sustainability

MDPI

Review

Bibliometric Review of Design for Digital Inclusion

Guanyu Li, Dian Li and Tang Tang *

School of Design, University of Leeds, Leeds LS2 9JT, UK; sdgl@leeds.ac.uk (G.L.); texdl@leeds.ac.uk (D.L.)
* Correspondence: t.x.tang@leeds.ac.uk

Abstract: The digitalization of the world has rendered design for digital inclusion particularly important, which highlights the need to gain a comprehensive understanding of this field. The purpose of this review is to reveal the current development of the field of design for digital inclusion and identify research gaps and directions.Therefore, this study adopted bibliometric mapping to achieve the research goal. A total of 721 relevant articles in English were identified from Scopus. Descriptive analysis, including the publication trend, the most cited journals, the most cited articles, and the top authors with institutions, is described in order to trace the state-of-the-art development of the field. Network analysis, including bibliographic coupling and co-occurrence keywords, was used to identify research themes and future research directions. The results reveal four main investigated topics in the field: (1) information technology; (2) online education; (3) assistive technology; and (4) digital health. The review also highlights the distinctive features of design for digital inclusion compared to inclusive design, discusses the research gaps, and offers potential future research directions.

Keywords: inclusive design; digital inclusion; bibliometric analysis; bibliometric coupling; keyword co-occurrence

Citation: Li, G.; Li, D.; Tang, T. Bibliometric Review of Design for Digital Inclusion. *Sustainability* **2023**, *15*, 10962. https://doi.org/10.3390/su151410962

Academic Editor: Fabrizio D'Ascenzo

Received: 18 May 2023
Revised: 7 July 2023
Accepted: 11 July 2023
Published: 13 July 2023

1. Introduction

The rapid growth of digitalization has a significant impact on people's everyday lives. It has come to shape the way that public and commercial services are structured and developed [1]. Digitalization refers to the restructuring of digital communication and media infrastructures [2]. A large body of research indicates that there are significant advantages to promoting digitalization [3–6]. For instance, digital services can minimize time and expenses and enhance the efficiency and efficacy of civil organizations for citizens [6]. The automation of the systems can improve and enhance work and minimize risks of goods stoppages for corporations [5]. Nevertheless, there are still a large number of populations that have been excluded from the digital world. The Office for National Statistics [7] points out that 56% of older adults who are aged above 75 will not be internet users in 2020 in the UK. Major barriers to the inclusion of digital services are prominently due to low accessibility, poor usability, and design issues; however, these are determined by a variety of factors, not only biologically but also psychosocially [8].

Digital inclusion, which refers to the process of ensuring universal access and effective use of information and communication technologies (ICT) by all populations [9], has become increasingly crucial. According to the goals of sustainable development set by the United Nations, digital inclusion can play a vital role in making the city and people living there a sustainable and inclusive environment and decreasing inequity both within and across nations [10]. There is a substantial body of literature that discusses digital inclusion. For example, Mariën and Prodnik [1] draw attention to the fact that policies regarding digital inclusion may have a tendency to regard difficulties as personal concerns when, in fact, they are social in nature. Reisdorf and Rhinesmith [11] present articles regarding digital inclusion initiatives for policymakers to advance their implementation. Adam and Dzang Alhassan [12] advise policymakers to implement policies that encourage the

utilization of ICTs after studying the cross-sectional data from 121 countries. However, most of these studies tend to approach the topic from a regulatory standpoint, providing guidelines and recommendations. There is a lack of research from a design perspective. For design practitioners and researchers, it is important to explore and uncover innovative approaches and solutions that address the challenges of digital inclusion in a more effective and sustainable manner.

Inclusive design refers to developing services and products that can be used by populations with diverse backgrounds and capabilities [13]. It is well known that inclusive design can foster digital inclusion because it aims to accommodate the needs of users with varying abilities. The early stages of inclusive design include a variety of non-digital everyday products, such as OXO Good Grips and Factory Wares saucepans [14]. With the rapid development of digitalization, inclusive design for digital solutions, or design for digital inclusion (DfDI), has become increasingly prevalent. DfDI refers to developing digital solutions that meet the needs of users with varying capabilities. However, the knowledge regarding the field is fragmented to date and has not been reviewed comprehensively. Although there are previous reviews in this field of inclusive design, the topics are specialized to specific non-digital inclusive design fields. Levey [15] reviews the universal design for instruction in the area of nursing education and synthesizes the major themes of the articles. Moore et al. [16,17] conducted reviews of inclusive design in public playgrounds and contributed to the topic by refining the conceptual framework and identifying the core factors that are crucial for designing inclusive playgrounds. To the best of our knowledge, there has not yet been a full mapping of the literature pertaining to the DfDI.

