IMPROVING INCLUSIVE DESIGN PRACTICE - TRANSFERRING KNOWLEDGE FROM SPORTS DESIGN PRACTICE

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Abstract

Despite the existence of many design tools to educate and assist the designer in implementing inclusive design, there is still a lack of inclusive design uptake in industry. The client is often cited as a barrier to inclusive design uptake, therefore it is important that this issue is addressed if inclusive design uptake is to be increased. Sports design is a highly user focused discipline, therefore it is anticipated that there is scope for inclusive design to learn from this user centred discipline. This research aims to investigate the potential of applying the sports design process within an inclusive design context to increase inclusive design uptake in industry. The paper reports on a practical study, which interviewed practising industry designers and designers from a UK centre specialising in inclusive design. The outcome is a set of recommendations from designers on how the sports design process model can be developed to facilitate inclusive design uptake in industry.

Keywords: Inclusive design, User centred design, Design process, Design practice, Sports design

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1   INTRODUCTION

A recent study (Wilson et al., 2015) found that the design process behind the design of sports equipment is highly user focused with the user fully integrated throughout the design process. This could be expected as sporting performance is dependent on the interaction between the equipment and the athlete (Stefanyshyn and Wannop, 2015). It is hypothesised that aspects of the sports design process will be applicable other user centred design disciplines to improve user integration throughout the design process. This research will focus on inclusive design – a highly user centred design discipline that is particularly relevant in today's society, with population ageing set to become one of the most significant social transformations of the twenty-first century (United Nations, 2015).

Inclusive design is a design philosophy that considers the needs and capabilities of the whole population (Johnson et al., 2010). A global ageing population presents a strong business and ethical case that inclusive design can address. However, the uptake of the approach in industry has been limited (Goodman-Deane et al., 2010). This highlights that despite the existence of methods and tools to aid the implementation of inclusive design, more has to be done to increase the uptake of the approach in industry. This paper aims to investigate the potential of applying the sports design process within a product design context to improve inclusive design practice. The research utilised semi-structured interviews with practising designers in industry and a workshop with inclusive design experts at a UK based centre specialising in inclusive design to determine the applicability of the sports design process model to inclusive design practice, what developments would be required in the model and what format these developments would take. The outcome of the paper will be a set of recommendations from practicing designers and inclusive design experts for the development of the sports design process model to improve the implementation of inclusive design in industry.

2   BACKGROUND

Inclusive design is defined by Waller, *et al.* (2015) as, "an understanding of customer diversity to inform decisions throughout the development process, in order to better satisfy the needs of more people". It is an approach that aims to design products that are accessible to as wide a diversity of the population, encompassing functionality, ergonomics and aesthetic appeal (Clarkson et al., 2013) and is regarded as good design practice since inclusively design products have the potential to benefit able-bodied users (Clarkson & Coleman, 2013).

2.1 The need for inclusive design

Life expectancy is increasing, resulting in an ageing population (Office for National Statistics 2015).
The number of people aged over 60 is expected to grow by 54% between 2015 and 2030 (United Nations, 2015), with the figure higher for developed countries. Old age is associated with a decline in physical performance (Langley et al., 2005), which combined with the movement to integrate disabled people into mainstream society has resulted in the drive for inclusive design. It is suggested (Clarkson and Coleman, 2010) that people are disabled by the design of the environment around them, which does not take into account the full range of human capabilities. Arup (2015) adds that it is not age that brings vulnerability – rather the failure to include older people in the decision-making process that excludes them from accessing products and services.

In order to support the ageing population, it is vital that these groups are included in the design process, so they can sustain quality of life. Sustainability is an important component of the inclusive design process (Heylighen, 2008). Heylighen (2008) discusses the link between inclusive and sustainable housing, highlighting that the tacit design knowledge possessed by users is rarely used within the design process. Vavik and Keitsch (2010) discuss the rising trend for relating inclusive design to social sustainable development, stating that the term 'sustainable development' signifies that economic, social and ecological developments are connected and dependent on each other.

There is a clear need for products that are designed to cater for a wider diversity of user needs (McGinley, 2012). With older adults and the disabled now forming a large (and expanding) proportion of the population with considerable spending power (Clarkson et al., 2013), with inclusive design implementation cited as increasing customer satisfaction (Mieczakowski et al., 2013). There are financial incentives for expanding the market to include a greater diversity of users, therefore it makes

commercial and ethical sense to cater to the needs of this population (Wilkinson and De Angeli, 2014). Products that fail to meet the functional capabilities of the user are highly likely to fail in the market (Gheerawo et al., 2010) and are more likely to suffer poor sales or high return rates (Waller et al., 2015). It is therefore important to product success that the needs of a wide diversity of users are accommodated within the design process.

