and job stress.

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FIGURE 1

**Theoretical Model**

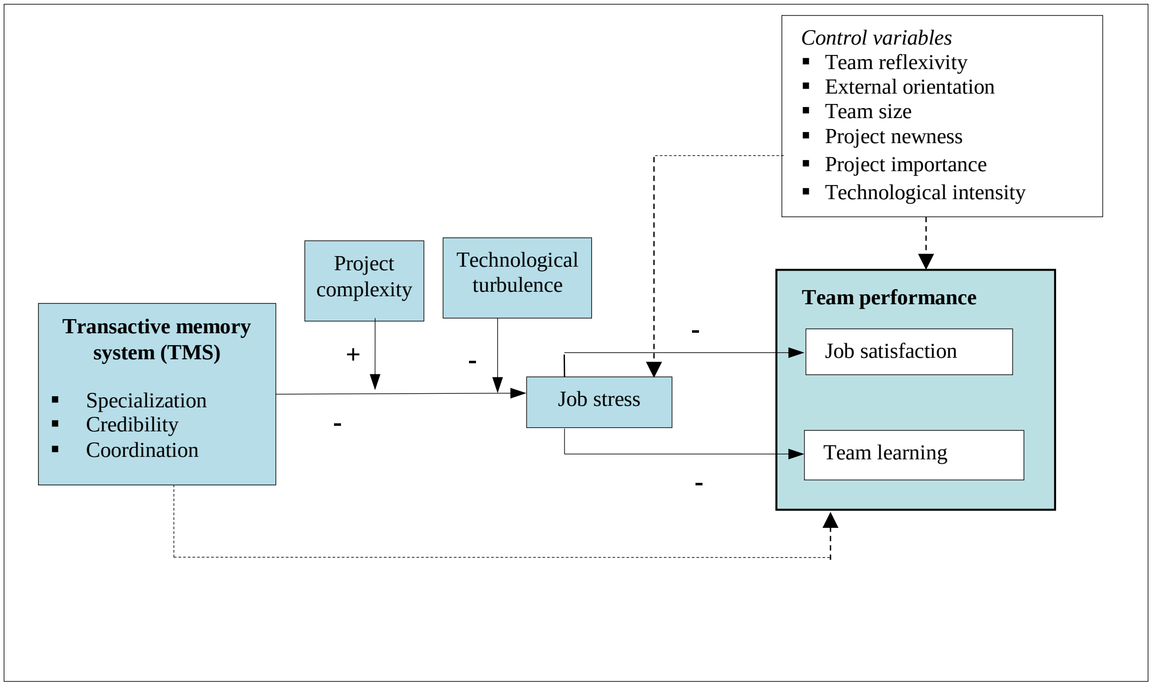


TABLE 1

**Population and sample distribution by industry**

| NAICS codes | Industrial sector | Amadeus directory | Population | | Sample | |
|---|---|---|---|---|---|---|
| | | | N | % of total | N | % of total |
| 311, 312 | Food and beverages manufacturing | 813 | 203 | 21.5% | 23 | 16.4% |
| 325, 326 | Chemical and plastics product manufacturing | 851 | 213 | 22.5% | 36 | 25.7% |
| 333 | Machinery manufacturing | 490 | 122 | 12.9% | 15 | 10.7% |
| 327, 331, 332 | Non-metallic mineral product, primary metal and fabricated metal product manufacturing | 781 | 195 | 20.6% | 21 | 15.0% |
| 334, 335 | Computer, electronic product and electrical manufacturing | 434 | 109 | 11.5%* | 28 | 20.0%* |
| 336 | Transportation equipment manufacturing | 417 | 104 | 11.0% | 17 | 12.1% |
| | TOTAL | 3786 | 946 | 100% | 140 | 100% |

