Chapter 10
Inclusion in the Third Wave: Access to Experience

Christopher Power, Paul Cairns, and Mark Barlet

Abstract In this chapter, we examine inclusive design of technology for people with disabilities in the context of the Third Wave HCI. As technology becomes more integrated into our lives beyond work, there are increasing opportunities for people with disabilities to have new experiences through technology. However, we argue design knowledge and practice in inclusive design has lagged behind the broader HCI field in two different, but related, ways. First, when new technology is released, an implementation lag in designs for access and enablement invariably lead to late adoption of technology for people with disabilities. Secondly, this implementation lag has resulted in a conceptual lag, where to solve these problems the research field remains grounded in HCI methodologies from First and Second Waves. This results in a reliance in checklist style engineering approaches that are unable to properly support user experience design. We explore these ideas in the two examples of the web and digital games, and argue that while we must not supplant previous approaches, we need to decouple the implementation lag from the conceptual lag to change inclusive design research and practice. We argue that we must not only plan for accessibility, but instead adopt pluralistic approaches that recognise the diversity of lived experiences of people with disabilities, and use them to design options for people to customise their own inclusive experiences.

C. Power (✉) · P. Cairns
Department of Computer Science, University of York, York, UK

The AbleGamers Charity, Kearneysville, WV, USA
e-mail: christopher.power@york.ac.uk

M. Barlet
The AbleGamers Charity, Kearneysville, WV, USA

M. Filimowicz, V. Tzankova (eds.), *New Directions in Third Wave Human-Computer Interaction: Volume 1 - Technologies*, Human–Computer Interaction Series,
https://doi.org/10.1007/978-3-319-73356-2_10

10.1 Introduction

Human-Computer Interaction has, on occasion, been described as the conscience of computing:[1] it reminds researchers and developers to remember the people who use their systems and to try to do good for those users. Accessibility is arguably the conscience of HCI. The field regularly gets excited about new technologies like Twitter, live-streaming and public interactive art, but it is Accessibility that reminds us to not forget people with disabilities for whom such technologies present new barriers to full participation in modern life. However, while mainstream HCI, through the Third Wave, has embraced understanding the unique, situated and value-driven approach of individual people using interactive systems (Bødker 2006, 2015), we make the case that Accessibility research has lagged behind the mainstream and, in many ways, has yet to enter the Third Wave. The reasons for an implementation lag in access that necessarily follows the appearance of any new technology are many and complex, ranging from economic factors, to societal attitudes, to designer training. However, we make the case that, as technology enters every corner of our lives, the conceptual lag cannot continue. If it is the case that leisure technology can have intrinsic benefits on our quality of life (Danilina et al. 2017), it is no longer enough to discuss inclusion in terms of how successful or efficient people are with systems. Inclusion needs to address the full range of outcomes, by recognising cultural, societal and physical facets of users that shape the design and evaluation of interactive technologies (Harrison et al. 2011).

In this chapter, we examine the current state of inclusion research for digital technology in terms of the first two waves of HCI research. First Wave approaches focus on "the user" as an information processor that needs to get information in and out of the machine. This serves to provide basic access to technology by addressing specific perceptual, cognitive or motor mismatches between the system and the individual. Once we have these basic access needs addressed, Second Wave approaches provide framing of people with disabilities as actors in the system, who use the system to achieve specific goals. These approaches tend to focus on task success rates and efficiency of operation, with these traditional usability measures encapsulating whether an individual is enabled to complete their goals.

However, in conceptualising these different levels of inclusion this way, a cycle of repeating exclusion begins to appear in the technology landscape. This cycle usually begins with a new technology being introduced without basic access needs of people with disabilities being considered. Then, in response to this, a series of initiatives start to bolt on alternatives and enhancements which allow people to get information in and out. Once we have this basic access, design then moves to try to enable people with disabilities to accomplish their goals. As we begin to understand how people with disabilities interact with the technology, we begin to encode the problems they encounter in sets of rules that designers should avoid, which then moves us to checklists for designers to refer to when they are doing their work.

[1] Alan Dix, http://alandix.com/academic/papers/thirty-years-of-HCI-2014/, Retrieved December, 2017

However, all too often, this is a never ending process. As problems present themselves, new rules are codified, and new checklists made. Further, when a new innovative piece of technology comes out, we start the cycle again because designers struggle to transition the rules from the previous generation into new designs.

This cycle defines the implementation lag in Accessibility: there is (and always will be) a lag from the introduction of a new technology to the time at which the technology is made accessible to users with disabilities. However, in examining the field of Accessibility, a conceptual lag is also seen in the progression of research approaches through the First, Second and Third waves, where Third Wave approaches are sparse. To illustrate this, this chapter delves deeply into two specific domains. The first is the web, where Second Wave approaches have used the above cycle to make real progress in inclusion on the web; however, only recently has that domain begun to consider the experiences of users in situ. Web accessibility is only now beginning to adopt Third Wave thinking. This is a conceptual lag of Accessibility research behind that of mainstream HCI.

In contrast, our second domain is that of digital games, which has come to maturity during the Third Wave of HCI, where understanding experience and the impact it can have on our lives is the key outcome of research. This domain requires Third Wave thinking from the outset even though the implementation lag of the First and Second Waves also must be addressed for each new game and game technology.

This chapter proposes decoupling the (inevitable) implementation lag of access from the conceptual lag of current research approaches. We close the chapter with a discussion of what the Third Wave of experiential research might look like for increasing inclusion in digital games. We relate it back to where we have come from as a field of passionate Accessibility researchers and practitioners. We acknowledge the contributions that have brought us this far in reducing the exclusion of people with disabilities from our digital society, while challenging the field to tackle new problems from a more broad set of approaches from across the three waves of HCI research.

