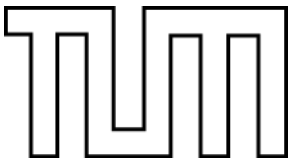


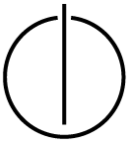
DEPARTMENT OF INFORMATICS

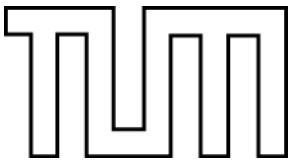
TECHNISCHE UNIVERSITÄT MÜNCHEN

Bachelor's Thesis in Informatics: Games Engineering

Enhancing Inclusion and Innovation in Games Engineering

Chrysa Bika





DEPARTMENT OF INFORMATICS

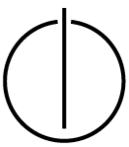
TECHNISCHE UNIVERSITÄT MÜNCHEN

Bachelor's Thesis in Informatics: Games Engineering

Enhancing Inclusion and Innovation in Games Engineering

Förderung von Inklusion und Innovation in Games Engineering

Author:	Chrysa Bika
Supervisor:	Prof. Gudrun Klinker, Ph.D.
Advisor:	Daniel Dyrda, M.Sc.
Submission Date:	15th October 2020



I confirm that this bachelor's thesis in informatics: games engineering is my own work and I have documented all sources and material used.

Munich, 15th October 2020 Chrysa Bika

Acknowledgments

Dear Daniel, I would like to express my sincere gratitude towards your trust in my work for this bachelor's thesis! Thank you for the long-ahead planned meetings, as well as the last minute ones throughout the semester. Thank you for your guidance and for granting me the freedom to explore innovation and inclusion in games engineering. Thank you for always being around to solve issues together or just take a tea break.

Dear Professor Klinker, thank you for providing this extraordinary thesis topic. I truly enjoyed researching and working at you chair! I am very grateful for the smooth processes within the faculty and the pleasant atmosphere.

Dear English Writing Center, thank you for the thoughtful sessions and the advice on grammar and coherence in my thesis.

Dear friends, thank you for being by my side and listening about my research for the millionth time. Thank you for proof reading and for your advice.

Dear family, thank you for the unlimited amount of coffee, tea, food and love! Thank you for always being there and providing a safe space. Thank you for listening to stories about my research and for reading my thesis.

Thank you whole-heartedly,

Chrysa Bika

Abstract

The main purpose of this bachelor's thesis is to develop methods and solution-oriented approaches, which will enhance inclusion and innovation in games engineering. To achieve this goal, the methodology of a thorough literature review was utilized. Much attention has been given to the state-of-the-art of games engineering, interaction of game development teams and the correlation between teams and their published video games. Numerous studies have shown the need to develop diverse games with female protagonists, as the female population that enjoys playing video games is constantly increasing. Moreover, the group of people with disabilities still face several issues when attempting to play video games. For an inclusive game experience, more accessibility features and accessible devices should be implemented.

Furthermore, two practical projects were developed in this thesis. With the first project, exercises and potential lecture slides for a games engineering curriculum were generated. Here students can, for instance, learn what it means to have an impairment and which accessibility features can be implemented to enable playing games. The second project is an interview with an expert from a famous video game company with studios across the world. The interviewee evaluated the introduced methods and gave insights into the work of a games company.

***Keywords**: games engineering, software engineering, inclusion, innovation, diversity, accessibility, discrimination, education*

Contents

1. Introduction and Motivation

Globalization is driving the importance of having a diverse and inclusive institution [PM04]. It is not a necessity anymore for employees in Germany to be able to communicate in German. At a lot of global companies it is sufficient to be fluent in the English language, as the local spoken language does not represent a barrier. This attracts people with various backgrounds and origins to move to a different country for work.

Consequently, businesses have to be open to talent from across the world. A diverse company will gain multiple view points through their employees. In this case, a game company might be able to expand their market from one specific country and one target group to other countries world wide. An advantage for the games industry lies therein that programmers usually write their code in English, which makes it easier to collaborate with people from all over the world.

However, companies usually have been focused on their products or services and just in recent years started taking action for diversity and inclusion matters. The organizations are still figuring out how to implement these changes and how to make every employee feel welcomed and comfortable in the work space, which could be in the industry or in academia.

In the past 20 years the women quota has been discussed and implemented in some countries. However, being diverse does not only mean employing more women. All underrepresented minorities should be taken into consideration. The most important aspect should be for the employees to be efficient at their work, no matter what their origin, gender, sexual orientation, etc. is. For these reasons, some companies employed a dedicated diversity and inclusion manager or corporate social responsibility managers. It gets clear that there is a need for research about diversity and inclusion in the engineering sector.

Moreover, the institutions should not only attract talent with diverse backgrounds to join their company, but they should pay attention that everybody is treated equally within the company. Therefore, teams and project structures have to be analyzed so that appropriate measures can be taken. This could include, for instance, to make an office space accessible or to grant parental leaves for both parents.

To confirm these assumptions, the author firstly explored the state-of-the-art of games engineering and the game industry. After distinguishing how diverse and inclusive institutions, companies and their processes are at this moment, solution-

oriented methods were developed and are ready for further research or respectively for implementation. The established methods will help the institutions create an appropriate learning and working environment where each and everybody is able to thrive and create new products with joint creativity. If the students and employees are able to tackle their unconscious biases, are educated about diversity and inclusion issues, and the structures are appropriately adjusted to suit everybody, the end product will indirectly be more diverse, inclusive and innovative, as well.

A lot of work and research in this area is depicted by blog and magazine articles, presentations, and videos. Therefore, this bachelor's thesis aims to provide a formal and rigorous literature review on which further research can be based on. Moreover, the practical part, on the one hand, acts as an example of how these processes could be included in education and teaching. On the other hand, en expert was interviewed to discuss the proposed methods and moreover, gain insights to a well-known game company and their internal structures and external representation.

2. Discrimination, Biases and their Positive Counterparts

To be able to find suitable solutions and methods, it is important to clearly define the problem and the aim. Therefore, definitions of important aspects will be stated in this chapter.

2.1. Discrimination

Discrimination is a major issue that a lot of people have to face during their leisure time, during studies at university and during their regular work. What is discrimination and where does it come from? How can we prevent discrimination? Defining discrimination with all its details and aspects would exceed the scope of the work of this thesis. Stating all the aspects humans can discriminate against, would create an infinite list. Therefore, the major factors it consists of, will be described shortly. In almost all existing definitions we will find the common grounds on which discrimination should be prohibited: race, color, sex, language, religion, political or other opinion, national or social origin, property, birth or other status, association with a national minority [Alt20]. These aspects are stated as those in several legal documents, for instance in the AGG (Allgemeines Gleichbehandlungsgesetz), in the International Covenants on Civil and Political Rights or in the European Convention for the Protection of Human Rights [Alt20]. Observing the pattern of discrimination we can distinguish that

> "[...] the moralized concept of discrimination is properly applied to acts, practices or policies that meet two conditions: a) they wrongfully impose a relative disadvantage or deprivation on persons based on their membership in some salient social group, and b) the wrongfulness rests (in part) on the fact that the imposition of the disadvantage is on account of the group membership of the victims [Alt20]."

Since the world we live in is constantly changing, we have to differentiate among the social groups which we compare to each other to identify discrimination [Alt20]. For instance, if we compare women in games engineering in Germany with women in games engineering in a development country, we would say that the women in

Germany are not discriminated against because they are given a better environment to gain and apply their knowledge. However, if we choose a different social group to compare the women in Germany, for instance, with men in games engineering in Germany, we will realize that discrimination occurred due to somebody's gender [Alt20]. Moreover, discrimination can be performed directly or indirectly with bad intentions or with unconscious biases.

2.2. Unconscious Bias

To get a better understanding, first, the term unconscious will be defined, then the term bias and as a last step the combination of both. On a side note, unconscious bias is sometimes referred to as implicit bias [Ren]. Its opposite, conscious bias, can be described as an explicit bias depending on the definition [Ren].

An unconscious action, a feeling or a thought, is one, where the individual is not aware that they have it [Cam14b]. A person's thoughts will influence their actions. Furthermore, an individual's personal experience will impact, how they behave in their everyday life, even without being completely aware about it [SB16].

Bias can be described as a tendency or inclination against a group of people or an individual [Psy20]. It can further be aimed against ideas or objects [Psy20]. These biases emerge from patterns, mostly from stereotypes, which the biased individual acquired at some point in their life, usually in a young age. Most prejudices arise through biases [Ren].

Unconscious bias might be present in situations when individuals feel they are under pressure [SB16]. In such a case, the individual might act biased based on their previous life experiences, without thoroughly thinking about the consequences [SB16].

2.3. Diversity

Diversity, in general, means to bring people with different viewpoints and stories together, so they can highlight their unique experiences [Que]. They should be provided with a safe space, where each difference is tolerated [Gre20; Glo]. People with different backgrounds, analyze issues with diverse perspectives and attribute different values to an issue [Glo]. If all these people work together their creativity and innovation will thrive [W A; Gre20]. This joint creativity is fundamental as Wulf, a well-known computer scientist and professor emeritus at the University of Virginia, explains [W A; Uni].

Diversity is needed in engineering, as well as in any other occupation. On the one hand, diversity with regards to gender, socio-economical background, age, religion etc.

is required. On the other hand there exists a need for individual diversity [FWT07]. Individual diversity will be discussed more thoroughly in section 5.3.1. Both will foster creativity and drive innovation [W A].

Nowadays a lot of universities and companies recruit new students by advertising their diversity concepts [JM02]. It creates a positive feeling seeing that universities and companies are trying to be diverse. At the same time, respective students have to be aware how these concepts are implemented, perceived and actually applied within the university [JM02].

No matter what the current situation is observed to be like, being diverse is a prosocial skill which can be learned and improved by anybody [Gre20].

2.4. Inclusion

Even though, diversity and inclusion seem to go hand in hand, there is a significant difference between them [KDM13]. For this reason these terms can not be used as synonyms.

Whereas diversity highlights the differences of people, inclusion should be the organizational objectives aiming to include everybody [Rob06]. This means, to not only have a team of people with different life experiences, but to really try and empower each and everybody to speak up and actively participate [Rob06].

Every person of a group should be granted the same opportunities, regardless of their background [Cam14d]. In the context of playing games, it can be considered to provide everybody with the chance to enjoy video games, for instance, by enabling accessibility options [BS12].

Inclusion within the games engineering workforce could mean to grant everybody the chance to prove themselves with their work. It should not matter where they come from or what they look like, the important factor lies therein to achieve their work goals and help the company thrive.

2.5. Innovation

Innovation, as defined by the Soziologielexikon, could mean the renewal or introduction of something new [Rei92]. This renewal can take place in the technological, scientific or economical field. For these new developed concepts or ideas to be innovative, they should be superior to the already existing solutions [Rei92].

Companies strive to be innovative, since innovation has been named one of the most important factors to be successful [Gor18]. It could be described as a cycle; if the company is innovative, they will make higher profits, which will enable them to grow

more rapidly and employ more staff [Gor18]. Moreover, to attract customers and to keep them engaged, a company should thrive to be innovative. They can only stay successful and keep growing, if they manage to adapt their products and services to the needs of their customers [Gor18].

3. Related Work

The related work chapter can be divided into two areas – games engineering, and then diversity and inclusion. After a short introduction to these fields and how they are intertwined, a specific case, namely section 3.3 about discrimination in visual computing, is observed in more detail.

3.1. Games Engineering as a Category of Software Engineering

Firstly, Apostolos Ampatzoglou and Ioannis Stamelos, detect the intersection of classical software engineering (SE) with software engineering for games (GSE) [AS10]. Secondly, in his book "The Art of Game Design", Jesse Schell describes how to design video games considering aspects such as the designer's experience, how to develop ideas, storytelling, writing a game design document, how teams work together, and much more [Sch19a]. The above fields are necessary to understand the state-of-the-art of games engineering.

3.2. Diversity and Inclusion in Games Engineering

Some approaches that exist in dealing with diversity and inclusion in games engineering and, in general, in computer science, will be introduced here. For instance, Joy Buolamwini, computer scientist and digital activist at the Massachusetts Institute of Technology (M.I.T.) Media Lab, addresses discrimination in Visual Computing [BG18]. Further, the author and associate professor, Adrienne Shaw, examines representation in video games, mostly based on feminist and queer theory [Sha14]. In a lot of cases, games, especially serious games, are generally used to foster the learning of diversity and inclusion at school and in the industry [HG17].

Moreover, research has been done to examine the correlation between disability and games, and how people with disabilities play games. Sarah Gibbons, for instance, divided this field into four topics: therapeutic and educational tools; game simulations; accessible features and controls; and narrative inclusion and identification [Gib15]. Another question arises: How can games become more inclusive for people with disabilities? Mark C. Bartlet and Steve D. Spohn try to find an answer. In their work

"Includification: A Practical Guide to Game Accessibility", they provide checklists for accessibility features in games and analyze the must-have-options to enable a pleasant play for everybody [BS12]. These checklists are divided into a console and a pc accessible checklist. Within them, the items include mobility, visual, and hearing arguments. A few examples are remappable keys, perfectly visible and readable subtitles, and a game that is playable only with the mouse or only with the keyboard [BS12].

3.3. Discrimination in Visual Computing

The target group for video games always seem to be young white heterosexual males [BL17a]. However, underrepresented minorities enjoy playing games as well [Sha14]. Women, people of color, people that identify themselves as Lesbian, Gay, Bisexual, Transgender and Queer (LGBTQ) are often excluded from taking part in the male dominated games [Sha14] and are even seen as spoilsports [BL17a].

