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Women's Experiences on the Path to a Career in Game Development

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Abstract:

Like other science, technology, engineering and mathematics (STEM) fields, women are highly underrepresented in the workforce of the video game industry. The pipeline metaphor of blocked and leaky pipes is the dominant theoretical and methodological paradigm for tracking the representation of women in STEM fields as well as interventions aimed at increasing the numbers. Yet a growing body of literature points to flaws in this as the dominant approach; women face continued challenges in accessing STEM careers through traditional 'pipes' despite a fixation on removing blockages and patching holes. This paper argues that where the traditional pipeline is still not working for women in STEM, so too it will not work for women in games because the pipeline to game development jobs remains hostile to women. Specifically this paper applies the traditional science and technology pipeline model of early access/exposure and continued formal schooling to the field of game development. It first reviews and synthesizes literature about the representation of female characters in video games and the access to games of girls and women. It next adds new quantitative data and qualitative data (from the 2014 and 2015 International Game Developers Association Developer Satisfaction Surveys) about women's representation in formal schooling and the experiences of women game developers. Taken together the experiences of women at these points in the traditional pipeline present a model of exclusion. Specifically, the paper concludes that women face barriers to entry through the negative stereotyping of female characters in video game content and through socially constructed barriers to access in video game play. They face barriers to stay because increased credentialism and formalized schooling for game-related careers reproduces the systematic barriers and occupational segregation already identified in other STEM fields. As well, staying in the industry is a challenge to women due to the structural norms created by a project-management form of work organization and systemic discrimination. As such, the traditional pipeline to a career in game development does not suit many women. The paper closes with a discussion of the need for different pipes rather than patched pipes.

Keywords: video games; career pipeline, women, gender, STEM

Introduction

Considerable research has been conducted about career pipelines, specifically in regard to understanding the underrepresentation of women in male-dominated fields such as science, technology, engineering and mathematics. The underrepresentation of women in the video game industry is well known, but has received limited attention. This paper seeks to examine and critique women's experiences with the career pipeline of game development.

Initially it was posited that if more women were put into the developmental 'pipeline' for a career, more women would come out the other end (Schwietzer, Ng, Lyons and Kuron 2011). This occurs through the normative general career trajectory process depicted in Figure 1, where initial exposure leads to further reinforcement through formal schooling, which leads to successful early job experiences and a sustained career in a field. However, the lack of success in interventions geared to increase the number of women entering the pipe demonstrated a more complicated process and sparked research into what can be conceptualized as 'blocked pipes' and 'leaky pipes' (Bennett 2011; Lucena 2000; Vitores and Gil-Juárez 2015). A blocked pipeline conceptualizes the barriers to initial entry into the career path. It also captures the "sticky floor" and "glass ceiling" effects of vertical segregation within a workplace (Yap and Konrad, 2009). The sticky floor effect suggests that women are more likely to stay at lower levels of an occupational ladder and/or pay grade (i.e., they are stuck) and the glass ceiling effect refers to the struggle women have faced in achieving the highest levels of an occupational hierarchy. A blocked pipeline also includes occupational/horizontal segregation within a larger field where jobs are male or female-dominated and garner differential occupational and societal status (i.e., female nurse and male surgeon in the health care field). The leaky pipeline conceptualizes reasons, some related to the blockages, why a person would leave a career path once they have begun. This can include not pursuing higher education in the field, not beginning a career in the field after achieving a credential, or leaving the field.

The pipeline metaphor has also received sustained critique due to its influence on how we view the 'problem' of, and articulate 'solutions' to, women's underrepresentation (Vitores and Gil-Juárez 2015). For some, the pipeline metaphor is insufficient as it assumes a neutral pipe and disregards that the career pipelines into male-dominated fields are systemically gendered (Mariani 2008). This implies that the methods used to conceptualize and measure people flowing through the pipeline and into careers may be inherently narrow or biased (Metcalf 2007; 2010).

Also, a focus on getting women into a specific pipe and making sure they do not leave may miss the point that these pipes and the resultant careers are inhospitable or problematic - to women, but also to others who do not fit the norms or expectations of that pipe (Hammonds and Subramaniam 2003; Subramaniam 2009).