10.2 First Wave Inclusion

A lot of our early work in inclusion with people with disabilities is framed around the idea that people should have access to technology. This framing sets up a very binary notion: is it accessible or is it not accessible? This framing originates in a way that many of our concepts in interactive systems are established: by using metaphor from the physical world into the digital. We understandably took the notion of access, enshrined in law in many developed and developing economies before the personal computing revolution, and brought it into the virtual world. The idea of physical access to buildings, for example, was well understood, so naturally we took this notion of access to the digital world.

As a result of this framing, much of the early work in inclusion is situated in the First Wave. The focus of early accessibility work is framed in issues relating to translating information into an alternate modality, replacing a sense with technology, or in technology that allows input to the machine, so that users can get information in and out of the system. Situated in the heart of the medical model of disability, much of the early work was not driven around what users wanted to do, but instead about overcoming impairments. Due to the fact that users were often unable to even take basic actions in the system, looking at any interaction beyond the fit between human and machine was not possible. It was not until the early 1980s that the social models of accessibility began to take hold in areas of research and practice, where we shifted to think of disabilities as a mismatch between a person's abilities their environment (or system). As a result, this is where the first conceptual lag occurred. Mainstream HCI had been considering the interaction between a person and the system well before this became an important discussion in inclusive design (Card et al. 1986).

Due to this framing, we see cycles of inclusion and exclusion as technology paradigms shifted. Taking one example, if we consider the case of people who are blind, there have been several paradigm shifts in computing that have led to a cycle of inclusion and exclusion. Blind programmers were explicitly recruited to work on punch card systems in the 1960s (Pullin 2009). When visual terminals were introduced, and punch cards gradually fell out of use, blind programmers found themselves excluded because they could not get at program information. As Bach-y-Rita and others begin work on sensory substitution using brain plasticity to replace vision with touch (Bach-y-Rita and Kercel 2003) and the first embossers are introduced to give access to large amounts of text previously available only in traditional books, we had display terminals see widespread use in computing labs. Then, just as the first screen readers are introduced to provide access to digital text (Adams et al. 1989), graphical user interfaces (GUI) are established as the dominant form of interaction for the next 20 years. Finally, as the first screen readers purpose built to navigate GUIs enter the research space, we see a shift to the web for digital transactions (Mynatt and Weber 1994; Petrie and Gill 1993; Petrie et al. 1995).

In this example, the conceptual lag is understandable. It is not possible to apply Second Wave thinking about tasks until First Wave engineering of access has been established. Invariably, over the last 50 years, behind the vanguard of change and innovation, there is a ground swell of researchers, practitioners, tinkerers and users who, out of necessity, revert back to trying to solve the First Wave human factors problems of getting information out of the machine to users, or for users to put instructions into the machine. Consequently, the problem of providing access remains an active and necessary part of inclusion research today.

10.3 Second Wave Inclusion

Towards the end of the twentieth century, there were a number of changes in the way that we conceptualised inclusion, that coalesced into a new framing for inclusion research and design practice. First was the framing of disability not just as medical conditions, but instead as a social construct. From this perspective, disability is something that can happen to anyone wherever there is a mismatch between the designs present in society and the abilities of individuals which prevents them from achieving their goals. This shift in framing co-occurred with strong civil rights movements across developed economies. A large number of legal frameworks were introduced throughout the 1990s that enshrined the rights of people with disabilities to not be excluded from society, for example: the Disability Discrimination Act of 1995 in the UK (DDA), and the Americans with Disabilities Act of 1990 in the USA (ADA). In 2000, Section 508 of the Rehabilitation Act of 1973 (Section 508) had its first set of implementation guidance notes published by the access board. Twenty five years on, many of these laws have been amended or wholly replaced to include access to digital services and information as part of their coverage (Clarkson and Coleman 2015), with the Equality Act 2010 in the UK and updates to Section 508 guidance in 2017 in the USA.

At the same time, we had number of factors emerge that necessitated the change in the way we talked about design in digital systems. First was an ageing population resulting in more people with a diversity of needs in terms of sensory, cognitive and mobility support, and this was combined a growing movement of including people with disability in society (Clarkson and Coleman 2015). At that time, we also saw personal computing technology become dramatically cheaper and more available. Machines became more powerful, including the necessary processing crunch to run a variety of assistive technologies. Further, they included robust hardware for generating sound and graphics, meaning that more options were available for developing assistive technologies for a wider variety of people. And within HCI, we had a shift away from humans as being information processors, and instead being actors in an active dialogue with systems to achieve goals, what Bødker (2006, 2015) and others identify as the Second Wave of HCI. For inclusion, this meant looking at how do we enable people with disabilities to achieve their goals.

As a result of all of these factors, we saw the emergence of three distinct movements about designing for diversity. The first is the Universal Design movement that appeared in the USA circa the mid-1990s. Mace (1988) bridged the gap between First Wave and Second Wave, relating issues of cognitive psychology to engineering in the way that Norman (1983), Nielsen and Molich (1990), and others did for mainstream usability. The team at North Carolina State University issued a set of guidelines that took many of the key concepts of usable design and related them to the challenges encountered with different motor, cognitive and sensory disabilities. Emerging around the same time were the design philosophies of Design for All (Europe) (Bühler and Stephanidis 2004) and Inclusive Design (UK) (Clarkson et al. 2013) which placed consideration of diversity as a component of design life cycles. This firmly moved inclusion into the Second Wave because now designing for user tasks, not just the design of input and output, was important to achieve inclusion. While work on access to different specific technologies continued (Fraser and Gutwin 2000; Brewster 2002; Wobbrock et al. 2005), around this time we began to see more of a discussion around technology as barriers to people participating in society (Gregor and Newell 2001; Gregor et al. 2005; Jacko and Hanson 2002;

Stephanidis 2001), and more publications talking about Accessibility using more traditional usability criteria of effectiveness and efficiency (Jacko et al. 2002). However, once again the field was conceptually lagging behind the practices in mainstream HCI. As the rest of the HCI world started to talk about user experience, many Accessibility researchers were only getting to grips with what inclusion really meant as a term in design practices for users being enabled in systems, and in particular the adoption of designing to checklists and heuristics.

