

The Impact of Gender and Department Climate on Job Satisfaction and Intentions to Quit for Faculty in Science and Engineering Fields

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ABSTRACT. This study investigates whether gender and the perceptions of department climate affects faculty job satisfaction and intentions to quit (work outcomes) with surveys responses from 308 faculty members in science and engineering fields. The study finds that both gender and department climate are related to work outcomes and that two facets of department climate (affective and instrumental) mediate the relationship between gender and both job satisfaction and intention to quit. This finding suggests that universities can benefit from improving department climate, which then may improve the retention of both male and female faculty, but may have an even greater impact on improving job satisfaction and reducing intentions to quit of female faculty.

Key Words: gender, climate, work outcomes, regression and/or mediation analysis, faculty

JEL Classifications: D23, M14, I20, C42

1. Introduction

Women faculty members are leaving academic positions in science and engineering fields at higher rates than men (NSF, 2004). This loss of women faculty can have a number of adverse consequences including: fewer role models for young women who are considering careers in these less traditional fields; loss of the intellectual capital to the universities of these highly trained women; and the increasing expenses of new searches and high start-up packages. One university estimated that it can take ten years for a new faculty member in science or engineering to develop enough of a positive revenue stream from grants and to recoup start-up costs (Hopkins, 2004). If a faculty mem-

ber leaves before start-up costs are recovered, the university loses money and must start over again with a search for a new faculty member.

This suggests that it is important to identify those factors that universities may influence to improve the retention of faculty in the sciences and engineering. Ideally the most critical factors can be identified and improved so that more of the best faculty members are retained. This study will specifically examine one possible factor that may impact faculty retention—department climate. Climate has been commonly defined as the shared perceptions of the work environment (Jones and James, 1979). The purpose of this study is to investigate whether there is a direct relationship between gender and work outcomes such as intentions to quit in science and engineering fields and if so, whether the relationship between gender and work outcomes is mediated by department climate.

Kanter's (1977) work suggested that many of women's challenges as they joined male-dominated organizations would fade as more women entered these fields. Acker (1990) however, has argued that numbers alone may not be enough to transform organizations that were established, often many decades ago, based on the assumption that employees or faculty members were white males. Gendered assumptions and stereotypes are often buried below the surface (Rapoport *et al.*, 2002) and may adversely affect female faculty in universities. Studying organization climate in university settings may provide more information about the relationship between gender and potential adverse effects.

Kanter (1977) also described adverse affects on those who were tokens (generally representing less than 20% of the total) in their departments or

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organizations. This study focuses on women faculty in science and engineering fields where women still represent low percentages of the total faculty. Difficulties for women may develop because organizations, and their notions of effectiveness, are often arranged around masculine models of work where competence may be associated with traits of toughness or self-promotion. However, women who act more masculine and strong may be judged harshly (Bem, 1993; Lorber, 2000). This work suggests that lower representations of women faculty in science and engineering departments may result in more negative work outcomes for these women.

The work outcome variables selected for this study include job satisfaction and intention to quit. Job satisfaction is defined as a positive emotional response to the job resulting from an appraisal of the job as fulfilling or allowing the fulfillment of an individual's values (Locke, 1984). Job satisfaction is such an important construct that it has generated literally thousands of empirical studies. Intention to quit is different from job satisfaction because intentions are more predicative of subsequent behavior. Intention to quit is generally predictive of subsequent turnover.

Hypothesis 1. Gender will be related to job satisfaction and intention to quit for women faculty in science and engineering fields such that women will report lower job satisfaction and higher intentions to quit than men.

Climate research suggests many dimensions of climate can be categorized into three higher order facets of organizational climate: affective, cognitive and instrumental (Ostroff, 1993; Carr *et al.*, 2003). In a meta-analysis of research on business organizations Carr and her coauthors found these facets of climate to be related to job satisfaction and organizational commitment. This study will extend their work to faculty at universities and focus at the department level because this is typically where the largest number of interactions and decisions occur that impact faculty members. It is also important to examine climate in relatively homogeneous work units (Jones and James, 1979) rather than trying to assess the climate of an entire college or university. This study will also replicate Carr's work in industry on the relationship

between climate and job satisfaction and extend this work to examine intentions to quit. Although some have argued that job satisfaction may be closely related to organizational climate, other climate researchers have clearly shown differential relationships between the facets of climate and job satisfaction and other work outcomes (Jones and James, 1979; Joyce and Slocum, 1984; Carr *et al.*, 2003).