This paper seeks to explore these topics with respect to the videogame industry. Specifically, it seeks to identify whether there is a dominant, presupposed pathway to a career in game development and then to look for women and women's experiences at each stage of that pipeline. It concludes such a dominant pathway does exist and this pathway both disadvantages women who attempt it and marginalizes other pathways. In most fields in the game industry, only a minority of women follow the assumed pathway, enrol in good proportions in appropriate training programs, obtain and remain with jobs in the industry. Along the way they deal with obstacles that can delegitimize their choices and experiences and/or make the assumed pathway inhospitable.

The paper relies on published literature as well as exclusive data from the 2014 and 2015 Developer Satisfaction Surveys (DSS) (n=2198 and 2928, respectively) conducted by the International Game Developers Association (IGDA) in partnership with the authors. The DSS is the most comprehensive international survey of people who study or work in any capacity in relation to the game industry. It therefore primarily captures people working in core development or support roles in game studios, but also includes students, academics, journalists and those working in game-related event planning. It is the culmination of the IGDA's earlier survey work on demographics, diversity and quality of life issues and also includes detailed questions about employment status and type, working conditions, compensation, education and training, developer perceptions of the industry and industry trends (for more detail about the survey, the questions it asks, and additional reports using its data see <http://www.igda.org/?page=surveys> and <http://gameqol.org>). It is particularly useful for research about diversity and gender in the game industry as it contains an extensive set of questions about demographics in the industry and in educational programs, organizational policies and programs about diversity, as well as developers' experiences of discrimination and inequity and their perceptions of diversity in the industry. When survey data is presented it is from only those respondents who were working in non-managerial development roles, unless otherwise stated. Included in development roles are:

programming, visual and audio art and production, game and level design, writing, user-experience and user-interface research and design, and localization.

Figure 1: General Model of a Traditional Career Pipeline



The Career Pipeline of Game Development

There is a dominant and accepted starting point for a career in game development: a love of games, passion for gaming, and a devoted history of playing games. This is made strikingly clear through studio job advertisements that literally state as specific requirements, “must love games” or “be an avid gamer” (Weststar 2015). The shared experience and language of games bonds people together and begins to develop a community of belonging even before official entry into the field (Weststar 2015).

From that point, the dominant practical path to the industry is through formal schooling in a relevant discipline. The 2014 and 2015 DSS asked developers their highest level of schooling and the type and relevance of their obtained degrees/diplomas. Student respondents were also asked about their educational programs. Data from the 2015 DSS show that 88% of developers have a college degree/diploma or higher. For many, this schooling is a generic degree in art, design, computer science or computer engineering where skills are then applied to game-making, but colleges and universities increasingly offer specific degree and diploma programs in game development, game/computer art and game design.

This credentialization and the rise of specific game development designations is a recent shift. Similar to the history of IT and computer programming, when the game industry was emerging in the 1970s, entry into the field was more porous; people came from diverse educational and professional backgrounds because they were drawn to this new exciting medium. As an immature field many were also self-taught (Adams, 2008; Ensmenger 2001; 2003). Shades of this ethos remain in the industry as evidenced by the advice given to people looking to enter the field; veterans indicate that the most important requirement is to be able to

show, in any way, the ability to make great games and they advise hopefuls to fully devote themselves to this task (Weststar 2015). As well, the rise of independent publishing due to the affordances of digital distribution, the emergence of the mobile game market, the ubiquity of game-making tools and growth of the maker and hobbyist movements may maintain some non-formalized routes for entry. However, for most new entrants, the pathway is through formal schooling. This paints the picture of a rather typical career pipeline for game developers and encourages us to look for and then examine the experiences of girls and women at each stage: exposure/access, education and training, and job experiences.

Exposure and Access

Research over the past decade has consistently argued against a gendered view of game play and game preferences (Carr 2005; Jenson and de Castell 2008; Jenson, Fisher and de Castell 2011) and emphasized that it is not a dislike or disaffinity for video games that keeps girls and women from playing. Specifically, the work of Jenson and colleagues shows that distinctions in video game interest among girls and boys that have been previously attributed to gendered preferences should be more accurately attributed to differential skill levels. When girls were given the opportunity to develop expertise and mastery in a girls-only video game club, they behaved in ways previously ascribed to males. In subsequent co-ed environments, observed differences in gameplay and corresponding social interactions were based on skill differentials and not gender.

