

Recruiting Women in IT: A Conjoint-Analysis Approach

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Abstract

The war for talent in the fields of information systems (IS) and information technology (IT) has intensified over the last years. Especially the attraction of skilled women to compensate for higher demands and to bring in different perspectives and diverse expertise has become a challenging task for organizations. So far, literature suggested promoting special female programs and a balanced work-family culture to attract more women to IT omitting that women may also seek general career characteristics such as salary and benefits, career advancement and promotion opportunities, and challenging tasks. By using an experimental conjoint design with 101 female and 115 male IT-professionals, we simultaneously tested and compared the effects of these factors on the intention to apply for an IT-related position. The results suggest that both female and male IT-professionals value work-family balance as the most important characteristic followed by general career characteristics while mentoring programs for women appeared as least important.

1. Introduction

Information technology is expected to be the essential driver of competitiveness, innovation, and productivity [10, 74]. According to the U.S. Bureau of Labor Statistics, occupations in computer and information technology are expected to grow by 12 percent from 2014 to 2024 adding about 488,500 jobs, “faster than the average for all occupations” [7]. Consequently, organizations and politics have reinforced their investments in attracting IT students and professionals. In addition, interests in hiring and retaining potential employees have received considerable attention in recruitment literature [9, 17, 62] and from researchers in other scientific fields such as information systems and psychology [18, 34].

The general gap of qualified IT-workers in North America and Europe could partially be filled by attracting women to IT jobs [53, 74]. Country-level data such as from the U.S. (24 percent), Sweden (22

percent), Canada (22 percent), the United Kingdom (18 percent), and Germany (15 percent) [12, 21] consistently shows that women are vastly underrepresented in IT-jobs. In comparison, women make up to at least 50 percent of the labor force in each of these countries [12, 21]. Attracting women to these jobs may not only help to fill the gap but also bring in different perspectives that could refine software as well as hardware concepts [49]. This is particularly important as companies often fail to address women’s needs and challenges in designing and advertising products and services despite women accounting for a significant amount of users and customers (e.g. 42% of active game players are women [25]) [40, 49].

Recent recruitment research on how to attract more women to IT has stated that women-oriented career characteristics such as mentoring programs for women [56] and work-family balance [28] may inspire women to apply for IT-jobs. Yet, women are also often disadvantaged in general career characteristics such as salary and benefits [39], career advancement and promotion opportunities, and challenging tasks [33], which may render these characteristics as particularly desirable. Most prior studies, so far, were focused on only one of these characteristics failing to compare the importance of career characteristics [24, 27, 28]. Applicants, however, evaluate several career characteristics simultaneously in applying for a position [45], making it crucial to understand which characteristic ultimately drives attraction of IT jobs. Thus, there is an urgent need to investigate these characteristics in combination regarding their effects on intention to apply for an IT-related position [11, 15].

We address this need for research by applying experimental conjoint analysis, an analytical technique adapted from marketing and herein used to measure the relative importance of particular career characteristics [9]. Thereby, we contribute to recruitment research in information technology in two ways. First, we advance research on applicant attraction by simultaneously examining and comparing the effects of women-oriented as well general career characteristics [9]. Second, by scrutinizing gender effects in attraction to IT jobs we also contribute to research on gender and

IS/IT [48, 72] by challenging if women indeed react differently on career characteristics than men.

We will draw practical conclusions for human resource management in IT by suggesting which content is most important in advertising IT jobs to increase the attraction of IT jobs for female applicants.

2. Theory and research questions

2.1. Signaling Theory

In recruitment literature, signaling theory is of pivotal importance [8, 9]. Within this concept, a potential applicant (receiver) assesses provided information (signals) in evaluating job advertisements of organizations (signaler).

Signaling theory further suggests that applicants exploit the information that is provided at the initial stage of the recruitment process to screen out specific alternatives [71]. Hence, organizations aim to send out advantageous signals about characteristics that heighten applicant attraction [7, 31, 73].

Women and men, however, may be attracted by different career-related signals or, at least, weight them differently [19, 32]. Thus, the signals provided by women-oriented and general career characteristics such as mentoring programs for women, work-family culture, salary and benefits, career advancement and promotion opportunities, and challenging tasks may have different weights in attracting female and male IT-professionals [2, 34, 60].

