Testing the Group Task Demands-Resources Model among IT Professionals

Completed Research Paper

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Abstract

Demands and resources of the work experience have been shown to be important antecedents to development of job burnout and exhaustion among individual workers, and a recent line of research has applied the demands-resources perspective to model pressures that can arise in group work. We conducted a study of the group task demands-resources model to extend testing from information technology (IT) student group settings—where the model was developed—to the context of group work among IT professionals. We find that most antecedents in the model are predictive of group work pressure or task performance satisfaction, however, several important differences emerged in findings between prior tests with IT students and the IT professionals we surveyed in this study.

Keywords

Work pressure, stress, IT workgroups.

INTRODUCTION

The Group Task Demands-Resources (GTD-R) model (Wilson and Sheetz, 2010) was developed in recognition that work within information technology (IT) groups can be a high-pressure experience. High levels of work-related pressures and stresses (hereafter referenced as *work pressure*) are known to reduce job satisfaction and performance and increase the likelihood of exhaustion, job burnout, and turnover among IT workers (Armstrong and Riemenschneider, 2011; Guimaraes and Igbaria, 1992; Moore, 2000). Although not much is known about work pressure specific to IT work groups, several characteristics of this context are anticipated to contribute to pressure. IT work tends to be situated in dynamic organizational settings (Mankin, Cohen, and Bikson, 1996), and IT work groups frequently face conditions of extreme time pressure (Austin, 2001), task complexity (Abdel-Hamid and Madnick, 1989), and environmental change (Jurison, 1999).

The potential for work pressure to reduce performance of IT group work suggests there is a need to learn more about causes and effects of work pressure in this context. We respond in this paper by studying IT professionals through the perspective of the GTD-R model, which has been applied previously to model work pressure from the perspective of IT students.

BACKGROUND

IT researchers generally have focused on effects of extreme work pressure (e.g., Austin, 2001; Guimaraes and Igbaria, 1992; Moore, 2000), however, Wilson and Sheetz took an alternative approach by studying effects across an extended range of work pressure perceptions and focusing not only on factors that are instrumental in promoting work pressure but also on factors that can mitigate it. In recognition that this approach could not be guided completely by prior research situated outside of group contexts, Wilson and

Sheetz (2009) conducted open-ended surveys of IT graduate students as a mechanism to develop a perceptual measure of work pressure in group settings and identify antecedent factors that promote or mitigate these pressures. Through card-sort analysis, they identified 11 perceptual factors as potential antecedents. Five factors were theorized to increase perceptions of work pressure in groups (interpersonal conflict, negative consequences, positive consequences, task complexity and time pressure), and six factors were theorized to mitigate perceptions of work pressure (equity of work, group expertise, group history, personal expertise, external resources, and task motivation).

Following up this initial instrument development, Wilson and Sheetz (2010) created and tested the GTD-R model with undergraduate and graduate IT student subjects. The GTD-R model builds upon the job demands-resources model of burnout, which predicts and explains effects of job demands and job resources on exhaustion and disengagement of workers (Demerouti et al., 2001). The central premise of demands-resources models is the ubiquitous nature of two underlying processes that characterize work environments. Bakker et al. (2004, p. 98) write:

> "Generally speaking, there seem to be two main processes that take place in the working environment. The first process is a stress process that initiates from job demands and results in exhaustion. The second process is motivational in nature and is driven by the availability of resources and resulting feelings of dedication. When resources are lacking, individuals experience cynicism toward their jobs."

The GTD-R model shown in Figure 1 extends the job demands-resources model of burnout to encompass moderate levels of pressure as well as extreme levels that might be anticipated to cause exhaustion or disengagement from the job. In addition it augments the prior model with an explicit measure of group work pressure (GWP), which is theorized to mediate certain effects of demands and resources on group performance. GWP is considered to differ from job burnout in several important ways.