The affective climate facet is defined as: people involvement and interpersonal or social relations. This study examines several important dimensions of the affective climate facet including: quality of relationships, psychological safety, pessimism or cynicism about organizational change and perceptions of isolation. Quality of relationships is a critical component of the social relations aspect of climate and has been used in a number of previous climate studies (cf. Jones and James, 1979). Psychological safety was introduced by Edmondson (1999) to assess whether group members have a shared belief that interpersonal risk taking is safe. This sense of safety in asking for assistance, for example, is likely to be valuable to faculty careers. Pessimism or cynicism about organizational change was developed by Wanous and his coauthors (2000) appears to be learned as a result of either little previous change or perceptions of ineffective leadership practices. Pessimism about change may be negatively related to job satisfaction and positively related to intention to quit because hope in future improvement would be low. Finally, feelings of isolation were included in this study because the "Study of the Status of Women Faculty in Science at MIT" (1999), which received international attention when it was released, where senior women scientists reported considerable feelings of exclusion and marginalization. Positive assessments of each of these four aspects of affective department climate are expected to have a positive impact on work outcomes.

The instrumental climate facet is defined as: work processes, structure, and extrinsic rewards (Carr *et al.*, 2003). The specific dimensions of instrumental climate selected as a focus in this study include: access to information, access to resources, and assessment of the promotion and tenure process. Access to information allows individuals to see a bigger picture or vision of the organization, understand their role in the

organization and feel empowered by additional knowledge (Spreitzer, 1996) and may be important for identifying available resources. Resources include space, funds, support staff, time and supplies and materials. Adequate resources can engender a sense control over one's destiny, while a lack of adequate resources contributes to a sense of powerlessness (Spreitzer, 1996). Finally, assessment of the promotion and tenure process is one of the critical processes that faculty participate in at universities. In this study we reason that a positive evaluation of the promotion and tenure process, as well as, positive assessments of access to both information and resources is expected to have a beneficial effect on work outcomes.

The cognitive climate facet consists of a sense of deriving intrinsic rewards from one's work. This study will specifically focus on three dimensions of cognitive climate: meaning, autonomy, and competence. Scholars have suggested that desire for autonomy is commonly found to be a primary reason faculty choose an academic career (Clark, 1987). Autonomy is also included as an important component in many assessments of climate (cf., Joyce and Slocum, 1984). Meaning is "the value of a work goal or purpose, judged in relation to an individual's own ideals or standards" (Spreitzer, 1995, p. 1443) and has been identified as an important factor in faculty motivation (Wergin, 2003). Competence refers to an individual's belief in his or her capability to perform activities with skill (Spreitzer, 1995). Together these individual dimensions of cognitive department climate suggest that if faculty members do not experience these cognitive elements of their work, they may become dissatisfied and may be more vulnerable to leaving.

Hypothesis 2a. Faculty perceptions of affective, cognitive and instrumental aspects of departmental climate will be positively related to job satisfaction.

Hypothesis 2b. Faculty perceptions of affective, cognitive and instrumental aspects of departmental climate will be negatively related to intentions to quit.

It is possible that improvements in department climate will have an even greater positive impact on

the retention of female faculty than they do on male faculty. Previous work has suggested that women leaving organizations at high rates may be symptomatic of organizational dysfunction (Rapoport *et al.*, 2002). The mediating impact of third variables has long been examined in the social sciences and often represent group level constructs (Baron and Kenny, 1986) such as department climate. Mediators represent constructs that transform the independent variable in some way. This study proposes that female faculty members will place greater importance on the quality of department climate than will male faculty members and that this will differentially impact the levels of job satisfaction, intentions to quit.