2.2 Inclusive design uptake in industry – barriers

Despite the introduction of new legislations, financial incentives and the existence of many appropriate inclusive design approaches, many companies are not adopting an inclusive approach to design (Goodman-Deane et al., 2010). An overview of several key barriers to the uptake of inclusive design are summarised in Table 1. Designers have to work within constraints where the focus is frequently on cost, novelty and brand positioning (Clarkson et al., 2013). From Table 1, it is apparent that the client is influential in many of these barriers, from detailing the problem to be addressed and setting the target user group, to allocation of time and resources throughout the design process and influencing design reviews. Many consultant designers are also reliant on the client for user information (Goodman-Deane et al., 2010). It was found (Bruseberg and McDonagh-Philp, 2000) that designers regretted the fact that they lacked more detailed user information. There is additional concern that a lack of diversity in the UK designer population may result designers designing for themselves, excluding a significant proportion of the population (Wilkinson and De Angeli, 2014).

Table 1. Barriers to inclusive design

Barriers	Paper
User involvement in the process can be expensive, appropriate users are difficult to identify, skills to integrate the user are out with the remit of the designer.	Dong, et al. (2004)
Lack of time and budget, lack of knowledge and tools to practice inclusive design, inclusive design was not perceived as a need of the end user.	Goodman, et al. (2006)
Client influence (in setting constraints and providing information), limitations on budget and time.	Goodman-Deane, et al. (2010)
Poor fit between inclusive support tools, poor awareness within management levels, limited communications across the company and client.	Mieczakowski, et al. (2013)
Constraints where the focus is more often on cost, novelty and brand positioning.	Clarkson & Coleman (2013)

While there are many existing tools and methods intended to aid the implementation of inclusive design, many of these are focused on the designer and equipping them with the tools and skill set needed to adopt an inclusive design approach. However, it is apparent that many of the barriers to inclusive design originate with the client, raising the need to increase client awareness of inclusive design and its benefits and educate the client in the implementation of inclusive design within the design process. It is anticipated that by educating the client of the benefits of inclusive design and how it should be incorporated within the design process may result in removing some of the client-based barriers to the uptake of inclusive design practice in industry.

2.3 Findings from sports design

Sports design focuses on the design and development of sporting equipment, which must interact with the athlete to facilitate sporting performance (Stefanyshyn and Wannop, 2015). As a result, user integration throughout the sports design process is essential to ensuring the product meets the needs of the athlete (Wilson et al., 2015). This research builds on an original model of the complete sports design process, shown in Figure 1, which emphasises characteristics of sports design practice. The sports design

process model illustrates a cyclic process, with iterations within all stages of the design process and a forwards only progression through the process. The emphasis is placed on user involvement throughout the design process – the user is physically involved at all stages of the design process, with results from user testing playing a key role in the decisions made at the design review stages. Sports companies were found to produce prototypes early to allow iterative testing and evaluation with the user throughout the design process. The emphasis placed on user integration within the design process is not surprising, considering the main objective of sports equipment is to improve athlete performance (Müller, 2011) – if the athlete and their equipment do not work effectively together, then sporting performance will suffer.
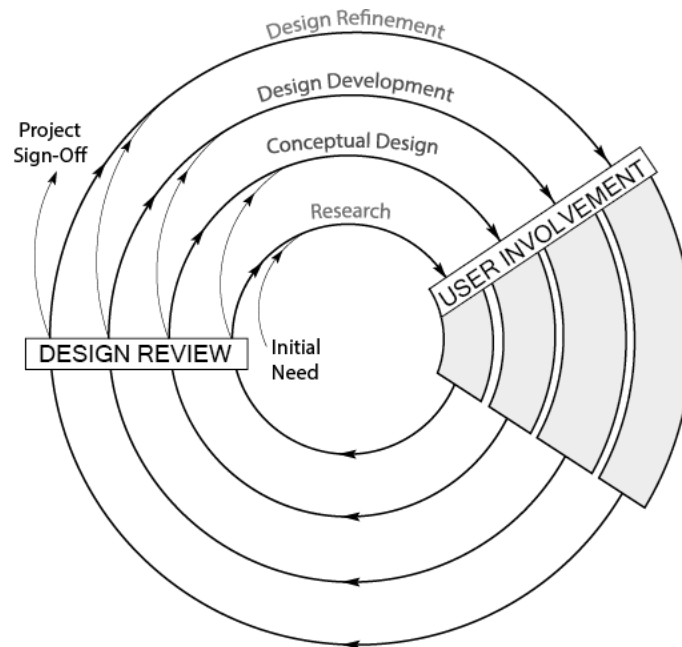

Figure 1. Sports design process model (Wilson, 2016).