> "First, GWP is a characteristic of normal work that is not limited to intense levels of work pressure that characterize burnout. While relatively few workers exhibit the high levels of exhaustion and disengagement that Demerouti et al. (2001) focused on when developing the job demands-resources model, GWP applies at varying levels to all individuals in normal task groups. Second, we conceptualize GWP as a unidimensional factor rather than the multidimensional structure which comprises job burnout (Maslach, 1982; Maslach and Jackson, 1981, 1986). Finally, our focus on group work requires consideration of characteristics related to other group members in addition to individual characteristics, supervisory relationships, and other factors that are prominent in job burnout research." (Wilson and Sheetz, 2010, p. 417)

The GTD-R model performed well during initial testing by Wilson and Sheetz (2010), predicting 51% of variance in GWP and 31% of variance in satisfaction with group task performance. The model that emerged from testing includes nine antecedent factors[1], four that contribute to task demands and five that contribute to task resources.

Our objective in this study is to test applicability of the GTD-R model to IT professionals. We acknowledge that the group work experience of IT students differs in several key ways from that of IT professionals.

- Student work groups are restricted by length of school terms, precluding lengthy group experiences that are possible for IT professionals.
- Students must balance conflicting demands of unrelated coursework and reward structures to a greater degree than IT professionals, whose work tends to be focused in a particular area rather than spread across an academic curriculum, potentially leading to reduced focus on a particular project.
- Students tend to have less professional experience than IT professionals, and a greater proportion of work group experiences are likely to be novel to them.

[1] Group expertise and positive consequences factors cross-loaded with other factors during confirmatory factor analysis and were removed from subsequent analyses.