Understanding the gameplay of girls and women from this socially deterministic standpoint acknowledges that the simple act of playing is “embedded in existing social dynamics and hierarchies” and that mixed gender households are not environments of equal access to gameplay (Schott and Horrell 2000:42). This means that girls and women are not given the same opportunities to develop the requisite level of interest and mastery to sustain investment in the video game medium. As Schott and Horrell (2000) discuss, females usually have secondary access to game devices and they must continually negotiate that access because they often engage in play in the presence or under the sanction of males. In most instances this stunts the ability of female players to acquire mastery in a game. In this context, Schott and Horrell (2000) suggest that games with easily learned mechanics, reduced risk of dying or losing, and free exploration to acquire goods or powers might be appealing not because of a gendered preference,

but because of a learned response to acquiring and maintaining control. These games do not require a large time commitment to achieve desired mastery and the game experience is not cut short by dying or failing in the objective. The player can thus maintain control of the game rather than lose the controller to a more ‘expert’ (male) player who will disenfranchise the female player in ‘showing them how to do it’ or doing the hard parts for them.

These barriers to access have implications for the accepted career pipeline to game development because they reduce the opportunity of girls and women to develop the investment and expertise of an avid gamer that is publically and normatively required by the industry. Winn and Heeter (2009) reported that a gaming orientation develops at an early age; early game play predicted later game play, and non-gamers were less likely than gamers to anticipate an increase in their gaming even if ‘better’ games were available. Due to the immense investment of time that gamers have made to hone their skills, simply knowing where to place one’s hands on the keyboard for a PC game or casual familiarity with complex modern controllers immediately signals belonging in the game community (Schmalz 2015). This belonging is denied or made harder for those without the required investment and experience.

Issues of access and expertise also exist in terms of the games played. As Consalvo and Paul (2013) articulated, the game community cultivates a system of insiders and outsiders by privileging ‘real’ games and positioning those who play them as ‘real gamers’. Consalvo and Paul (2013) identified the importance of developer pedigree, particular game mechanics, the depth of interactive meaning, and the price/pay structure of games as tacit signals of which games matter and which do not. This is largely an approach to occupational closure that is common to many professional and professionalizing occupations as it effectively denigrates new entrants and forces them to comply with the standard in which natives are heavily invested (Witz 1990). However, this protectionist attitude and the reification of real games and gamers further disenfranchise women who have invested time in the wrong games. It also may prevent girls and women from leveraging innovations in technology to gain access to the game space rather than evening the playing field if these innovations are devalued (Jenson and de Castell 2008).

Research suggests that women have taken up the social and casual games populating Facebook and mobile devices and that casual games and innovation in game controllers such as the Wii may have removed some barriers to entry (ESA 2016; Fron, Fullerton, Ford Morie and Pearce 2007; Juul 2010). Industry statistics suggest that women represent 45-49% of gamers and are the

fastest growing consumer group (ESA 2013; ESAC 2013). However, statistics about the rise of casual games and gamers may overstate as they often include traditional games such as cards that have migrated to computer interfaces (Jenson and de Castell 2005). These are not considered real video games. As well, figures about the number of people who play games belie the existence of a stratum of gamers that is based on factors like the type of games purchased and the time devoted to play; again, the manufactured sense of ‘real’ games and gamers (Fron, Fullerton, Ford Morie and Pearce 2007).