2.4 Application of sports design to inclusive design

Inclusive design is an iterative process of gaining new knowledge resulting in continuous design improvement, increased customer satisfaction and brand loyalty (Clarkson and Coleman, 2013) and should be taken into consideration at decisions made throughout the design process (Waller et al., 2015). To deliver inclusive design effectively, there is a need to follow a design process that reflects an inclusive design approach and validates the outcomes of the process (Clarkson et al., 2013). However, there appears to be a lack of guidance for incorporating the end user in the inclusive design process.

Sports design is a discipline that has received relatively little attention, with the recent development of the sports design process model the first to capture the design process behind sports equipment as a whole. As sports design places emphasis on an iterative design process with user integration throughout (Wilson et al., 2015), it is apparent that there are similarities in the characteristics of sports design and inclusive design practice. There is evidence of design processes specific to certain areas of design being used across design disciplines – for example: the design spiral, intended for ship design, is now used in the design of aircraft and in mature product architecture (Clarkson and Hamilton, 2000). This highlights the potential scope for inclusive design practice to learn from other user centred design disciplines, where characteristics relevant to inclusive design practice are routinely implemented effectively within everyday design practice. This paper reports on research, which investigates on whether aspects of the sports design process are applicable to inclusive design practice.

3 APPROACH

To ensure the outcome of this research is applicable to industry, a practical study was undertaken involving both practicing product designers from industry and experts in inclusive design from a UK based centre specialising in inclusive design. An overview of the research approach is illustrated in Figure 2.

The study utilised individual semi-structured interviews with product designers to gain feedback on the applicability of the sports design process model within an inclusive product design context. Five experienced product designers from industry were involved in the interviews, each from a different design company and had experience in designing user centred and/or inclusive products. Companies that participated included those that designed medical devices, headphones and three design consultancies, which designed a range of products. Semi-structured interviews were conducted to ensure that in-depth data was collected which would address key points. Interviews lasted around an hour and interviewees were given freedom to develop their thoughts on key areas. Designers were initially questioned regarding their own design process and inclusive design practice. The sports design process model was then presented to the designers, who were asked for their initial impressions with no explanation of the model provided. Designers were then questioned on the sports model in more detail following a detailed explanation of the model by the researcher. Seven questions were asked, which included the reflection of an inclusive design approach within the design process followed by the company, methods used within that process, user involvement in the process, initial impressions of the sports design model and developments that could be made to implement the process in practice and to promote inclusive design. All interviews were completely transcribed and were analysed using a general inductive approach (Thomas, 2006), which involved creating a framework to interpret and compare significant themes within the interview data.
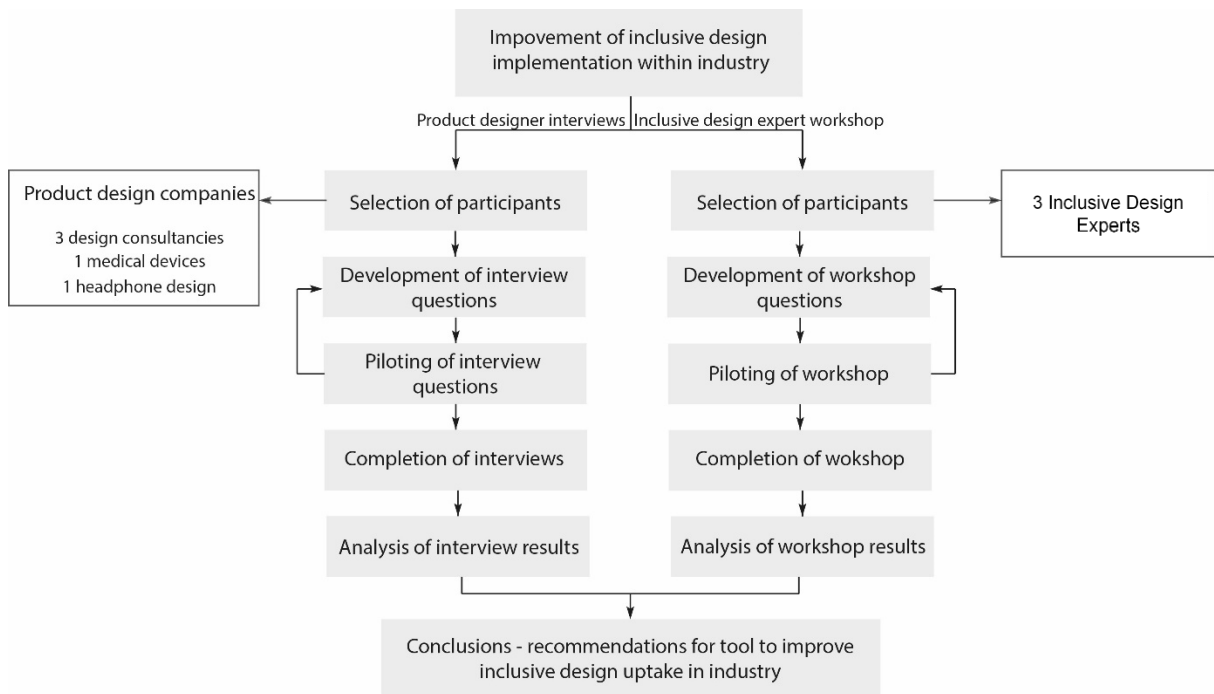