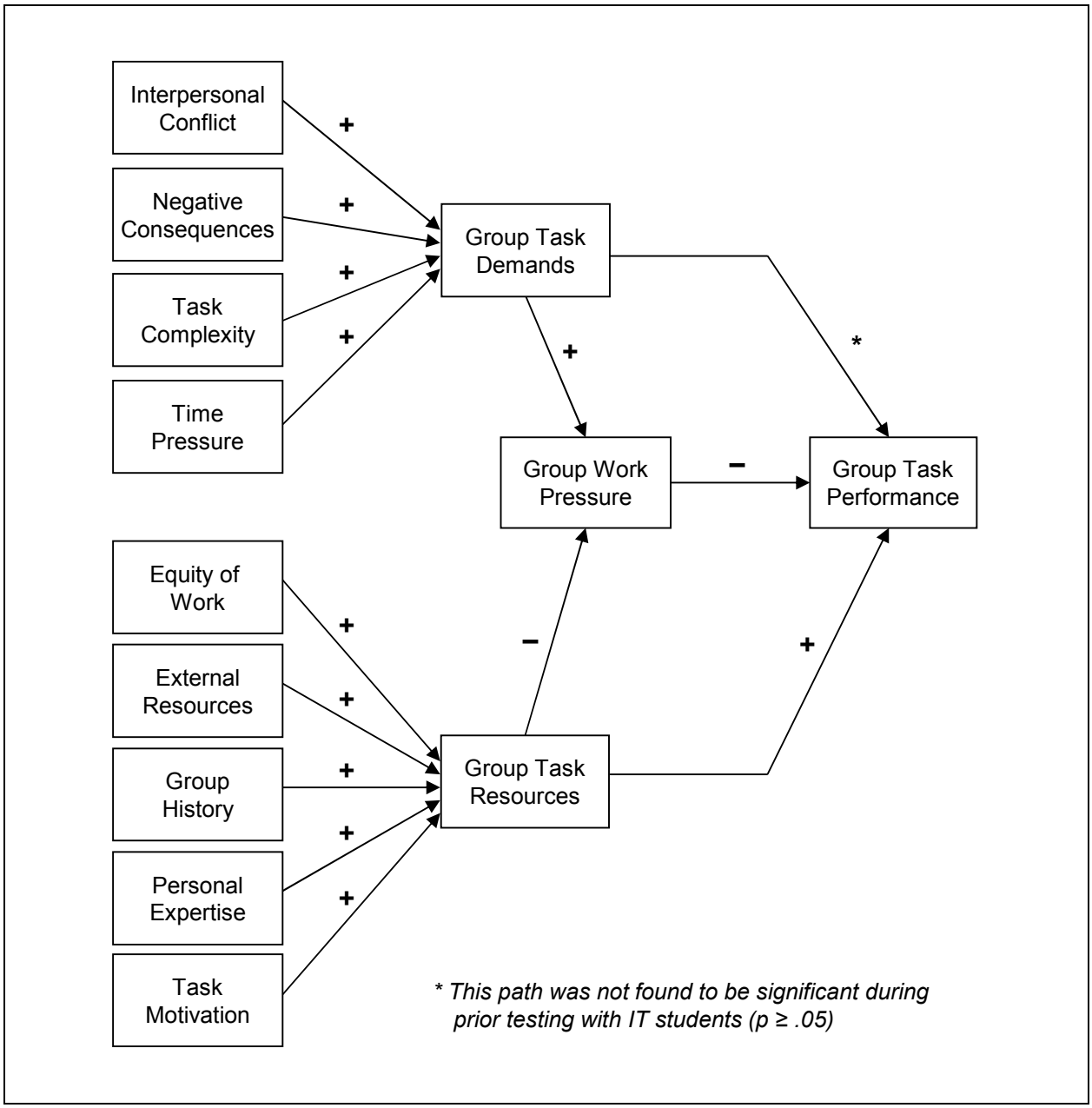

Figure 1. Results of GTD-R Model Testing with IT Students (Wilson and Sheetz, 2010)

- IT professionals typically have greater financial incentive than students to devote energy to the success of group work.
- Differences between work and non-work group contexts, such as between students and professionals, can produce divergent perceptions among participants (Wilson and Sheetz, 2008).

Despite these differences, we anticipate that the GTD-R model will prove to be applicable to IT professionals based on two observations. First, many of the IT graduate students who participated in the initial identification of antecedent factors within the GTD-R model described their own experiences within professional IT work groups, suggesting that their comments will be relevant to professional settings. Second, we note that the job demands-resources model of burnout that underpins the GTD-R model has been validated in a variety of professional settings (Demerouti et al., 2001; Bakker et al., 2004).

The following sections describe the research method we applied, present the results, and discuss several implications of our findings.

RESEARCH METHOD

This research was conducted via an online survey over the course of four weeks. Participants for the study were recruited through email messages, which included a short description of the study as well as the URL for the online survey. The online survey consisted of two sections. In the first section participants were asked with open-ended response, "Briefly describe the task you performed as part of a group that caused you to feel work pressure." They then were asked to select a range describing how many hours were required to complete the task. The second section asked participants to respond to 22 items representing the nine antecedent factors identified by Wilson and Sheetz (2010), GWP, and satisfaction with the group task performance (hereafter referenced as performance satisfaction).

Participants

A total of 147 employees of a large U.S. IT company were recruited to participate in this study. The chance of winning a $100 gift certificate was offered as incentive to participate.

Primary Measures

Participants were administered a short-form version of the Group Work Pressure instrument developed by Wilson and Sheetz (2010). Use of the revised instrument was necessitated by the requirement to limit the time it took for participants to complete the survey and thereby meet constraints set in place by their employer. Development and testing of the short-form instrument are described in (Wilson et al., 2014). Measurement items are presented in Table 1. Administration order of all measurement items was individually randomized for each subject by the survey administration software, as recommended by Wilson and Lankton (2012).

Second-Order Factors

In addition to reflective primary measures, the GTD-R model assesses group demands and group resources as second-order formative factors in which the primary measures represent different dimensions of the factor rather than reflecting overlapping variance (Gefen et al., 2001; Petter, et al., 2007; Wilson and Sheetz, 2010).

ANALYSIS AND RESULTS

We selected WarpPLS version 4.0 Kock (2014) to use for confirmatory factor analysis (CFA) and structural model analysis in order to account for the presence of significant skewness in negative consequences, task complexity, GWP, and performance satisfaction measures. PLS analysis does not require variables to be normally distributed (Chin, 1998), and WarpPLS is effective at modeling and estimating non-linear relationships which often are encountered in cognitive and behavioral research (Kock, 2013).