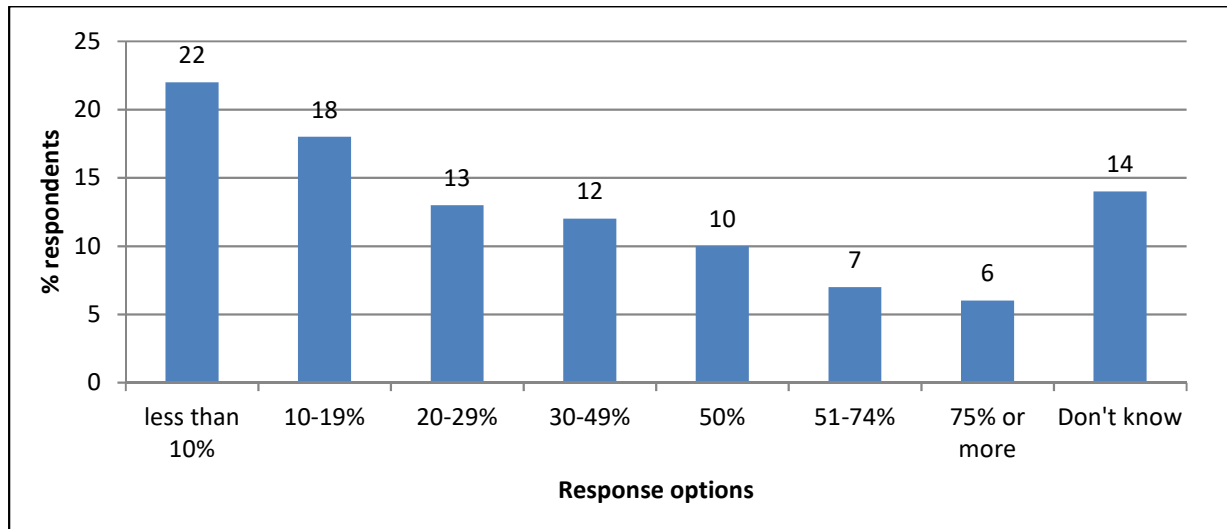
This suggests that even if gamer/non-gamer distinctions decrease, a gendered dichotomy or hierarchy of hard-core/casual may remain (Harvey 2011). Hard-core gamers may play casual games like everyone else (Bouça 2012), but casual gamers do not engage in the hard-core universe from which most future game makers are drawn. The gravitation of women to particular forms of play can ghettoize and delegitimize that experience and expertise in the face of dominant, masculine interpretations of technical competence and the industry maintained hegemony of ‘real’ games. It has been noted that much of the play by women is not considered true gaming by themselves or others (Fron, Fullerton, Ford Morie and Pearce 2007; Harvey 2011; Jenson and de Castell 2005). Therefore, even girls and women who gain some access to games and achieve some mastery of game play may not see themselves or be seen as future game makers under the dominant screening and signaling norms and mechanisms. They are a square that does not fit in the round pipe and therefore have the potential to be disregarded.

Education and Training

Accepting the argument above - that collectively girls and women have less investment in the game industry due to limited opportunities to gain valued expertise - leads to the assumption that fewer girls and women pursue additional training in this field. The DSS data we use for this chapter included a number of respondents who were students studying to enter the game industry or studying games. They were asked questions about their domain of study as well as the gender representation of their classes. In the DSS 2015, 20% of the survey respondents identified as students. Their data show a lack of women in formal game-related education as only 25% of the student respondents to the survey identified as female compared to 73% as male. Self-selection response bias is a concern with this data; however, students were also asked what percentage of their class was women and this provides supportive evidence. The majority responded that

women made up less than half of the class; 22% indicated that their class was less than 10% women (Figure 2).

Figure 2: Percentage of class that is women



Source: IGDA DSS 2015

The DSS 2015 data also show a gendered bifurcation in the type of education game developers have obtained. Men were found to outnumber women in obtained computer science and software engineering degrees by more than 2:1 while the opposite was true for degrees in animation, art, art and design and graphic design. The distribution was more balanced for degrees specifically in game design and game development. This gendered segregation by degree type is also present among the student respondents to the DSS 2015 survey. Students were asked, “What kind of game industry job are you most interested in?” ‘Programmer/software engineer’ was selected by 32% of males and 20% of females while ‘visual art’ was selected by 9% of males and 20% of females. ‘Writer’ also displayed a gender split; it was selected by 6% of males and 14% of females. The distributions for key roles such as ‘producer/project manager’ and ‘game designer’ were roughly similar.