10.3.1 An Example: Web Accessibility

There is perhaps no better example of the process of transitioning inclusive design through the first two waves of HCI than work on inclusion on the web. During the middle of the 1990s there was increasing concern about people with disabilities, in particular motor and sensory disabilities, being left behind by the shift of services and information to the web. In 1994, in a now famous keynote in accessibility circles, Tim Berners-Lee first mentioned disability access[2] and kicked off what would be a flurry of activity around the sphere which culminated in the publishing of the Web Content Accessibility Guidelines 1.0 (WCAG 1.0) (Chisholm et al. 1999).

Early problems on the web were often conflicts between assistive technology and the technology on which the web ran. These problems are firmly situated within the First Wave, and these mismatches in technology can still occur, but in lesser numbers than the early days of web accessibility. WCAG 1.0 had a number of guidelines that were intended to help alleviate these problems, and many of the guidelines were grounded at the level of web code, with checklists supporting developers by indicating what their code should and should not include.

As people with disabilities gained more access, we were able to ask different questions about how people with disabilities use the web, and try to approach things in a more Second Wave, usability oriented, point of view (Iwarsson and Stahl 2003; Shneiderman 2000; Petrie and Kheir 2007). For example, early work on strategies of blind screen reader users and low-vision magnifier users subsequently influenced the creation of new assistive technologies (Theofanos and Redish 2003).

However, there were also reports that pointed to problems that were beyond what existing guidelines covered. One of the largest ever conducted, the Disability Rights Commission report of 2004 (Disability Rights Commission 2004), pointed to a number of problems that looked distinctly like usability problems encountered by non-disabled users. For example, unclear and confusing navigation mechanisms that were not only a problem for blind screen-reader users but also cross-cutting with all groups with disabilities who were engaged in the studies detailed in that report.

[2] It seems to be a mandatory requirement for all web accessibility articles to include the precise text, so: “The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect.” – Tim Berners-Lee.

One way to look at these problems are that they are the first problems to be encountered after we had succeeded in providing users with basic *access*. Disabled users were able to identify that there was a navigation bar and that it was very confusing, and so users were unable to complete their goals. Consequently, this should not be seen as a condemnation of WCAG but instead an important milestone. The maturity of access had reached a point that these very thorny, difficult, design problems could be discussed and debated within communities of users and practitioners.

In 2008, WCAG was refined, updated and re-arranged (Caldwell et al. 2008). Guidelines were linked with overarching principles tied to core HCI concepts, such as making it so users with disabilities could perceive, understand and operate the web. The checklist approach was maintained, and success criteria were phrased carefully to be testable, and techniques for implementation were linked to the success criteria. Within WCAG 2.0, we saw an evolution of a set of guidelines that commuted the First Wave into the Second Wave. No longer were we trying to simply "create a logical tab order through links" (WCAG 1.0), but instead we were trying to make content understandable to people with disabilities by conveying a "Meaningful Sequence" through our content and seeking to provide "Information and Relationships" (WCAG 2.0) to users trying to link content together content within a page to complete their goals.

10.3.2 Emergent Experiences

After this shift of WCAG 2.0, several studies began to collect and classify the problems of users with disabilities on the web (Power et al. 2012; Rømen and Svanæs 2012). Users were found to have problems with information overload, or not finding what they were looking for, or being confused by irrelevant information, and these problems were not directly covered by guidelines in WCAG 2.0.

However, we should not expect them to be covered. Many of the problems described above only occur when we have solved some of the navigation problems found during the transition between WCAG 1.0 and WCAG 2.0, and many of the problems are conditional on the users being able to more effectively take action in web systems. As a result, they are new and different problems than those covered by WCAG 2.0.

This is where things get complicated: do we now amend the guidelines again to capture these problems and recommend ways to solve them? This could be quite hard given the variety of designs now on the web. Even more problematic is the question: where do we stop writing guidelines? If we are forever finding new problems, we will reach a point where we no longer have a checklist but a catalogue!

For a more clear demonstration of this point, we present the following description of some recent user studies recently completed at the University of York (Savva 2018).

Assume that we have a shopping website laid out in the modern fashion for online shopping as shown in Fig. 10.1. It has all the standard design elements: a