Confirmatory Factor Analysis

WarpPLS was applied to calculate combined loadings and cross-loadings of CFA using Promax oblique rotation (see Table 2). Each of the nine antecedent factors was represented by two measurement items, as shown in Table 1. Initial results showed that interpersonal conflict and external resources factors produce negative indicator weights within their respective second-order factors, task demands and task resources, and neither primary measure made an important contribution to the second-order factor. Therefore, these two factors were removed from subsequent analyses as suggested by Cenfetelli and Bassellier (2009). Results of the remaining factors show a prominent factor structure in which all measurement items loaded on the anticipated factor at a value of .824 or above with cross-loading on other factors at .284 or below (see Table 3).

Interpersonal Conflict	IC1	There were feelings among members of my work group that tended to pull the group apart.
(Removed)	IC2	There was constant bickering in my work group.
Negative Consequences	NC1	I was concerned that if I performed poorly in the task, it would have a negative impact on the evaluation of my group.
	NC2	I was afraid of what would happen if this project did not succeed.
Task Complexity	TC1	The task was simple. (*Reverse coded)*
	TC2	The task was complex.
Time Pressure	TP1	I had less time than usual to complete the task.
	TP2	Lack of time was a big problem for my group.
Equity of Work	EW1	I could always rely on my group members to complete their parts of the task.
	EW2	Other group members did not put forth nearly enough effort. (*Reverse coded)*
External Resources *(Removed)*	ER1	No experienced help was available from outside the group. (*Reverse coded)*
	ER2	Our group gave up on being able to get outside help with this task. (*Reverse coded)*
Group History	GH1	I knew most of the group members well.
	GH2	I knew all about these group members before the task began.
Personal Expertise	PE1	I had a lot of experience in performing the task.
	PE2	I had performed this same task frequently before.
Task Motivation	TM1	The task was fun.
	TM2	I looked forward to the time when I would work on this task.
Group Work Pressure	GWP1	The task placed extreme pressure on me.
	GWP2	The task was very stressful.
Performance Satisfaction	PS1	My work group produced excellent-quality results on this task.
	PS2	Members of my work group were very pleased with the way the task was completed.

All responses used 5-point Likert scales ranging from 1 = Strongly Disagree to 5 = Strongly Agree

Table 1. Measurement Items

As described in Table 4, WarpPLS 4.0 provides several measures of model fit and qualitative assessment, and the measurement model we tested through CFA meets established criteria for each measure. The recommended interpretation of each measure is described by Kock (2013).

In addition, all full collinearity variance inflation factors (VIFs) are well below the recommended 3.30 criterion, indicating that vertical and lateral collinearity are not important problems in this analysis (Kock and Lynn, 2012).

Convergent validity of measures was assessed by calculating composite reliability, which was .80 or greater for items comprising each factor and exceeded the .70 criterion proposed by Hair et al. (2009). Discriminant validity was assessed through analyzing Average Variance Extracted (AVE). The AVE for each measure is .82 or higher, and the square root of AVE is higher than any correlation of that factor with another measure, thereby meeting the criteria proposed by Fornell and Larcker (1981). These results support the assumption of construct validity within the measurement model.

	NC	TC	TP	EW	GH	PE	TM	GWP	PS
Negative Consequences (NC)	**0.82**								
Task Complexity (TC)	0.27	**0.82**							
Time Pressure (TP)	0.15	0.13	**0.84**						
Equity of Work (EW)	-0.09	0.24	-0.02	**0.85**					
Group History (GH)	-0.05	0.14	0.15	0.13	**0.85**				
Personal Expertise (PE)	-0.08	-0.13	0.17	0.11	0.32	**0.93**			
Task Motivation (TM)	-0.09	0.14	0.00	0.29	0.26	0.15	**0.91**		
Group Work Pressure (GWP)	0.22	0.36	0.42	0.03	0.15	0.10	0.10	**0.87**	
Performance Satisfaction (PS)	-0.09	0.18	0.08	0.45	0.27	0.22	0.23	0.20	**0.84**
Mean Score	4.00	3.97	3.20	3.30	3.22	2.72	3.20	3.58	3.74
Standard Deviation	0.79	0.74	0.94	0.98	0.97	1.13	1.01	0.85	0.80
Block VIF	1.13	1.13	1.04	1.11	1.23	1.14	1.20	1.13	—
Composite Reliability	0.80	0.80	0.83	0.83	0.84	0.94	0.90	0.87	0.83