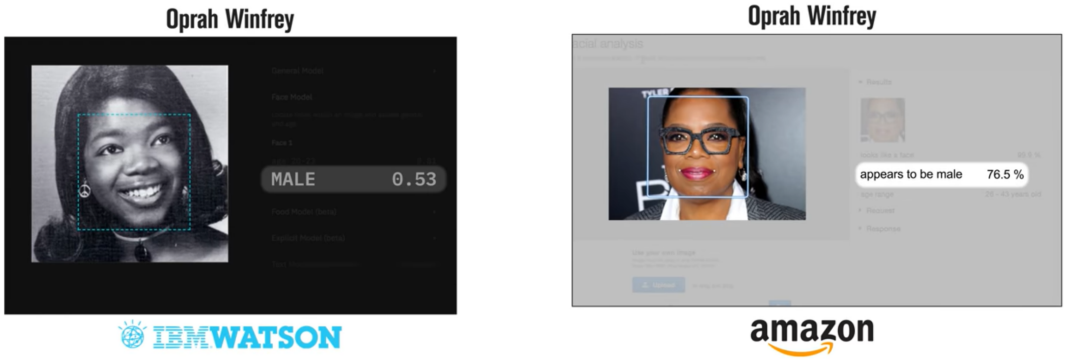
Joy Buolamwini did not only get excluded from a game, while she was travelling. She, moreover, experienced biased algorithms when she was working with a generic facial recognition software as a college student, and, furthermore, as a graduate student at the M.I.T. Media Lab [Joy18b; Joy16]. As a person of color (POC), she has been confronted with this issue several times. Although, she did not pay much attention to it in the beginning, it started bothering her. On a closer look, Buolamwini always had to wear a white mask or use her friends as test objects during her work with the generic facial recognition software [Joy18b]. Figure 3.2 shows Buolamwini with her white face mask.

One major problem that underlines these issues, lies in the training sets of machine learning techniques. The computer learns with the data we enter, for instance, it can be biased regarding race and gender [BG18]. If this data is already biased and only includes faces of white people, the software will have trouble correctly recognizing POC. Therefore, developers have to pay attention and create diverse training sets. It can even get worse, when the algorithms are biased against certain groups of people. It can lead, for instance, to misidentifying suspected criminals [BG18].

Buolamwini was invited to present "How I'm fighting bias in algorithms" at TEDxBeaconStreet in 2016. TED is a conference for technology, entertainment and design, founded in 1984 [TED]. She describes precisely in her TED talk: "Who codes matters, how we code matters and why we code matters [Joy16]." Inclusion and diversity are decisive for great algorithms and technological services for our communities. Therefore, Buolamwini created the Algorithmic Justice League, where she advocates for more inclusion in the broad field of technology. One of her projects encompassed the spoken

word visual audit "AI, Ain't I A Woman?". The Artificial Intelligence (AI) was not able to identify strong, intelligent and famous women of color. Some examples include Michelle Obama and Oprah Winfrey. In Figures 3.1a and 3.1b Oprah was misidentified as a male by several systems. Buolamwini explains that the error rates of misclassifying darker-skinned females increased up to a maximum of 34.7%. In contrary, lighter-skinned males have a maximum error rate of 0.8%. The discrepancy between both groups is very high [BG18]. This shows that there is a need for more inclusive AI, and more inclusive software, in general. In a later research by Raji and Buolamiwini, they state how algorithmic auditing is necessary to improve AI [RB19]. Moreover, they realized:

> "Within 7 months of the original audit, we find that all three targets released new API versions. All targets reduced accuracy disparities between males and females and darker and lighter-skinned subgroups, with the most significant update occurring for the darker-skinned female subgroup, that underwent a 17.7% – 30.4% reduction in error between audit periods [RB19]."



(a) Misidentifying Oprah by 53% as Male [Joy18a].

(b) Misidentifying Oprah by 76.5% as Male [Joy18a].

Figure 3.1.: AI, Ain't I A Woman?

Figure 3.2.: Joy Buolamwini with white face mask [Mat19].

4. Methodologies

4.1. The Literature Review

For this bachelor's thesis a thorough literature review took place, as it is described by von Brocke [Bro+09]. The accrued knowledge by the literature research builds a foundation for further analyses and the implementation of practical projects.

4.2. Scientific Writing

Furthermore, articles and scientific papers, such as "The Science of Scientific Writing" [GS90], were read to create a pleasant reading and to facilitate the acquiring of knowledge for the reader. Moreover, the resources of the TUM English Writing Center were consulted to improve the coherence and style of this bachelor's thesis.

In his book "From Research to Manuscript", Michael J. Katz describes how to compose a well-informed, well-written, scientific paper about one's research [Kat09]. He adds: "As a scientist, you must write, and as an experimentalist, writing while you work strengthens your research [Kat09]."

4.3. Keywords and Databases

The following databases and digital libraries were rigorously used: "Google Scholar", "Scopus.com", "Dblp", "ACM Digital Library", "JSTOR" and "OPAC" with the most important keywords being "Games Engineering", "Games Development", "Game Design", "Software Engineering", "Metagaming", "Discrimination", "Unconscious Bias", "Inclusion", "Diversity", "Accessibility", "Innovation", "Education", "Meetings", "Teams". These keywords were, on the one hand, searched by themselves and, on the other hand, searched for in combination. This bachelor's thesis mostly discusses scientific papers, but nevertheless includes articles, books, panel discussions and interviews into the argumentation.

4.4. Practical Projects

Besides the theoretical part, practical projects were developed as well.

4.4.1. A Lecture and Exercises for the Games Engineering Curriculum

To create content for a diversity and inclusion lecture in games engineering, already existing lectures were analyzed from several institutions. This process considers lectures and curricula of institutions in Germany and the United States. Moreover, exercises for more diversity and inclusion were designed and can be found in the appendix B.1.

4.4.2. An Expert Interview with a Representative of the Games Industry

An expert interview with a representative of company XYZ, a video game company with studios across the world, was conducted. The respondent is working at one of the XYZ studios in Germany for the past years. XYZ is used as an alias to keep the anonymity of the interviewee and the company.

Expert interviews are widely used in empirical research [Rei92]. They can take place before the actual research starts to receive information about the field of study, or in this case, after a thorough literature review and after most of the solution-oriented approaches of chapter 6 were elaborated [Rei92]. Thus, this semi-structured interview evaluates the results and interpretations of this thesis [Rei92; SHE93]. Semi-structured means that questions were prepared and pre-formulated [SHE93]. The interviewer can choose in which order to ask the questions and change the structure during the interview [SHE93]. Moreover, this technique allows to go deep into the topic of diversity and inclusion, by gaining new perspectives from the interviewee and leaving room for discussions [LHF17].

The interview duration was 95 minutes, with a 30 page transcript in German language. This transcript was afterwards analyzed with the qualitative content analysis by Mayring [May19] and translated into English.

4.5. The Research Questions

The research questions for this bachelor's thesis are defined as:

RQ1: How is the games engineering sector perceived? In regards to diversity and inclusion while studying and/or working in games engineering.

RQ2: How can we enhance inclusion and innovation in games engineering to create more diverse and inclusive environments and games?

5. Games Engineering - From the History to Teams to Project Structures to Communities

In order to better understand the research topic and to answer the research questions, firstly the state-of-the-art of games engineering is analyzed in this chapter.

5.1. A Short History of Computer Games

To be able to discuss about games, the term itself needs to be established. Games, in particular, video games allow the player to master challenges in virtual worlds [CC11]. These worlds can seam very close to reality or depict a fantasy setting. Moreover, a game needs rules [CC11]. Some of them are presented before starting the game, while others have to be discovered during the game. For many players, a game has to be fun. However, fun is subjective. A better approach would be to describe the desired state of playing with the concept of flow. Regarding to Csikszentmihalyi, being in flow means to be in balance with the provided challenges and one's skills [Csi90; Csi14a]. Necessary for this are clear goals and immediate feedback [Csi90; Csi14a], which both can be communicated within video games. If the challenges get harder, the skills should get better [Csi90; Csi14a]. Figure 5.1 depicts the concept of flow, where the correlation between actions and capabilities can be observed.

The development of computer games is rapidly evolving [AS10]. Ever since the first computer game was developed in the 1950's, an astonishing development took place [CC11]. This has been possible due to hardware and software architecture that has been revolutionary in the last two decades.

Game playing started with the strategy game Tic-Tac-Toe on the EDSAC and Tennis for Two on an analog computer, evolving into arcade games in the 1970's and 1980's, moving on to 3D graphics and new genres in the 1990's and arriving at online games since the 2000's [CC11; KD16a]. Many older game consoles, such as the Atari, can be found in computer game museums. For instance, the "living computers. museum + lab" in Seattle provides a space to look at and try out some of the very first computers and game consoles [Paua]. A picture of an 80's exhibit is depicted in Figure 5.2.

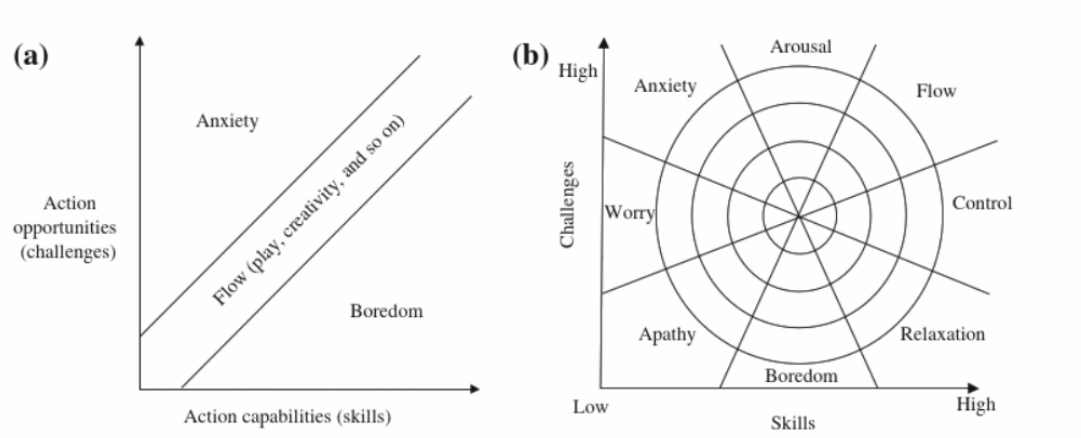


Figure 5.1.: **a)** the original concept of flow by Csikszentmihalyi and **b)** the current model of the concept of flow [Csi14b].

5.2. The Applications of Computer Games

Computer games not only focus on the simple joy of playing. They can have more purpose-driven applications in the fields of education, health care, defence, or scientific research [CS15].

Games (software) engineering (GSE) is a subdivision of the wide field of software engineering (SE) [AS10]. Hence, many techniques applied in SE can be used in GSE and vice versa [AS10]. Some aspects of GSE are emergence, real-time interaction, and computationally-challenging components [LW11]. Altogether a new sector evolves through games [LW11]. The field of GSE is broad; it creates possibilities for users to acquire knowledge in several application fields, communicate with others, and experience and try out new virtual situations [KD16c]. Hence, several types of software and video games exist, all with very specific requirements in terms of art, design, engineering features, project constraints and documentation [KD16b].

A developer can have outstanding skills in a specific section of GSE while using a specific game engine to create a video game for a specific platform and a specific genre. However, they might not be able to create an adequate video game if all these requirements change [CS15]. This is especially the case while taking a look at the huge amount of genres. Everything is possible, from music, rhythm and dancing games, over to role-playing games, to first- or third-person shooters, adventure, fighting, simulations, real-time strategy, puzzle, educational, and massively multiplayer online games [CS15].

Today it is even possible to study games engineering and game design at universities.

Figure 5.2.: 80's exhibit at the living computers. museum + lab in Seattle [Paub].

5.3. Study and Work in the Field of Games Engineering

The following section discusses the context of the first of the two presented research questions, **RQ1**: "How is the games engineering sector perceived? In regards to diversity and inclusion while studying and/or working in games engineering." To manage this, study programs in games engineering and the past and current perception of the gaming industry are observed. A focus lies on games engineering in Germany and the United States. Furthermore, sociological and psychological aspects, such as Pierre Bourdieu's concept of the habitus, will be considered.

It has to be noted that the research in the following sections might seem shocking at first. It does not apply to every institution, every faculty member, student or employee. However, enough studies have shown that sadly the majority of underrepresented groups have to deal with issues such as discrimination on a daily basis. For this reason, this viewpoint is central in the following section.

5.3.1. Gender Stereotypes in Education and at Work

> Ruth Bader Ginsburg summarizes: "The object was to get at a stereotype that held women back from doing whatever their talent would allow them to do [Ala15]."

Conefrey explains that an often underestimated issue in education regards sexual discrimination [Con01]. Because of this, a lot of young women switch their majors from science and engineering to something very different. Even though, Conefrey's research has found that these women had better test results in science, mathematics and engineering in their final examinations at school, they do not hold these high grades in their first and second years at university [Con01].

Almost 15 years after this research, the phenomenon that women are underrepresented in certain STEM fields, still holds [Che+17]. Whereas more than half of the undergraduate students in biology, chemistry and mathematics are female, the numbers drop significantly to less than 20% in the fields of computer science, engineering and physics [Che+17].

Sadly, gender stereotypes are intensified by faculty and students for the disadvantage of women [Con01]. While other students focus on the sexuality of women, as research has found, faculty seems to not be able to acknowledge the women's abilities [Con01]. Consequently, as Conefrey says, this leads to a "hostile, academically unproductive environment for many women [Con01]." They do not feel as they belong in this men dominated field [Che+17].

Women deal with the pressure of having to be feminine, but not too feminine [Con01]. They should be attractive and not just nerds, but if they are too attractive, their peers instantly jump to assumptions that these women just got that far for flirting with faculty [Con01].