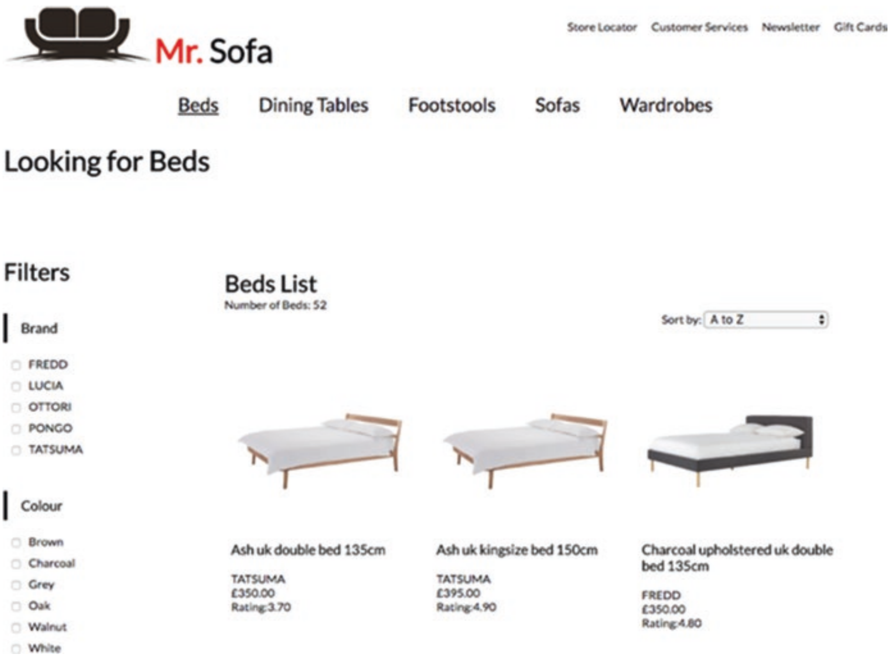

Fig. 10.1 An example furniture shopping website with a search and filter interface from (Savva 2018)

heading area, a navigation bar, a breadcrumb, some filters, and a content area where products are displayed and refreshed based on the filters selected.

Now, we know that one key element of design for blind screen reader users is to have headings that describe sections of the page (Theofanos and Redish 2003; Watanabe 2009; Power et al. 2013). If a first level heading (element h1) is placed at the top of the page, then the page will come back as being technically accessible, by which we mean that an automated accessibility tool will tell the developer that the heading tests have been passed. However, we also know that the effectiveness, of blind screen reader users will be low in completing their goals with only a single heading. In fact, they will almost certainly report a number of the problems identical to those reported circa 2004 (Disability Rights Commission 2004; Power et al. 2012).

To address (some of) these issues, we could add new headings to each visual section of the page so that blind users can find their way around the different sections. When evaluated by screen reader users, we will find that new problems are reported. Among them will be that users are unable to understand what happened on the page in relation to the filters they selected. While we have higher success rates climbing into the 85–90 percentile range, the user problems have morphed, and are clearly still having a detrimental effect on users.

To address those emerging problems, we could again add new headings, this time into the filters to help users find their way around within the filter sets. This time, success rates are between 95 and 100% success rate. However, in evaluations users will report issues of insufficient feedback that prevents them from knowing whether or not the content has updated the way they expect. Further, they report the refresh of the page puts the cursor of their screen reader back to the top of the page, and while they can find their way back to the filters or the content, there is large amounts of extra effort involved, leading to frustration.

Looking at the above example, even if all of the above designs were encapsulated into a checklist, not only would the checklist become unwieldy, there would still be new problems that have to be addressed. Even though we might be able to say that structure is present in a meaningful way for users to navigate via headings, the situated nature of users' tasks means that there are differences in the experiences and expectation of users that we cannot account for a checklist based approach. The epistemological orientation of checklist based approaches is rooted in that of planned accessibility, that of codifying and testing for a set of properties to which the designer will potentially provide access (Hedvall 2009). In this regard, a well constructed checklist can ensure properties are present or absent, but it is impossible to predict the actual experience users have from those properties alone. When technology is put to use by people with disabilities, they bring with them all of their goals, expectations, and all of their own experiences with them, which shapes the experience into what Hedvall refers to as lived accessibility (Hedvall 2009). This lived experience, which will change over time, based on both the individual using the technology and the contextual factors around them, needs to be accounted for an understood in our design processes. This is true of all users, not just users with disabilities, and is at the heart of the move of HCI into the Third Wave (Harrison et al. 2011).

10.4 From Access to Experiences

The example of the web brings to the fore what it means to design something inclusively. When grounded in past successes and challenges, we start to see an overall picture emerge depicted in Fig. 10.2.

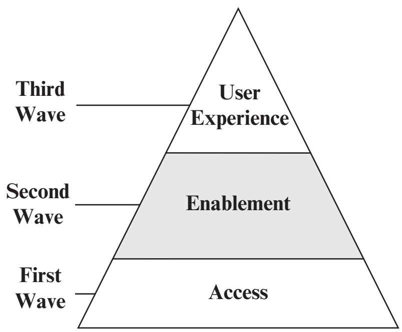

Fig. 10.2 The layers of inclusion, from basic access where users can perceive and operate aspects of the system, to enablement where they can achieve goals, which then yield different experiences

First, users need access. They need to be able to operate systems, and consume information that is presented to them. In order to address these needs, we need to apply First Wave approaches where we build and test pieces of technology to ensure they are of appropriate fidelity for users. Once those needs have been addressed, users can be enabled to do things in the system through Second Wave approaches that focus on ensuring users can meaningfully act in the system. While succeeding, or sometimes failing, in their goals, people with disabilities will have situated experiences, that are shaped by the technology they are using, the options available to them, their own self-efficacy and competence, and many other facets of their inter-action.

As a result, we can see access and enablement as precursors to any type of experience, and as such it is important to not ignore work that has come before. Perhaps more than any other field in HCI, we must not supplant that which has come before. We must remember what we have learned about access and enablement, and where and when to use different types of techniques.

However, in regards to capturing and understanding the experiences of users with disabilities in interactive systems, we have very few tools and techniques. Worsening the situation, with the advent of technology that is wholly about hedonic experiences, and not about pragmatics, there is a lack of criteria that we can measure in regards to "task success." In that design space, we need new ways to conceptualise how we measure success in inclusion, and develop design thinking approaches that take into account the situated actions, the experiences, and the values of people with disabilities with whom we are designing. We need to decouple the conceptual lag from the implementation lag, and start thinking ahead of how we design with experiences of users with disabilities in mind. Only then, will see truly inclusive technology.