Given the rapid growth and diverse perspectives in the field of DfDI, there is a pressing need to gain a deeper understanding of its potential future development. The major contribution of this review lies in offering research themes, identifying research gaps, and providing potential future research directions in the field. Bibliometric mappings, including descriptive and network mappings, allow efficient overviewing of the research domain from a macro view. The co-occurrence keywords and bibliometric couplings enable researchers to identify the research themes in the topic. Thus, this review aims to employ these bibliometric methods to first trace the state-of-the-art development of design for digital inclusion, then identify themes and research gaps, and lastly, offer potential future research directions for the field.

2. Material and Methods

2.1. Search Strategy and Data Collection

For this review, Scopus was chosen as the database to conduct the search. Scopus has a wide range of peer-reviewed sources in social science areas and detailed citation information, which supports bibliometric analysis. The search strategy included the use of the keywords "inclusive design" or "universal design" AND "digital" or "online" or "app" or "interface" or "phone" or "web" or "tablet" or "system" or "HCI" OR "digital inclusion" or "digital inclusivity" and design in the TOPIC field. No start date was appointed in order to include all relevant studies. Following is the search string conducted on 7 April 2023:

(TITLE-ABS-KEY ("inclusive design" OR "universal design") AND TITLE-ABS-KEY (digital OR online OR app OR web* OR interface OR phone OR tablet OR system OR hci) OR "digital inclusion" or "digital inclusivity" and design).

The initial search yielded 3214 results, which were filtered to include journal and review articles in English, resulting in 1269 records. After screening the titles, abstracts, and full texts of each record, 721 eligible records were identified for data extraction and analysis using the VOS viewer. Articles that discussed or promoted the design for digital inclusion were included. Articles that focused on non-digital design for inclusion were excluded. Articles in electronics and material science areas that used the "universal design" concept completely differently, referring to adaptive component design, were excluded (e.g., [12,13]).

The researcher exported a CSV (Comma-separated values) file of 721 eligible records, including citation information, bibliographical information, an abstract, keywords, and references. The accuracy of the downloaded information was examined, and errors displayed in Excel were removed. Then the CSV file was imported into the bibliometric analysis tool VOSviewer for further data analysis.

2.2. Data Analyses

The review adopted the VOS viewer to conduct the bibliometric mappings. VOS viewer 1.6.18 is a software program that can be used to create maps of authors or journals based on data from citations or maps of keywords based on data from co-occurrence [18]. For example, such a program can visually demonstrate the co-occurrence keywords with colored clusters or with period change, which offer valuable opportunities to identify insights from these informative mappings. The bibliometric information from the database can be indexed and imported into the VOS viewer for generating the bibliometric mappings.

Descriptive analysis has gained widespread application in the research field, identifying the publication trend, the most cited journals, and the top authors with institutions to trace the state-of-the-art development of the field. Regarding network analyses, bibliographic couplings and co-occurrence keywords were selected. Bibliographic coupling aims to count the number of times two articles cite the same references, which has proven to be an appropriate approach to identifying the present development of themes in a research field [19]. Co-occurrence keyword analysis, as part of the co-word analysis, can be utilized as an addition to deepening understanding of the clusters resulting from the bibliographic coupling. Also, it can be used to identify research gaps in the field. Thus, by combing both results, the thematic structure and the research gaps of the field are identified. According to these results, potential future research directions are discussed further.

3. Results

3.1. Descriptive Analysis

3.1.1. Publication Trend

The annual number of publications regarding DfDI is presented in Figure 1. The figure provides insights into the growth and development of research in this domain over time. The first study was published in 1994, and then there was a mild increase in 1997–2003. However, the number of publications remained relatively low until around 2003. This indicates that prior to 2003, the field was not extensively investigated. There is a notable fluctuation yet increasing trend in the number of publications during 2004–2020. This suggests a growing interest in and recognition of the importance of DfDI within the academic community. In 2021, there will be a dramatic growth in the number of published articles, with 106 publications. This surge indicates a sharp increase in attention and research activities within the field. It is notable that the COVID-19 pandemic, which presented unprecedented challenges in ensuring inclusive digital products and services for diverse populations, likely played a role in this upsurge. The growth trajectory continued in 2022, with the number of publications peaking at 139. This substantial increase reflects the rapid development and expanding research efforts in recent years, highlighting the increasing significance of DfDI as a research area. It is estimated that the number of publications will increase in 2023.

