Trinity Women's Review

Factors Affecting the Attrition Rate of Women in Computing-Related Occupations.

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Abstract

This essay examines the factors which contribute to the rate of decline of women in technology roles; the women who have entered this field and subsequently leave. Many initiatives focus their energies on attracting women into the IT sector and rightly so. However, if talent is getting lost along the way amongst women who do enter the Tech field, it needs to be acknowledged and addressed. This essay seeks to highlight factors that have been identified in the research as possible causes and their potential solutions. It examines workplace culture and gendered spaces in computing-related disciplines.

Introduction

The lack of women in STEM fields is a long remarked upon phenomenon in literature, with IT work allocated as a typically male occupation in the public imagination. This recognition of the homogeneity of those involved in these fields is reflected in the efforts and initiatives that have been undertaken to diversify the workforce and student body in technological areas such as computing. These initiatives have been aimed at increasing the number the number of female workers entering the workforce, with

a view to increase the numbers along the 'pipeline' as a result. This is seen in the focus on the uptake of STEM subjects in schools and universities. However, there is another set of problems to deal with. The issue is not only that numbers of women are low entering ICT fields; there is also the issue of them leaving once they get there. The relevance of this research concerns a 'critical mass' viewpoint. I am referring here to the goal to enable women to reach critical mass in the technology sector, with the aim of reaching gender parity in numbers, and the belief that this very state of being will naturally eradicate the many issues faced by a male dominated tech industry. This is the utopia that is envisaged. Throughout this paper I have identified the research about the attrition of women in ICT employment, establishing it as a legitimate phenomenon worthy of closer inspection.