* Proportion test, significant differences: $p < 0.05$

TABLE 2

**Items measurement and psychometric properties of the scales**

| | Mean (S.D.) |
|---|---|
| **Transactive memory system** | |
| **Specialization** (AVE=0.50; CR=0.77; α=0.64) | |
| ▪ Each team member has specialized knowledge of some aspect of our project. | 5.56 (1.27) |
| ▪ Each team member has knowledge about an aspect of the project that no other team member has. | 3.90 (1.68) |
| ▪ Different team members are responsible for expertise in different areas. | 4.87 (1.44) |
| ▪ The specialized knowledge of several different team members was needed to complete the project deliverables. | 5.56 (1.35) |
| **Credibility** (AVE=0.79; CR=0.92; α=0.87) | |
| ▪ Team members were comfortable accepting procedural suggestions from other team members. | 5.99 (0.91) |
| ▪ Team members trusted other members' knowledge about the project. | 6.00 (0.84) |
| ▪ Each team member was confident relying on the information that other team members brought to the discussion. | 5.88 (0.87) |
| **Coordination** (AVE=0.80; CR=0.89; r=0.62) | |
| ▪ Our team worked together in a well-coordinated fashion. | 5.57 (1.09) |
| ▪ We accomplished the task smoothly and efficiently. | 5.01 (1.16) |
| **Job stress** (AVE=0.60; CR=0.88; α=0.83) | |
| ▪ Team members felt overwhelmed by work during this project. | 4.23 (1.56) |
| ▪ Team members experienced tension during this project. | 4.73 (1.51) |
| ▪ Team members felt that things were out of control during this project. | 3.10 (1.54) |
| ▪ Sometimes, team members felt like giving up on the job during this project. | 1.96 (1.13) |
| ▪ Team members felt pressured while working on this project. | 4.18 (1.68) |
| **Job satisfaction** (AVE= 0.51; CR=0.80; α= 0.71) | |
| ▪ Our work on the NPD project was stimulating | 5.74 (0.97) |
| ▪ The project provided us with a sense of worthwhile accomplishment. | 5.33 (1.07) |
| ▪ It provided many opportunities for personal growth and development. | 5.50 (0.97) |
| ▪ We enjoyed a pleasant working atmosphere | 5.35 (1.09) |
| **Team learning** (AVE= 0.51; CR=0.64; α=0.62) | |
| ▪ Member's experience with the team is likely to help them perform better in cross-functional teams in the future. | 5.66 (0.90) |
| ▪ Member's experience with the project is likely to help them perform better on product development projects in the future. | 6.02 (0.83) |
| ▪ Team members are likely to repeat the mistakes made here on other projects [R]. | 3.13 (1.07) |
| ▪ Due to their experience on this project, team members will be better prepared to handle similar situations. | 5.65 (0.89) |
| **Project complexity** (AVE=0.89; CR=0.93; α=0.85) | |
| ▪ The development process associated with the product was relatively complex. | 5.37 (1.06) |
| ▪ The product developed by our team was complex. | 5.23 (1.16) |

| | |
|---|---|
| **Technological turbulence** (AVE= 0.70; CR=0.87; α=0.81) | |
| ▪ The technology in the industry was changing rapidly. | 3.39 (1.64) |
| ▪ A large number of new product ideas have been made possible through technological breakthroughs in the industry. | 3.81 (1.64) |
| ▪ Technological changes provided big opportunities in the industry. | 4.30 (1.75) |
| **Team reflexivity** (AVE= 0.58; CR=0.87; α=0.82) | |
| ▪ We regularly discuss whether the team is working effectively together. | 4.62 (1.39) |
| ▪ In this team we modify our objectives in the light of changing circumstances. | 5.21 (1.30) |
| ▪ This team often reviews its approach to getting the job done. | 5.27 (1.12) |
| ▪ Team members identify strengths in their work and areas that need improvement. | 4.97 (1.34) |
| ▪ Team members are committed to ongoing improvement. | 5.29 (1.32) |
| **Firm's external orientation** (AVE= 0.70; CR=0.88; α=0.79) | |
| In the context of new product development activities, my company places great important on: | |
| ▪ Building solid relationships with key external stakeholders. | 5.04 (1.54) |
| ▪ Acquiring knowledge from persons outside the firm. | 5.49 (1.39) |
| ▪ Collaborating with other professionals out of our firm that can offer support and guidance. | 5.27 (1.36) |
| **Project newness** (AVE= 0.66, CR=0.85, α=0.74) | |
| ▪ The product category was new to the company. | 5.27 (2.03) |
| ▪ The product could not have been manufactured using existing company equipment. | 3.61 (2.18) |
| ▪ The technology used in the development of this product was not familiar to the company. | 3.76 (2.02) |
| **Project importance** (AVE= 0.70, CR=0.87, α=0.78) | |
| ▪ Poor market performance by this product would have serious consequences for our firm. | 4.12 (1.76) |
| ▪ Arriving late to the market would have serious consequences for our firm. | 4.41 (1.65) |
| ▪ Our organization had a lot of riding on this project. | 4.13 (1.59) |
| **Team size** | |
| Number of people on the team who were fully involved in the project | 7.55 (6.26) |