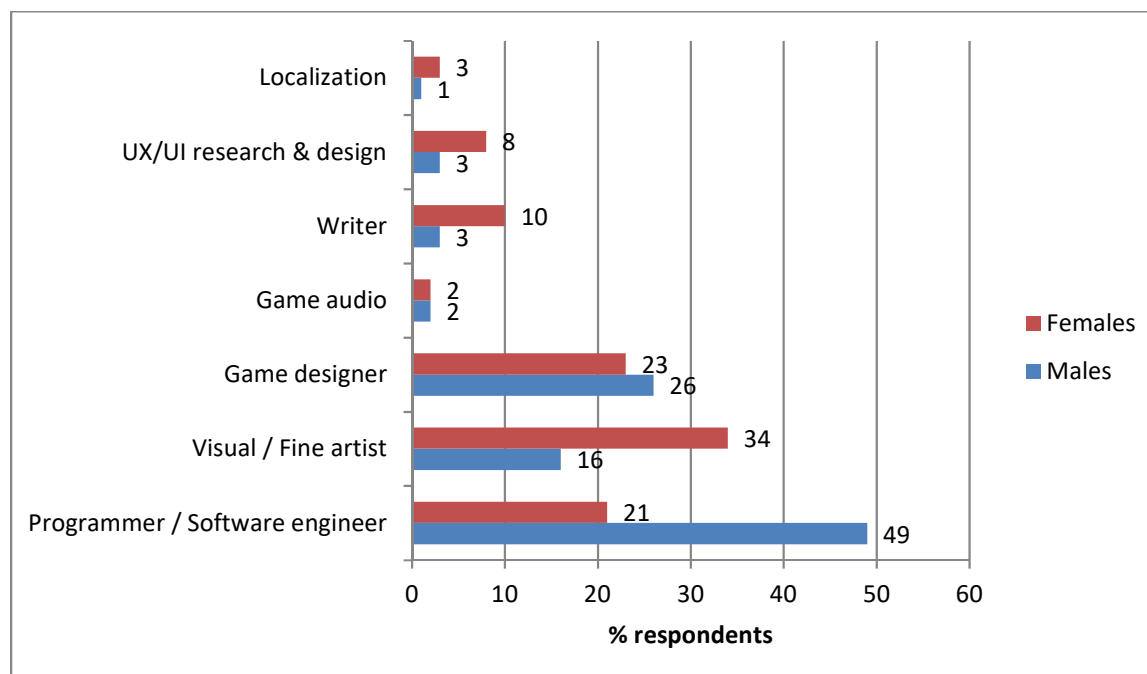
Despite these differences in degree and occupation, among the student respondents, there was no gendered difference regarding a love for the industry and the importance of early experiences. Males and females responded similarly to questions about being passionate about

games and wanting to share this by being in the industry, about playing games as a hobby and turning that into a career, and about making games as a hobby and turning that into a career. Both groups were also similarly confident about their ability to get a job in the industry after graduation. That said, females were significantly less likely than males to agree that there was “equal treatment and opportunity for all in game-related educational programs”; 40% of females versus 17% of males said there was not equal treatment for all.

Sustained Career in the Field

Not surprisingly under a dominant pipeline model, the representation gap and occupational segregation between males and females persist from formal schooling to game developer jobs. Among the respondents to the DSS 2015 survey who work in non-managerial core development jobs, 19% identified as female while 78% identified as male. Males were heavily represented in programming roles and females were more likely to be found in artist, writer, UX/UI and localization roles (Figure 3). When we examine the 2015 DSS data for managerial roles in the industry, females are slightly more represented across the board at 22%. Specifically, they are underrepresented in senior management roles compared to males (47% versus 61%), but overrepresented in producer/project manager roles (40% versus 21%). There was equal gender representation in the managerial sub-sample for middle managers and team leads.

Figure 3: Occupational Segregation of Non-Managerial Core Developer Roles by Gender



Source: IGDA DSS 2015

Given the critiques about narrow career definitions often leveled at pipeline research (Metcalf 2014), it is informative to look for women in game industry roles off the dominant path of commercialized development. When we include the whole sample of the DSS 2015, the representation of females rises to 23%. This is due to a slightly higher tendency for females to work in game-related journalism, academia and event-planning and a much higher tendency for women to work in roles that support game development. Across all the occupations classified as support roles in the DSS 2015, there was an equal gender split; however, there was still strong occupational segregation within those roles. Females were much more likely to work in community management and administration (e.g., human resources, accounting, legal, office manager) while males were more likely to work as consultants and in technical and customer support. Public relations and marketing had more equal balance.