This importance of department climate to women is suggested by the comprehensive review of the gender literature by Cross and Madsen's (1997) that asserts that women are more likely to be socialized to have an interdependent sense of self and therefore a greater desire for relationships and connectedness with others than men who are more likely to have been socialized to have an independent sense of self. They also summarize the gender socialization literature which suggests that girls are socialized from young ages to be more attuned to the emotions of others and that the interpersonal nature of emotions appears to be more salient to girls than to boys. This evidence suggests that female faculty members may place greater importance on department climate because it is within departments that many decisions and interactions with people occur. Therefore this study explores the relationship between gender and work outcomes: job satisfaction and intention to quit, predicting that these relationships will be mediated by department climate such that the differences in job satisfaction reported by male and female faculty in science and engineering will be significantly reduced when controlling for each of the three facets of department climate. In other words, while it may appear that women have lower job satisfaction and higher intention to quit, the primary explanation for these work outcomes will come from the quality of department climate, not from gender.

Hypothesis 3a. Department climate quality (affective, instrumental and cognitive) will mediate the relationship between gender and job satisfaction.

Hypothesis 3b. Department climate quality (affective, instrumental and cognitive) will mediate the relationship between gender and intentions to quit.

2. Method

For a survey to claim to have sampled an organization adequately, the norm within the organizational literature suggests that at least a 50% response rate is appropriate. In order to maximize the response rate, the Dillman (2000) method of garnering higher response rates with multiple reminders was used. With Institutional Review Board (IRB) approval, the survey was confidential, not anonymous. This allowed non-respondents to be targeted for additional reminder mailings. Surveys were sent to 416 faculty members at a western research university in all four science and engineering colleges including Science, Engineering; Agriculture, and Natural Resources. Three hundred and eight surveys were returned for a response rate of 74%.

Measures

Gender was asked on the survey with male coded as one and female coded as two. Any missing gender responses from the survey were completed by looking at the department website and calling the department to confirm the gender. Rank was completed by checking both the department website and the current faculty directory published at the same time the survey was sent. Any discrepancies between the two were resolved by asking the department. Rank was coded as: non-tenure track including instructors, clinical and research faculty; assistant; associate and full professors. This study assessed all climate measures and outcome measures with 5-point Likert scales with endpoints of strongly agree = 5; agree = 4; neutral = 3; disagree = 2 and strongly disagree = 1. Several items were included that were reversed scored to reduce the risk of response set bias.

Affective department climate was measured with a combination of four dimensions ($\alpha = .87$). *Relationship quality* (Jones and James, 1979) was assessed with six items including: "The best thing about this job is the people I work with" and

"There is a strong sense of 'family' in my department." *Pessimism about organizational change* (reversed) (Wanous *et al.*, 2000) was measured with four items including: "Attempts to make things better around here will not produce good results" and "Plans for future improvement in this department will not amount to much." *Feelings of isolation* (reversed) were assessed by four items developed for this study including: "I feel excluded from informal networking in my department" and "I feel like I 'fit' in my department" (reverse scored). *Psychological safety* (Edmondson, 1999) was assessed with seven items including: "It is safe to take a risk in this department" and "No one in this department would deliberately act in a way that undermines my efforts."

Instrumental department climate was measured with a combination of three dimensions ($\alpha = 0.67$) including access to resources, access to information and promotion process information. *Access to resources* was based on Spreitzer's (1996) work and modified for this study. It was measured with three items including: "I have access to the resources I need to do my job well" and "If I need additional resources (equipment, supplies, space or funding) to do my work, I can usually get them." *Access to information* was derived from Spreitzer's (1996) work and was assessed with three items including: "I regularly receive all of the important information I need at work" and a reversed scored item "I often feel that I am 'out of the loop' in terms of receiving information around here." *Assessment of the Promotion Process* was measured with six items developed for this study including: "I am comfortable with my level of understanding of the criteria for achieving tenure/promotion" and "I receive/d enough feedback on my progress toward tenure/promotion."