3.1.2. The Most Cited Publication Sources

The most frequently cited publication sources refer to the most productive sources that included the research topic regarding design for digital inclusion. Figure 2 presents the most frequently cited publication sources in the field. Among them, six of the journals mainly focus on design for information inclusion, including Universal Access in the Information Society, Technology and Disability, Techtrends, Sage Open, Nec Technical Journal, and Library Hi-Tech. Overall, three journals include the design for online education inclusion (the Journal of Special Education Technology, the International Journal of Information and

Learning Technology, and the Online Learning Journal) and one includes digital Health topics (the Journal of Medical Internet Research).

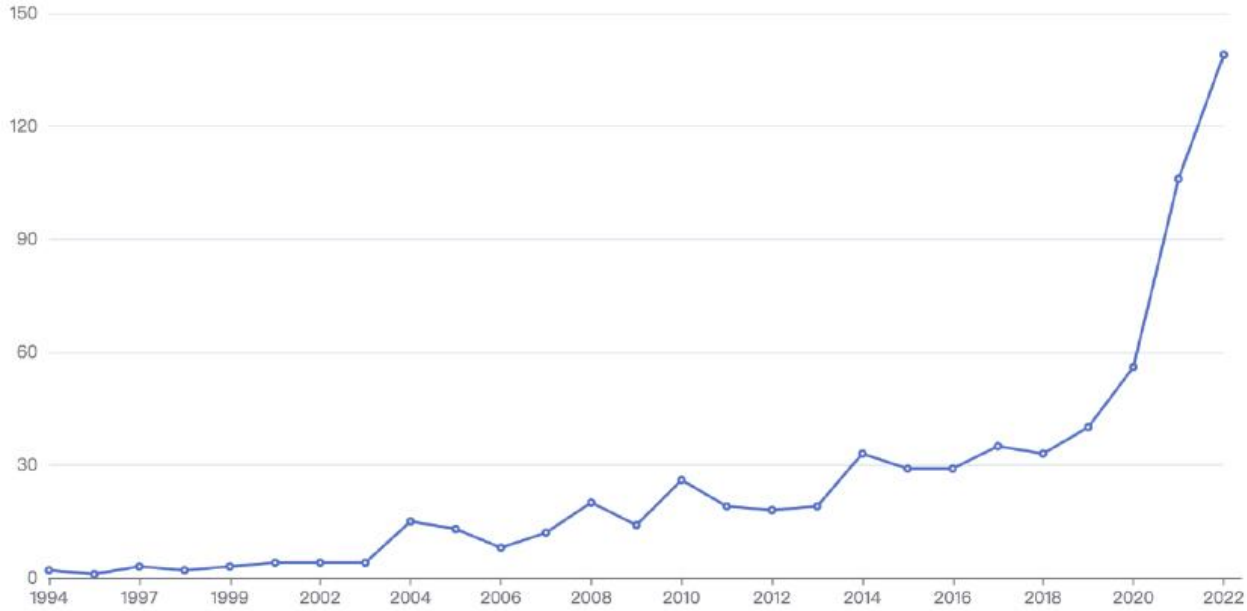

Figure 1. Publication trend of DfDI.