Research Review

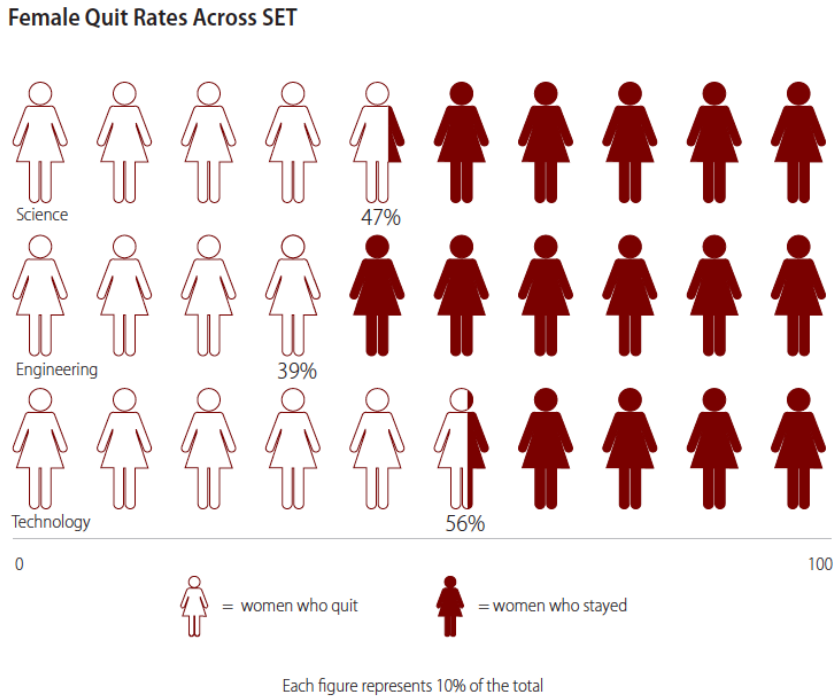
Attrition

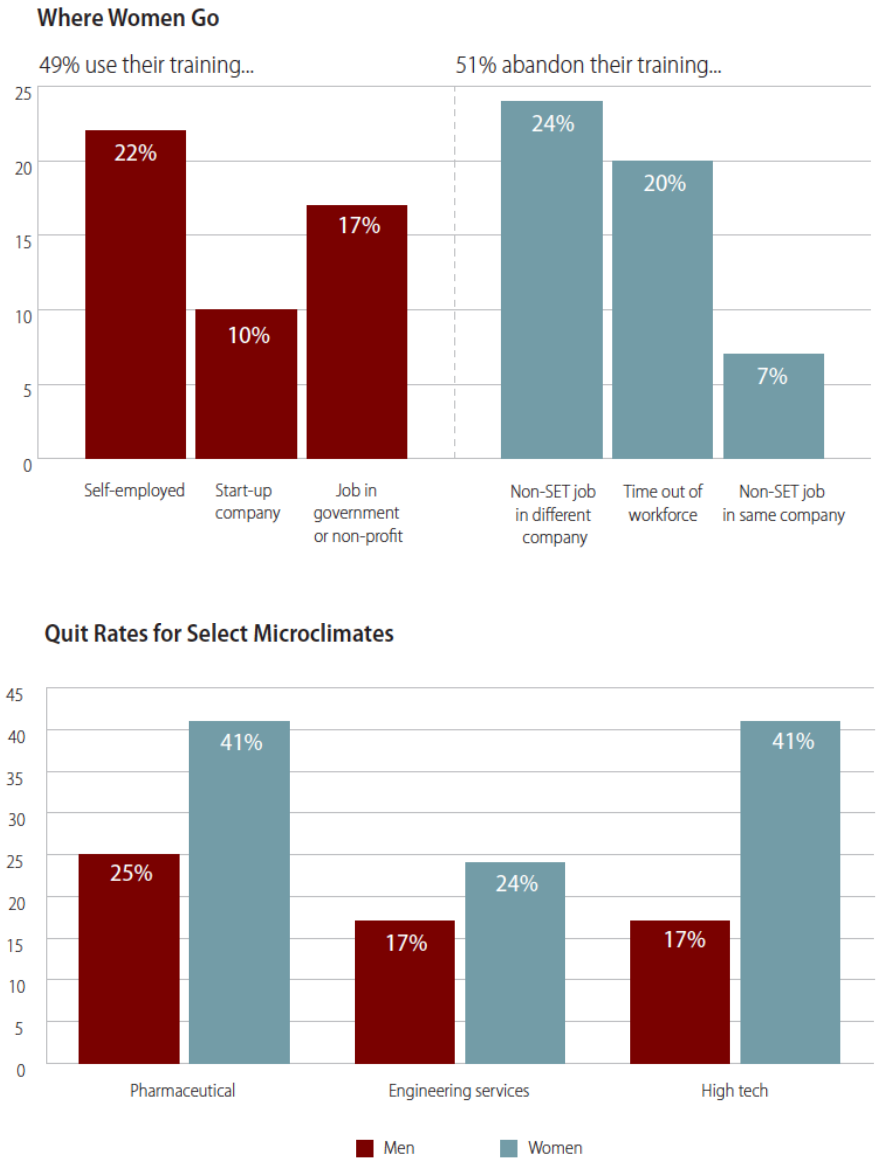
In the literature, there is recognition of a pattern of attrition from women in the IT sphere. In the UK, Etzkowitz & Ranga (2011) highlight the amount of women leaving ICT. The result of this is a decrease in women's participation in the sector, which dropped from 27% of women to 21% in 2004. They hold that women are leaving the UK ICT sector in disproportionate numbers but there is very little research being conducted in that area. Their study involved qualitative interviews with 9 individuals who fit what they call the 'Disappearing woman' model – women who left the IT sector – and examined the reasons that emerged. The authors discuss the relevance of these findings for future policy.

Adam et.al. (2006) point to the problem in attracting women into the ICT sector and also in their retention. Platman and Taylor (2004) identify a drop in the UK ICT workforce from 100,892 women in 1999, to 53,759 by 2003. As noted by Singh et all (2013), 40% of women leave STEM fields within the first 7 years of getting

a job. In 2006, NSF reported that only 27% of bachelor's degrees in computer science were awarded to women, and in occupations that centered around computing, there was a 2% decline in the number of women in these jobs (Leroy & Tolle, 2008). Glass et al. (2013) examined departure from STEM occupations over time. Their findings indicated that women were more likely to leave their field in STEM related-occupations than women in other fields. They attributed this to a possible issue with working conditions and 'chilly' climate, which I will explore later in this paper. In highlighting statistics from both the Information Technology Association of America and the National Center for Women & Information Technology, Soe & Yakura show a fall in percentage of women from 41% in 1996 to 26% in 2006 for professional IT occupations (2008).