2.2. Mentoring programs for women

Mentoring refers to sponsoring, coaching, protection, confirmation, visibility, and role modeling by an experienced mentor to provide career and psychological support to a mentee [4, 44]. Considering the critical influence of mentoring on career development [4], organizations often encourage their employees to engage in mentoring relationships. In this vein, mentoring programs have become a standard management tool to facilitate individual success [4].

Regarding women in IT, several authors have stated that specific mentoring programs for women may be necessary to provide adequate support for female employees [2, 22, 49]. They have argued that given a male-dominated, competitive, and self-absorbed environment in IT, women may have difficulties to find adequate mentors providing them with role modeling [49]. Further, women often self-select themselves or are allocated into caretaking positions [47] which, in turn, compromises women's career opportunities [5]. Moreover, as women have been

found to rely more on personal relationships for career development than men [65], special mentoring programs for women may increase women's career opportunities in IT [69]. Considering their proposed positive outcomes, women may be attracted to IT organizations that provide women specific mentoring programs.

Whereas mentoring programs for women are generally seen as being beneficial for the attraction of female applicants, the signaling effect on potential male applicants appears to be unknown. On the one hand, women-oriented mentoring programs may trigger in-group behavior [16] leading men to avoid organizations for signaling special treatments for women. On the other hand, men may support the effort of bringing in more women to IT as they see the positive effects of diversity in the workforce [63].

2.3. Work-family culture

Work-family culture is defined as an organization's values, beliefs, and support regarding the integration of employees' family lives and work responsibilities [67]. More specific, work-family culture refers to organizational time demands and attitudes such as long working hours [57], negative consequences for prioritizing family over work [58], and sensitivity for family-related responsibilities [66].

The IT environment is associated with long work hours, late nights, and on-call services including travel [3]. Thus, working in IT was found to elicit conflicts between work demands and family responsibilities [2]. In contrast, women are assumed to and have shown to be focused on family and children [2]. Especially at earlier career stages, female professionals are confronted with managing their careers and family lives [2]. Consequently, working in IT may imply a double bind for women either sacrificing their future careers by starting a family or neglecting their responsibilities to their families by aiming for a professional career [49]. Thus, communicate a family friendly culture may help to attract women to IT.

Recent research has shown that men, similar to women, are concerned with work-family balance in IT [3]. As dual-career marriages are becoming more common [59], men may also value family friendly organizational structures in IT companies. Signaling a well-balanced work-family culture may thus also attract male applicants in IT [45].

2.4. Salary and benefits

Financial rewards usually refer to an overall earning package for employees including base salary,

bonus payments, and additional benefits such as stock options [51].

With regard to attracting women to IT, scholars have argued that women on average receive less salary and benefits than their male colleagues [2]. According to Panteli et al. [55], career breaks and part-time work due to family responsibilities may be main drivers for this gap. Yet, research also indicates that the gender pay gap is rarely warranted by performance differences [39]. Thus, signaling a focus on financial rewards may attract women to apply for an IT-position.

In addition to earning more than their female colleagues, men in IT are also assumed to be more concerned with payment aspects as they generally see themselves as breadwinners [45, 55]. Hence, male IT professionals may likewise be attracted by financial rewards.

2.5. Career advancement and promotion opportunities

Career advancement and promotion opportunities can be described as the extent of developmental opportunities to gain responsibility and strengthen personal skills [43]. Training, encouragement for advancement, and continuing education, amongst other determinants, have been found to be essential for career advancements in organizations [29].

Similar to salary and benefits, professional women in IT were found to receive less career advancement and promotion opportunities than men [2]. Again, a male-dominated environment and lack of role models may hinder women from receiving opportunities for advancement and promotion in IT [2, 38]. Signaling opportunities for career advancement and promotion may therefore also attract women to IT jobs.

This phenomenon is not applicable to men, as they are frequently encouraged to improve their IT-skills and were also found to receive more promotions than women [37]. Nevertheless, career advancement and promotion opportunities are linked to future work assignments [68], career success, and rewards [52]. Thus, signaling high career advancement and promotion opportunities can be assumed to have a positive effect on job attraction for men.