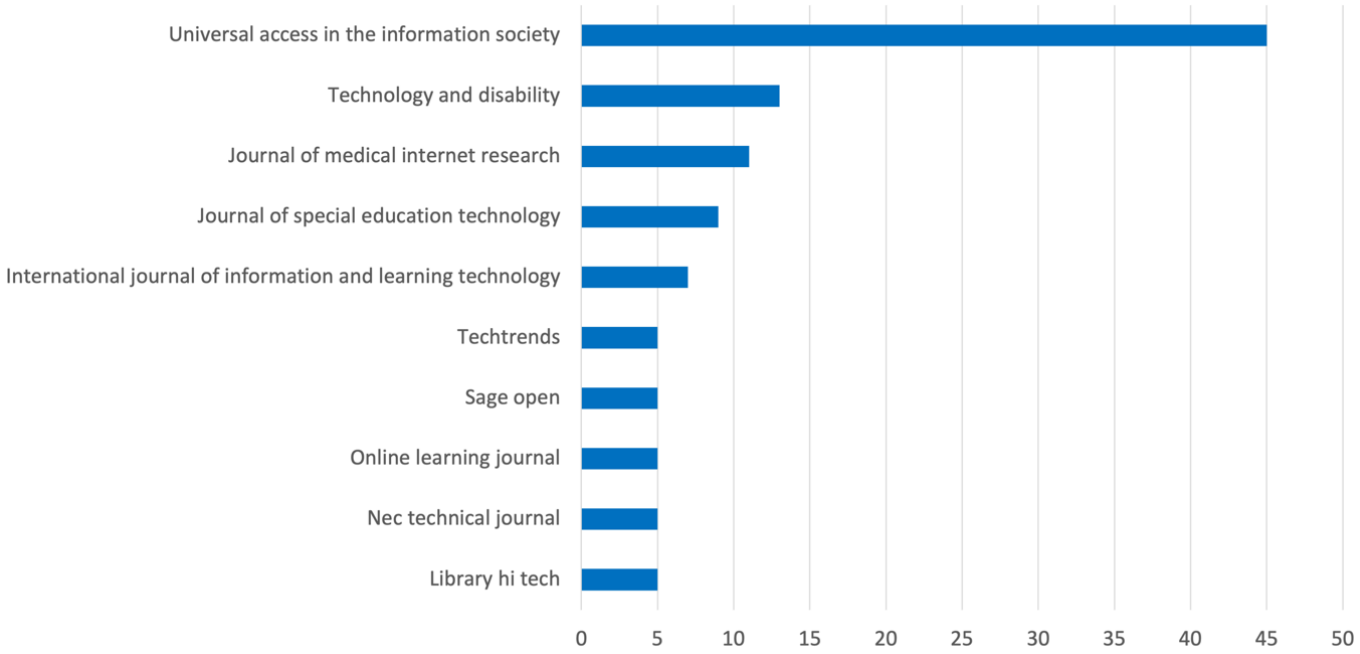

Figure 2. Top 10 most popular publication sources in DfDI.

3.1.3. The Most Cited Articles

The summary of the most cited articles allows for the identification of influential studies and their contributions. Table 1 presents the most influential articles in the field of DfDI. The study ranked at the top [20] states the importance of considering human capability towards a more inclusive digital environment and proposes seven ability-based design principles. The study offers an ability-centric perspective when developing inclusive products and services. The 297 citations indicate the high impact of this perspective toward inclusive design. Kim [21], which is followed by Wobbrock, Kane, Gajos, Harada, and Froehlich [20], presents a theoretical model for utilizing blogs in educational contexts and

discusses the necessity of employing the inclusive design approach in blog design, which improves online communication through interaction. Wu et al. [22] examine the attitude of older adults towards accepting the use of assistive robots and highlight the advantages of employing inclusive design to accommodate the special needs of older adults. The study emphasizes the importance of destigmatizing the perception of assistive robots to overcome any preconceptions that may hinder their acceptance among older adults. In terms of the research topic of these articles, seven articles focus on the field of information technology [20,23–28], two articles research the area of digital health [22,29], one article investigates the domain of online education [21], and the other one studies the field of assistive technology [22].

Table 1. Top 10 most cited articles in DfDI.

Author	Year	Title	Journal	Citation
Wobbrock, Kane, Gajos, Harada, and Froehlich [20]	2011	Ability-based design: Concept, principles, and examples	ACM Transactions on Accessible Computing	297
Kim [21]	2008	The phenomenon of blogs and theoretical model of blog use in educational contexts	ACM Transactions on Computer-Human Interaction	197
Wu, Wrobel, Cornuet, Kerhervé, Damnée, and Rigaud [22]	2014	Acceptance of an assistive robot in older adults: A mixed-method study of human-robot interaction over a 1-month period in the living lab setting	Clinical Interventions in Aging	156
Abascal and Nicolle [23]	2005	Moving towards inclusive design guidelines for socially and ethically aware HCI	Interacting with Computers	136
Huggins, Wren, and Gruis [29]	2011	What would brain-computer interface users want? Opinions and priorities of potential users with amyotrophic lateral sclerosis	Amyotrophic Lateral Sclerosis	131
Ferro, Helbig, and Gil-Garcia [24]	2011	The role of IT literacy in defining digital divide policy needs	Government Information Quarterly	124
McCrickard and Chewar [25]	2003	Attuning notification design to user goals and attention costs	Communications of the ACM	109
Stephanidis [26]	2001	Adaptive techniques for Universal Access	User Modeling and User-Adapted Interaction	107
Hill, Beynon-Davies, and Williams [27]	2008	Older people and internet engagement: Acknowledging social moderators of internet adoption, access, and use	Information Technology and People	102
Malinverni, Mora-Guiard, Padillo, Valero, Hervás, and Pares [28]	2017	An inclusive design approach for developing video games for children with autism spectrum disorder	Universal Access in the Information Society	96