This is aggravated by women's decreased self confidence [Con01]. Research has shown that academically smart women are more likely to believe the opinion of their professors if they tell them that they do not fulfill the abilities to be an engineer [Con01]. Low self esteem, leads to lower academic performance, which might lead to leaving the sciences [Con01].

This should not be the desired case. For the products and services of tomorrow, diversity is needed in engineering [W A]. Hence, a need for more female students, and later on, employees, exist [W A].

Being an engineer requires to be very creative [W A]. This creativity thrives from life experiences. Only with a diverse team, different view points and experiences can be joint together to achieve the unthinkable [W A].

Wulf not only argues to spotlight women and underrepresented minorities, he also adds the need for individual diversity. This includes the knowledge one single person

contributes because of their individual experiences [W A].

Stereotypes which continue at the work place have to be considered carefully. A phenomenon that arises in research is that the stereotype of how women behave is matched to specific roles on the team or the company, such as being a secretary [HE08]. Nonetheless, these roles are usually not what women are aiming for [HE08]. A widespread believe is that people in high organizational positions need to fulfill specific characteristics [HE08]. These characteristics, however, are attributed to male rather than female employees. Consequently, prejudice and biases arise [HE08].

5.4. Teams in Game Development

After explaining how studying and working in the field of games engineering is structured in section 5.3.1, the questions arise, how teams in games engineering behave, how diverse they and their products are and how the general culture of the games industry is observed. The systematic literature review in this chapter aims to further obtain insights for **RQ1**.

5.4.1. A Requirement for Love in Games Engineering

Reading the book "The Art of Game Design" by Jesse Schell, the first sentence in chapter 26 about designers and their teams starts with: "To create a modern videogame, a team of tremendous diversity is required [Sch19a]." Schell even takes it one step further when he says: "The secret to successful teamwork is love [Sch19a]." Now, people do not have to be in love with each other, but they should bring a good amount of passion for their work and the specific game they are developing.

According to Schell [Sch19a] a distinction between three problems can be made. Firstly, some team members may not love a single game. Secondly, even if they love games, they may not love the one they are currently working on. Thirdly, if point one and two are proven wrong and they indeed are in love with their work and the specific game, they might still be in love with the wrong version of this specific game. Hence, they are in love with how their perception of the game looks like. However, the team's perception of the game might be completely different [Sch19a].

How can everybody gain the same understanding of the soon to be developed game? A very common approach is depicted in the use of a Game Design Document (GDD). This is a central document that states all the important information of the project. Furthermore, everybody on the team should be able to access it and make changes. In chapter 5.5 the GDD will be discussed in more detail.

5.4.2. Privileges and Diversity in Teams

Lisanne Pajot and James Swirksky observed the production of three video games in their movie "Indie Game: The Movie" [Lis12]. The featured games consist of "Braid", "Super Meat Boy" and "Fez", which each were created by teams consisting of two white males [BL17b; Lis12]. It strikes attention that during the whole film only one woman is interviewed. Subsequently, the statements in "Indie Game" might be "historical, geographic and gendered" as Boluk and LeMieux analyzed [BL17b]. The game development teams of "Braid", "Super Meat Boy" and "Fez" seemed to consist of, and only focus on the target group of North American male players, who were raised in the 80's and 90's. The consistency in this phenomenon is astonishing. Furthermore, the message is conveyed that anything is achievable if you work hard for it. This statement might be true for some cases and wrong for others. Especially, if the game developers privilege is not taken into account. A further asked research question could be: How are these privileges handled in general, by the team, the industry and the community?

5.4.3. The Behaviour in Teams

Teams usually consist of a manager and a group of people, subordinates, working on the same project. Studies found that both male and female managers who socially compare themselves to others are more willing to accept other's opinions from subordinates of the opposite gender [GLH17]. These opinions are usually comprised of feedback, ideas, concerns etc. The phenomenon of accepting the opposite gender's opinions, derives from the perception that the manager would feel threatened in their position if the voice was expressed by the same gender. Hence, this might lead those managers to be biased against same-gender subordinates [GLH17].

On the contrary, research found that managers who do not socially compare themselves, tend to accept opinions from subordinates of the same gender. Now, these managers might be biased against the opposite gender [GLH17].

For teams to function well and for the company to be innovative, all ideas should be reviewed fairly and considered by their worthiness rather than by their influenced biases. Morela Hernandez suggests in [GLH17] to develop training seminars for managers to work on their biases and be able to view all subordinates the same way. Furthermore, she suggest having a diverse committee for fundamental decisions, rather than leaving it to a "single, potentially biased manager" [GLH17].

5.5. Project Structures in Games Engineering

This section analyzes the project structures in games engineering and more general in software engineering. Therefore, the Game Design Document (GDD) is considered as an important factor in the game development process that might be able to lead to more diversity and inclusion.

5.5.1. The Game Design Document

As discovered in section 5.4, teams can behave in various ways. However, all teams need a common understanding of the project's aims to be able to work sufficiently and take deliberated decisions. Therefore, a GDD can be used. The intention of a GDD lies therein to **1. memorize what has been agreed on** and to lead the way for **2. easier communication** [Sch19b].

Figure 5.3 by [Sch19b] shows different departments that use a GDD for their internal communication, and for the communication between the departments as well. It depicts an exemplary segmentation into Design, Art, Production, Engineering, Writing, and Players [Sch19b].

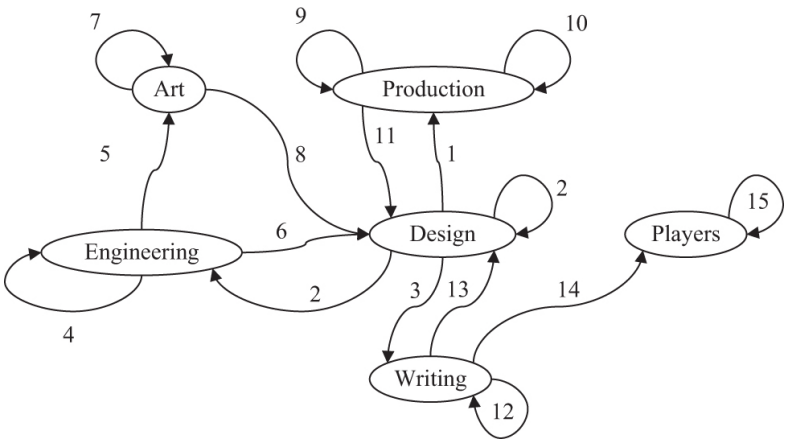


Figure 5.3.: Depicting correlations between team departments for memory and communication. Every arrow can be more than one document [Sch19b].

Each of these orientations can have their own document, specified with the requirements they need. Hence, documents of various contents and lengths are created. Some of them might include a short overview of the project, others might include a complete and detailed overview. A document could be written to describe the story line, while another one could be used for budgeting and planning the structure of the project. Moreover, the technological documents for the engineers might use different

terminology than the documents for the artists. However, regarding the pipeline and the system overview, it is imperative that everybody has complete knowledge of the involved terms. Therefore, engineers might create a document in easier language for the art department, in which, for instance, they explain how the art can be integrated into the game and what the specific limitations are [Sch19c].

5.6. Community of Gamers

The community of players should not be disregarded in the literature review. The following sections provide context for **RQ2**: "How can we enhance inclusion and innovation in games engineering to create more diverse and inclusive environments and games?" Furthermore, the community of people with disabilities and the progress that takes place in video games, by providing accessibility features, will be analyzed.

5.6.1. Games and Gender

Sabine Hahn analyzes in her dissertation the complex and multilayered issue of gender and games [Hah]. Among other things, she argues that the female game playing community is growing significantly [Hah]. Statistics show that the discrepancy between male and female gamers in Germany is declining [F T20]. From a total of 34.3 mio video game players, the statistic shows that 17.8 mio male players vs. 16.8 mio female players enjoyed games in the year of 2020 [F T20]. Within the practical project of this thesis, the interviewee of games company XYZ reveals that it is not up-to-date to keep thinking that the majority of players is male. Game companies can not keep this standpoint for ever; they should rather work on adjusting their target group as the market of people who enjoy games is shifting. The interviewee explains:

> "If you would like to reach more people, then you have to be more diverse, then you have to provide more options and [...] not keep the standpoint of the stereotype gamer of a 15 year old white heterosexual boy, so quasi, I don't think this is up-to-date anymore."

This stereotype is sadly still widespread. Pierre Bourdieu explains that today's gendered society is patriarchal in its thought and behavioral patterns [BR18]. Moreover, anything people do can be connotated as feminine or masculine [But18]. Barcanec argues that women do not want to be seen as nerds, which is connotated as masculine, and might secretly play video games [Jen19]. She explains that playing secretly is related to the phenomenon that girls and women only got in touch with video games through their brothers or fathers. Hence, playing games was more like a family activity than something they would openly do by themselves [Jen19].

This image seems to be reflected in the games. The games developed by male developers, showcase male protagonists [Jen19; BL17a]. If a woman is featured she is usually the sexy sidekick or the damsel in distress [Jen19; BL17a]. Consequently, it is assumed that firstly, a woman is not evolving during the game, and secondly, can not fight for herself.

There is a need for more female developers that will create realistic female characters, which then again will draw more women into the games industry, a phenomenon known as the Virtuous Cycle [Hah; Kaf08].

5.6.2. Are Metagames Always Diverse and Inclusive?

First of all, Prof. Boluk and Prof. LeMieux, authors of "Metagaming: Playing, Competing, Spectating, Cheating, Trading, Making, and Breaking Videogames" explain the term of metagaming as:

> "games about games, games within games, games around games, and games without games [BL17b]."

This explanation is partially based on Richard Garfield's perception of metagaming. Garfield argues that everything that happens in the context of playing a game is part of the metagame [CGH12].

However, metagames can even become dangerous. One case led Anita Sarkeesian, a feminist media critic with Canadian-American origin, to receive murder threats for funding her YouTube series entitled "Tropes vs. Women in Videogames" on Kickstarter [BL17a]. This series would follow her "Tropes vs. Women" videos on her in 2009 founded channel "Feminist Frequency", and analyze in more detail the gender roles and sexism in video games and its biased storytelling [Ani20a; Ani20b; BL17a]. It should never have to reach the point, where somebody is physically and mentally harmed and fears for their life.

Unfortunately, female gamers are often perceived as spoilsports or intruders [BL17a; Jen19]. This is why gamers might seem reluctant if the video game takes this major shift to spotlight women as protagonists and as characters who develop throughout the game [BL17a; Jen19].

5.6.3. Accessible Games

Nowadays, everybody can use computer technology, anywhere and anytime [LHF17]. As technology is evolving, so are the video games and the group of people who enjoy playing them. This includes people with disabilities and people without. It might not

always be possible to provide complete inclusion, however it should always be possible to provide access to entertainment [BS12].

In his book "Research Methods in Human-Computer Interaction", Jonathan Lazar explains that while doing research, or in our case, developing video games, attention has to be paid towards people with disabilities [LHF17]. The developers, similarly to researchers, cannot simply make assumptions about the behaviour of people with disabilities and their reactions to certain game features [LHF17].

Moreover, we should not put all people with disabilities in one group. A distinction into three major categories can be made: perceptual disabilities, motor disabilities, and cognitive/intellectual disabilities [LHF17]. As Lazar explains, some people might be hard of hearing or have visual impairments. Others might not be able to use their hands to operate a game controller, mouse or keyboard. People that fall into the third category might have Down syndrome, autism or dementia [LHF17].

For some gamers with a disability it might be fundamental to use assistive technologies, whereas for others it might not. Assistive technologies might create a more pleasant user experience for some gamers, and might even make it possible for others to interact with the game at all [Adv]. Taking a closer look at audio books, speech recognition and captioning, it is clear that these technologies were developed for people with disabilities [Laz15]. However, nowadays, people without disability use them in various contexts as well [Laz15]. Accessible games may have originated from a need to cater to specific populations, but features such as captioning are used by many people when they are, for instance, in a loud place and they prefer to read about what is going on in the subtitles. This leads to all populations using assistive technologies in the end.

6. Methods and Solution-Oriented Approaches

> “Fight for the things that you care about, but do it in a way that will lead others to join you," by Ruth Bader Ginsburg [Ala15].

After a detailed literature review, solution-oriented approaches can be developed. This chapter introduces concepts that might enhance inclusion and innovation in games engineering. Figure 6.1 displays all introduced methods and their correlation to each other. Some methods might be more interesting in specific settings than others. It is not necessary to implement all at once or in this specific order. Moreover, the quality of these methods will be discussed with further literature and an interview with an employee of the games company XYZ, a video game company with studios across the world. The section 6.6 includes a practical project which is available in the appendix.

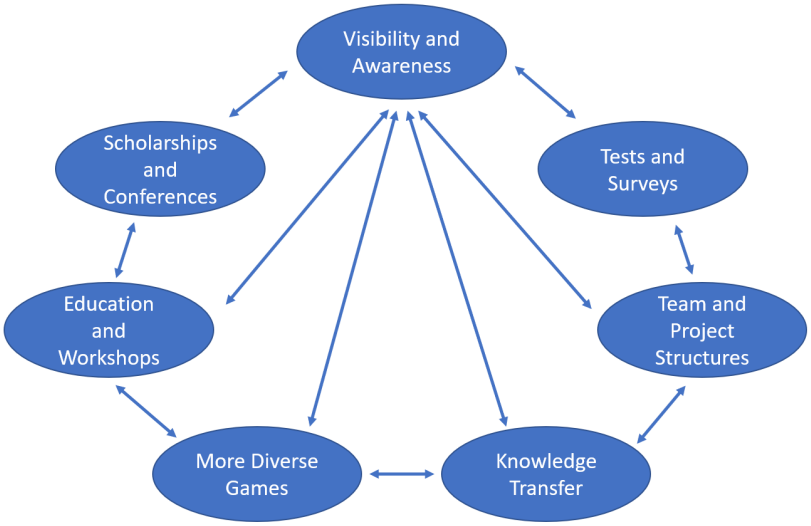


Figure 6.1.: This Figure shows an overview of the introduced methods. Arrows could be drawn between all the bubbles, but are only exemplary depicted between "Visibility and Awareness" and the rest.