2.6. Challenging tasks

Challenging job demands can serve as intrinsic motivators in organizational settings. For instance, forcing employees to make decisions and solve problematic tasks under uncertain circumstances, on-the-job challenges can stimulate performance and personal development [54].

Regarding women in IT, working on challenging tasks has been found to be “very important” in choosing a job [55]. Challenging tasks may be especially important for women as research shows that they are more often assigned to less challenging work assignments than men [42] which, in turn, can hurt their career development [20]. Therefore, signals of challenging tasks may increase job attractiveness for women.

In contrast, their male colleagues are expected to solve difficult jobs, which leads to them being staffed on more challenging tasks [33]. In any case, challenging tasks are the basis of intrinsic motivation [42]. Thus, men may value the signal of challenging tasks in applying for an IT-position as well.

2.7. Formulation of hypothesis and research questions

In sum, we found arguments that both women-oriented career characteristics, i.e., mentoring programs for women and work-family culture, and general career characteristics, i.e., salary and benefits, career advancement and promotion opportunities, and challenging tasks, can signal to women and men that an IT-position is attractive.

H1: 1) Mentoring programs for women, 2) work-family culture, 3) salary and benefits, 4) career advancement and promotion opportunities, and 5) challenging tasks have a positive influence on intention to apply for an IT-related position for women and men.

Yet, in line with women and men generally differing in their preferences for career characteristics [43], we also found different reasons why women-oriented and general career characteristics are important for women and men. Therefore, female and male IT-professionals may also differ in the extent to which these characteristics influence their intention to apply for an IT-related position.

RQ1: Are there gender differences in the extent to which 1) mentoring programs for women, 2) work-family culture, 3) salary and benefits, 4) career advancement and promotion opportunities, and 5) challenging tasks have a positive influence on intention to apply for an IT-related position?

Also resulting from the differences in reasoning why women-oriented and general career characteristics are important for women and men, arises the question about which characteristics are most important for women and men. Thus, even when all characteristics increase job attractiveness for both women and men, differing strengths of the effects may lead to a different ranking of the characteristics for women and men.

RQ2: Which are the most important career characteristics for women and men?

3. Method, sample, and measurement

Applying an experimental conjoint design, we asked participants to evaluate descriptions of job postings regarding their intention to apply for an unspecific IT-related position.

The participants were presented with vignettes to assess intention to apply for an IT-related position. By requiring participants to evaluate vignettes that depict a combination of characteristics, experimental conjoint design facilitates the understanding of causal relationships in providing a more realistic decision-making scenario and simultaneously enables to manipulate and control independent variables, thereby improving internal and external validity [1, 6].

The five characteristics 1) mentoring programs for women, 2) work-family culture, 3) salary and benefits, 4) career advancement and promotion opportunities, and 5) challenging tasks were manipulated on two levels each, as depicted in Table 1. An orthogonal design was applied to reduce the number of vignettes and, thereby, avoiding overload for participants. In this way, the initial 2*2*2*2*2 matrix was compressed to eight vignettes. To account for order effects, the vignettes were presented in random order.

Table 1. Levels of characteristics

Characteristic	Low Level	High Level
Mentoring for women	hardly available	broadly available
Work-family culture	very poor	very good
Salary and benefits	no focus on	focus on
Career advancement	very low	very high
Challenging tasks	very low	very high

Mentoring for women = Mentoring programs for women; Career advancement = Career advancement and promotion opportunities

3.1. Sample

Data was collected between December 2016 and January 2017 using an online survey. The sample consisted of 216 professionals currently working in or with experience in IT and IT-related jobs, including 101 women and 115 men of different origin. Most participants were German (37%), of another European origin (31%), or Asian (12%). Participants' age ranged from 23 to 61, with a mean of 38.71 ($SD = 9.24$). Most participants had a university degree with 58% having a master degree or similar equivalent and 21% having a bachelor degree or similar equivalent.

3.2. Induction and measurements

At the beginning of the conjoint experiment, participants were shown a brief description of each of the five characteristics. Within the vignettes, each characteristic was presented at one of two levels [45]. Vignettes were developed according to best practice examples [6]. A sample vignette is presented in Figure 1.

Following each job posting, participants were asked to rate their intention to apply for the position on an 11-point scale ranging from 0 to 100% [23]. Scale anchors were, 0% - *I would definitely not apply* and 100% - *I would definitely apply*. Within experimental vignette designs, one-item measures are frequently used to avoid overloading for the participants [6].