Finally, cognitive departmental climate was assessed with a combination of three dimensions ($\alpha = 0.65$). *Autonomy* (Spreitzer, 1995) was assessed with three items including: "I have significant autonomy in determining how I do my job" and "I have considerable opportunity for independence and freedom in how I do my job." *Meaning* (Spreitzer, 1995) was assessed with three items including: "The work I do is very important to me" and "My job activities are personally meaningful to me." *Competence* (Spreitzer, 1995) was assessed with three items including: "I am

confident about my ability to do my job” and “I am self-assured about my capabilities to perform my work activities.”

This study used two work outcome variables that have been used in numerous other studies and been shown to have good validity and reliability: a measure of global job satisfaction (Hackman and Oldham, 1975) and intention to quit (Cook *et al.*, 1981). Job satisfaction was measured with three items ($\alpha=0.764$) including: “Generally speaking, I am very satisfied with this job;” and “Most people on this job are very satisfied with the job;” and “I am generally satisfied with the kind of work I do in this job.” Intention to quit was measured with two items ($\alpha=0.859$) including: “I often think about leaving my job” and “I will probably look for a new job soon.”

Mediation analyses

A variable may be considered a *mediator* to the extent to which it carries the influence of a given independent variable (IV) to a given outcome or dependent variable (DV). To investigate whether department climate mediates the relationship between gender and both job satisfaction and

intention to quit, this study followed procedures described by Baron and Kenny (1986). As they describe this analysis, three regression equations should be tested to establish mediation. The first condition is that the independent variable must influence the outcome variable. Second, is the independent variable must influence the potential mediator. Third, when simultaneously predicting the work outcome from both the independent variable (gender) and the potential mediator (climate), then the statistical effect of the independent variable on the outcome variable must be reduced. It is considered complete mediation, if the independent variable does not influence the outcome variable when the mediator is controlled (James and Brett, 1984). The Sobel test (Sobel, 1982; Preacher and Leonardelli, 2001) is used to show whether there is a significant reduction in the impact of the independent variable on the outcome when controlling for the mediator.

3. Results

Women represented 21.8% of the sample, while men made up 78.1% of the sample which is consistent with national percentages (NSF, 2004) for women faculty in science and engineering fields. Means and standard deviations by gender are shown in Table I. The demographic data shows that the average respondent is 48 years old. Eighty-six percent of the respondents are married. Non-tenure track faculty made up 25% of respondents, while untenured faculty made up 20% and tenured faculty made up 55% of the sample.

ANOVA analyses supported Hypothesis 1 as shown in Table II. Gender significantly predicts job satisfaction ($F_{(1, 295)} = 4.649, p < .05$) and intention to quit ($F_{(1, 302)} = 4.542, p < .05$). The means in Table I show that women have lower job satisfaction and higher intentions to quit. Hypothesis 2 suggesting that department climate is positively related to work outcomes of job satisfaction and negatively related to intention to quit was supported (see Table III). Specifically, department climate was positively related to job satisfaction (H2a) for affective ($F_{(227, 41)} = 2.078, p = .003$), instrumental ($F_{(52, 205)} = 4.44, p < .000$ and cognitive ($F_{(20, 263)} = 5.273, p < .0001$) facets. Department climate was

Table I
Means of work outcomes and department climate by gender

	Male	Female
<i>Work outcomes</i>		
Job satisfaction		
Mean	3.82	3.61 ^a
S.D.	0.68	0.75
Intention to quit		
Mean	2.16	2.48 ^a
S.D.	1.08	1.07
<i>Department climate facets</i>		
Affective		
Mean	3.28	3.11 ^a
S.D.	0.42	0.47
Instrumental		
Mean	3.48	3.27 ^a
S.D.	0.63	0.70
Cognitive		
Mean	4.25	4.16
S.D.	0.43	0.54

N = 308, 241 Males (78.2%), 67 Females (21.8%).

^aSignificant differences between males and females $p < .05$.

Table II
Hypothesis 1: Relationship between gender and work outcomes

	Sum of squares	df	Mean square	F	Sig.
<i>Independent variable: Gender</i>					
Job satisfaction					
Between groups	2.232	1	2.232	4.65	.032
Within groups	141.614	295	.480		
Total	143.846	296			
Intent to quit					
Between groups	5.258	1	5.258	4.54	.034
Within groups	349.624	302	1.158		
Total	354.882	303			

N = 308.

positively related to intent to quit (H2b) for affective ($F_{(230, 42)} = 1.091, p = .005$); instrumental ($F_{(52, 208)} = 2.33, p < .0001$); and cognitive ($F_{(20, 268)} = 2.895, p < .0001$) facets.