10.5 Inclusion in Digital Games

When thinking about what inclusion in the Third Wave of HCI looks like, it is tempting to use the web as an example. After all, it has dominated much of the research landscape in inclusion over the last 20 years, and the web is still an area of expanding influence in our lives. People spend time on it not only to pay their taxes, but also to pass the time watching funny cat videos, browse the daily news, read Wikipedia, book a hotel, and so on. Similar to other technologies, and perhaps magnified by the flexibility of the web, there has been a conceptual lag in uptake of different types of approaches, but we are now starting to catch up in thinking about what does an user experience on the web looks like for people with disabilities (Horton and Quesenbery 2014; Horton and Sloan 2015; Aizpurua et al. 2016). There is also an encouraging increase in individuals who are interested in examining our methodologies around web accessibility (Savva et al. 2015; Brajnik et al. 2016; Bigham et al. 2017). Indeed, early in the Second Wave of inclusion research, Newell and Gregor were pushing the boundaries of Third Wave approaches with their work in understanding the needs of older adults on the web (Newell and Gregor 2000; Newell et al. 2011). However, even with these promising signs, we would argue that most things on the web are goal driven and enablement tends to dominate the discussions. While many of the activities above may be considered fun (and others clearly not), only the funny cat videos appear at first glance to be solely about leisure, and the rest are measured primarily by whether or not someone can do the thing for which the site was designed.

In order to avoid the task-based bias of web research, therefore, we adopt digital games as the place to explore aspects of the future of inclusion in the Third Wave. Digital games (games hereafter) represent probably one of the most extreme examples of where technology is used by people almost exclusively simply to provide some kind of experience. Games elicit a variety of different experiences from players and at their heart are about play, representing perhaps the quintessential example of leisure technologies discussed by Bødker (2006, 2015), representing an evolution of technologies to meet rest-of-life needs. Whether a player is playing hide-and-seek alone against the undead, raiding dragon hordes with guildmates, or crushing rows of candies, there is the potential for everyone to find a game they want to play.

10.5.1 Access in Games

Much like other interactive systems, access in games is primarily about taking action within the game, or consuming information about the state of the game through different modalities.

Players need to control different aspects of games, but what they need to control will vary wildly based on the type of game it is and the platform on which it runs. For example, consider Monument Valley. This beautiful game uses Escher inspired impossible objects to create puzzles that players need to solve to advance a princess through the levels. In order to do this, players must tap quite precisely on the screen where they want the princess to move. Compare this to a game like Dragon Age on a games console using a controller. In Dragon Age, players navigate in three dimensions around an immense world, while also managing a variety of combat oriented spells and attacks to defeat enemies, all through the combinations of 2 analog sticks, 4 bumpers and 4 buttons. Further compare these two sets of controls to those of the popular Starcraft series on a personal computer (PC), where dozens of mapped keys, mouse movements and clicks are required to gather resources, produce units, and then send forces to pile-on your enemy. Similarly, when we look at the presentation of information in the above games, we find a similar variety in types of information is provided (e.g. health bars, status of attacks, what players can interact with) and the modalities they are presented in (e.g. visual movement of surroundings, sounds of footsteps behind the heroes, text streams of unit statuses).

Clearly, there are many different ways that the above games could exclude players with disabilities. Players are diverse, and in many cases there will be co-occurrence of a number of different mismatches between players and the game controls and presentation. We could prescribe specific solutions, but there is no guarantee that it would meet the needs of even a small number of players, and indeed we would need to do it for every different type of game.

The reality is, each player will encounter a different set of problems within a game that need to be addressed, and the best people to tell us what works for them is the players themselves. As opposed to prescribing designs to game developers, and in particular petitioning to remove variety from the gaming space, in our experience it is better to advocate for options be provided to people with disabilities to customise their controls and their presentation. For controls, some of these options will be of the form of allowing alternate controllers or providing ways to remap buttons. For presentation, options can include allowing alteration of colour or size of things on the screen, resizing elements of the user interface, or hiding unnecessary details. Providing the option for players to do these different things, allows players to customise things to meet their own needs and moving them forward to enablement within the game space.

10.5.2 Enablement in Games

Where games become really interesting in inclusive design, and where we start to bump up against the limits of Second Wave approaches, is when we start trying to identify what it means for players to be enabled in the game space. While it is easy to say that if a player can play the game, then they are enabled, that may not be the end of the story for that player. What if the game isn't fun?

For instance, let's assume that a player with mobility disabilities sets up a controller to play Dragon Age such that they can reach all of the controls to control their party, trigger spells and abilities, and make dialogue choices in the narrative. Is that enough? If the game operates at a speed where the player's reactions cannot keep up, and their performative uncertainty (Costikyan 2013) is too high, then it is likely that they will quit the game before long and try something else. Luckily, Dragon Age provides mechanisms for pausing the game, reducing the level of challenge to a point where it is balanced against the player's experiences in the game so that the game remains fun. Our player can still play the game, and the developers get the money from a sale to a now loyal customer. Everyone wins.

When we unpick this example, the remapping of the controls removed the fundamental barriers that kept our player from playing the game. Beyond that barrier, there were further barriers introduced by the level of challenge presented by the game. The challenges in the game itself were likely balanced with an average player in mind, and tested with average players in the gaming chair. For our disabled player, their situated context is very different from the average. Some of that context might be fixed over time, such as the range of motion the player has in their hands and arms. On the other hand, some of the context, like our player's natural reaction time, might improve over time, similar to any other player who is new to a particular game or genre of game. If we provide ways and means for players to change the

Fig. 10.3 The layers of inclusion in games, starting with basic controls and presentation, providing access to challenges which may further need to be customised by players, so that they can have fun and other accessible player experiences (APX) in games

game, so that the challenge is better suited to their current context, then the result is another game that is now including those players. We end up with our levels of inclusion for games looking more like Fig. 10.3.