Despite the differences in representation and occupational sub-group, male and female game developers held similar sentiments toward their jobs. Most felt that their job making games was their career and reported that it was a large part of their life (53% males, 57% females). Some reported that making games was their life and a smaller number acknowledged that it was just one part of their life, but the pattern of response showed no gender difference. However, data from the 2014 DSS suggest some gender differences in the intention to stay in the industry.

When asked how long they planned to remain in the industry, the dominant response for both males and females was to stay indefinitely (80% and 71%, respectively), but almost twice as many females as males selected options of six years or less. The data also suggest that the path to a game development career may not be as direct for some women. In both the 2014 and 2015 DSS data, females were more likely than males to report that their career path into the game industry was unintentional, though the majority response for both groups was an intentional career path. This data should be considered carefully, however, due to the conflation of gender and occupational role. Respondents who identified as programmers (mostly men) were much more likely to report an intentional career path into games than an unintentional path. Conversely, roles comprised of more women (UX/UI research and design, writing, localization) were associated with an unintentional career path into games. Visual artists and game designers were as likely to report an intentional career path as unintentional.

In addition to differences in representation and occupational role, women experience a different lived experience as game developers. The past two years have seen intense interest in the topics of sexism, discrimination and harassment in video games, video game workplaces and the broader gamer community. The challenges women face as developers came to the fore through the Twitter hashtags #1reasonwhy and #1reasontobe that went viral in 2013. #1reasonwhy was flooded with personal accounts of struggle in answer to the question, “Why are there not more women game developers?” And #1reasontobe arose in solidarity, but also in challenge, to document reasons why women *should* be in the industry and to share stories of success and perseverance.

The DSS surveys contained numerous questions about diversity and equity and the data echo many of the challenges surfaced in the Twitter movement and expressed publicly by female game developers at industry conferences and in the press. In both the 2014 and 2015 data, a high percentage of respondents across genders reported that sexism in games, among gamers, and in the workforce contributed negatively to the industry (Weststar and Andrei-Gedja 2015; 2016) and 49% of the DSS 2015 respondents felt that there was not equal treatment and opportunity for all in the industry (12% were not sure). Similar to this question as posed to students, when analysed by gender, these sentiments were reported more by females than males in all cases. For instance, compared to males, twice as many females reported experiencing inequity in recruitment and hiring processes, four times as many females reported experiencing inequity in

the promotion process, five times as many females reported inequity on monetary grounds, six times as many females reported microaggressions in the workplace (verbal, behavioral, and environmental indignities), and seven times as many females reported experiencing inequity in both discipline and social/interpersonal interactions. The absolute incidence of these inequities for all genders ranged from 8-16% of respondents, but the relative incidence for women is striking.

As well, the work environment of the video game industry poses challenges that are not unique to women, but may present greater barriers. The long hours culture has been well documented (Peticca-Harris, Weststar and McKenna 2015; Weststar and Legault 2015) and it has been concluded that long hours and/or crunch time and the project-based organization of work are a significant challenge to women in the games industry (Chasserio and Legault 2010; Consalvo 2008; Legault and Chasserio 2012; Legault and Ouellet 2012). For these reasons, it has been argued that game work tends to favour young and unattached males who better conform to the dominant professional identity of long hours and the required national and international mobility (Deuze et al. 2007). It is notable that the mean industry age is 30 and the number of game developers answering the DSS surveys who have children is very low (Edwards, Weststar, Meloni, Pearce, Legault 2014; Weststar and Legault 2015). Additional studies have also found a particular lack of women with children among game developers (Deuze et al. 2007; Consalvo 2008; Prescott and Bogg 2010) as opposed to men (Prescott and Bogg 2011a, b). Interruption in career path is a long-enduring burden in women's professional lives (Simpson 1998). Women also tend to experience more work-family conflict than men and this can lead to reduced opportunities for promotion and advancement as women may be more likely to refuse overtime, refuse extra work, or turn down high-profile, yet high demand projects (Chasserio and Legault 2010; Weststar 2011). Recalling the 'real' games argument of Consalvo and Paul (2013), game studios or lower-profile projects within studios that do tend to support flexible working time policies or resist crunch time are not often those that are esteemed as prestigious in terms of the games that they make (i.e., casual games, children's games, educational games, serious games) (Legault and Ouellet 2012). Therefore they do not build the kind of reputation that can leverage a developer's career.