Participant sex was coded male (0) and female (1). We controlled for age since career preferences have been found to change within peoples' lifetime and, thus, affect participant attraction [43]. Applicant age was given in years.

In addition, we controlled for job satisfaction as satisfaction with current workplace situation has been found to influence employers' information processing regarding job postings [43]. We used the three-item measure from the Michigan Organizational Assessment Questionnaire [14] to assess global job satisfaction. Participants responded on a 7-point Likert scale ranging from (1) - *strongly disagree* to (7) - *strongly agree*. Internal consistency reliability for this measure was .77.

3.3. Analytical strategy

The orthogonal design of our conjoint experiment resulted with eight ratings from 216 participants in 1.728 total observations. Because the data were nested within individuals, we applied a random effects regression model [61, 64]. Standardized regression coefficients were compared by calculating 95% confidence intervals for each coefficient. They are expected to be significantly different when they do not lie within each other's confidence intervals [41]. When controlling for age and job satisfaction, data were analyzed using a subsample of 1.664 observations as eight participants did not indicate their age.

4. Results

Descriptive characteristics and correlations for between-person differences are presented in Table 2.

Organization A is focused on the following characteristics promoting an IT-related position.

Criteria	Characteristic
Salary and benefits	No focus
Mentoring programs for women	Broadly available
Career advancement and promotion opportunities	Fully given
Challenge	Very low
Work-family culture	Very good

Figure 1. Sample Vignette

We first investigated H1 according to which we expected positive effects on intention to apply for an IT-related position for all five characteristics. The analysis revealed positive and significant coefficients for women and men regarding all five characteristics, as depicted in Table 3. Thus, H1 was supported for all characteristics for women and men.

Next, we examined RQ1, which asked for differences between women and men in the positive effects of the five characteristics on intention to apply for an IT-related position. Results are depicted in Table 4. Controlling for age and job satisfaction, moderation analyses revealed no significant influence of sex on the positive relation between any of the five career characteristics and intention to apply for an IT-related position.

Finally, we examined RQ2 asking which characteristics were most important for women and men. For women, results revealed the following rank-order: 1) work-family culture, 2) career advancement, 3) challenging tasks, 4) salary and benefits, and 5) mentoring for women. The effect of work-family culture was significantly stronger than the effects of challenging tasks, salary and benefits, and mentoring for women, while the effect of mentoring for women was significantly smaller than all other effects. No significant differences resulted between effects of career advancement, challenging tasks, and salary and benefits. For men, the rank-order resulted to be: 1)

work-family culture, 2) salary and benefits, 3) challenging tasks, 4) career advancement, and 5) mentoring for women. The effect of work-family culture was significantly stronger than the effects of challenging tasks, career advancement, and mentoring for women, while the effect of mentoring for women was significantly smaller than all other effects. The effect of salary and benefits was also significantly larger than the effects of challenging tasks and career advancement

5. Discussion

The overall results of our study suggest that female and male IT-professionals are more similar than different in their perception of favorable career characteristics in applying for an IT-position.

All job characteristics had a positive effect on intention to apply for an IT-related position for women and men. In addition, results did not indicate differences in the positive effects for the five career characteristics between women and men. This is noteworthy, as mentoring programs for women are especially designed for increasing the attraction of women, but not for men [49]. Further, for women and men, work-family culture was most important and mentoring programs for women was least important with the general job characteristics landing in between.

Table 2. Correlation matrix

	<i>M</i>	<i>SD</i>	<i>MIN</i>	<i>MAX</i>	1.	2.	3.	4.	5.
1. Sex	0.47	0.50	-	-	-				
2. Age	38.71	9.24	23.00	61.00	-.27***	-			
3. Degree	3.58	0.88	1.00	6.00	.06	.02	-		
4. Job satisfaction	5.71	1.14	2.00	7.00	.06**	-.04	-.04	(0.77)	
5. Intention to apply	4.65	3.12	1.00	11.00	.02	-.05	.06*	-.03	-