From the analysis of this example, enablement in games can be conceptualised as being able to have options around the challenges presented in games. After gaining access, players need to be able to shape the challenge so that it better suits them. Due to the range of different challenges presented in games it becomes impossible to write a checklist to meet them all, nor would we expect to do so. Where it is appropriate, we can provide a checklist at the level of whether or not the options have been included, which is what AbleGamers has done with their Includification guidelines (Barlet and Spohn 2012). These guidelines ensure that developers can question whether or not they have found alternatives that players can use, and whether they have considered adding different features to their games. However, it cannot tell them how to design those options, or if the game will be fun.

10.5.3 *Experience in Games*

However, the diversity in games highlights another key aspect that makes them distinctive for exploring inclusion from a Third Wave perspective. Games are intricately connected to players and their standpoint as to why they are playing. When someone goes to pay their taxes on the web, there is basically one reason they are doing that: to pay their taxes. When people play a game, their individual reasons for play are as varied as the players. In some cases, people may be looking to simply de-stress and unwind after a busy day (Collins and Cox 2014). Alternatively, players may want to earn achievements, explore a world, simply exist in the world to spend time with friends (Bartle 1996), or something else entirely. Even when goals are shared by players, such as “to win”, what it means “to win” may vary from player to player. One person might see being at the top of the leaderboard as being the only acceptable winning condition, while another may just want to take the other person down with them. In any of these cases, the standpoint of the players frames and contextualises the challenges presented within the game in different ways. Even when players all experience the same game, they may all have different takeaways from that game in terms of experience.

Indeed, this is what makes digital games perhaps the most important technology for improving opportunities for diverse experiences for people with disabilities. Digital games themselves expand the range of experiences that people with disabilities can have in our society. It allows players get out beyond their four walls, to connect with other people, and to engage in a shared experience that can be related to and discussed well beyond any individual play session. People discuss their play sessions, share stories, avoid spoilers, and can forge lifelong friendships that extend out into the "real" world. Games provide not only a place where people can connect, but something people can connect over.

So what are the ways that we can help games developers design new games that are inclusive? It seems to us that when it comes to designing for experiences with people with disabilities, First Wave access and Second Wave enablement are necessary but insufficient. To achieve the experiences that designers and developers want for their users, disabled or not, requires Third Wave thinking.

10.6 Third Wave Inclusion: Inclusive Experiences

Despite the extensive research in accessibility and inclusion, and the notable improvements in accessibility of many different interactive devices, to achieve inclusive experiences requires a further evolution in design research and practice.

We need a step change away from the idea that we are planning for accessibility, and instead focussing on what are the lived the experiences of players when they encounter our games. In what Hedvall (2009) referred to as epiaccessibility, we need to consider not only what types of options we are providing, but we need to consider the range of ways people will use those options, how they will opportunistically use technology, the expectations they bring playing games, and many other facets users' situated contexts.

While we still have a long way to go in providing access and enablement in the game space, we now have enough players playing games that we can begin to understand how the myriad of factors that impact their play and their subsequent experience. Further, we need to acknowledge that while different players have different standpoints, in the end everyone wants to have a "good game."

For research, this means that we need to go back to first principles, and begin understanding what players with disabilities expect and want from their experiences in games. Some of these, such as a desire to socialise with friends, or to rise to meet a challenge in game, or to engage with an emotionally satisfying story, are shared among all players, but will be shaped by the cumulative experiences each different person has had in their lives. In other cases, some experiences will be very specific to individual players with disabilities, such as the level of comfort they have using a piece of assistive technology, or how they use games to manage pain in their day-to-day lives. Capturing, conceptualising and understanding these accessible player experiences (APX) will push beyond the types of traditional approaches where we have users undertake a task and count the number of times they get something "right". It will require a variety of methods drawn from participatory design, contextual design, ethnography and beyond, to understand the different facets of these experiences. We will need not only large studies with many players, but also more focused, intimate case studies with players or groups of players so we can get rich descriptions and depictions of the experiences of players with disabilities and their peers. In places where players can identify and describe the experiences of players, we can begin to build measures for testing different designs.

However, with any measure that we define, we need to be aware when interpreting the outcomes that the experience may have a substantially different meaning for different players. For example, consider the situation where a player has all of their access needs met in a first person shooter (FPS) game. They can play the game, but don't find it particularly fun because they die within seconds of their respawn point. Through the use of target assist, they reduce the challenge to the point where they are able to tag their opponents. They still get knocked out, but they have enough of a chance to take the opponent down that they find it fun. Another player might be an avid FPS player, and they might consider that they don't need target assist and resist turning it on even though it would allow them to compete on a more even footing. Both of these players would probably rate the challenge as being particularly high, but that does not necessarily mean that either is a negative experience.

For game designers, we need to identify new ways of conceptualising the experience of players with disabilities in terms of the goals of the designer. While checklists of accessibility options provide a means of challenging assumptions in design, as demonstrated in the web, it is not enough to enable designers to deliver experiences. We need to change the paradigm. Designers want to build games that deliver some kind of experience to their players, so we need to shift to providing designers insight into what are the physical, cognitive and emotional challenges of games (Denisova et al. 2017) and the ways players will want and need to customise that challenge. For example, if a designer wants to tell a moving story about swashbuckling space cowboys, they want all players to be able to take in that story. However, for a player who may struggle to read dialogue options, with the cognitive challenge being too high, we want designers to think of ways to deliver that story without compromising the emotional resonance of it in the player. Similarly, if a player finds it difficult to sit through large cutscenes due to their attention preventing them from engaging in the emotional challenge the story offers, we want designers to be thinking of ways for players to skip the story, yet still have the narrative feed into the game's main theme.