In 2008, Hewlett et al., produced a report on the 'brain drain' of women from STEM fields. Their results were illuminating, showing that over time, over half (52%) of women in private sector SET roles leave, with the highest proportion of female attrition found to be in the technology sector. (Hewlett, et al., 2008)





(Graphs from Hewlett et al., 2008)

Thus, it has been established that attrition of women in Computing related disciplines is indeed occurring. What remains to be done is to examine the factors which may contribute to this phenomenon.

Factors Contributing to Attrition

Field Status Paradox

Much of the narrative around women in technology centres around their unsuitability and the lack of inclusivity they face. The very idea that "women don't belong" is an interesting one and is often used to discredit and even silence women in technological spaces. What is most interesting about this is that women were among the first programmers- in fact, it was initially a predominantly female occupation. Here I will look into the shift of this occupation into the male arena and the circumstances around this cultural shift.

Saxa et al. (2017) highlight the journey of computer programming from a female occupation to a predominantly male pursuit. They maintain, along with Ensmenger (2012) that in the 1970s and 1980s programming was thought of as low-status clerical work, thus suitable for women, rather than a field with any scientific merit. As computing became legitimised as a science, it became more gendered. As demand for programmers increased, in line with establishing computing as a scientific occupation, it moved from promoting a more female-centric skillset, to a masculine one, aligning itself with engineering. At the same time computing and the introduction of personal computers was coded as gendered male by tech companies and the media (Sax, et al., 2017) (Henn, 2014). The emergence of nerd culture contributed to the propagation of computing as a male activity in the popular imagination – the release of the film "Revenge of the Nerds" is cited by many as a catalyst in aligning male programming with the geek stereotype (Henn, 2014) (Sax et al., 2017).

The field status paradox can be described as follows: when the status of a field is low, it is generally accepted as women's work. As the field gains stature, it becomes coded as male and so there develops a narrative where women are unsuitable for various reasons. Etzkowitz & Ranga (2011) discuss this, pointing out that in the opposite direction of status, the paradox is also true – when status

of a certain occupation falls, and the pay scale with it, it becomes more acceptable for women to hold these positions, and there is suddenly room for them. "Either way women lose" (2011). They put forward that the field-status paradox is a key reason why so few women occupy high status, well-paid positions in STEM. This theory is echoed by Griffiths & Moore (2010) who remark on the vertical gendered segregation observed even within the ICT sector, highlighting that women are more present in low level, low status and low paying ICT jobs than in higher status positions (2010, p. 97).

Leaky Pipeline

The "Leaky Pipeline" metaphor is often mentioned by researchers as a contributing factor the lack of women in IT. It identifies stages on a career trajectory where women "leak" from the pipeline; for example, at college-level, or at employment level which is where my research will focus. Proponents of this metaphor in the course of the research include Jacobs & Simpkins (2005); Watt, Eccles, & Durik (2006); White (2004); Soe & Yakura, (2008)

There have been critiques of this metaphor, with those arguing that it is overly simplistic, failing to take into account the various systemic layers and changing labour market climate that have an effect on the exit of women. Soe and Yakura (2008) are such critics, they put forward an alternative to the pipeline metaphor, focusing instead on the cultural layers within an organisation, advocating for systemic change.

Soe & Yakura's theory (2008) encapsulates the cultural layers of an organisation – where to achieve true change the existence of these interdependencies need to be appreciated, a single change will not easily take place in one "layer", as the assumptions embedded in other layers will move to oppose it. The social system in a workplace is created and enforced by such details, it is this social system that dictates who stays and who leaves, voluntarily or not. To claim an individual left "voluntarily" from an organisation is to fail to examine the causative factors in any case. The surrounding

culture needs to be acknowledged as a factor in the retention of female talent in the technological sector. Soe & Yakura promote the achievement of critical mass of women in the sector as part of the solution, with their claim that this will disrupt the layers of culture sufficiently to imbue true change.

Others, such as Etzkowitz & Ranga (2011) argue the limitations of the "leaky pipeline" metaphor in measuring the exit of women from IT, pointing to the reinsertion of women successfully in an alternative context such as that at the intersection of business and technology is often left out by the leaky pipeline analysis. They coin their own metaphor to reflect this, that of the "Vanish Box".