6.1. Visibility and Awareness

> Marcus Aurelius in Meditations, 11.5: “What is your vocation? To be a good person [Ste19a]."

To be a good person may cover very different subjective viewpoints. As undoubtedly discrimination is part of society’s social interaction, it seems indispensable that people are getting aware about it. Pless and Maak support the strategy to, first of all, raise awareness to build an inclusive diversity [PM04].

The term visibility refers to being able to see something, whereas awareness is the knowledge or understanding that something exists [Cam14a; Cam14c]. To start with, AnitaB.org, a global organization for women technologists, organizes virtual panel discussions and webinars addressing diversity and inclusion in the workplace and at university. These talks provide attendees with a better understanding of diversity and inclusion (D&I) issues within a short time frame.

Pless and Maak agree on creating understanding within the first steps, besides simply raising visibility [PM04]. Moreover, they would like to encourage reflection [PM04]. This can be observed in the following example. The Computerspielakademie within the JFF - Institut für Medienpädagogik organized a panel discussion on the live streaming platform Twitch with the topic entitled "Gamerworlds? Gender roles in the virtual room" [Med20]. Dealing with the gender issue live and online might lead more gamers to think about how they treat other underrepresented gamers or how they act when somebody is treated undignified. Some video game players might not even notice that others are facing non-inclusivity and discrimination on a daily basis. As Honeyball, a known female video game streamer, says during the panel discussion, as soon as she joins the voice chat she has to endure inpolite and mean comments [Med20]. Other people either think she is a young boy or they immediately recognize her as a female and tell her to leave the game [Med20]. Everybody should take responsibility to treat others with respect, as the golden rule says: “Do unto others as you would have them do unto you [Bil].”

Furthermore, humans thrive with role models they can relate to and identify with [Jos18]. Seeing a person from an underrepresented group making great achievements in games engineering or in technology, in general, might inspire more people to choose this as career. Role models might be able to draw attention to the fact that anybody can make it if they work hard and are passionate about what they are doing [Jos18]. However, not only people who were successful can function as role models [LJK02]. Studies found that individuals might need positive or negative role models depending on their specific goals [LJK02]. To raise awareness, the company Accenture held in collaboration with the Global Digital Women a live stream on YouTube entitled: "Role

Model Breakfast - Inspiration by female role models" [Tij20]. They invited four strong women in different stages of their career to openly discuss about their work and their lives [Tij20].

6.2. Tests and Surveys

This section introduces self-tests and surveys that could be implemented at the work place to improve the work environment.

6.2.1. Self-test on Unconscious Biases and Implicit Associations

Should all employees have to do a self-test, for instance, on racism, gender, or sexual orientation, to find out about their unconscious biases and implicit associations?

This section will shortly present what an implicit association test (IAT) is. Afterwards, section 7.2.1 will discuss the risks that go hand in hand if an IAT would become mandatory for the employees.

A self-test not only reveals a person's biases, but also "attitudes, stereotypes, self-concept, and self-esteem" [Hof+05]. Even though individuals sometimes purposely hide behaviours or attitudes, they might at the same time not even know that they act with these behaviours [11a]. An example would be thinking that women and men should take equal turns of staying at home and taking care of their children. However, the test might reveal that most people unknowingly associate this role to the mother, rather than the father [11a]. The IAT would detect these associations and give feedback, with which the test-taker could work to become more inclusive.

The test gives short time intervals to respond to questions, alternatively to map categories [GMS98; 11a]. In the first rounds the tasks are designed to be easy by mapping categories with each other, such as saying 'goodbye' when presented with a female face, and 'hello' to a male face. Each round becomes a little bit more difficult. Round five, the final one, is the most difficult. Here, the test-taker has to reverse the previous, and map a male face to 'goodbye', but a male name to 'hello', and vice versa for females. At the end the results of round three and five are compared to detect the implicit associations [GMS98].

For further information the interested reader is kindly requested these resources [GMS98; Gre+09; Hof+05; 11a; 11b].

Managers could introduce and provide these and more resources about the IAT, and biases in general. This way, they might increase their employees' awareness about their associations. Nevertheless, section 7.2.1 will explain why such a test should not become mandatory for anybody.

6.2.2. Employee Surveys

Surveys are used in a social-scientific context to determine views, opinions, and needs of a target group [Rei92]. In most cases the surveys are conducted with the help of a questionnaire which will be send to the employees [SHE93]. Analyzing the surveys can help the company improve, for instance, the environment, meetings, and breaks. It can also detect if somebody feels discriminated against or uncomfortable at work.

6.3. Team and Project Structures

After having analyzed the context of teams and project structures in games engineering, this chapter introduces methods to enhance inclusion and innovation in both.

6.3.1. Assessment of Actual Conditions

In order to examine the structures of a company or university to make them more diverse and inclusive, an assessment of the current situation and conditions should take place [19]. This assessment might clarify which concepts have already been put into practice and what might still be needed [19].

As a first step, the processes already taking place, should be secured [19]. This could happen, by writing them down and saving them for traceability, transparency, and continuity [19]. Moreover, it could lead to new employment possibilities, for a person who will handle these processes in the future [19].

Within this context, it could be observed whether students and employees work in anonymity or rather feel comfortable expressing their individuality. The advantages and risks of individuality vs. anonymity will be further discussed in chapter 7.3.1.

6.3.2. Using Artificial Intelligence to Hold Effective Meetings

Employees might feel treated unfairly during meetings or with decisions made by their managers. The employees might think that their ideas were not considered, because they have a specific gender, orientation or origin. How can the structures change to include everybody appropriately and take proper decisions without bias? A solution-oriented approach consists therein to develop an artificial intelligence (AI) that assists certain tasks.

For instance, with the recent crisis of COVID-19 pandemic, home office has become the norm. This means that meetings are taking place virtually with tools such as Skype, Microsoft Teams or Zoom. Through this change, difficulties arise that may include hard

to follow discussions, people not speaking up or alternatively, everybody speaking simultaneously.

Minute taking has become increasingly challenging as well as it is harder for the responsible person to listen and actively participate in the discussion [Ste19b]. The minute taker is usually caught up in transcribing as much as possible and keeping up with the speed of the discussion, and hence, they do not offer their own perspective [Ste19b]. An approach might be to use an AI which will transcribe the whole meeting [Ste19b; Cha]. Now, the job of the minute taker becomes superfluous. Moreover, the transcript of the AI is more accurate than it was before, since every word is written down [Ste19b; Cha]. The AI could even create a summary of the meeting [Ala]. After the meeting, the attendees can refer to the transcript again and quickly look up topics, keywords or read through specific sections again [Ste19b]. This way nobody should feel they were given the burden of taking notes. Hence, they can actively participate and share their ideas with the group.

In a study conducted by Cisco in 2017, 95% of the employees agreed to the advantages of having an AI assistant for tasks, such as note taking [Chr17]. This concludes an example of the increased confidence people have in technological improvements through AI. However, the same study indicated that 65% admitted to have an issue with the security of such an AI [Chr17]. The AI would have to be developed in a way to abide by data privacy, otherwise employees might not want to use it.

If data privacy issues are resolved, the AI could be assigned project management tasks such as tracking deadlines and sending notifications to team members [Ste19b]. This would cover the case, if anyone felt they were being forgotten by their team manager or team members or purposely only notified last minute. Thanks to AI, everybody would receive the same reminder at the same time.

Maybe the AI realizes that at the past meetings somebody did not participate at all. It could, for instance, check the person's calendar and realize that the meetings are overlapping with another important appointment. The AI could decide then to choose another date and time that would better fit the schedule of all team members.

Another use of AI could be to recognize who is currently speaking and what they are talking about [Ala]. This way, the AI could track speaker proportions and withdraw or attribute speaking rights to people who have talked a lot or not contributed to the discussion yet.

These methods might not only increase the feeling of belonging and inclusion, they might also enhance productivity and creativity in the work place, which will fuel innovation.

6.4. Knowledge Transfer

The question arises, whether computer science (CS) and software engineering (SE) can learn from other disciplines. While dealing with behavioral science, it might be possible do draw a parallel between social sciences to CS and SE. Pierre Bourdieu explains in his book "Distinction: A Social Critique of the Judgement of Taste" that lower classes will respond to politics differently if they were explained to them in easy language [BR18]. Lower class in CS might be equivalent to the class of people who started programming at a later age, or the class of people who do not come from an academic background, or the class of people who have a different socio-economic background. The formation of a person's political opinion depends on social mechanism, as does the technical understanding. All this can be partially described as the habitus of Bourdieu's theories [BR18].

Consider the possible scenario of three computer scientists having a conversation, where two of them (*A* and *B*) have been programming since the age of 12 and one of them (*C*) started programming at entering university at the age of 19. *A* and *B* constantly use superfluous technical terms. At the beginning *C* finds this fascinating and terrifying at the same time. *C* does not understand everything they are talking about and constantly asks questions to reach the same level. At some point, it will get tiring to ask about every second word they use, and eventually, *C* will stop asking. However, if *A* and *B* would have used easier language and not insist on applying technical terms, where they were not needed, *C* would have been able to contribute to the conversation. After this experience, *C* might feel like an outsider and instil self-doubt themselves for not being able to keep up with their peers. They might "wish that [they] belonged more in this whole engineering group [FWT07]."

How can this scenario be prevented? All students or all employees could be asked to treat newcomers with respect and understanding. However, this is not enough, since society usually already expects human beings to treat each other with respect and understanding [Bil].

The scenario could be taken one step further. If *A* is *C's* supervisor and they demand to talk in technical jargon all the time, the entry point for *C* will become more difficult. *C* might already have the knowledge, but might not be able to express it appropriately due to a language barrier or some other reason. In this case, however, *C* is dependent on *A*. What would happen if this dependency gets eliminated? The company might be able to establish manuals and documentation with the usage of technical jargon, on the one hand, and easy language, on the other hand. *A*, as the supervisor, would delegate tasks to the team, and hence, to C. Here, they might still use superfluous words and unintentionally make something more complicated than it has to be. Nevertheless, now *C* would not have to ask *A* questions all the time, but would be able to look up

how everything is supposed to work in the documentation or manual. They could go through the material in easy language first, and as soon as they feel comfortable they could switch to technical jargon.

Moreover, it is important to let *C* know about all the ways they can extract information from the system. Making the entrance hurdle as low as possible might be advantageous for the whole team and create a more inclusive and welcoming environment. In chapters 5.3 and 5.4 the appearance of such an environment has already been discussed.

6.5. Making Games More Diverse

The aim is to include more underrepresented minorities in the process of developing games, but also to make games enjoyable for them.

Boluk and LeMieux argue that the soft- and hardware developed by the game industry usually focus on one specific type of body [BL17c]. In this case, disabled bodies are not considered, neither are gendered bodies. Created by a majority of male developers, the games neglect the needs of further target groups than just the typical video game player stereotype [BL17c].

Consequently, action has to be taken to represent minorities in video games and adjust the soft- and hardware in a way that makes it possible for them to play games.

6.5.1. Tackling Gender Stereotypes

Barcanec distinguishes in her work the need for characters with real emotions and behaviours, rather than forcing the protagonist to be female [Jen19]. Hahn, moreover, argues that it is more important for female players to identify with their characters and be able to develop with them throughout the story [Hah]. This might help male video game developers shifting their focus and creating female characters with a certain depth [Jen19]. It is important that game developers stop sexualizing female characters and stop putting them in conservative roles [Jen19]. To do so, the designers and engineers have to get aware and be educated on topics such as diversity and inclusion.

6.5.2. Accessibility in Games

How can accessibility be improved in games engineering? On the one hand, approaches could be taken to renovate office spaces to be accessible or to allow work from home for employees who are not able to work in an office with other people.

On the other hand, the games themselves could include more accessibility features and accessible devices. This section will explain some approaches to accomplish this aim.

Barlet and Spohn from the ablegamers foundation created checklists and guidelines that can be used by game development teams [BS12]. As mentioned in chapter 3.2 the checklists are split into console and pc accessibility. These checklists could be included in the GDD and used for the game review [BS12]. If too many features stay unchecked, the team should reevaluate the game and try to include more of them. A few examples are to adjust the difficulty levels, not have mandatory button mashing and allow colorblind options [BS12].

It is easier to implement accessibility features from the very beginning. Even small changes can transform the player experience [BS12]. For a better understanding of how to assess the accessibility options, Barlet and Spohn created a three-tier style [BS12]. Level One consists of the basics, that are usually already implemented in common games. Level Two focuses on providing better accessibility options, while still remaining easy to implement. Level Three aims to offer accessibility features, thus that there is almost no barrier for disabled gamers [BS12].

An exemplary game entitled "The Last of Us Part II" was created by Naughty Dog, a game company founded in 1984 [Pla20]. The game development team implemented more than 60 accessibility options into their game. To ease the experience, hence, to help the gamer choose the settings, Naughty Dog provides three accessibility presets. They are divided into vision, hearing and motor accessibility. Throughout the game it is possible to adjust the presets to one's needs [Pla20].

Visually impaired or blind players have, for instance, the opportunity to skip puzzle options, to play with a high contrast display and to enable text-to-speech [Pla20].

Hearing impaired or deaf players are provided, amongst other things, with awareness indicators, pick-up notifications and combat vibration cues [Pla20].

The third preset enables accessibility options for gamers with a physical or mobility impairment. Some examples include auto weapon swaps, navigation and traversal assistance and infinite breath [Pla20].

On their website, Naughty Dog provides a detailed list of all the accessibility features, how to turn them on or off and how they work within the game [Pla20].