With these examples, it is easy to see that we cannot prescribe lists of do's and do not's to game design. We need to be developing deep understanding of how players experience games, generated from a wide variety of methods, and deliver it into the hands of designers. We need mechanisms by which designers can integrate this knowledge into their own practices, and situate it in the way they design, as it is starting to be done on the web. Further, we need deep, contextual knowledge about how games, or other systems, are created so that we can graft these understandings onto the language and goals of designers. By doing this, we can provide new approaches. Only by understanding these different standpoints will we be able to make inclusive design something new and supportive, and possibly reach the point where games are designed to be inclusive simply because it is part of how we do things.

10.7 Decoupling the Lags

The implementation lag of providing access to games seems unavoidable. New games use different modalities, such as haptic or VR interactions, in new ways and new platforms offer new controllers, like the Nintendo Switch. However, it is already being recognised by games designers that there are solutions, such as providing options in games, that make engineering access easier (Barlet and Spohn 2012). This is reducing the implementation lag from new games and games technology to players with disabilities being able to play. However, there will always be some degree of implementation lag because developers cannot easily account for the diversity of players with quick fixes. There will also be a need for further work as each new game technology is produced.

However, what need not happen is the conceptual lag. If we remain with First and Second Wave thinking in game design, games cannot deliver to all the players the experiences that are, in essence, their purpose. Third Wave thinking is necessary from the outset. If designers think of a diversity of players with their own goals, values and contexts of play (Harrison et al. 2011), they can be thinking as much about diversity in terms of the disabilities of their players as much as they think about their capabilities as gamers. No one player or type of player needs to be privileged in terms of the experiential goals that the designers want to deliver. If this conceptual lag is removed, then there is no need for further work once the implementation catches up: the diverse experiences of a game will be ready to whomsoever is enabled to play.

Games are in some sense pure experience (Cairns 2016), and as such, they provide an ideal domain in which to explore Third Wave thinking for inclusion. Indeed, this is perhaps one of the largest opportunities that will be provided by pursuing this pluralistic approach in games. By shifting the epistemological approach we use to design games, to be situated on experiences and outcomes for players with disabilities, we will undoubtedly learn new methods that can be transferred back to the web and other systems.

References

Adams FR, Crepy H, Jameson D, Thatcher J (1989) IBM products for persons with disabilities. In: IEEE Global Telecommunications Conference and Exhibition Communications Technology for the 1990s and Beyond'(GLOBECOM), 1989, IEEE, pp 980–984

Aizpurua A, Harper S, Vigo M (2016) Exploring the relationship between web accessibility and user experience. Int J Hum Comput Stud 91:13–23

Bach-y-Rita P, Kercel SW (2003) Sensory substitution and the human–machine interface. Trends Cogn Sci 7(12):541–546

Barlet MC, Spohn SD (2012) Includification: a practical guide to game accessibility. The Ablegamers Foundation, Charles Town

Bartle R (1996) Hearts, clubs, diamonds, spades: players who suit muds. J MUD Res 1(1):19

Bigham J, Lin I, Savage S (2017) The effects of "Not Knowing What You Don't Know" on web accessibility for blind web users. In: Proceedings of 19th International ACM SIGACCESS Conference on Computers and Accessibility (AS-SETS 2017). ACM, New York, pp 101–109

Bødker S (2006) When second wave hci meets third wave challenges. In: Proceedings of the 4th Nordic conference on Human-computer interaction: changing roles. ACM, New York, pp 1–8

Bødker S (2015) Third-wave HCI, 10 years later—participation and sharing. Interactions 22(5):24–31

Brajnik G, Vigo M, Yesilada Y, Harper S (2016) Group vs individual web accessibility evaluations: effects with novice evaluators. Interact Comput 28(6):843–861

Brewster S (2002) Visualization tools for blind people using multiple modalities. Disabil Rehabil 24(11–12):613–621

Bühler C, Stephanidis C (2004) European co-operation activities promoting design for all in information society technologies. In: Computers helping people with special needs. ICCHP, Paris, pp 625–625

Cairns P (2016) Engagement in digital games. In: Why engagement matters. Springer, pp 81–104

Caldwell B, Cooper M, Reid LG, Vanderheiden G, Chisholm W, Slatin J, White J (2008) Web Content Accessibility Guidelines WCAG 2.0. Web Accessibility Initiative, W3C

Card S, Moran T, Newell A (1986) The model human processor–an engineering model of human performance. Handbook of perception and human performance 2:45–1

Chisholm W, Vanderheiden G, Jacobs I (1999) Web content accessibility guidelines WCAG 1.0. Web Accessibility Initiative, W3C

Clarkson PJ, Coleman R (2015) History of inclusive design in the UK. Appl Ergon 46:235–247

Clarkson PJ, Coleman R, Keates S, Lebbon C (2013) Inclusive design: design for the whole population. Springer, Heidelberg

Collins E, Cox AL (2014) Switch on to games: can digital games aid post-work recovery? Int J Hum Comput Stud 72(8):654–662

Costikyan G (2013) Uncertainty in games. MIT Press, Cambridge, MA

Danilina O, Cox A, Fonseca A, Johnson S (2017) The effectiveness of serious video games on mental health related outcomes: systematic review. In: Proceedings of CHI play 2017. ACM, New York