3.1.4. Top Authors with Institutions

Table 2 demonstrates contributors with their number of publications, total citations, institutions, countries, and publication topics. Regarding the number of publications, Dr. Vanderheiden from the University of Maryland contributed the most with six articles, followed by Dr. Rao, who is tied for second place with four articles. In terms of total citations, Dr. Stephanidis from the University of Crete leads with 194 citations, followed by Dr. Dalton from the University of Colorado Boulder, who was cited 152 times. Dr. Sandnes, affiliated with Oslo Metropolitan University, ranked third regarding the total number of citations (122). Regarding publication countries, half of the institutions come from the U.S., and the other half of the authors come from Europe and the U.K., respectively. In addition, the table also reveals that the influential authors from the U.S. mostly focus

on the design of digital inclusion regarding learning, while other authors from Europe and the U.K. study the design of digital inclusion regarding information technology and assistive technology. It is also notable that there is a high likelihood of authors from the same institutions appearing in the same paper sources. For example, Dr. Clarkson and Dr. Langdon, both from the University of Cambridge, have jointly contributed to the paper. Similarly, Dr. Rao and her co-author, Dr. Min Wook Ok, affiliated with the University of Hawaii, have collaborated on two occasions. These instances underscore the prevalence of intra-institutional collaborations among researchers who share institutional affiliations and jointly conduct research, leading to the publication of their findings in DfDI.

Table 2. Top authors with institutions.

Author	Total Publication	Citation	Institution	Country	Publication Topic
Vanderheiden, Gregg C.	6	79	University of Maryland	U.S.	Information technology, assistive technology
Rao, Kavita	5	73	University of Hawaii	U.S.	Universal design for learning, assistive technology
Stephanidis, Constantine	4	194	University of Crete	Greece	Information technology, assistive technology
Clarkson, John	4	81	University of Cambridge	U.K.	Information technology
Dalton, Bridget	4	152	University of Colorado Boulder	U.S.	Universal design for learning
Sandnes, Frode Eika	4	122	Oslo Metropolitan University	Norway	Assistive technology, Information technology
Basham James D.	4	81	University of Kansas	U.S.	Universal design for learning
Smith, Sean J.	4	31	University of Kansas	U.S.	Universal design for learning
Murano, Pietro	4	2	Oslo Metropolitan University	Norway	Information technology
Langdon, Patrick	3	88	University of Cambridge	U.K.	Information technology

3.2. Network Analysis

3.2.1. Bibliographic Coupling Analysis

When two articles cite a common third article, it indicates that both articles share similar themes. Table 3 presents the bibliographic coupling clustering of the field. There are mainly four clusters in the field, including information technology, online education, assistive technology, and digital Health.

Information technology (cluster 1) is the largest cluster and includes diverse application contexts. The highlights of this cluster include interface (websites, smartphones, and systems) usability for users with diseases or disabilities. Wobbrock, Kane, Gajos, Harada, and Froehlich [20], cited 297 times, offer a set of seven design principles based on user abilities and describe the projects that inspired the development of the principles. The principles are categorized into stance, interface, and systems sections in order to develop inclusive interface design. Abascal and Nicolle [23], cited 136 times, are the second most cited work in the cluster. The article stressed the need to use inclusive design guidelines and analyzed the advantages of using them. Ferro, Helbig, and Gil-Garcia [24], cited 124 times, investigate the process of acquiring IT skills and offer a metaphorical interpretation in the context of the digital divide, which provides detailed references for inclusive designers to better understand their users. Overall, the cluster comprises articles that aim to foster digital inclusion regarding user interfaces in varying domains.

Table 3. Overview of four clusters.

Cluster	Central Focus	Topic Examples	Most Cited Articles				
			Title	Authors	Year	Journal	Citations
1	Information technology	User interface (web, mobile apps), smart cities, online library.	Ability-based design: Concept, principles and examples	[20]	2011	ACM Transactions on Accessible Computing	297
			Moving towards inclusive design guidelines for socially and ethically aware HCI	[23]	2005	Interacting with Computers	136
			The role of IT literacy in defining digital divide policy needs	[24]	2011	Government Information Quarterly	124
2	Online education	Distance learning, online courses, learning tools.	The phenomenon of blogs and theoretical model of blog use in educational contexts	[21]	2008	Computers and educations	197
			Improving comprehension online: Effects of deep vocabulary instruction with bilingual and monolingual fifth graders	[30]	2011	Reading and Writing	71
			Towards an inclusive digital literacy framework for digital India	[31]	2018	Education and Training	69
3	Assistive technology	Assistive robots, disabled persons, tablets-based services.	Acceptance of an assistive robot in older adults: A mixed-method study of human-robot interaction over a 1-month period in the living lab setting	[22]	2014	Clinical Interventions in Aging	125
			Tablet-based video modeling and prompting in the workplace for individuals with autism	[32]	2013	Journal of Vocational Rehabilitation	65
			Universal design and assistive technology in communication and information technologies: alternatives or complements?	[33]	1998	Assistive technology	40
4	Digital Health	Brain-computer interface, electronic prescribing, mHealth interventions.	What would brain-computer interface users want? Opinions and priorities of potential users with amyotrophic lateral sclerosis	[29]	2011	Amyotrophic Lateral Sclerosis	126
			Human factors in the development and implementation of telerehabilitation systems	[34]	2008	Journal of Telemedicine and Telecare	49
			SlowMo, a digital therapy targeting reasoning in paranoia, versus treatment as usual in the treatment of people who fear harm from others: Study protocol for a randomized controlled trial	[35]	2017	Trials	33