6.6. Education and Workshops

After taking the first steps of raising visibility and awareness, it would be great to educate people more thoroughly on diversity and inclusion issues. This education can start at schools, continue at the university and later be enhanced and practiced at the work place.

6.6.1. Education at University

While doing research one might find a lot of valuable resources on tackling discrimination and creating a more diverse and inclusive environment. The environment could be a university, the work place, the world within a game etc. However, if never confronted with these issues it is harder to overcome the hurdle and start researching by oneself. Maybe people think there is no need, since they themselves did not face any discrimination. For these reasons, the following section will discuss how education could be extended to address these issues directly.

The following suggestions can be adjusted to suit different study programs and modules in a university setting.

A Lecture about Diversity and Inclusion

To start with, a presentation with exercises on diversity and inclusion could be inserted in a module for the first or second semester students. This presentation could be designed for a three hour lecture or two one and a half hour lectures, and an additional tutorial of one and a half hours. Consequently, the students will receive a stable foundation on diversity and inclusion in games engineering. With this knowledge, the students would be better equipped to design more diverse and inclusive games throughout their studies. Moreover, a presentation and exercises on inclusion and accessibility could be integrated in a module for the third or fourth semester students. The time frames could be the same here. The students can build onto the previous foundation and include accessibility features in their games.

Furthermore, a representative from the games industry could be invited to talk about diversity and inclusion topics at the Ringvorlesung Games. On the one hand, the professors can present the scientific and academic perspective, and on the other hand the guest speaker can talk about the industry's perspective. This talk might last for one to one and a half hours.

Exercises to Sensitize Students to Diversity, Inclusion and Accessibility

The final presentation slide set could be used as a basis for one week of teaching. It can be inserted into any game related lecture. In addition to this, exercises were created for a deeper understanding of diversity and inclusion in correlation to innovation in games engineering. Some exercises will be introduced here. However, a complete list of exercises can be found in the appendix B.1 of this bachelor's thesis.

1. What does playing mean for you? How would you describe a game?
    a Consider you are visually impaired, in what regards does the game change?

b What would change if you were hard of hearing?

c Can you play the game with only one hand or maybe just by using your feet?

d Write a short essay (300 words) in which you answer the above questions and how you would proceed to solve some of the issues that might arise. Can you find three aspects to make a game more accessible?

These tasks should sensitize the students to D&I issues. The aim is to get the students thinking about existing impairments and how these influence the gaming experience. The students should try to answer the question, how games can be developed to provide entertainment for more than just the usual video game player. This exercise is theoretical and asks the students to write a 300 word essay. A possible approach to encourage students to perform this exercise, could be to set up a grade bonus system which will be added to the final exam grade at the end of the semester.

Once the students have learned about D&I issues in theory and have discussed their thoughts in an essay and with the class, the task could get more practical. For instance, the next exercise combines theory and practice:

2. Play a video game that was designed for individuals with a visual impairment or play a regular video game blindfolded.
   a How does your (personal) experience change?
   b Did you use different equipment to play than usual?
   c Which mechanics were important for your experience?
   d Write a short essay (300 words) in which you answer the above questions.
   e Develop a mini game which will not use any visuals. Think about audio features that will enable a smooth gaming experience. Which accessibility features could be implemented for visually impaired players? (The professor or teaching assistant could provide a template for mini games).

Through the practical part of this exercise, students will, firstly, understand what it means to play a game without being able to see any visuals. Secondly, they will gain hands-on-experience on how to implement accessibility features themselves. Depending on the class and whether the exercises are graded or not, the professor or teaching assistant could provide code snippets or templates for mini games to help the students implement the accessibility features.

A Practical Class to Implement Accessibility Features

Moreover, the students could be encouraged to create a completely diverse and inclusive game. What could such a class look like?

One elective module could have room for 15 bachelor or master students in total. The students should split up into groups of three. Each group has one semester to develop a video game on a platform and engine of their choice. Depending on the university's resources and curriculum, those requirements can be fixated to fulfill specific needs. For example, the Games Lab, which is well equipped, could be used to develop a game for the Xbox or a VR game. Everyone's mandatory responsibility would be to integrate at least three aspects for accessibility.

The first two or three weeks of the class, should consist of learning about the basic features in theory and creating a Game Design Document (GDD). The basics of a GDD are discussed in chapter 5.5. The student's GDD should already include the accessibility features and explain how and why the game is diverse and inclusive. Moreover, the GDD should describe the team, and the team structures. It should be clearly stated who takes up which role on the team. Afterwards each student of the group picks at least one accessibility feature and implements it. Of course it is possible to integrate more than three features.

At the end of the semester the students present their game and explain the diversity and accessibility features in front of the whole class. Furthermore, they can present their game at events such as the DemoDay at the Technical University of Munich [Tec20b].

6.6.2. Workshops at University and the Workplace

Educating people is a good starting point for gaining more inclusion and innovation. It is important to show everybody that they belong in computer science and engineering [Che+17]. The author of this thesis conducted as a Woman in Computer Science Officer, the #IamRemarkable (#iar) Workshop with the IFF - Women in Computer Science at the Technical University of Munich [20]. More information about the IFF will be available in section 6.7.2. The workshop is aimed at one and a half hours, but can take longer depending on the length of discussions and the participation of attendees [20].

All in all, 11 female participants joined the Google initiative to learn about self-promotion for almost 2 hours on 5th May 2020. It is advised to conduct workshops with 10-20 attendees, or if held virtually, with 6-20 [20]. Due to COVID-19 the workshop took place virtually via Zoom, where it is more difficult to encourage the participants to speak up. However, as one anonymous participant described in the post-workshop survey: "I liked that we were encouraged to start sharing our accomplishments right away." Another participant's view is quite similar: "Honest and valuable insights and

perspectives from all the contestants, and a great feeling of community when we all shared things with each other." Humans often think they are the only ones struggling with a specific issue. Providing a safe space for discussion and sharing their own feelings, can tackle this issue [20]. It gives almost everybody a sense of belonging and shows that they can overcome the obstacles in their way. Especially, women in computer science do not feel comfortable in speaking up [20]. Some do not want to seem weak, others think nobody will listen to them. With initiatives like the #iar these issues can shift and create a positive and inclusive space in computer science for everybody [20].

Moreover, anybody can participate in a Train-the-Trainer (TTT) Session for free and become an #iar facilitator. During this TTT session, the trainee will learn the fundamentals of self-promotion, statistics and research that has been conducted about women and underrepresented groups, with regard to self-representation [20].

Positive feedback in the anonymous post-workshop survey included comments such as: "It is quite empowering, I think it should continue." Hence, the next #iar workshop is currently in planning at the Technical University of Munich for the winter semester 2020/2021.

6.7. Scholarships and Conferences

Another way to encourage women and underrepresented groups in computer science, is through scholarships and conferences.

6.7.1. An Overview of Miscellaneous Opportunities

In the past years, more and more events, training seminars and scholarships are aiming to empower women and underrepresented minorities in technology. Some examples include:

1. the Informatik-Forum-Frauen (IFF) at TUM
2. the IFF Gender and Diversity Grant at TUM
3. the DEVersity Brunch
4. the Female Tech Leaders
5. the Accenture Female Talent Program
6. the Women Techmakers by Google
7. the #SheMeansBusiness by Facebook

8. the Palantir Scholarship
9. the European Women in Tech
10. the Grace Hopper Celebration for Women in Computing (GHC)

Section 6.7.2 presents the IFF in more detail. Some of the other points will be shortly discussed in this paragraph.

The DEVersity Brunch initially started as the More Women In Games Brunch in Munich a few years ago. As their aim is to not only support women, but also other underrepresented minorities in the games industry, they changed the name and made it more inclusive for everybody. During the brunch, the attendees usually enjoy two talks of representatives from the games industry. Here, they can gain valuable insights into the work in games engineering and moreover, network and discuss with other attendees in a relaxed environment.

Leaving the games industry, to take a closer look into business consulting, technology, and outsourcing, the Accenture Female Talent Program offers great opportunities for female students in technical studies. The program does not only focus on computer science students, but also expands on other disciplines like mathematics and business. Accenture offers a six-month mentoring program, full of webinars and workshops, for the 50 chosen female participants. They learn about Accenture in general, Artificial Intelligence, Cyber Security, the everyday life of a consultant and much more. It is important for students to be able to network early on in their career.

Another great example which provides opportunities to network and which aims to support women in the STEM area, is the Grace Hopper Celebration (GHC). It usually takes place in Orlando, Florida or Houston, Texas. However, this year it will take place virtually, due to COVID-19. The GHC is the largest conference for women and underrepresented groups in computing with over 26.000 participants annually.

6.7.2. The IFF and its Gender and Diversity Grant at TUM

The IFF fosters the equal participation of women and underrepresented groups at the department of informatics at the Technical University of Munich [Tec20a]. Throughout the semester, the informal group of bachelor, master and PhD. students develop workshops, training seminars and networking events to empower each other [Tec20a].

The IFF offers the IFF Gender and Diversity Grant for bachelor and master students at TUM each year [Tec19]. Students with extraordinary achievements for women and underrepresented groups in computer science can choose a technical conference they are eager to attend with this scholarship. The grant includes travel costs, accommodation and the conference ticket. The favourite conference for scholarship winners is the GHC.

7. Evaluation of Methods and Solution-Oriented Approaches

After introducing methods and approaches in chapter 6 to enhance inclusion and innovation, this chapter aims to examine their advantages and risks. It will further discuss **RQ1** and **RQ2**. To gain more detail, an expert interview with a representative of a famous games company was conducted and interpreted. For most parts of this chapter, the analyzed interview is used to evaluate the methods. As a recap of the introduced methods, Figure 7.1 is shown again. This chapter aims to discuss and evaluate the approaches in the same order.

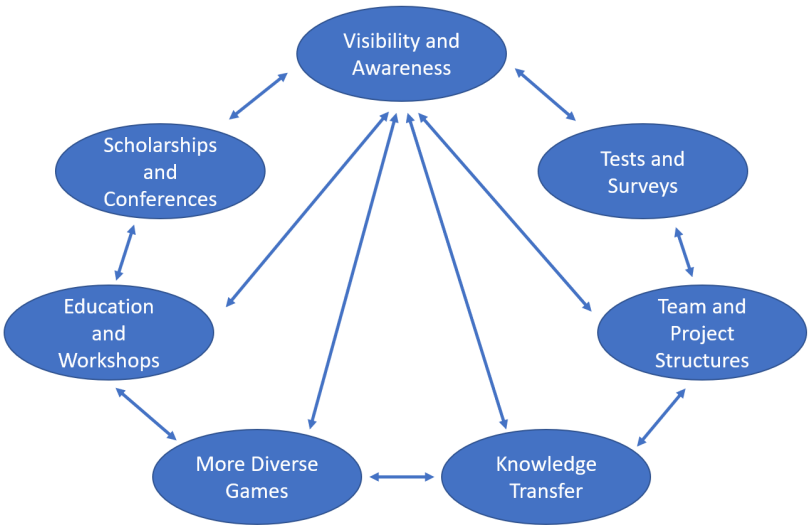


Figure 7.1.: This Figure shows an overview of the introduced methods. Arrows could be drawn between all the bubbles, but are only exemplary depicted between "Visibility and Awareness" and the rest.

7.1. The Pros and Cons of Raising Visibility and Awareness

As the interviewee explained, the gaming industry is not always perceived as a professional industry, even though it is a very professional sector, as analyzed in chapter 5.3. How can the image and the general environment be changed? To start, a distinction can be made between the external and internal impact of increased visibility and awareness.

7.1.1. External Impact: Discussions and Representation

The external raising of visibility can, first of all, advance the overall image of the gaming sector. Hence, it is important to actively participate in enhancing diversity and inclusion, by taking action and showing up for underrepresented minorities.

To spread awareness about diversity and inclusion (D&I) the interviewee holds the opinion that it is very important to participate in group discussions, panel discussions, and talks at companies or universities.

A risk to this approach, however, might consist therein that team members react negatively on the increased amount of visibility for certain groups. As the interviewee explained, a reason for this could be that some team members do not know enough about underrepresented minorities and hence, do not see the need for spotlighting them. They might wonder why these groups are put into focus, but nobody seems to discuss their own group. However, this risk can be resolved by educating everybody on the team and providing them with the right resources.

Last but not least, attention should be given to websites, flyers and other material which the company is distributing not only for the public, but also for internal use. The people creating this material should ask themselves whether they need another picture of only male heterosexual white programmers or if they should mix it up a bit and attract diverse people to the company. Nonetheless, a good balance needs to be met. It should not be exaggerated up to a point where it is almost not credible, to which the expert agrees.

7.1.2. Internal Impact: Role Models and Mentors

For internal impact it would be great to provide the employees with mentors who might also function as role models. Moreover, some companies have implemented buddy systems which provide great support for all employees. The difference between mentors and buddies consists of the mentors being responsible for the whole team for any type of questions. On the other side, the buddies are specialized in, for example, coding. So a coding buddy will answer all your programming-specific questions. These questions might be harder to answer for a mentor, who might be a team manager, since

they do not necessarily know how to code.

As employees are usually guided by their team leads or managers, they become their natural role models. The interviewee argued that role models are especially important for internal impact:

> "If you have somebody on top of the hierarchy, who finds this [diversity and inclusion] important, who lives and breathes it, and says 'hey let's do something in this direction', you notice that. You really notice that. [...] Then it becomes important for them [the employees] as well. You really need people who will set an example for this [diversity and inclusion]."

It becomes clear that the chiefs and directors are responsible for a great part of how the company's culture is represented. If the people on top lead by example and are inclusive, most likely the employees will indirectly be more inclusive as well.