Mean scores and standard deviations are calculated as averaged summations of the raw data; block variance inflation factor (VIF) and composite reliability are shown as reported by WarpPLS; the square root of average variance extracted (AVE) for each latent factor as reported by WarpPLS is shown as a bolded entry in the diagonal

Table 2. Measurement Scale Characteristics

Structural Model

Results of WarpPLS analysis of the structural model are shown in Figure 2. The model accounts for 23% of the observed variance in GWP and 23% in performance satisfaction. All primary measures contribute significantly to their respective second-order formative factor within the GTD-R model. Several other effects correspond to those found in testing of the GTD-R model with IT students (Wilson and Sheetz, 2010): group task demands significantly increase GWP, group task resources significantly increase performance satisfaction, and effects of group task demands are mediated through GWP. Notably, every relationship tested within the structural model was interpreted as a non-linear or "warped" relationship within WarpPLS.

Other aspects of the findings diverge from those of the prior test with IT students. Along with the issues that led to removal of interpersonal conflict and external resource factors, as discussed earlier in this paper, a positive association between GWP and performance satisfaction was found in this study instead of the negative association reported by Wilson and Sheetz (2010), and no significant effect was found between group task resources and GWP.

In order to explore project length as a possible explanation for this discrepancy, the data were split to produce two separate data sets, one containing group tasks of 1-40 hours reported length (n = 51) and the other containing group tasks greater than 40 hours in length (n = 96). The GTD-R model subsequently was rerun with each of these separate data sets in WarpPLS, producing results shown in Table 5.

	1	2	3	4	5	6	7	8	9
NC1	**0.960**	0.060	-0.110	-0.021	-0.057	0.185	0.043	-0.133	-0.073
NC2	**0.952**	-0.066	0.120	0.023	0.062	-0.202	-0.047	0.145	0.080
TC1	-0.185	**0.940**	-0.064	0.089	-0.003	-0.089	-0.050	-0.134	-0.204
TC2	0.256	**0.881**	0.090	-0.123	0.005	0.124	0.070	0.186	0.284
TP1	-0.057	-0.097	**0.967**	0.139	-0.029	-0.076	0.019	-0.107	0.117
TP2	0.071	0.121	**0.949**	-0.173	0.036	0.095	-0.024	0.134	-0.145
EW1	0.101	-0.159	0.104	**0.974**	0.028	0.058	0.030	0.022	-0.005
EW2	-0.108	0.171	-0.112	**0.970**	-0.030	-0.062	-0.032	-0.024	0.006
GH1	0.077	-0.091	-0.225	0.101	**0.926**	0.079	0.046	0.206	0.132
GH2	-0.066	0.078	0.193	-0.086	**0.946**	-0.068	-0.039	-0.176	-0.113
PE1	-0.040	0.185	-0.044	-0.050	0.055	**0.978**	-0.019	-0.002	-0.016
PE2	0.042	-0.194	0.046	0.052	-0.058	**0.976**	0.020	0.002	0.017
TM1	0.053	-0.015	-0.071	0.025	-0.007	-0.008	**0.993**	-0.072	-0.004
TM2	-0.054	0.015	0.072	-0.026	0.007	0.008	**0.993**	0.074	0.004
GWP1	-0.134	-0.048	0.088	-0.082	0.136	-0.132	0.070	**0.957**	0.099
GWP2	0.128	0.046	-0.084	0.078	-0.130	0.126	-0.067	**0.960**	-0.095
PS1	0.007	0.153	-0.013	0.028	-0.080	0.055	0.061	-0.032	**0.981**
PS2	-0.006	-0.140	0.012	-0.026	0.074	-0.051	-0.056	0.030	**0.984**

Legend: NC = negative consequences; TC = task complexity; TP = time pressure; EW = equity of work; GH = group history; PE = personal expertise; TM = task motivation; GWP = group work pressure; and PS = performance satisfaction.