Online education (cluster two) receives articles from a variety of education-related journals. The major topic includes inclusive online learning design during K-12 lessons and university lessons for students with disabilities. Kim [21] has the most citations in this field, followed by Proctor et al. [30], with 71 citations. In this work, they explore the impacts of the online intervention program that was developed to achieve digital inclusion among all students. The article by Nedungadi et al. [31] occupies the third slot with 69 citations. The study created and implemented the framework of Inclusive Digital Literacy to overcome the challenges faced by disadvantaged people in India. The studies in this cluster highlighted the themes of online learning, distance learning, and special education.

Assistive technology (cluster 3) is given comparatively less focus than clusters one and two. Major topics discussed in this cluster include assistive tool development and evaluation for disabled people. The Wu et al. [22] article is the most influential work in this cluster (125 citations). The study evaluated the acceptance level of an assistive robot among older adults and identified barriers that affect the adoption of such new technology. Burke et al.'s [32] article is the next most influential work in this cluster, cited 65 times. The study evaluates the effectiveness of helping individuals with autism by using the tablet app VideoTote. The app complies with universal design principles. The encouraging results suggested that this digital tool would support the inclusivity of people with autism in completing a complex shipping task. The third most influential paper comes from Vanderheiden [33], which is cited 40 times. The study discusses the relationship between universal design and assistive technology and concludes that it is important to combine these two fields. The cluster mainly includes varying assistive tool developments for digital inclusion.

Digital health (cluster 4) is the smallest cluster compared with the other three clusters. The publication years in this cluster are relatively recent. Overall, the research focus is on the application of inclusive design in varied online healthcare service domains, mainly including the design of mHealth (mobile health) apps. The most cited article is from Huggins, Wren, and Gruis [29] (126 citations). The study follows universal design principles to involve end users in each design stage. They investigated perspectives on the adoption of brain-computer interfaces among users with amyotrophic lateral sclerosis. Such technology triggered a strong interest in the adoption of these individuals in order to promote inclusion. Brennan and Barker's [34] article, cited 49 times, is the second most cited work in the cluster. The study developed and implemented telerehabilitation systems that meet the users' needs with varying abilities. Garety et al.'s [35] article is the third-highest cited work in the cluster, with 33 citations. Through the inclusive design approach, the study created blended digital therapy that included face-to-face sessions and tasks on a web-based app. Overall, the clusters focus on design for digital inclusion regarding eHealth, Telehealth, and mHealth (mobile health) design.

3.2.2. Co-Occurrence Keyword Analysis

Co-occurrence keywords establish a connection between the keywords when they appear together [36]. Out of 3095 keywords, the top 257 (indexed keywords and author keywords) with at least five occurrences were selected to ensure the representability of the results. Eleven general keywords ("human", "universal design", "humans", "article", "female", "male", "adult", "inclusive design", "aged", "inclusive design", and "design") were removed and left with 246 keywords.

Figure 3 shows the network of co-occurrence keywords. The size of the nodes determines the number of keyword occurrences. The color of the keywords represents clusters, in which similar keywords share the same color. Overall, the most salient keywords include "accessibility", "universal design for learning", "digital inclusion", "user interfaces", "internet", "usability" and "assistive technology". In cluster one, the keywords mainly included "accessibility", "user interfaces", "technology" and "usability", which implies that the theme of this cluster is information technology-related. For example, Abascal et al. [37] developed a tool that can automatically verify the accessibility of websites with the help of

a set of guidelines. In cluster two, the keywords primarily comprise "universal design for learning", "e-learning", "disability" and "digital inclusion", which suggests the theme of the cluster is relevant to online education. For example, Hall et al. [38] report how CAST, an education organization for universal learning, developed a system that blended universal design for learning and Curriculum-based Measurement to enhance the teaching of reading comprehension. In cluster three, the major keywords comprise "assistive technology", "self-help device(s)", "disabled persons" and "quality of life", which indicates the cluster of assistive technology. For example, Periša et al. [39] develop a conceptual model that employs a smart wristband to inform disabled persons, regardless of the extent of their capabilities. In cluster four, which is the smallest one, the keywords basically consist of "health care delivery", "telemedicine" and "digital health", which implies the theme of the design for digital health inclusion. For example, Holst et al. [40] create online health information resources that include videos, quizzes, and messages for health promotion. The identified clusters supplement the results from the bibliographic coupling.