Mediation results

Following the three steps outlined by Baron and Kenny (1986) the results are shown in Table IV. First, the independent variable, gender, must influence the outcome variables. This is demonstrated in H1 above. Second the independent variable, gender, does influence department climate (mediator). This relationship is significant for affective department climate ($F_{(1, 271)} = 7.09, p < .05$), and instrumental department climate ($F_{(1, 259)} = 4.46, p < .05$), but it is not significant for cognitive department climate ($F_{(1, 287)} = 1.94, p > .05$). Since this first criterion is not met, no further analyses are needed to conclude that cognitive department climate does not mediate the relationship between gender and the outcome variables of job satisfaction and intention to quit. Hence H3a was not supported for cognitive climate.

Finally, the third step tests for a mediating relationship by simultaneously predicting the outcome variable from both gender and department climate. The effect of gender should be non-significant or significantly reduced compared to the regression testing the relationship between gender and the work outcome variable. The results show a significant relationship when simultaneously predicting job satisfaction from

Table III
Hypothesis 2: Relationship of department climate to work outcomes

	Sum of squares	df	Mean square	F	Sig.
<i>Affective facets of department climate</i>					
Job satisfaction					
Between groups	121.312	227	.534	2.078	.003
Within groups	10.546	41	.257		
Total	131.859	268			
Intent to quit					
Between groups	295.541	230	1.285	1.961	.005
Within groups	27.521	42	.655		
Total	323.062	272			
<i>Instrumental facets of department climate</i>					
Job satisfaction					
Between groups	66.672	52	1.282	4.44	.000
Within groups	59.192	205	.289		
Total	125.864	257			
Intent to quit					
Between groups	109.984	52	2.115	2.332	.000
Within groups	188.679	205	.907		
Total	298.663	260			
<i>Cognitive facets of department climate</i>					
Job satisfaction					
Between groups	39.965	20	1.998	5.273	.000
Within groups	99.672	263	.379		
Total	139.637	283			
Intent to quit					
Between groups	59.225	20	2.961	2.895	.000
Within groups	274.102	268	1.023		
Total	333.327	288			

both affective department climate and gender ($F_{(1, 266)} = 71.82, p < .001$). The effect of gender is not significant (Beta = .03, $p > .05$). The Sobel test (1982), which indicates that this is a significant reduction of influence of gender on job satisfaction when controlling for department climate, is significant ($z = 2.116, p < .05$). Together these indicate support for H3a for affective climate.

When simultaneously predicting intentions to quit from both affective department climate and gender ($F_{(1, 270)} = 51.73, p < .001$), the effect of gender is not significant (Beta = $-.04, p > .05$), the Sobel test is significant ($z = -2.114, p < .05$). This indicates support for H3b for affective department climate.

Testing the third step for the instrumental facet of department climate shows there is a significant relationship when simultaneously predicting job satisfaction from both instrumental department

Table IV
Hypothesis 3: Results of mediation analysis

	β	R	F
<i>Step 1: I.V. (Gender) related to outcomes</i>			
Job satisfaction		.125*	4.65*
Intention to quit		-.122*	4.54*
<i>Step 2: I.V. (Gender) related to mediators</i>			
Affective facets of department climate		.16*	7.09**
Instrumental facets of department climate		.13*	4.46*
Cognitive facets of department climate		.12	1.94
<i>Step 3: IV (Gender) is not significantly associated with outcomes while controlling for mediator</i>			
Job satisfaction			
Gender	.03		
Affective department climate	.58***		
			71.82***
Gender	.03		
Instrumental department climate	.61***		
			78.14***
Intention to quit			
Gender	-.04		
Affective department climate	-.52***		
			51.73***
Gender	-.06		
Instrumental department climate	-.47***		
			39.88***

N = 308.