Figure 2. Research approach

Three inclusive design experts from an internationally renowned UK based design consultancy specialising in inclusive design took part in a workshop to discuss the potential development of the sports design process model in the context of inclusive design. The inclusive design centre is involved in design research and projects with industry that aims "to contribute to improving people's lives". As a long running centre for design research, the designers at the centre have an expert knowledge of inclusive design practice and in a position to provide valuable feedback on the potential application of the sports design process model within an inclusive design context. The three participants in this study were all highly experienced in inclusive design, having worked at the Centre for an average of seven years. The workshop was conducted at the inclusive design centre and lasted approximately three hours. The aim of the workshop was to identify the processes and activities carried out by the Centre, which would be indicative of "best practice" in inclusive design. Feedback was also sought on the applicability of the sports design process model to industry practice and ideas were generated on how the model could be developed further for implementation within industry.

Both the questions from the designer interviews and the workshop structure were piloted to ensure that appropriate questions were asked and that questions were interpreted correctly. As a result of the pilot studies, minor refinements were made to both the interview questions and workshop plan.

4 RESULTS

Designer responses to interview questions were transcribed using a general inductive approach (Thomas, 2006), which highlighted core themes within the data. Outputs from the workshop were analysed using the same approach. Results are discussed within the core themes that emerged, which were: 1) current industry practice for designers, 2) current practice within the inclusive design centre, and 3) feedback on development of the sports model for application within inclusive design.

4.1 Current industry practice

Industry designers reported that although they tried to involve the user (and a diversity of user groups) in the design process where possible, inclusive design was not a term that was commonly used in practice as it was perceived negatively by clients. All designers interviewed had experience working with users but all commented that the level and diversity of user involvement within the design process was highly dependent on demands and funding from the client. One designer commented that projects which involved the user more often resulted in a better product – "where we were able to do (user) research, you make the product better from the research". All designers reported that the client was often the main barrier to user involvement within the design process as the client was responsible for allocating funding for the project and was often directly involved in influencing the level of user involvement. General user involvement within the design process was rare, with diversity in those user groups even more uncommon.

It was noted that the client was rarely from a design background and often lacked knowledge of the design process – "the client is quite often very ignorant to the design process". This created problems when designers were trying to communicate with the client – the client often assumed the design process was a linear route with one concept selected from the start and progressed through to the end. It was commented by all designers that clients often found the concept of an iterative approach to be a daunting one - "the idea of going round and round can be quite scary for clients." The client focused on the value of design activities carried out in the design process and wanted to see the output from each activity – "clients want to see tangible outcomes". The value of providing primary user data for designers with a diversity of user groups was perceived by client to add little value to the design process.

Designers often found it difficult to communicate to the client that user involvement was important in the early stages of a project to educate the designer on the needs of the user - "there's a narrative to doing the first bit well and having user consideration – if you don't properly understand the need or the problem you're trying to address, there's no point in moving on to the next bit because you're more likely to fail". It was also found that when users were involved in the process, clients were unaware of how to recruit appropriate users and how long this recruitment process would take.