Denisova A, Guckelsberger C, Zendle D (2017) Challenge in digital games: towards developing a measurement tool. In: Proceedings of the 2017 CHI conference extended abstracts on human factors in computing systems. ACM, New York, pp 2511–2519

Disability Rights Commission (2004) The web access and inclusion for disabled people: a formal investigation conducted by the Disability Rights Commission. The Stationary Office

Fraser J, Gutwin C (2000) A framework of assistive pointers for low vision users. In: Proceedings of the fourth international ACM conference on Assistive technologies. ACM, New York, pp 9–16

Gregor P, Newell AF (2001) Designing for dynamic diversity: making accessible interfaces for older people. In: Proceedings of the 2001 EC/NSF workshop on Universal accessibility of ubiquitous computing: providing for the elderly. ACM, New York, pp 90–92

Gregor P, Sloan D, Newell AF (2005) Disability and technology: building barriers or creating opportunities? In: Adv Comput, vol 64, Elsevier, p 283–346
Harrison S, Sengers P, Tatar D (2011) Making epistemological trouble: third-paradigm HCI as successor science. Interact Comput 23(5):385–392
Hedvall PO (2009) Towards the era of mixed reality: accessibility meets three waves of HCI. In: Symposium of the Austrian HCI and Usability Engineering Group. Springer, Heidelberg, pp 264–278
Horton S, Quesenbery W (2014) A web for everyone: designing accessible user experiences. Rosenfeld Media, Brooklyn
Horton S, Sloan D (2015) Accessibility for business and pleasure. Interactions 23(1):80–84. https://doi.org/10.1145/2843590. http://doi.acm.org/10.1145/2843590
Iwarsson S, Stahl A (2003) Accessibility, usability and universal design—positioning and definition of concepts describing person-environment relation-ships. Disabil Rehabil 25(2):57–66
Jacko JA, Hanson VL (2002) Universal access and inclusion in design. Univ Access Inf Soc 2(1):1–2
Jacko JA, Scott IU, Sainfort F, Moloney KP, Kongnakorn T, Zorich BS, Emery VK (2002) Effects of multimodal feedback on the performance of older adults with normal and impaired vision. In: ERCIM workshop on user interfaces for all. Springer, Berlin, pp 3–22
Mace R (1988) Universal design: housing for the lifespan of all people. The Center for Universal Design, North Carolina State University, Washington, DC
Mynatt ED, Weber G (1994) Nonvisual presentation of graphical user interfaces: contrasting two approaches. In: Proceedings of the SIGCHI conference on human factors in computing systems 1994 (CHI'94). ACM, New York, pp 166–172
Newell AF, Gregor P (2000) "User sensitive inclusive design" – in search of a new paradigm. In: Proceedings on the 2000 Conference on Universal Usability. ACM, New York, pp 39–44
Newell AF, Gregor P, Morgan M, Pullin G, Macaulay C (2011) User-sensitive inclusive design. Univ Access Inf Soc 10(3):235–243
Nielsen J, Molich R (1990) Heuristic evaluation of user interfaces. In: Proceedings of the SIGCHI conference on human factors in computing systems 1990 (CHI'90). ACM, New York, pp 249–256
Norman DA (1983) Design principles for human-computer interfaces. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems 1983. ACM, New York, pp 1–10
Petrie H, Gill J (1993) Current research on access to graphical user interfaces for visually disabled computer users. Eur J Special Needs Edu 8(2):153–157
Petrie H, Kheir O (2007) The relationship between accessibility and usability of websites. In: Proceedings of the SIGCHI conference on human factors in computing systems 2007 (CHI 2007). ACM, New York, pp 397–406
Petrie H, Morley S, Weber G (1995) Tactile-based direct manipulation in GUIs for blind users. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems 1995 (CHI'95). ACM Press, New York
Power C, Freire A, Petrie H, Swallow D (2012) Guidelines are only half of the story: accessibility problems encountered by blind users on the web. In: Proceedings of the SIGCHI conference on human factors in computing systems 2012 (CHI 2012). ACM, New York, pp 433–442
Power C, Petrie H, Swallow D, Murphy E, Gallagher B, Velasco CA (2013) Navigating, discovering and exploring the web: strategies used by people with print disabilities on interactive websites. In: IFIP conference on human-computer interaction. Springer, Heidelberg, pp 667–684
Pullin G (2009) Design meets disability. MIT press, Cambridge, MA
Rømen D, Svanæs D (2012) Validating wcag versions 1.0 and 2.0 through usability testing with disabled users. Univ Access Inf Soc 11(4):375–385
Savva A (2018) Understanding accessibility problems of blind users on the web. PhD thesis, University of York
Savva A, Petrie H, Power C (2015) Comparing concurrent and retrospective verbal protocols for blind and sighted users. In: Human-Computer Interaction. Springer, Heidelberg, pp 55–71

Shneiderman B (2000) Universal Usability. Communications 43(5):84–91

Stephanidis C (2001) User interfaces for all: new perspectives into human-computer interaction. In: User interfaces for all-concepts, methods, and tools, vol 1. Lawrence Erlbaum Associates Inc, Mahwah, pp 3–17

Theofanos MF, Redish JG (2003) Bridging the gap: between accessibility and usability. interactions 10(6):36–51

Watanabe T (2009) Experimental evaluation of usability and accessibility of heading elements. Disabil Rehabil Assist Technol 4(4):236–247

Wobbrock JO, Aung HH, Myers BA, Lopresti EF (2005) Integrated text entry from power wheelchairs. Behav Inform Technol 24(3):187–203