* $p < .05$; ** $p < .01$; *** $p < .001$.

climate and gender (IV) ($F_{(1, 255)} = 78.14$, $p < .001$). Also the effect of gender is not significant (Beta = .03, $p > .05$). The Sobel test is significant ($z = 2.081$, $p < .05$). Together these indicate support for H3a for instrumental climate. Likewise there is a significant relationship when simultaneously predicting intentions to quit from both instrumental department climate and gender ($F_{(1, 271)} = 39.88$, $p < .001$) and the effect of gender is not significant (Beta = -.06, $p > .05$). The Sobel test is significant ($z = -2.043$, $p = .041$). Together these indicate additional support for H3b for instrumental climate. Altogether these show complete mediation occurring such that both affective and instrumental department climate mediate the relationship between gender and both job satisfaction and intention to quit.

4. Discussion

This study clearly shows the importance of department climate and its effect on work outcomes—job satisfaction and intention to quit.

There is a strong direct effect of department climate on outcomes suggesting that department climate is an important factor for universities to consider when attempting to improve faculty job satisfaction and intentions to quit. The second important finding of this study is that while gender influences job satisfaction and intention to quit (female faculty members report significantly lower levels of job satisfaction and higher intentions to quit), this relationship is completely mediated by department climate. This indicates that female faculty members are not inherently unsatisfied or unhappy with their jobs, but rather that it is likely that they value department climate, such that when they experience negative department climates they are more likely to experience lower job satisfaction and consider going elsewhere. This is consistent with Cross and Madsen's (1997) review of gender research that finds that women are more likely than men to desire relationships and connectedness with others. Extrapolating from this, the evidence suggests that female faculty members may be more aware of and place more value on the

quality of interactions that take place within departments.

Together these findings suggest an even stronger imperative for universities to focus on improving department climates if universities wish to retain female faculty in underrepresented fields such as science and engineering. The results also imply that universities could benefit from assessing the climates of their departments and determining where department interventions would be useful. Improving department climates may improve the retention of their faculty, reduce the expense of searches and investments in new start up packages and, if faculty members are more satisfied with their jobs, may improve recruitment of students. While recognizing that universities do not necessarily wish to retain all of their faculty, it is also important to remember that the most productive faculty are typically the ones that have the easiest time finding new positions should they determine that their current department climate is undesirable.

These findings have important implications for increasing the numbers of young women studying science and engineering. If faculty women, the potential role models of women students, are dissatisfied with their jobs and thinking of leaving, it is much less likely they will be a positive influence on the next generations of young female scholars.

The results of this study did not support the prediction that the cognitive facet of department climate would be related to job satisfaction and intention to quit. While cognitive climate has been found to be significant in studies of other types of organizations (Carr *et al.*, 2003), it appears to have a restricted range among faculty members who reported high levels of each cognitive climate component: autonomy; work meaning; and competence. These levels are consistently high and do not vary by gender.

This study is limited by the collection of a majority of the data from one survey which may create method bias and inflate the relationships between constructs. However gender, a key variable was verified independently of the survey. This study also may be limited by collecting data from a survey that was confidential but not anonymous. This might result in respondents providing more positive answers. However, there were still significant variations in the results by department. The college deans independently verified that those

departments that reported the poorest department climates were also the departments that reported the most faculty complaints to the dean's office. In this study we measured intentions to quit which is typically predictive of turnover. However, future research will ideally test to see if department climate mediates the relationship between gender and subsequent turnover.

In conclusion, maintaining positive department climates appears to be an important factor in work outcomes—job satisfaction and intention to quit among faculty, but is an even more important factor for female faculty members. This suggests many potentially fruitful avenues of further research. It would be valuable to understand more about the various factors that influence department climate. For example, some possible factors include: the knowledge, skills and abilities of department chairs or heads; the use or abuse of knowledge and power by senior faculty; the aftermath of combining two departments into one; the amount and quality of interaction that occurs between departments members; and the frequency and tone of department meetings. All of these could be investigated as potential factors that may influence department climate. Also future investigations of the efficacy of various types of department interventions, designed to improve department climate, could prove fruitful for providing specific guidance to universities about how to improve their departments with the poorest climates.

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