This said the industry may slowly be changing. Regarding working time, Legault and Weststar (2015) used the DSS 2014 data as well as interviews with developers to review trends

over a 10 year period. They found that the duration, frequency and intensity of crunch time are decreasing. However, crunch remained a challenge for a significant population of game developers. For instance, in the 2015 DSS, respondents reported that crunch time or long hours had negatively affected their family relationships (50%), their emotional health (58%) and their physical health (55%). There were no significant differences found across gender with respect to these experiences. Importantly, this indicates that the structural features of the industry such as long hours may increasingly be a barrier to both men and women.

Discussion

There is a dominant pathway into a career in game development that begins with exposure and investment in the medium through play. According to data from the IGDA surveys over the past ten years and from anecdotal experience with the industry, a majority of people who work in video games counted playing video games as a major hobby (IGDA 2004; Legault and Weststar 2012; Weststar and Legault 2015) and immersion in the medium is part of the occupational community of game developers (Weststar 2015). As these are conditions of entry to the dominant pathway toward a career in game development, it is therefore a problem if girls and women are underrepresented among gamers, or if they are segregated into playing certain games that are themselves stereotyped. It is also a problem if girls and women play games, but face negative and marginalizing experiences both within the game and from the gaming community.

Following the dominant pipeline through formal schooling shows that some women are pursuing game development as a career choice and they are no less interested or passionate than their male peers. However, these women remain greatly outnumbered and may exist in occupational ghettos within academic programs. As expected this pattern translates into the industry at large where women remain underrepresented, occupationally segregated and in many instances marginalized through systemic and overt sexism.

There are some alternative pathways for women into the game industry, though they are not without challenges. First, the important roles of game designer and producer/project manager seem to be of equal interest to male and female students and show more balanced gender distribution in the workforce. Particularly coupled with an increase in specialized game design/development programs, these jobs could be alternative pathways of a sort, where women can gain access to and influence the field, but side-step the need to break into programming or

software engineering as a domain. However, these roles present opportunities for change only insofar as they are imbued with meaningful power and influence that is leveraged to enact change rather than to reproduce the gendered status quo of so-called women's skills, game intellectual property and/or working conditions (Powell and Sang 2015). Work that is done primarily by women, even if once dominated by men, faces a legacy of devaluation (Levannon, England and Allison 2009; Miller 2016). Recent attacks against female game designers under the Gamer Gate mantle could be considered an example of outright attempts at this delegitimization.

There is little known research on the internal hierarchy and power dynamic among the sub-disciplines that contribute to the making of a game; therefore, some occupational roles will be more influential than others. We would suggest that the male-dominated field of programming is dominant due to the hegemony of hard science and technical skill, the centrality of computer coding to the game-making process, and the sheer relative number of programmers. Certainly, the DSS survey data indicates that programmers are among the highest paid occupational groups while artists and disciplines with higher numbers of women receive lower compensation; within occupations women also make less than their male counter-parts (see also Gamasutra 2014). The roles of writer or user-experience or localization specialist allow for alternative educational pathways and roles in journalism and event planning provide game-related careers, but these jobs do not sit at the core of game development in terms of compensation or influence on the medium.