NOTE. Items were measured with 7-point scale where 1 is "totally disagree" and 7 "completely agree".

TABLE 3

**Zero-order correlations and discriminant validity**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. TMS | N.A. | | | | | | | | | | |
| 2. Job stress | -0.248** | 0.774 | | | | | | | | | |
| 3. Job satisfaction | 0.519** | -0.179 | 0.714 | | | | | | | | |
| 4. Team learning | 0.465** | -0.047 | 0.567** | 0.714 | | | | | | | |
| 5. Project complexity | -0.065 | 0.428** | 0.199** | 0.302** | 0.931 | | | | | | |
| 6. Technological turbulence | 0.169 | 0.123 | 0.141 | 0.345** | 0.176* | 0.836 | | | | | |
| 7. Team reflexivity | 0.469** | 0.038 | 0.469** | 0.478** | 0.186* | 0.159 | 0.763 | | | | |
| 8. External orientation | 0.105 | 0.151 | -0.006 | 0.146 | 0.172* | 0.129 | 0.274** | 0.838 | | | |
| 9. Project newness | 0.094 | 0.175* | 0.135 | 0.056 | 0.173* | 0.190* | 0.115 | 0.132 | 0.811 | | |
| 10. Project importance | 0.092 | 0.362** | 0.031 | 0.182* | 0.429** | 0.285** | 0.219** | 0.161 | 0.092 | 0.837 | |
| 11. Team size | -0.112 | 0.202* | 0.006 | 0.144 | 0.265** | 0.117 | 0.063 | 0.168 | 0.135 | 0.333** | N.A. |

Values on the diagonal show the square root of AVE. Values off the diagonal are the correlations between constructs.

N.A.: not applicable.