Results are presented as normalized pattern loadings and cross-loadings obtained using Promax oblique rotation as reported by WarpPLS; bolding indicates anticipated factor loadings.

Table 3. Confirmatory Factor Analysis of Measurement Items

Measure	Value (Sig.)	Evaluation Criteria
Average path coefficient (APC)	0.48 (p<0.001)	Acceptable if p < 0.05 overall for APC, ARS, and AARS
Average R-squared (ARS)	0.40 (p<0.001)	
Average adjusted R-squared (AARS)	0.39 (p<0.001)	
Average block Variance Inflation Factor (VIF)	1.07	Acceptable if ≤ 3.3
Average full collinearity VIF	1.30	Acceptable if ≤ 3.3
Tenenhaus GoF	0.52	Value ≥ 0.36 indicates large explanatory power
Simpson's paradox ratio	0.92	Acceptable if ≥ 0.7
R-squared contribution ratio (RSCR)	1.00	Acceptable if ≥ .9
Statistical suppression ratio (SSR)	0.96	Acceptable if ≥ 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)	1.00	Acceptable if ≥ 0.7

Table 4. WarpPLS Model Fit and Quality Indices

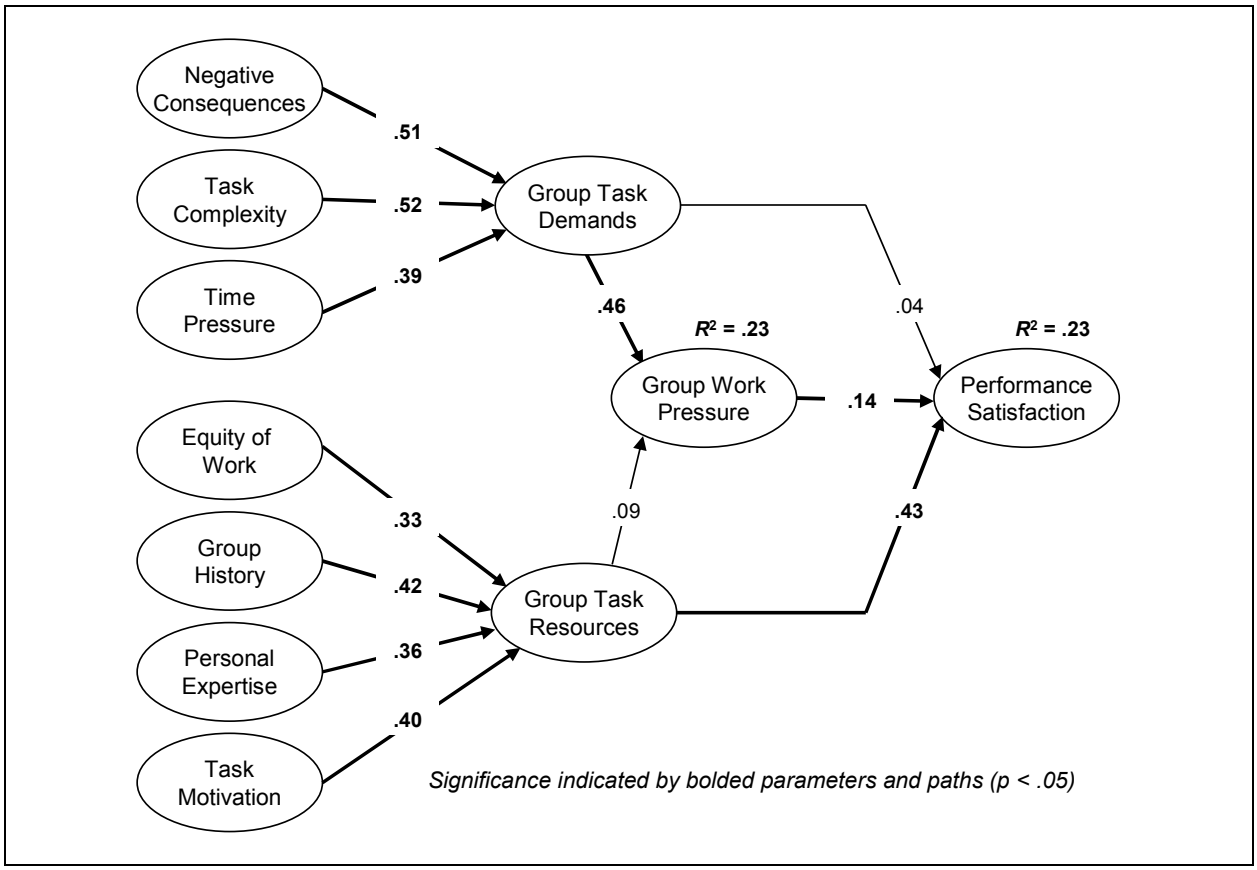

Figure 2. PLS Analysis of Structural Model.

		Wilson and Sheetz (2010)	1-40 hour length IT professional group tasks	40+ hour length IT professional group tasks
GTD-R Model Path Weights	Group Task Demands → Group Work Pressure	0.56	0.64	0.35
	Group Task Demands → Performance Satisfaction	0.10[ns]	-0.17	-0.21
	Group Task Resources → Group Work Pressure	-0.27	0.12[ns]	0.23
	Group Task Resources → Performance Satisfaction	.40	0.42	0.37
	Group Work Pressure → Performance Satisfaction	-0.30	0.36	0.11[ns]
Number in Sample		395	51	96
Group Work Pressure R^2		0.51	0.46	0.17
Performance Satisfaction R^2		0.31	0.38	0.21

[ns] Non-significant path weight (p ≥ .05)

Table 5. Comparison of Results: IT Students vs. IT Professional Subgroups

It also is possible this finding is an artifact of using performance satisfaction vs. other subjective or objective measures of task performance. Future research will be needed to study this possibility. Satisfaction measures have been used frequently in the group work literature to provide attitudinal assessment of group performance (Cohen and Bailey, 1997) and, as noted by Wilson and Sheetz (2010), subjective satisfaction with group task performance is particularly well-suited for comparing performance across a range of tasks and work contexts, as was the case in the research design in this study.