The first step might be to educate everybody. It could be implemented in a top-down perspective. The directors educate themselves or are educated by workshops and seminars to learn what has to be achieved to be diverse and inclusive as a single person and as a company. Then they arrange workshops and seminars for managers, who will carry the new perspectives into their teams. The teams can learn by their role models and if needed receive specific training seminars. Not only will the company environment improve, but the products of the company might become more innovative and include a wider target group. A downside might be that a top-down model could take quite a while until everybody is included in the process. As a proposal, some seminars could be run in parallel for managers and their teams. Furthermore, it usually resolves in a questions about resources. How much time and money is the company able and willing to invest into training seminars? Once this questions is answered, the business can make plans about who will participate in the seminars and in which order.

7.2. Dangers and Advantages of Self-Tests and Surveys

This section will evaluate the advantages and risks that emerge through self-tests and surveys at the work place.

7.2.1. Self-Tests

A self-test can help identify biases. However, as the term already says it should be used by oneself to improve one's own self. It might bring more risks if the results are published for everybody to see, even if they are anonymized. As the inventors of the IAT state, it is not ethical to demand of somebody to take the test, nor to have them share their feedback [11b].

The interviewee shares the view that for a diverse company it might bring more complications if anonymized test results would be published:

> "Because we are a very colorful company, that means people come join us from all over. And this is not only based on countries, but also on origin, gender, sexual orientation and so on and so on."

This comment implies that people working in the games industry have diverse backgrounds. Hence, the employees should not have too many biases, otherwise they would not be able to work together.

What would happen if the results of the self-tests are published? Employees might not feel comfortable in the work space anymore. They might not know whom they can trust and who will have their back. This might lead to more instability within the company and less innovation.

Moreover, if the tests would be mandatory for all employees, they might feel monitored. Being monitored at work might result in more pressure to perform well. More pressure at work might lead to more stress, and hence, worse results of the project work.

A middle ground could be to assign one responsible person at the company who will receive the anonymized test results in percentages of how many people are biased against a specific characteristic. Based on these results they could develop workshops and seminars to educate everybody on the team.

For the above mentioned reasons, making self-tests mandatory and publishing the anonymized results, brings huge disadvantages for the work environment and the company in general. Nevertheless, the managers could provide resources and inform their teams that such self-tests exists. The managers could encourage their teams to do such a self-test and work on their biases on their own. Nobody should report their test results to others.

7.2.2. Surveys

Employee surveys are a good way to analyze the current state of the company [Rei92]. They could take place every six months and question the employees about topics such as: 'How do you feel?', 'How do you enjoy your job?', and 'In which way could we improve the environment?' This would help the company understand the employees views. If needed, the company could initiate changes to improve the well-being of the employees.

Furthermore, some companies organize listening sessions with external partners. The interviewee agreed that they are a great way to casually and openly discuss concerns and ideas.

They added:

> "And that makes perfect sense. We became aware of a lot of things, where we thought, that shouldn't be a problem."

The managers might think that everything is running smoothly, because nobody is making any remarks about anything. However, sometimes people need encouragement to speak up about their concerns [20]. So if the company regularly conducts surveys where the employees can anonymously share their opinions, or listening sessions where they openly talk about their current state, it might improve the overall picture.

7.3. Team and Project Structures

The following sections will discuss the different impact of anonymity vs. individuality and why game development companies should use a GDD.

7.3.1. Anonymity vs. Individuality

Anonymity might complicate a lot of processes within the company. The case can be considered, where an individual, *A*, codes a certain feature of the game and commits it via git [Atl]. Before it is merged to the master branch, somebody might discover an issue. To quickly resolve the issue it would be easiest to discuss with individual *A*, what they intended to do and where it could possibly have gone wrong. Moreover, if somebody from the assurance testing department has questions for a specific section of code or they want to propose some changes, they need to know who was working on this part. It is easier to fix bugs if they know who to address. Hence, it should be clearly identifiable who coded which part.

Moreover, the interviewee adds that it is quite difficult to implement anonymity in such a familial sector as the gaming sector. Usually everybody knows who is working on which feature, aspect, design etc., since the teams are rather small.

For these reasons anonymity should not be implemented within game companies. The employees should rather be able to express and enjoy their individuality and be their creative selves.

7.3.2. Meetings

The goal is to enhance creativity and innovation during meetings. Most employees prefer to use a Meeting-AI system, when it is well-programmed and adheres to data privacy regulations [Chr17]. However, if it does not abide by data privacy, most

employees refuse to use it and state that they feel uncomfortable [Chr17]. A good balance has to be found.

7.3.3. The Game Design Document

The GDD is a great resource to use as a reference book for any issues on the game development. It is supposed to improve the communication and memorization. As Schell explains, every team probably has their very own GDD, with which they continuously work [Sch19b].

The expert interviewee adds that the GDDs are very valuable for the quality assurance. The game testers might prefer to research things on their own rather than having to ask people about every detail. For this reason, the teams try to always have the GDD updated to the current version of the game. Moreover, the interviewee argues that D&I should be part of the GDD, and that it is in fact already listed in some documents. This way, the employees are confronted with D&I issues and possible solutions on how to resolve them within the game.

7.4. Making Games More Diverse

This section analyzes which methods might already be in practice to make games more diverse and what might still be needed.

7.4.1. How Gender Stereotypes are Changing

A positive shift in game development can be observed in recent years. This shift occurs within the games, where the characters and the story line seem to be getting more diverse. For instance, the game Assassins Creed Syndicate, which was developed and published by Ubisoft in 2015, had promised to assign equal play times to the sibling protagonists Evie and Jacob [Gam20; Ubi15]. However, in the published game, Jacob had 24 missions, which is twice as many missions as his sister Evie, who has only 12 [Gam20].

Fast forward to 2021, the year another game of Ubisoft will be published, namely Far Cry 6. In this game it will be possible to completely choose the protagonist, Dani Rojas, who can either be male or female [Sar20; Ubi20]. This option of choosing the gender is already available in Far Cry 5 and Far Cry New Dawn. However, Ubisoft is planning to emphasize different characteristics, depending on which gender the player chooses [Sar20; Ubi20].

This shift from games that only provide male protagonists, to games with a slightly higher representation of female protagonists, to finally games were you are completely

free to choose the gender is a recent phenomenon. The interviewee suggest that the reasons might be that in recent years awareness has increased and the voice of female gamers has become louder. Moreover, this change could have been made possible because the teams have become more diverse in the past years, and have positively influenced the games in becoming more diverse as well.

7.5. Furthering Education

> "I think, if you start enlightening a lot, adults as well as children, then [the issue] will resolve itself", says the interviewee.

This chapter is going to evaluate modules in the games engineering curriculum.

7.5.1. Designing Classes for Engineering Students

Computer science students choose this major, because they are interested in the sciences. They usually enjoy programming and solving mathematical equations. However, they might lose interest in classes about inclusion and diversity if those are mandatory. In general, bachelor students have a majority of mandatory classes, but are able to choose electives. Designing the curriculum to include D&I might have an impact on the final product.

Diversity and Inclusion Module

The interviewee argued that even nowadays, many people believe that diversity just means female quota, but of course it is much more than that as explained in the previous chapters. It has become clear that people need to be educated about diversity and inclusion issues. Having such a module within the games engineering curriculum might help eliminate misunderstandings. Enlightenment is a key word here. Altimira supports the argument that a module on diversity can strengthen the inclusion at university [AC17].

Accessibility Module

In these circumstances it makes sense to have a module where students learn about accessibility features. The target group of video games is continuously growing. An increasing number of people enjoy playing games, which also includes people with disabilities. Teaching students to implement these features early on during studies can prove beneficial for the workplace environment later on. As the interviewee agrees about designing an accessibility module:

> "Perfectly reasonable. So this is extremely good, because this is also a topic in the AAA industry, for us actually, as well as for Microsoft etc. everybody does it. [...] These are extremely important topics, as well in the Triple A sector."

The interviewee continued to give some examples, such as features for colorblindness, minimizing and maximizing user interfaces and so on. At their and other companies they even have designated coders who will pay attention that such accessibility features are implemented. Most of these coders are just regularly working on the video game, but accomplished an advanced training about accessibility in games. It really depends on the team and the studio.

7.5.2. Training Seminars at the Workplace

At the workplace employees are usually provided with in-house-seminars or workshops. These can help to strengthen their skills and moreover, raise awareness for diversity, inclusion and accessibility. Sweeney argues that workshops have to take place constantly and people have to be reminded about biases and discrimination on a regular basis [SB16]. Otherwise they won't memorize what they learned and won't be able to be more diverse and inclusive [SB16]. Of course, organizing workshops and continuously educating the employees will cost the company a lot of resources, such as money and time. Being able to provide workshops each weak, would create a major positive impact on the employees. However, this is barely feasible for an organization. A well-balanced schedule has to be developed.

Some of the workshops are very technical, while others aim to enhance diversity and inclusion, which will indirectly advance the innovation. The interviewee revealed that they offer partially mandatory training seminars at the very beginning for newcomers. At these training seminars they can learn about the fundamentals of working at the company, but also about biases, diversity and inclusion. The seminars are organized internal, but external partners are invited as well. The advantage of external partners is that they usually are experts in a very specific field and can grant greater insights. For example, the external partners can be coaches, therapists, or sometimes self-employed. For regular employees, these workshop usually take place two or three times a year for a group of about twelve participants. The interviewee noted that the workshop is offered first to people higher up in the hierarchy. This means that the team leads, such as product managers and directors, will receive the workshops first. Hopefully they will positively influence their teams, until the team members can attend the workshops as well.

7.6. Advantages and Risks of Specifically Targeting Minority Groups

Some people might argue that too much spotlight is put on minority groups, rather than focusing to help everybody. As section 6.7 shows, the amount of conferences and scholarships for women and underrepresented groups is constantly growing. Some men argue that they wish they had the same amount of opportunities as women.

Even though, at first this view might seem reasonable, a lot of conferences for women advertise their events saying: "We welcome **every woman and man** who is interested in computer science". Now, a lot of people do not bother reading further than the title of the conference which might be "Women in Computer Science" and directly assume that they are excluded from participating. Moreover, even if the event does not directly advertise itself to be for women and men, it usually allows participants of any gender to attend. If individuals are eager to attend a certain program, they should kindly ask, whether they can join and in most cases the issue is resolved immediately. Another example are technical conferences for the LGBTQ community. They usually welcome allies as well to join and participate in discussions and workshops.

The interviewee adds that at their company, they try to grant access to everybody for conferences, training seminars, workshops, etc. Whenever they have to choose representatives for conferences they ask women and men if they would like to participate. Moreover, they constantly point out that these opportunities are available for allies, too. Because the more attention these events receive, the better.

Taking everything into consideration, spotlighting underrepresented minorities should continue. However, to avoid misunderstandings, everybody should be able to attend the events.

For scholarships it looks slightly different. A scholarship for women in computer science should not just open up to be a scholarship for anybody in computer science. These specific opportunities are there for a reason, namely to foster more female computer scientists. Another approach could be to offer an additional scholarship for male computer scientists.

8. Outlook

This chapter will introduce ideas that can be established and elaborated in the future.

8.1. Application of Methods in Real-Life

The proposed solution-oriented approaches and methods of chapter 6 could be applied in real-life and researched in more detail. They could be implemented, for instance, in Germany to observe how they evolve in this environment. Later on they could be implemented in other countries to draw a comparison.

The practical exercises could be integrated into an already existing lecture at university. Moreover, parts of this thesis could be taught as one lecture or maybe as 10 to 15 minutes sections in appropriate lectures.

8.2. Expert Interviews

For this thesis, an expert interview was executed with a representative of a game development company. In further research, it would be valuable to hold more expert interviews with representatives of different institutions. These could include:

1. A representative from academia, such as a Professor
   - of Computer Science and Games Engineering
   - of Sociology
   - of Psychology
   - of Gender Studies
2. A gender equality officer
3. An inclusion equality officer
4. A representative of a smaller and a bigger game development company
5. A representative of a society or organization who are working towards equality for underrepresented minorities in the field of technology.

8.3. User Study

Moreover, it would be great to conduct a user study to evaluate the introduced solution-oriented methods, in further research. Such a user study could evaluate the perception of bachelor, master and Ph.D. students at university versus the perception of professors and lecturers.

Moreover, different gamer populations could be asked to participate in a questionnaire. This would help to further identify the needs of, for instance, gamers with disabilities or female gamers.

8.4. Research Question

During the research for **RQ1** and **RQ2**, another question emerged. **RQ3** could be asked as follows: Is it possible to intentionally create inclusive metagames by the developers and the community?

9. Conclusion

Only because an issue might seem self-evident to a group of people, it might be completely surprising for others.

How can inclusion and innovation be enhanced in games engineering? The literature review and research show that it is important to analyze the state-of-the-art. Once it is clear, which approaches are already in practice, they can be secured and evolved.

Furthermore, education is an important aspect. People have to be educated in school, university and the work place about issues such as discrimination and how to be more diverse and inclusive. This can happen through panel discussions, specific inclusion-modules, training seminars and workshops. It is not enough to only mention diversity and inclusion on the side, it is an important topic which has to be addressed constantly. Otherwise it won't stick with people. Above that, diversity is needed for creativity. The more creative a team or company is, the more innovative will their products be.

Moreover, attention has to be paid to make processes and structures smoother for everybody. This includes minority groups such as people with disabilities. Companies should think about how they can make their offices accessible and their products and user experience convenient for everybody. If the environment is appropriate for individuals and they have a feeling of belonging, they will be able to thrive. With people feeling heard and empowered, the company will thrive as well.

As the interviewee said: "I am extremely happy, it is a dream job. [...] I am not leaving the [games] company [...] It is perfect." The goal would be to reach this enthusiasm in every employee and every student.