N = 1,728 (216 participants); levels of significance for correlations between variables 1–4 are based on number of participants (216), levels of significance for correlations with variable 5 are based on number of ratings (1,728); sex was coded with 0 = male and 1 = female; degree was coded with 1 = Secondary school, 2 = High school, 3 = Bachelor, 4 = Master/Diploma (and similar), 5 = PhD, 6 = Professorship; Cronbach's alpha on the diagonal in parentheses; **p* < .05, ***p* < .01, ****p* < .001

Table 3. Comparison of job characteristics

	Total			Women			Men		
	β	95 % <i>LLCI</i>	95% <i>ULCI</i>	β	95 % <i>LLCI</i>	95% <i>ULCI</i>	β	95 % <i>LLCI</i>	95% <i>ULCI</i>
Work-family culture	0.367***	0.336	0.398	0.366***	0.321	0.410	0.368***	0.326	0.410
Salary and benefits	0.313***	0.282	0.343	0.293***	0.249	0.338	0.330***	0.288	0.372
Challenging tasks	0.291***	0.260	0.322	0.302***	0.258	0.347	0.281***	0.239	0.323
Career advancement	0.291***	0.260	0.321	0.326***	0.281	0.370	0.259***	0.218	0.301
Mentoring for women	0.195***	0.165	0.226	0.220***	0.175	0.264	0.173***	0.131	0.215
R^2	0.440			0.465			0.421		

$N = 1,728$ (216 participants); *LLCI* = lower limit confidence interval, *ULCI* = upper limit confidence interval; Mentoring for women = Mentoring programs for women; Career advancement = Career advancement and promotion opportunities; * $p < .05$, ** $p < .01$, *** $p < .001$

Only slight gender differences resulted in the ranking of the general job characteristics. While for women, career advancement and promotion opportunities followed work-family culture with these effects not being significantly different, for men work-family culture was followed by salary and benefits with these effects neither being significantly different.

These results rather support the gender similarities hypothesis [36] which states that women and men are more alike, but not different, on most psychological variables [35] and especially on preferences for job characteristic [43]. Also explaining similar career preferences, women and men in IT could internalize a set of similar norms and values because of identification and commitment with their profession [43]. Rated highest by women and men, the overall importance of work-family culture further indicates a possible break-up of traditional gender roles in the context of IT professions [48].

5.1. Theoretical contribution

With these results, we contribute to existing literature in the following ways. We add to research on career determinants in IT [18] by providing empirical evidence on the positive signals of work-family culture, salary and benefits, career advancement and promotion opportunities, challenging tasks, and mentoring programs for women.

Further, our results contribute to gender and IS/IT research in suggesting that men and women in IT are more similar in their perceptions of favorable career characteristics than hitherto expected [48]. Literature has argued that women in IT face different career-related barriers [2], increasing the need for organizations to signal women-oriented career characteristics to be attractive for female applicants

[49]. Within our sample, however, applicant sex had no influence on the relation between any of the career characteristics and intention to apply for an IT-related position, indicating that women in IT prefer similar career characteristics as their male colleagues.

Identifying work-family culture as the most important characteristic for both, women and men, our research emphasizes the importance of a balance between work responsibilities and family time in IT-professionals' career motivations [38, 60]. Although previous research already showed the importance of family-supportive cultures on female IT-professionals [48], our findings indicate that work-family culture is not only the most important career characteristic for women but also for men. These indications highlight the notion that work-family culture must be seen as a general rather than a women-oriented career characteristic [33]. This, in turn, indicates that the classical understanding of men being more career-oriented and less family-oriented than women may be outdated [33].

Comparing the importance of mentoring programs for women with other career-related characteristics, in research on recruiting and retaining women in IT [49], our study advances research on the assumption that mentoring programs for women may help to attract women to IT [27]. Although mentoring programs for women had a positive effect, it was smaller compared to all other characteristics, which puts corporate practice to advertise their jobs with women-oriented programs under question.

Finally, as mentoring programs for women also had a small yet positive influence on men's intention to apply, we contribute to literature on diversity in IT by suggesting that men indeed value interventions to increase workforce diversity [63].