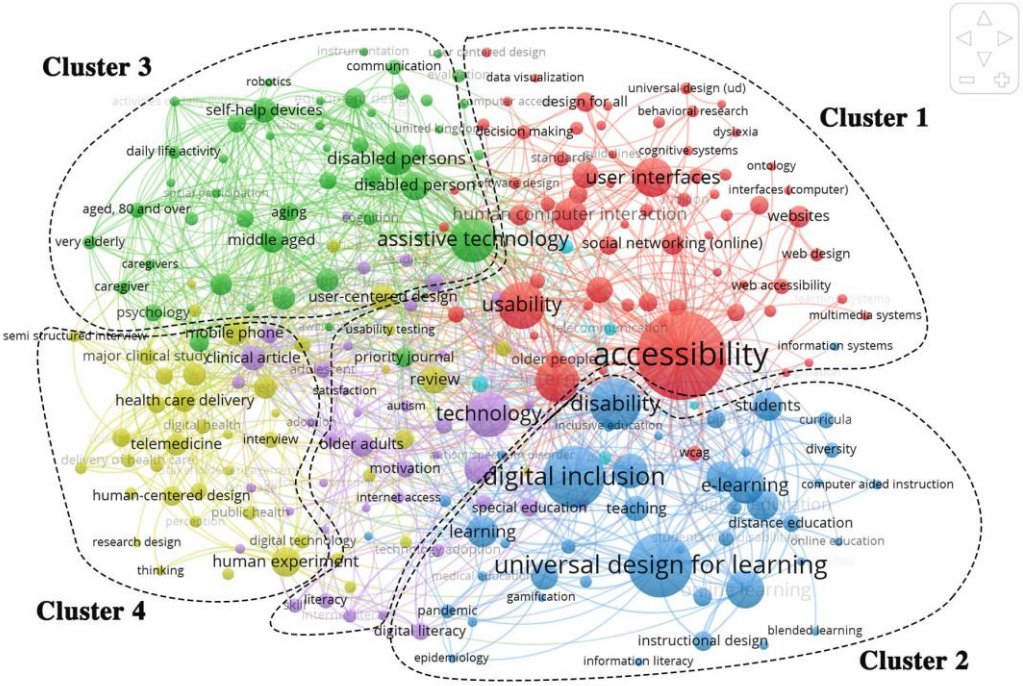

Figure 3. Co-occurrence keyword network (Keyword $\geq$ 5 time occurrences).

Figure 4 shows a chronological view of the co-occurrence keyword network. The chronological network allows not only the demonstration of high-occurrence keywords but also the identification of potential research directions and gaps. The color of the keywords represents the publication year; for example, the oldest studies are automatically colored purple, while the most recently published studies are automatically colored yellow. Overall, in the most recent years (around 2019-), keywords such as "healthcare delivery", "telemedicine", "universal design for learning", and "online learning" appear most frequently, which suggests that digital health and online education are the main research topics regarding design for digital inclusion. In the earlier years (before 2019), the keywords included "accessibility", "assistive technology", "usability", "user inter-face", "information technology" and "websites", which implies that the research in the earlier period highlighted assistive technology and information technology. Although the results may reveal a trend that different periods have diverse major research topics, these keywords are interrelated with each other, which suggests that different research topics within the design for digital inclusion may appear in any period. Such research trends in different time periods can be used as a reference to understand the major research topics within a chronological view.