4.2 Best practice in inclusive design

The workshop focused identifying areas of best practice in inclusive design, as it was carried out at the inclusive design centre. The design process followed by the Centre originated from the double diamond design process model (Design Council, 2005), with the process split into a research phase and a solution phase. Due to the Centre being more research orientated than typical design consultancies, the designers interviewed stated that greater time was spent on the research phase of the process to ensure a thorough understanding of a diversity of user needs. In the early stages of the process, designers gathered as much user information as possible, with methods typically involving observations and interviews with users – "more talking to the users and compressing that information into a single question or direct question" – with the aim of verifying the nature of the design problem.

User involvement played a greater role on a regular basis in the design process followed by the Centre compared to that observed in the design companies interviewed. A range of diverse users were included to ensure that the final design was as inclusive as possible. User involvement was continuous throughout the design process with the early stages involving open interaction with users and talking to as many people as possible with a broad range of capabilities to help the designers understand the design problem. At concept generation it was reported there were times when the user was involved - "when you're

sketching or developing the concepts, you have users involved. They can be quite creative." However, it was also reported there were times when the designers needed time to design by themselves. Users were involved extensively in the later stages of the design process once ideas are more developed. At this stage, specific user groups were involved based on capability and diversity, to allow ideas to be tested against the user group from where the idea originated.

4.3 Sports model feedback and development

In response to the applicability of the sports model to inclusive design practice in industry, all designers involved in the research commented that they liked the visual format of the sports design model – "it makes sense when you look at it – it's very understandable". The concept of the cyclic model was felt to be more representative of the iterative nature of inclusive design practice compared to the traditional linear process representation. Designers liked the simplicity of the model and felt that it should not become overly complex – "I wouldn't complicate it more because it works well and if you complicate it, you take away from the core stages".

The designers from industry and those at the inclusive design centre all commented that the model would be of limited use to designers themselves in industry practice, as all were well aware of the design process that they followed day-to-day – "once you've been in industry a while, you just kind of do it". However, the potential of the simple cyclic model as it currently presented was discussed as a useful reference tool to aid communication between designers and to track project progress.

All those who were interviewed thought that the sports design process model would be highly useful if developed further into a communication tool to help the client understand the inclusive design process. Designers commented that aspects of the model, such as emphasis on iterations, effort involved at core stages and the value of user involvement would all be beneficial if included in a framework to accompany the design process. Designers at the inclusive design centre added that an indication of where the client should be involved in the design process would also be useful to ensure the client is aware of their role within the process – potentially as a source of information or at key decision making points. However, it was vital the process model did not become over-complicated with this additional information. It was suggested that the supporting framework could be used to illustrate the additional information that it would be needed to provide a client with a clear over-view of the inclusive design process and should be presented in a format that could be updated to reflect individual project needs.

5 DISCUSSION

5.1 User involvement in design practice

All participants within this research felt that user involvement within the design process was highly beneficial and allowed clearer definition of the project early on, in agreement with previous studies. User involvement helps designers gain a thorough understanding of the design problem and the environment in which that problem originated. However, all industry designers felt that the user was often not involved to the extent they would like – user involvement within the design process at all was rare for all industry designers interviewed. The lack of diversity reported when users were involved is also concerning. Reasons given for this included a lack of time within the process and insufficient funding allocated to user research. This is in agreement with the literature, where allocation of time and resources are frequently cited as barriers to inclusive design.

There is therefore a need to address where these barriers arise from. The client is responsible for the allocation of funding and resources, therefore there is a need to educate the client on the value of including not just the user, but a diversity of user groups in the design process. The client was reported as failing to see the value in allocating funds to the research phase, instead providing the designer with secondary user information. However, designers commented that projects benefited when a larger proportion of the budget was spent on the research phase – this allowed the designer to gain a better understanding of the problem, carry out observation activities and assess user needs in the environment of product use.

All participants felt there was a need to educate the client of the inclusive design process, as the client was rarely from a design background, not understanding needs of the designer or the value gained from investing in the early stages of the design process. There is also a need to remove the negative perception of inclusive design within industry and promote the benefits of the approach.

To summarise the conclusions of the research regarding inclusive design in industry:
- Designers noted the benefits of user involvement in the design process, however reported that involvement of users was rare in industry practice.
- Lack of diversity in user groups that are involved.
- The client is responsible for allocating funding and resources, but lacks understanding of the value of user research.
- There is a need to educate the client of the value in following an inclusive design approach.