Trends toward improved hours of work will benefit all developers and in particular ease additional burdens that may be faced by women. As well, the rise of independent studios, self-employment and the increased democratization of game development through the new technological affordances of self-publishing, digital distribution systems, sophisticated open-source development tools and mobile platforms may also present opportunities for both women and men to create new pipelines toward revisioned career end-points that are more representative and sustainable. In the DSS 2014, 48% percent of the respondents said they worked as independent developers and in 2015 39% percent identified as indies. As well, the percentage of respondents who identified as self-employed was 15% in 2014 and 19% in 2015. Self-employed respondents reported choosing that path to gain greater intellectual control over their work, but the most common reason was that self-employment gives more control over their working conditions. In the 2015 DSS, males and females were equally likely to report working in an indie environment and the representation of women in independent studios was higher than the general

developer sample which included all studio types (23% versus 19%). Females were as likely to be self-employed as males (14% versus 18%).

It would be an overstatement to claim that indie development presents a nirvana of ideal game development practices or that it is a safe haven for female developers in particular. This form of employment comes with its own challenges in terms of work-life balance, the downloading of employment risks and uncertainties onto the individual and the lack of access to many legal protections or social security programs. As well, the market is increasingly crowded with games and indies must work very hard to achieve and sustain success. However, there are exemplars. For instance Dames Making Games is a feminist non-profit organization in Toronto, Canada dedicated to “supporting dames interested in making, playing and changing games.” (<https://dmg.to/about>) Part of their mission statement reads, “We believe that creating **space and time** to make and talk about games in an explicitly feminist context elevates the craft, amplifies alternative and diverse narratives, and supports the socio-cultural changes that are necessary to make game design accessible to all.” (<https://dmg.to/about>; emphasis theirs) Here, women may claim a segment of the industry by creating it themselves.

Conclusion

This paper argued that, like many other industries, the dominant pipeline to a career in game development is one of early experience -> additional training -> first job -> sustained career (Figure 1) and it is not working for women. Though men and women are equally predisposed to love playing and making games, girls and women face more barriers than boys and men in gaining access to and legitimacy in early gaming experiences and they are underrepresented, occupationally segregated and perceive negative differential treatment in game-related degree and diploma programs. These patterns persist into employment where women remain in the minority, may occupy roles that are lower in the occupational hierarchy or more tangential to what is considered the ‘core’ work of developing games, may be confined to low-scaled or less prestigious projects, and may be disadvantaged under a project-management regime that emphasizes extreme commitment, long hours and high employment insecurity. These findings are not surprising as similar stories have been told about somewhat cognate fields in the domains of science, technology, engineering and mathematics as well as entertainment fields such as film and television (Cicmil, Hodgson, Lindgren and Packendorff 2009; Chasserio and

Legault 2010; Henderson and Stackman 2010; Lindgren and Packendorff 2006; Turner and Lingard 2009; Watts 2009). Research has documented how project management theory and training is also deeply gendered. Masculine assumptions about time allocation, professionalism and masculine cognitive styles are embedded into the Project Management body of knowledge (PMBok) (Buckle and Thomas 2003; Thomas and Buckle-Henning 2007).

The evidence presented above demonstrates that women do experience blocks and leakages when trying to navigate the dominant career pathway into game development. They are sorely underrepresented as a whole and generally experience the glass ceiling and sticky floor effects of vertical segregation as well as occupational segregation in core domains and genres. However, there is also some evidence that women are finding alternative pathways/pipelines to work in the industry. They are better represented in industry roles outside of core development occupations, some enter the industry through non-game-related educational programs, and some are creating new spaces for the making and distribution of video games that challenge industry norms. As well, the challenges faced by women in the game industry are receiving growing attention as women game developers speak out at industry events, through the attention of the women developers' associations and grassroots movements and through social media movements. As such the inhospitality of the traditional pipes is increasingly revealed and is being rejected by both men and women. As Subramaniam (2009, 964) succinctly put it, "Imagining the regimented travels in pipes that give the travelers no agency in their journey, we might start rooting for the leaks and for those who escape the drudgery of pipe travel."

It remains to be seen whether imagined new pathways will lead to a sustained and influential presence for women and whether they will also for a reimagining of the game industry as a whole, or whether they will be devalued like the old "mommy track" (Lewin 1989). Thus, it remains important to analyse the experiences of girls and women both along the dominant pipeline and in areas that may provide refreshing alternatives for all game workers. As knowledge work is more important, so are project-based organisations. We should also pursue the study of project-based organisations as a whole, as they pose many common challenges to their workforce and often share a common gendered workplace culture.

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