

ACCESSIBILITY THROUGH USER-CENTRED DESIGN AND INCLUSIVE DESIGN PROCESSES

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This PhD dissertation addresses the subject of accessibility through user-centred and Inclusive Design processes (ID). The project takes as its starting point the observation that the concept of Inclusive Design is not adequately delimited. The supporting literature in the field of ID is structured around the fact that the needs of individuals with reduced capabilities compared to the norm (referred to for convenience as "the elderly and disabled") have not been properly addressed by standard design processes. In response to this fact, ID is a proposed design method to find more effective means to improve the usability of consumer goods. The method focusses on using a wide range of techniques to identify user needs, chiefly deployed at the start of the design process but also emphasises involvement at middle to final stages.

The research question that this dissertation is centred upon is: can ID be delimited by examining design for accessibility in the areas of assistive technology (AT) and public transport (PT) with reference to consumer product design?

Whilst a considerable body of literature exists on why ID should be done (technical and ethical reasons) and on methods to achieve this aim, there has not been made an attempt to define the limits of ID methods. No process or design method is universal. There is a means, ID, and an objective or end, accessibility for a much broader range of users but in existing literature the means and ends are not disentangled. Whilst accessibility is a constant requirement, the methods outlined to achieve this end are presented on the assumption that approaches intended for design for mainstream consumer products are universally applicable. As such, ID is not delimited. Logically, there must be conditions when ID

methods are more or less successful and appropriate and in delimiting ID, the dissertation sets out to see what those limits are.

In order to proceed to the theoretical points of departure, it is necessary to put ID in context. The evolution of design is a path from handmade, often tailor-made objects to mass-production for a generalised population of users. Whilst cost was reduced, the fit between the product and the user deteriorated. ID combines industrial design methods with ergonomic methods to redress the failings of mass production. Three approaches are distinguished: Universal Design, User-Centred Design and Inclusive Design. These are attempts to provide a solution to design exclusion but they are not complete. They don't embody a single, unified model of the design process but a set of aims and design tools. The Cambridge Engineering Design Centre (EDC) model comes closest but it tends towards a hard-systems model of design whereas ID addresses open-ended problems that might tend toward the condition of "wicked problems".

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Determining how ID is done within its intended field of consumer product design provides a baseline to compare with design for assistive technology which has borrowed from and has also inspired ID practitioners. A third design field, public transport hardware, was selected on the basis that there was an inherent need for accessibility and so it would be instructive to see how the requirement for ID was addressed in a field outside ID's core area. If universally applicable, one could a priori reasonably assume the methods of ID would be useful and used and if they were not, the reasons for the difference would cast light on the strength and limitations of ID.

The methodology of the dissertation involves (1) determining how ID is applied in the field of consumer product design and assistive technology by looking at 66 documented academic design studies; (2) students' design processes were examined to see the fine-grain of activities not revealed in the academic cases; (3) the ethical and theoretical aspects of ID and design for public transport were examined in two papers; (4) a more detailed examination of two assistive design cases examined instances where user-involvement was problematic and (5) nine semi-structured interviews were each carried out with practitioners of assistive technology design and public transport design, 18 interviews in total. The first step showed that the focus of activity was in the early stages of the design process and that the use of the available design methods did not follow the sequence recommended by the reference design process, the ECD model. The next step (2) was to look in detail at design processes from within to examine the sequence of activities by logging students'

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conducting ID-themed projects. The result was to discover the rapid switching between tasks that the early stages of the projects, driven by the need to answer questions raised in the course of design research. Requirements definition constituted only a small part of the activities but is an important feature of the EDC model. Modelling and detail design was also a phase where user-involvement was reduced or absent. Initial interviews conducted with designers of assistive technology raised the question of how ID was done in the case of frail or effectively "absent" users, step (4). This points towards the need to use surrogates so as to identify users' requirements and to validate the design decisions. Simultaneously, it raises the possibility of accessible design without the use of what are understood to be the core information-gathering methods of ID. The analysis of design for assistive technology required detailed semi-structured interviews with nine assistive technology design practitioners. The findings of this work (5) added to that of the previous study by identifying the under-emphasis of requirements gathering and requirements definition and the relatively greater importance of prototyping. From this one can see that a substantial amount of assistive technology research lies outside the range of ID, specifically those cases when the user is unable to be as large a part of the design process as ID requires. That part of (5) related to public transport design indicated that approaches to accessibility varied considerably. Industry standards were the dominant means to guide development. Where operators were in charge of the design process accessibility was addressed more comprehensively, whilst design consultancies tended to adopt a customer-led stance such that accessibility and the appropriate design processes to achieve this were adopted if it the clients viewed it as a priority. The work suggested that ID is not well-suited to the prevailing conditions in the rail industry since design, construction and operation were divided across geographic space and there was a weak-link between designers and passengers.

In sum, the work conducted reveals the key limiting factor in models for Inclusive Design. Whilst the end or aim can be supported by substantial arguments, the means as proposed in models such as the EDC model, and the literature in general, does not take into account differing conditions in areas outside mainstream product design for which the models are intended. Yet the literature does not address this point and presents ID methods as universally applicable. The feasibility of direct, sustained user-participation defines the applicability of ID.