5.2 Application of the process for designers

All industry designers felt that the sports design process model would be of limited use to designers themselves as all were comfortable with the design process they had experience in following day-to-day. This was expected as the core stages of the sports model do not vary significantly from other theoretical design process models. Designers from the inclusive design centre were in agreement, although added that a visual representation of the sports process on the wall of a design office could be a useful tool to allow designers to evaluate their progress throughout a project and could be used as a communication tool between designers to discuss project progress.

The design process followed by the inclusive design centre (reflective of good inclusive design practice) showed similarities with the characteristics of the sports design process model – both in the iterative nature of the process and in the emphasis placed on integrating the user throughout. On this high level, it is concluded that the characteristics illustrated in the sports design process model are reflective of and applicable to inclusive design practice. Participants in this research also commented on the visual attractiveness of the sports model, indicating that the aesthetic appeal of the model may be a good foundation on which to build. However, further development is required develop the sports design process further to enable designers to educate clients of the inclusive design process.

To summarise the conclusions of the research regarding the application of the sports design process model to inclusive design practice:
- Designers do not need a high level representation of the inclusive design process to guide their everyday practice.
- The characteristics of the sports design process model are representative of inclusive design practice, which could be used to educate the client of the inclusive design process.

5.3 Client communication tool

All participants commented that the sports design process would be highly useful if developed further into a communication tool to educate the client of the inclusive design process. It was apparent from the interviews with the industry designers that a lot of time can be taken up educating the client of the design process and what is expected to happen. Designers would find the support of a tool beneficial when communicating with those not familiar with the design process. The tool must also reflect the value to the client by adopting an inclusive design approach. There was agreement between participants that a tool targeted specifically at communicating the inclusive design process to the client would be beneficial to designers, in terms of discussing time and cost allocation in addition to securing access to a diversity of user groups. The tool must therefore be developed to communicate the design process to those not from a design background and should be easily understandable to the client with minimal explanation required.

The following recommendations for the development of a tool to facilitate designer-client communication within the inclusive design process were collated from the analysis of the interview and workshop results and are summarised as follows:
- Illustrate to the client that iterations are a natural part of the design process and vital to ensuring the optimal design solution is arrived at.
- Illustration of iterations to convey to clients where time is spent during the design process.
- Illustration of user recruitment time in addition to the value of undertaking user related activities with a range of user groups.
- Communicate where effort is required in the design process (in terms of time and resources).
- Ability for the designer to use the tool to quote for each stage of the process.
- Flexibility in the tool so applicable to different design projects.
- Understandable to those not from a design background but must convey the complex nature of inclusive design.

- Layers should be created within the tool to avoid cluttering the current sports design process model.

6 CONCLUSIONS

This research aimed to investigate the potential of applying the sports design process model within a product design context to improve inclusive design practice. Through interviews with industry designers and experts at the inclusive design centre, it was found that while there are many inclusive design tools, these focus on the designer rather than the client. This research agrees with existing literature that the client is often a significant barrier to the uptake of inclusive design in industry and concludes that there is a need for an inclusive design tool targeted at educating the client on the inclusive design process and the value it brings.

Feedback from all participants was positive regarding the overall look and content of the sports design process model. The simplistic representation was easy to follow, with the user integration and the cyclic nature visually attractive and more representative of the inclusive design process than traditional linear representations. However, it was felt that adding more detail to the model to communicate the inclusive design process would make it "messy" and would over-complicate the model, detracting from the core stages.

This paper has presented a summarised list of recommendations for the development of a tool to facilitate designer-client communication within the inclusive design process. Recommendations for future work indicate that a tool should be developed that would build on the sports design process model, providing a greater level of detail to communicate the complex nature of the inclusive design process without over complicating the model itself. The tool should be developed based on the recommendations presented here to ensure the tool meets the needs of designers in industry. This will allow clients to make informed decisions regarding funding and resource allocation to ensure maximum benefit to the designer. Areas highlighted that should be included within the framework include user involvement, value of stages and activities (particularly in the early stages of the process), recruitment time of user groups, areas of designer effort and areas of client involvement. The final outcome will be a communication tool with clients who are not from a design background and are unfamiliar with the inclusive design process – it will differ from existing inclusive design tools as it is intended for the educating client rather than the designer.

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