Second, we find group task resources have no effect on GWP in results from our full data set of IT professionals although Wilson and Sheetz (2010) report a negative association between these factors when assessed among IT students. Follow-up analysis finds this effect is driven by results from long-term group work; the relationship is not significant where group projects are 40 hours or less in length. It will not be possible to determine the source of this finding without further study, however, we speculate that in professional settings availability of external resources may be highly associated with difficulty and importance of the group task, potentially to the point that the resources do not act to mitigate pressures.

Finally, we note that the GTD-R model decreases in predictiveness among IT professionals as group projects increase in length. Prediction of performance satisfaction decreases from explained variance of 38% for projects of 1-40 hours length to only 21% for longer projects. We interpret this finding to indicate that factors outside the current GTD-R model gain importance in project length increases, implying that future research may be able to substantially improve model predictiveness in long-term professional work groups. We also view the finding as a confirmation of our previously-discussed recognition that the group work experience of IT students differs in important ways from that of IT professionals.

Conclusion

We find that the GTD-R model provides good predictiveness of pressure and outcomes relating to group work among IT professionals. The model provides further explanatory benefits through identifying seven antecedent factors and by extending the demands-resources perspective from individual work to group work contexts. These findings provide a foundation for further development and refinement of the GTD-R model and a mechanism for studying the impact of pressure and stress in professional IT group work.

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