Table 4. Regression predicting intention to apply for IT-position

Variable	Model 1	Model 2
Work-family culture	0.368***	0.368***
Salary and benefits	0.310***	0.310***
Challenging tasks	0.296***	0.296***
Career advancement	0.292***	0.292***
Mentoring for women	0.193***	0.193***
Age	-0.047	-0.046
Job satisfaction	-0.028	-0.028
Sex		0.006
Work-family culture × Age	0.002	0.003
Salary and benefits × Age	-0.013	-0.019
Challenging tasks × Age	0.018	0.024
Career advancement × Age	-0.030	-0.024
Mentoring for women × Age	0.004	0.012
Work-family culture × Job sat.	0.015	0.014
Salary and benefits × Job sat.	0.033*	0.035*
Challenging tasks × Job sat.	0.008	0.006
Career advancement × Job sat.	0.024	0.022
Mentoring for women × Job sat.	0.038*	0.036*
Work-family culture × Sex		0.003
Salary and benefits × Sex		-0.024
Challenging tasks × Sex		0.022
Career advancement × Sex		0.024
Mentoring for women × Sex		0.029
R ²	0.445	0.449

$N_{Model\ 1/2/3} = 1,664$ (208 participants); table shows standardized coefficients; sex was coded with 0 = male and 1 = female; Mentoring for women = Mentoring programs for women; Career advancement = Career advancement and promotion opportunities; Job sat. = Job satisfaction; * $p < .05$, ** $p < .01$, *** $p < .001$

5.2. Limitations and future research

Despite applying an experimental conjoint approach the current study has some limitations, which should be addressed by future research. First, the intention to apply for an IT-related position was hypothetical and based on signals about job characteristics in simplified job postings. Yet, and despite the use of self-reporting and social biases

resulting from signaling career characteristics, research has shown that conjoint results are consistent with real-life settings [50]. Further, supporting the use of signaling theory even in real-life settings potential applicants may have limited information in applying for a position [70]. Nevertheless, future research should examine the job characteristics in actually experienced decisions to apply for a job.

Second, due to reasons of practicability and potential overload, we limited our list to five job characteristics that were directly linked to attraction of women in IT. The positive effect of all five characteristics on intention to apply generally emphasizes their importance regarding the attraction of IT-professionals. Nevertheless, potential applicants may also be attracted by additional job or organizational characteristics such as work climate, job security, and social interaction as these aspects have been found to influence applicant attraction of IT-students [45]. Further, a more fine-grained view detailing, for example, human resource management approaches to work-family culture such as promoting different levels of flextime and flexplace [48, 67] may provide a deeper understanding on recruiting and retaining IT professionals. Future research in the form of qualitative approaches may include these additional workplace factors and human management approaches to determine applicant attraction and women and men's career advancement in IT.

Third, questions on the generalizability of our results may be raised due to research having shown that geographical differences influence job characteristic preferences of respondents [13]. Although our sample included participants from different origins future examinations may address if, for example, cultural values such as power distance [26] or socio-economic factors such as income-levels [9] may influence the signaling effect of career characteristics. Additionally, individual differences other than gender may influence the attractiveness of IT jobs. Future studies may examine if, for example, employees with strong preferences towards regular working hours and a balanced work-life culture [30] may value work-family culture even more or general career characteristics less.

Fourth, investigating professionals with an IT-related background our findings may be different for respondents in particular IT jobs such as data scientist or software developers or on different career stages such as IT students. More specific studies in this field are needed to examine potential differences between the various IT jobs. Moreover, signaling career-related characteristics may also be important for applicant attraction in other professions aside from IT. For example, technical and male-dominated environments

such as engineering have been found to have difficulties in attracting women [10]. Thus, researchers may also apply our approach to identify important drivers for applicant attraction in other professions.

5.3. Implications for organizations

The results of this study provide important insights for the recruitment and attraction of female and male IT-professionals. First, organizations should place a particular emphasis on a family friendly culture to attract both, women and men. This is even more crucial, as working in IT has been assumed to elicit work-family conflicts [3]. Second, organizations should highlight career-related characteristics in their human resource activities with career advancement and promotion opportunities being particularly important for women. Third, although mentoring for women is not the primary factor for the attraction of female applicants, IT-companies should not fear to promote special female programs as women and men may consider such programs as beneficial.

Signaling favorable career characteristics, however, is only successful if carefully integrated into an organization's overall recruitment and communication strategy [46]. Consequently, our results may encourage organizations to establish targeted strategies for the attraction and retention of female and male IT professionals.

6. References

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