And as Ruth Bader Ginsburg said: "Young women today have a great advantage, and it is that there are no more closed doors [Ala15]." The doors should be open for anybody, regardless of their gender, their background, and whether they have a disability or not. It is important to grant access to education and the opportunity to enjoy one's leisure time. Especially, in today's globalized world, where the majority of people has access to computer and computer games, it would be great for everybody to have the option to enjoy developing and/or playing them.

List of Figures

Bibliography

[11a] *Project Implicit: Education*. 2011. URL: https://implicit.harvard.edu/implicit/education.html (visited on 09/05/2020).

[11b] *Project Implicit: Ethics*. 2011. URL: https://implicit.harvard.edu/implicit/ethics.html (visited on 09/05/2020).

[19] *Gleichstellungskonzept der Otto-Friedrich-Universität Bamberg*. Bamberg, 2019. URL: https://www.uni-bamberg.de/fileadmin/uni/verwaltung/gleichstellung/dateien/2019-07-17_Gleichstellungskonzept_Bamberg.pdf (visited on 08/19/2020).

[20] *#IamRemarkable*. July 2020. URL: https://iamremarkable.withgoogle.com/ (visited on 08/15/2020).

[AC17] M. Altimira and C. Casanueva. "RAISING AWARENESS ON DIVERSITY AND EQUALITY IN STEM DEGREES IN HIGHER EDUCATION." In: *INTED2017 Proceedings*. 11th International Technology, Education and Development Conference. Valencia, Spain: IATED, Mar. 2017, pp. 1037–1041. ISBN: 978-84-617-8491-2. DOI: 10.21125/inted.2017.0399. URL: http://dx.doi.org/10.21125/inted.2017.0399.

[Adv] Advidera, ed. *Accessibility*. Köln. URL: https://www.advidera.com/glossar/accessibility/ (visited on 08/29/2020).

[Ala] Alan Shen. *Advantages of Artificial Intelligence for Modern Meetings*. Ed. by UNIFY SQUARE. URL: https://www.unifysquare.com/blog/advantages-of-artificial-intelligence-for-modern-meetings/ (visited on 08/20/2020).

[Ala15] Alanna Vagianos. *Ruth Bader Ginsburg Tells Young Women: 'Fight For The Things You Care About'*. Ed. by The Huffington Post. 2015. URL: https://www.radcliffe.harvard.edu/news/in-news/ruth-bader-ginsburg-tells-young-women-fight-things-you-care-about (visited on 09/21/2020).

[Alt20] A. Altman. "Discrimination." In: *The Stanford Encyclopedia of Philosophy*. Ed. by E. N. Zalta. Summer 2020. Metaphysics Research Lab, Stanford University, 2020.

[Ani20a] Anita Sarkeesian. *Feminist Frequency*. 2009 - 2020. URL: https://www.youtube.com/user/feministfrequency (visited on 08/18/2020).

[Ani20b] Anita Sarkeesian. *Feminist Frequency*. 2009 - 2020. URL: https://feministfrequency.com/ (visited on 08/18/2020).

[AS10] A. Ampatzoglou and I. Stamelos. "Software engineering research for computer games: A systematic review." In: *Information and Software Technology* 52.9 (2010), pp. 888–901. ISSN: 09505849. DOI: 10.1016/j.infsof.2010.05.004.

[Atl] Atlassian Bitbucket, ed. *Getting Git Right: Git verstehen – mit Tutorials, Neuigkeiten und Tipps*. URL: https://www.atlassian.com/de/git (visited on 10/10/2020).

[BG18] J. Buolamwini and T. Gebru. "Gender shades: Intersectional accuracy disparities in commercial gender classification." In: *Conference on fairness, accountability and transparency*. 2018, pp. 77–91.

[Bil] Bill Puka. *The Golden Rule*. URL: https://iep.utm.edu/goldrule/ (visited on 07/20/2020).

[BL17a] S. Boluk and P. LeMieux. *Metagaming: Playing, Competing, Spectating, Cheating, Trading, Making, and Breaking Videogames*. Vol. v.53. Electronic Mediations Ser. Minneapolis: University of Minnesota Press, 2017. Chap. 6. ISBN: 0816687161. URL: https://ebookcentral.proquest.com/lib/gbv/detail.action?docID=4745543.

[BL17b] S. Boluk and P. LeMieux. *Metagaming: Playing, Competing, Spectating, Cheating, Trading, Making, and Breaking Videogames*. Vol. v.53. Electronic Mediations Ser. Minneapolis: University of Minnesota Press, 2017. Chap. 1. ISBN: 0816687161. URL: https://ebookcentral.proquest.com/lib/gbv/detail.action?docID=4745543.

[BL17c] S. Boluk and P. LeMieux. *Metagaming: Playing, Competing, Spectating, Cheating, Trading, Making, and Breaking Videogames*. Vol. v.53. Electronic Mediations Ser. Minneapolis: University of Minnesota Press, 2017. Chap. 3. ISBN: 0816687161. URL: https://ebookcentral.proquest.com/lib/gbv/detail.action?docID=4745543.

[BR18] P. Bourdieu and A. Russer. *Die feinen Unterschiede: Kritik der gesellschaftlichen Urteilskraft*. 26. Auflage 2018. Vol. 658. Suhrkamp-Taschenbuch Wissenschaft. Frankfurt am Main: Suhrkamp, 2018. ISBN: 9783518282588.

[Bro+09] J. v. Brocke, A. Simons, B. Niehaves, K. Riemer, R. Plattfaut, and A. Cleven. "Reconstructing the Giant: On the Importance of Rigour in Documenting the Literature Search Process." In: June 2009.

[BS12] M. C. Barlet and S. D. Spohn. "Includification: A practical guide to game accessibility." In: *The Ablegamers Foundation, Charles Town* (2012).

[But18] J. Butler. *Das Unbehagen der Geschlechter*. Deutsche Erstausgabe, 19. Auflage. Vol. 1722 = Neue Folge, Band 722. Gender Studies. Frankfurt am Main: Suhrkamp, 2018. ISBN: 3-518-11722-X.

[Cam14a] Cambridge Dictionary, ed. *Awareness*. 2014. URL: https://dictionary.cambridge.org/de/worterbuch/englisch/awareness (visited on 10/10/2020).

[Cam14b] Cambridge Dictionary, ed. *Unconscious*. 2014. URL: https://dictionary.cambridge.org/de/worterbuch/englisch/unconscious (visited on 10/10/2020).

[Cam14c] Cambridge Dictionary, ed. *Visibility*. 2014. URL: https://dictionary.cambridge.org/de/worterbuch/englisch/visibility (visited on 10/10/2020).

[Cam14d] Cambridge University Press, ed. *Inclusion*. 2014. URL: https://dictionary.cambridge.org/de/worterbuch/englisch/inclusion (visited on 09/16/2020).

[CC11] H. M. Chandler and R. Chandler. *Fundamentals of game development*. Sudbury, Mass: Jones and Bartlett Publishers, 2011. Chap. 1. ISBN: 0-7637-7895-8.

[CGH12] M. Carter, M. Gibbs, and M. Harrop. "Metagames, paragames and orthogames: A new vocabulary." In: *Proceedings of the international conference on the foundations of digital games*. 2012, pp. 11–17.

[Cha] Charlotte Sturman. *How AI will revolutionise team meetings*. Ed. by Cisco. URL: https://www.cisco.com/c/en_uk/solutions/small-business/tech-connection/workforce-productivity/how-ai-will-revolutionise-meetings.html (visited on 08/20/2020).

[Che+17] S. Cheryan, S. A. Ziegler, A. K. Montoya, and L. Jiang. "Why are some STEM fields more gender balanced than others?" In: *Psychological bulletin* 143.1 (2017), p. 1.

[Chr17] Christine Johansen, Ben Culp, Marilyn Mora. *Cisco Survey Indicates Adding a Virtual Assistant May Be the Key to Happiness at Work*. 2017. URL: https://newsroom.cisco.com/press-release-content?type=webcontent&articleId=1895738 (visited on 08/20/2020).

[Con01] T. Conefrey. "Sexual Discrimination and Women's Retention Rates in Science and Engineering Programs." In: (Mar. 2001).

[CS15] K. M. L. Cooper and W. Scacchi, eds. *Computer games and software engineering*. Vol. 9. Chapman & Hall / CRC innovations in software engineering and software development. Boca Raton: CRC Press Taylor & Francis Group, 2015. ISBN: 9781482226690. URL: http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&AN=997008.

[Csi14a] M. Csikszentmihalyi. *Flow and the Foundations of Positive Psychology: The Collected Works of Mihaly Csikszentmihalyi*. s.l.: Springer Netherlands, 2014. ISBN: 9789401790871. URL: http://lib.myilibrary.com/detail.asp?id=648808.

[Csi14b] M. Csikszentmihalyi. *Flow and the Foundations of Positive Psychology: The Collected Works of Mihaly Csikszentmihalyi*. s.l.: Springer Netherlands, 2014. ISBN: 9789401790871. URL: http://lib.myilibrary.com/detail.asp?id=648808.

[Csi90] M. Csikszentmihalyi. *Flow: The psychology of optimal experience*. New York: Harper and Row, 1990. ISBN: 0060162538.

[F T20] F. Tenzer. *Anzahl der Computerspieler in Deutschland nach Geschlecht 2020*. Ed. by Statista. 2020. URL: https://de.statista.com/statistik/daten/studie/197219/umfrage/anzahl-der-computerspieler-in-deutschland-nach-geschlecht/ (visited on 08/28/2020).

[FWT07] C. E. Foor, S. E. Walden, and D. A. Trytten. ""I wish that I belonged more in this whole engineering group:" Achieving individual diversity." In: *Journal of Engineering Education* 96.2 (2007), pp. 103–115.

[Gam20] GameStar Redaktion. *Ubisoft: Gewerkschaft plant Klage nach Sexismus-Vorwürfen*. Ed. by GameStar. 2020. URL: https://www.gamestar.de/artikel/assassins-creed-sexismus,3360069.html (visited on 08/28/2020).

[Gib15] S. Gibbons. "Disability, neurological diversity, and inclusive play: An examination of the social and political aspects of the relationship between disability and games." In: *Loading...* 9.14 (2015).

[GLH17] C. L. Guarana, J. Li, and M. Hernandez. "Examining the effects of manager-subordinate gender match on managerial response to voice." In: *Journal of Experimental Social Psychology* 72 (2017), pp. 147–160. ISSN: 00221031. DOI: 10.1016/j.jesp.2017.04.004.

[Glo] Global Diversity Practice, ed. *WHAT IS DIVERSITY & INCLUSION?* URL: https://globaldiversitypractice.com/what-is-diversity-inclusion/ (visited on 08/29/2020).

[GMS98] A. G. Greenwald, D. E. McGhee, and J. L. Schwartz. "Measuring individual differences in implicit cognition: the implicit association test." In: *Journal of personality and social psychology* 74.6 (1998), p. 1464.

[Gor18] Gordon Tredgold. *4 Reasons Why You Need To Focus On Innovation: Innovation is a differentiator*. Ed. by Inc. 2018. URL: https://www.inc.com/gordon-tredgold/4-reasons-why-you-need-to-focus-on-innovation.html#:~:text=Businesses%20that%20innovate%20are%20able,you%20can%20grow%20your%20business. (visited on 10/12/2020).

[Gre+09] A. G. Greenwald, T. A. Poehlman, E. L. Uhlmann, and M. R. Banaji. "Understanding and using the Implicit Association Test: III. Meta-analysis of predictive validity." In: *Journal of personality and social psychology* 97.1 (2009), p. 17.

[Gre20] Greater Good Magazine, ed. *What is Diversity?* Berkeley, 2020. URL: https://greatergood.berkeley.edu/topic/diversity/definition (visited on 08/29/2020).

[GS90] G. D. Gopen and J. A. Swan. "The Science of Scientific Writing." In: *American Scientist* 78.6 (1990), pp. 550–558. ISSN: 00030996. URL: http://www.jstor.org/stable/29774235.

[Hah] S. Hahn. "Gender und Gaming: Frauen im Fokus der Games-Industrie." In: *EBOOK PACKAGE Social Sciences 2017 : EBOOK PACKAGE COMPLETE 2017*. Edition Medienwissenschaft. Bielefeld: transcript. ISBN: 978-3-11-054055-0. DOI: 10.14361/9783839439203.

[HE08] M. E. Heilman and A. H. Eagly. "Gender Stereotypes Are Alive, Well, and Busy Producing Workplace Discrimination." In: *Industrial and Organizational Psychology* 1.4 (2008), pp. 393–398. DOI: 10.1111/j.1754-9434.2008.00072.x.

[HG17] J. Himmelstein and G. Gopalakrishnan. "Tackling Implicit and Explicit Bias Through Games That Teach Workplace Diversity." In: *European Conference on Games Based Learning*. Academic Conferences International Limited. 2017, pp. 244–252.

[Hof+05] W. Hofmann, B. Gawronski, T. Gschwendner, H. Le, and M. Schmitt. "A meta-analysis on the correlation between the Implicit Association Test and explicit self-report measures." In: *Personality and Social Psychology Bulletin* 31.10 (2005), pp. 1369–1385.

[Jen19] Jennifer Barcanec. "Game Designerinnen und ihr Einfluss auf den aktuellen, westlichen Videospielmarkt. Eine Analyse am Beispiel der Action-Adventure-Reihe Uncharted." PhD thesis. Köln, 2019. URL: https://gamingnerd.net/wp-content/uploads/2020/02/SS19_UNDO_Barcanec_ONLINE.pdf (visited on 08/28/2020).

[JM02] D. G. Johnson and K. W. Miller. "Is diversity in computing a moral matter?" In: *ACM SIGCSE Bulletin* 34.2 (2002), pp. 9–10.

[Jos18] Josefine Olsson. *Why Women in Tech Need Strong Role Models*. Ed. by Accenture. Stockholm, 2018. URL: https://www.accenture.com/us-en/blogs/blogs-women-in-tech-need-strong-models (visited on 10/10/2020).