** p<.01; * p<.05.

TABLE 4

**Standardized parameter estimates**

| | Model 1 | Model 2 |
|---|---|---|
| **Hypothesized relationships** | | |
| TMS → Job stress | -0.24** (H1) | -0.24** |
| Job stress → Job satisfaction | -0.21** (H2 | -0.21** |
| Job stress → Team learning | -0.13* (H3) | -0.13* |
| TMS x Project complexity → Job stress | | -0.18** (H4) |
| TMS x Technological turbulence → Job stress | | 0.17** (H5) |
| **Control relationships** | | |
| TMS → Job satisfaction | 0.35** | 0.35** |
| TMS → Team learning | 0.31** | 0.31** |
| Project complexity → Job stress | 0.31** | 0.36** |
| Project complexity → Job satisfaction | 0.28** | 0.29** |
| Project complexity → Team learning | 0.28** | 0.28** |
| Technological turbulence → Job stress | 0.04 | 0.05 |
| Technological turbulence → Job satisfaction | 0.03 | 0.03 |
| Technological turbulence → Team learning | 0.23* | 0.23* |
| Team reflexivity → Job stress | 0.02 | 0.01 |
| Team reflexivity → Job satisfaction | 0.29** | 0.29** |
| Team reflexivity → Team learning | 0.26** | 0.26** |
| External orientation → Job stress | 0.07 | 0.05 |
| External orientation → Job satisfaction | -0.15* | -0.15* |
| External orientation → Team learning | -0.02 | -0.02 |
| Team size → Job stress | -0.18 | -0.20 |
| Team size$^2$ → Job stress | 0.06 | 0.06 |
| Team size → Job satisfaction | 0.02 | 0.02 |
| Team size → Team learning | 0.10 | 0.10 |
| Project newness → Job stress | 0.13 | 0.14 |
| Project newness → Job satisfaction | 0.05 | 0.05 |
| Project newness → Team learning | -0.07 | -0.08 |
| Project importance → Job stress | 0.19* | 0.21* |
| Project importance → Job satisfaction | -0.05 | -0.05 |
| Project importance → Team learning | -0.01 | -0.01 |
| Low-tech industry[1] → Job stress | -0.02 | 0.00 |
| Low-tech industry → Job satisfaction | -0.01 | -0.02 |
| Low-tech industry → Team learning | -0.01 | -0.01 |
| High-tech industry[1] → Job stress | 0.02 | 0.01 |
| High-tech industry → Job satisfaction | -0.02 | -0.01 |
| High-tech industry → Team learning | 0.04 | 0.03 |
| R2 of job stress | 0.31 | 0.35 |
| R2 of job satisfaction | 0.42 | 0.42 |
| R2 of team learning | 0.45 | 0.45 |

**= p<.01, * = p<.05 (one-tailed test). Significance levels were estimated using bias-corrected bootstrap confidence intervals. (1) Medium-tech industry serves as reference group

FIGURE 2

**Simple slope analysis for high, medium and low levels of project complexity**

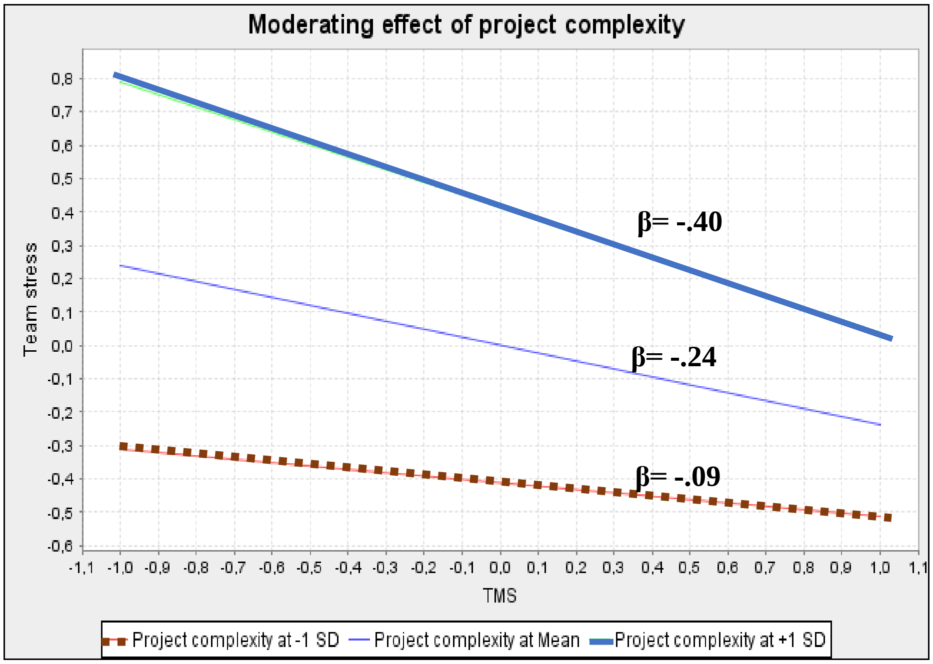


FIGURE 3

**Simple slope analysis for high, medium and low levels of technological turbulence**