Blockages and Barriers

Workplace Culture

The culture of the workplace is often cited as a determinate in women leaving a work setting (Greenhalgh-Spencer, 2017) (Draus, et al., 2014) (Wentling & Thomas, 2009).

Greenhalgh-Spencer takes a look at the language that proliferates in the computing workplace where "There is a culture at play that makes women feel like outsiders." (2017, p. 35). The culture in place is facilitated through discourse – "the terms, language, expectations and performances that abound", a discourse which, as Greenhalgh Spencer argues, serves to undermine and overlook women, and facilitate their "disappearance" from technological fields (2017). Research conducted by Teague reported a dissatisfaction by women working in computing with the overwhelmingly male-environment they worked in and the dearth of female colleagues (2002). The "toxic environment" of the tech industry (Gardner, 2012, p. 71) is certainly a phenomenon that needs to be taken into account when examining reasons for women's attrition in this space. The cultural narrative emerging from the tech industry itself can act as a deterrent to women joining and thus perpetuate the underrepresentation of women within an organisation. If a person cannot visualize themselves as "fitting" a

culture, it is difficult to imagine they will choose to put themselves in a situation where they are immersed in it. “The perception that various elements (gaming software, hacker fraternities, IT education, and IT promotion policies) of IT culture are male-oriented adds to the perception that IT organizational contexts are unfriendly towards women.” (Soe & Yakura, 2008, p. 186)

Chilly Workplace

The “Chilly” workplace is a phenomenon discussed widely in the context of women leaving technological spaces (Faulkner, 2004) (Soe & Yakura, 2008).This is a cumulative experience of various discriminatory practices and negative experiences in the workspace that contribute to the production of a generally unpleasant, unwelcoming space for women to work in. Rasmussen & Håpnes (1998) point out an element of this is the rewarding of technological skills over social skills, which women are expected to be naturally good at and so are not rewarded. The emphasis on individual achievement over teamwork is cited by Himanen (2001) as a causative factor. Gendered attitudes towards assertiveness is also pointed to, where women are view as “bitchy” when they behave assertively, whereas men face no such backlash in the workplace (Gherardi, 1995) (Katila & Merilainen, 2002). Of course, the very fact of being the lone female in a team or section can reinforce the feeling that many women get of being unwelcome, this is discussed by Cukier et al. (2002), and by Soe & Yakura (2008) who argue that simply being in a gender minority can cause significant discomfort. The very idea of a chilly climate was attributed to this effect by Sandler and Hall (1982) as they applied it to a classroom setting where students were learning STEM subjects. Soe & Yakura (2008) argue that the discourse in male-dominated technological spaces contributes to creating a “female-unfriendly space”, the language and performance used serve to cast women as outsiders.

Stereotype Threat

Stereotype threat is the term conceived by Claude Steele and Joshua Aronson. It relates to the threat experienced when a person is a member of a negatively stereotyped group where their individual performance (on a standardised test in the case of Steele and Aronson) can be used to reinforce that negative perception about their group (Steele & Aronson, 1995). Additional research has been done in relation to the gendered experience in the classroom where the climate of the environment may instigate gender stereotypes about "natural" gender pursuits, where men and women are more or less gifted in pre-defined arenas (Good, et al., 2007) (McGlone & Pfeister, 2007) (Spencer, et al., 1999).

If we apply this to women in computing setting, we can extrapolate that a woman may experience stereotype threat in the sense that women are, for example, typically believed to not be good at programming, and this pressure might then induce an inferior performance than if the women did not feel like she was representing her whole gender group. Indeed, this is suggested as a factor in the attrition rate of women from gender-atypical fields by Good et al. (2012).