[Joy16] Joy Buolamwini. *How I'm fighting bias in algorithms*. 2016. URL: https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms (visited on 07/30/2020).

[Joy18a] Joy Buolamwini. *AI, Ain't I A Woman?* 2018. URL: https://www.youtube.com/watch?v=QxuyfWoVV98 (visited on 08/28/2020).

[Joy18b] Joy Buolamwini. "When the Robot Doesn't See Dark Skin." In: *The New York Times* (2018). URL: https://www.nytimes.com/2018/06/21/opinion/facial-analysis-technology-bias.html (visited on 07/30/2020).

[Kaf08] Y. B. Kafai, ed. *Beyond Barbie [R] and Mortal Kombat: New perspectives on gender and gaming*. Cambridge, Mass.: MIT Press, 2008. ISBN: 0-2621-1319-8.

[Kat09] M. J. Katz. *From research to manuscript: A guide to scientific writing*. New York: Springer, 2009. ISBN: 978-1-4020-9467-5.

[KD16a] G. Klinker and A. Dippon. *Einführung in die Informatik für Games Engineering: Game History*. Ed. by Technische Universität München. Garching bei München, 2016. URL: https://www.moodle.tum.de/pluginfile.php/1074353/mod_resource/content/1/EIGE-GameHistory.pdf (visited on 07/10/2020).

[KD16b] G. Klinker and A. Dippon. *Einführung in die Informatik für Games Engineering: Game Requirements*. Ed. by Technische Universität München. Garching bei München, 2016. URL: https://www.moodle.tum.de/pluginfile.php/1092331/mod_resource/content/0/19-EIGE-GameRequirements.pdf (visited on 07/10/2020).

[KD16c] G. Klinker and A. Dippon. *Welcome to Informatik: Games Engineering: Motivation, Introductions*. Ed. by Technische Universität München. Garching bei München, 2016. URL: https://www.moodle.tum.de/pluginfile.php/1016146/mod_resource/content/0/01-EIGE-GamesMotivation.pdf (visited on 07/10/2020).

[KDM13] M. Kaplan, M. Donovan, and A. D. McCarthy. *Inclusion Dividend: Why Investing in Diversity & Inclusion Pays off*. Brookline: Taylor and Francis, 2013. Chap. 1. ISBN: 9781937134402. URL: http://gbv.eblib.com/patron/FullRecord.aspx?p=4722571.

[Laz15] J. Lazar. *Ensuring digital accessibility through process and policy*. Waltham, MA: Morgan Kaufmann, 2015. ISBN: 9780128006467. URL: http://proquest.tech.safaribooksonline.de/9780128007105.

[LHF17] J. Lazar, H. Hochheiser, and J. H. Feng. *Research methods in human-computer interaction*. Second edition. Cambridge, MA: Morgan Kaufmann, 2017. ISBN: 9780128093436. URL: http://proquest.tech.safaribooksonline.de/9780128093436.

[Lis12] Lisanne Pajot and James Swirsky. *Indie Game: The Movie*. 2012.

[LJK02] P. Lockwood, C. H. Jordan, and Z. Kunda. "Motivation by positive or negative role models: regulatory focus determines who will best inspire us." In: *Journal of personality and social psychology* 83.4 (2002), p. 854.

[LW11] C. Lewis and J. Whitehead. "The whats and the whys of games and software engineering." In: *Proceedings of the 1st international workshop on games and software engineering*. 2011, pp. 1–4.

[Mat19] Matt O'Brien. *MIT Researcher Exposing Bias in Facial Recognition Tech Triggers Amazon's Wrath*. Ed. by Insurance Journal. 2019. URL: https://www.insurancejournal.com/news/national/2019/04/08/523153.htm (visited on 08/28/2020).

[May19] P. Mayring. "Qualitative Inhaltsanalyse – Abgrenzungen, Spielarten, Weiterentwicklungen: Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, Vol 20, No 3 (2019): Qualitative Content Analysis I / Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, Vol 20, No 3 (2019): Qualitative Content Analysis I." In: (2019). DOI: 10.17169/fqs-20.3.3343.

[Med20] J. .-. I. für Medienpädagogik, ed. *Gamerwelten? Geschlechterrollen im virtuellen Raum*. 2020. URL: https://games.jff.de/csatalk6/ (visited on 05/06/2020).

[Paua] Paul Allen. *living computers: museum + labs*. URL: https://www.livingcomputers.org/ (visited on 08/25/2020).

[Paub] Paul Allen. *living computers: museum + labs: Totalla 80s rewind*. URL: https://www.livingcomputers.org/Exhibits-Events/Exhibits/Totally-80s-Rewind.aspx (visited on 08/25/2020).

[Pla20] Playstation, ed. *ACCESSIBILITY OPTIONS FOR THE LAST OF US PART II*. United States, 2020. URL: https://www.playstation.com/en-us/games/the-last-of-us-part-ii-ps4/accessibility/ (visited on 09/16/2020).

[PM04] N. Pless and T. Maak. "Building an inclusive diversity culture: Principles, processes and practice." In: *Journal of business ethics* 54.2 (2004), pp. 129–147.

[Psy20] Psychology Today, ed. *Bias*. 2020. URL: https://www.psychologytoday.com/intl/basics/bias (visited on 10/10/2020).

[Que] Queensborough Community College, ed. *Definition for Diversity*. URL: https://www.qcc.cuny.edu/diversity/definition.html#:~:text=It%20means%20understanding%20that%20each,political%20beliefs%2C%20or%20other%20ideologies. (visited on 07/10/2020).

[RB19] I. D. Raji and J. Buolamwini. "Actionable auditing: Investigating the impact of publicly naming biased performance results of commercial ai products." In: *Proceedings of the 2019 AAAI/ACM Conference on AI, Ethics, and Society*. 2019, pp. 429–435.

[Rei92] G. Reinhold, ed. *Soziologie-Lexikon*. 2., überarbeitete Auflage. München and Wien: Oldenbourg, 1992. ISBN: 3-486-22340-2.

[Ren] Renee Navarro. *Unconscious Bias*. Ed. by University of California, San Francisco. San Francisco. URL: https://diversity.ucsf.edu/resources/unconscious-bias (visited on 10/10/2020).

[Rob06] Q. M. Roberson. "Disentangling the meanings of diversity and inclusion in organizations." In: *Group & Organization Management* 31.2 (2006), pp. 212–236.

[Sar20] Sara Petzold. *Far Cry 6: Hauptfigur lässt die Wahl zwischen Mann oder Frau*. Ed. by PCGH. 2020. URL: https://www.pcgameshardware.de/Far-Cry-6-Spiel-72873/News/Hauptfigur-Mann-oder-Frau-1354143/ (visited on 08/28/2020).

[SB16] C. Sweeney and F. Bothwick. *Inclusive leadership: The definitive guide to developing and executing an impactful diversity and inclusion strategy - locally and globally*. First edition. Harlow, England: Pearson, 2016. Chap. 9. ISBN: 9781292112756.

[Sch19a] J. Schell. *The Art of Game Design, 3rd Edition*. 3rd edition. A K Peters/CRC Press, 2019. ISBN: 9781351803632.

[Sch19b] J. Schell. *The Art of Game Design, 3rd Edition*. 3rd edition. A K Peters/CRC Press, 2019. Chap. 26. ISBN: 9781351803632.

[Sch19c] J. Schell. *The Art of Game Design, 3rd Edition*. 3rd edition. A K Peters/CRC Press, 2019. Chap. 27. ISBN: 9781351803632.

[Sha14] A. Shaw. *Gaming at the edge: Sexuality and gender at the margins of gamer culture*. Minneapolis, MN: University of Minnesota Press, 2014. ISBN: 978-0-8166-9316-0. DOI: 10.5749/j.ctt1287nqh. URL: http://www.jstor.org/stable/10.5749/j.ctt1287nqh.

[SHE93] R. Schnell, P. B. Hill, and E. Esser. *Methoden der empirischen Sozialforschung*. 4., überarb. Aufl. München: Oldenbourg, 1993. ISBN: 3-486-22728-9.

[Ste19a] H. Stephen. *The Daily stoic*. 2019.

[Ste19b] Steve Duignan. *5 Ways AI Could Make Meetings More Creative*. Ed. by TECHNATIVE. 2019. URL: https://technative.io/5-ways-ai-could-make-meetings-more-creative/ (visited on 08/20/2020).

[Tec19] Technische Universität München, ed. *Scholarships*. 2019. URL: https://www.in.tum.de/fuer-studierende/chancengleichheit/scholarships/ (visited on 10/10/2020).

[Tec20a] Technische Universität München, ed. *Chancengleichheit*. 2020. URL: https://www.in.tum.de/fuer-studierende/chancengleichheit/ (visited on 10/10/2020).

[Tec20b] Technische Universität München, ed. *Demo Day*. München, 2020. URL: https://www.in.tum.de/fuer-studierende/bachelor-studiengaenge/informatik-games-engineering/aktivitaeten/demo-day/ (visited on 10/10/2020).

[TED] TED, ed. *TED: Ideas worth spreading*. URL: https://www.ted.com/about/our-organization (visited on 09/05/2020).

[Tij20] Tijen Onaran. *Inspiration von weiblichen Vorbildern | Rolemodel Breakfast mit Accenture*. Ed. by YouTube. 2020. URL: https://www.youtube.com/watch?v=ETTr-2iwTsI (visited on 06/05/2020).

[Ubi15] Ubisoft, ed. *Assassins Creed Syndicate: Die Unterdrückung muss enden*. 2015. URL: https://www.ubisoft.com/de-de/game/assassins-creed-syndicate/ (visited on 08/28/2020).

[Ubi20] Ubisoft. *Far Cry 6: Willkommen auf Yara*. Ed. by Ubisoft. 2020. URL: https://www.ubisoft.com/de-de/game/far-cry/far-cry-6 (visited on 08/28/2020).

[Uni] University of Virginia, ed. *William Wulf: AT&T Professor of Computer Science and University Professor (Emeritus)*. URL: https://engineering.virginia.edu/faculty/william-wulf (visited on 07/10/2020).

[W A] W. A. Wulf. "The Importance of Diversity in Engineering." In: *Diversity in Engineering*, pp. 8–14. DOI: 10.17226/10377. URL: https://www.nap.edu/read/10377/chapter/4#14 (visited on 07/10/2020).

A. Appendix – Abbreviations

- iar = IamRemarkable
- API = Application Programming Interface
- CS = Computer Science
- D&I = Diversity and Inclusion
- GDD = Game Design Document
- GSE = Games Software Engineering
- LGBTQ = Lesbian, Gay, Bisexual, Transgender and Queer
- M.I.T. = Massachusetts Institute of Technology
- RQ = Research Question
- SE = Software Engineering
- STEM = Science, Technology, Engineering, and Mathematics
- TED = Technology, Entertainment and Design Conference
- TUM = Technical University of Munich
- XYZ = anonymized game development company

B. Appendix – Exercises

B.1. Exercises for a University Module

The presented exercises can be devided into theoretical and practical ones.

B.1.1. Theoretical Exercises

1 Do a self-test on unconscious biases and implicit associations. You can find such a test for example here: `https://implicit.harvard.edu/implicit/`

   a Did you find anything surprising?

   b Do you agree with the results?

   c How are you planning to apply the newly acquired knowledge in the future?

   d **Notes:** For this exercise it is important that the students don't feel obligated to share their test results. Such as self-test can be very private and intimate. However, the students should think about their test and write a short statement (300 words) what they learned and what they will take away from this exercise. Will they consider their unconscious biases in the next group project, while implementing their next game or when they start working in the industry?

   e **Alternative:** If the students do not feel comfortable taking a self-test, they should write a short essay (300 words) about unconscious biases, where these come from and how to prevent them.

2 What does playing mean for you? How would you describe a game?

   a Consider you are visually impaired, in what regards does the game change?

   b What would change if you were hard of hearing?

   c Can you play the game with only one hand or maybe just by using your feet?

   d Write a short essay (300 words) in which you answer the above questions and how you would proceed to solve some of the issues that might arise. Can you find three aspects to make a game more accessible?

3 Analyze the story line of one game of your choosing. Is this game inclusive and diverse? How can you change the story to make it more diverse and inclusive? For instance, the protagonist of the game could be non-binary etc.

4 Choose a small discussion group of at least three people. Visit the LEAN IN website with following link to access the LEAN IN card game: `https://leanin.org/gender-bias-cards`

Discuss at least five different cards and take some notes. After the discussion you should present the two most astonishing issues in front of the whole group and explain in what regards they stand to engineering.

For more information about LEAN IN, use follow this link: `https://leanin.org/`

B.1.2. Practical Exercises

1 One elective module could have room for 15 students in total. The students should split up into groups of three. Each group has one semester to develop a video game on a platform of their choosing with an engine of their choosing. Mandatory for everybody is, to integrate at minimum three aspects for accessibility. The first two weeks of the class, should consist of creating a Game Design Document. This should include the accessibility features and how and why the game is diverse and inclusive. Moreover, it should describe your team, and the team structures. Clearly state who takes which role. Afterwards each student of the group picks one accessibility feature and implements it. Of course it is possible to integrate more than three features. At the end of the semester they present their game and explain the diversity and accessibility features in front of the class. Furthermore, they can present their game at the DemoDay at TUM.

2 Play a video game that was designed for individuals with a visual impairment or play a regular video game blindfolded.

a How does your (personal) experience change?

b Did you use different equipment to play than usual?

c Which mechanics were important for your experience?

d Write a short essay (300 words) in which you answer the above questions.

e Develop a mini game which will not use any visuals. Think about audio features that will enable a smooth gaming experience. (The professor or teaching assistant could provide a template for mini games).