The Women Who Leave

In their 2010 research work, Griffiths & Moore examine phenomenon of 'disappearing women' from the ICT sector, seeking out women who had left and gathering qualitative data via interviews. The reasons cited by Griffiths & Moore (2010) as contributory factors in these women's decision to leave their ICT profession included the following:

- Heavy workload and long hours
- Ostracizing and hostilities in the workplace
- 'Turning Points' in life
- Ageism
- Illness/Disability

- Dual roles – work/life balance
- A ‘Realisation’ they didn’t have to stay

Gender Diversity as a Solution

The research certainly points to the dearth of women in the ICT sector as a causative factor in women’s attrition. This leads to a scenario which perpetuates the problem – if women are leaving a sector where there are few women to start with, then the number of women will never reach critical mass and the issue persists. Initiatives to promote gender diversity have been carried out in organisations, and yet women are still low in numbers and attrition rates exist. This would point to a low level of effectiveness of efforts thus far. Danbold and Huo (2017) found that such initiatives can often have the opposite effect, causing male STEM workers to create an inhospitable atmosphere for female workers recruited as a result: Amoung those who believed it is legitimate for men to represent STEM, men's prototypicality threat mediated the relationship between perceptions that more women were entering their field and resistance toward this change (i.e., opposing women in STEM initiatives, wanting women to conform to the field's traditional norms, and expressing exclusionary intentions toward women peers). (2017, p. 57)

Danbold and Huo go on to link this behavior as a causative factor in women’s attrition from STEM, highlighting that the hostile work climate is often cited as an impetus for women leaving STEM sectors (Cheryan, et al., 2009), and that even ‘successful’ efforts at gender diversity in organisations “may threaten men's sense of ownership over the STEM identity, causing them to create even less hospitable climates for women successfully recruited into STEM” (Danbold & Huo, 2017, p. 65) They argue that in order to allow these schemes to work, male motivations to curtail female representation in these fields need to be considered.

Changing Attitudes

As I have highlighted throughout this paper, female attrition in male-dominated STEM fields, such as computing, is affected by the sense that women 'do not belong' due to their minority status. To challenge this view there have been suggestions for challenging such gendered assumptions at school level, paving the way for women in future technological fields (Greenhalgh-Spencer, 2017). Of course, making changes in education is a positive step – but what can be done to stem (pardon the pun) the flow of women out of computing right now? Online movements have emerged via platforms such as Twitter – the hashtag #1Reason Why, referring to the #1 reason why there is such a lack of women in software development, was closely followed by the #1Reasontostay hashtag in addition to the #1ReasonMentors hashtag, showing a real appetite for positive change in this space and a willingness to engage, alerting the community to places of work to avoid and alternatively those which are positive places of employment (Greenhalgh-Spencer, 2017).

Strategies for identifying and remedying attrition rates of women from male-dominated fields are important to combat sex segregation. Combatting the significant outflow of women from traditional male occupations is an essential part of doing so (Torre, 2014).

Structural Intervention

Soe and Yakura (2008) raise the concern that strategies such as increased recruitment and mentoring, although beneficial, may not fully address the issue. The women assigned as mentors may be affected by their need to fit in and may well perpetuate the norms of the dominant male culture along with the onus on women to adapt and socialise within it. Thus, to achieve true parity in a sex segregated arena such as computing, a cultural shift is needed. Soe and Yakura, among others, advocate for this as a crucial step. To achieve this, they advocate reaching critical mass of leaders (male or female) with a full understanding of the issues at hand.

Conclusion

A major theme emerging from the data on attrition was that the greatest risk time for women leaving the tech sector aligns with when they have additional responsibilities in their home and family lives, such as caring for children or elderly relatives. Due to the social position of women as overwhelmingly burdened with such responsibilities, one could argue that attrition across multiple sectors of full time employment is inevitable – why would the tech sector be any different? Due to the large proportion of women who bear the brunt of childcare, both modern day and historically, even women who choose not to do so often suffer from the effects of the stereotype. This could explain the lessened company investment in their 'comfort' due to their potential 'flight risk' status. Of course, due to improvements in the legal system, an employer cannot ask of a woman's plans to have a family. However, it certainly appears to impede women's progress. This is a cross-sector issue as opposed to a narrow concern of one industry, one that arguably will not be resolved without a societal overhaul of the gendered division of labour. The research highlighted here will give a good grounding for the further exploration of this subject matter. In the collection of my findings I have proven that the attrition of women from computing is a real phenomenon, I have identified causative factors and thus done away with the argument that the cause is unknowable or mysterious. We cannot claim ignorance as a defence for inaction.

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