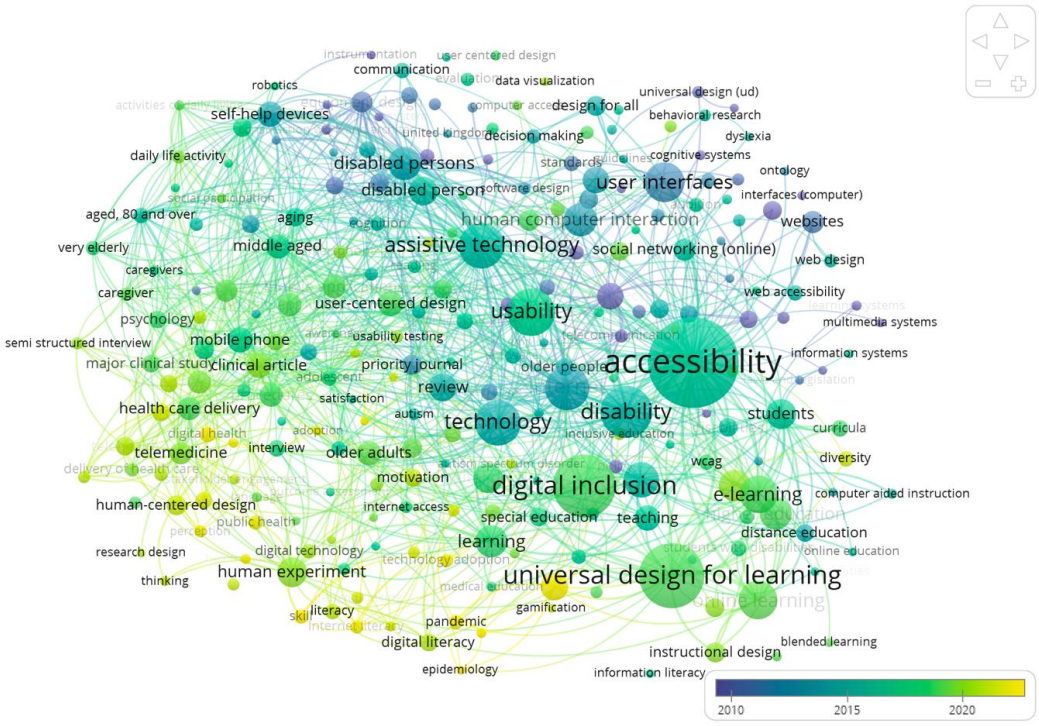

Figure 4. Co-occurrence keyword network with period change (Keyword $\geq$ 5 time occurrences).

4. Discussion

The present study sheds light on the current stage of research in DfDI. Through bibliographic coupling analysis, four major research themes emerge: information technology, digital health, online education, and assistive technology. The study employs descriptive and network analysis to uncover a possible strong relationship between the COVID-19 pandemic and the exponential increase in publications by DfDI since 2020. Additionally, co-occurrence mapping revealed that DfDI might possess unique challenges as a branch of inclusive design, relating to abilities and skills, adoption motivation, and technology access. The review also identifies four possible research gaps and suggests corresponding potential research directions, informed by the analysis of co-occurrence mapping and an in-depth examination of studies identified in the field of DfDI.

4.1. Impact of COVID-19 Pandemic on DfDI

Through descriptive and network analysis, the study provides an overview of the influential works and publication trends in this field. The analysis reveals an exponential increase in publications since 2020, coinciding with the onset of the COVID-19 pandemic.

The Co-keyword occurrence trend map supports this finding, highlighting that digital health, online education, and assistive technology have dominated publication keywords after 2019, implying that research in these domains has been shaped by the pandemic and its associated challenges. For example, the effective use of inclusive methods such as screencasting, online games, and accessible reading and writing options has promoted the inclusion of students with special needs [41–44]. Well-designed telemedicine services have also been found to promote inclusion, while the benefits of telemedicine outweigh its potential risks in times of crisis [45].

Policy initiatives further support the impact of the pandemic on DfDI. For example, the ONC Cure Act focuses on online medical information accessibility for patients [46]. While the majority of literature on the digital inclusion of information technology was published before 2019, the pandemic has also promoted research in this area, such as the research on design for e-government inclusion (e.g., [47]). Therefore, the COVID-19 pandemic has contributed to the development of the DfDI field, highlighting its relevance and importance in addressing the challenges posed by the pandemic.

4.2. Characteristics of DfDI Compared with Inclusive Design

The analysis of co-occurrence mapping and literature review uncovers three distinctive features of DfDI in comparison to inclusive design.

Firstly, when considering ability-based challenges, inclusive design addresses a diverse range of user abilities, including vision, reach, dexterity, hearing, thinking, and mobility [48]. On the other hand, DfDI places emphasis on users' thinking abilities as well as vision and dexterity (e.g., [49–51]). This is supported by the co-occurrence of keywords such as "digital literacy", "skill", and "cognition" in the co-occurrence map, indicating the importance of thinking abilities in the context of digital literacy. Bhattacharjee et al. [52] specifically highlight the challenge faced by older adults in terms of digital literacy, providing further support for this distinction.

Secondly, in terms of adoption motivation, everyday inclusive design products or services, such as kettles, are often essential and unavoidable for users, leading to stronger motivation for usage. Conversely, in the case of digital inclusive design, many designs offer alternatives, allowing users to choose not to adopt them and avoid additional learning efforts, potentially resulting in weaker motivation for usage. The presence of the keyword "motivation" in the co-occurrence map supports this point.

Thirdly, regarding technology access and affordability, inclusive design often results in exclusion due to insufficient user abilities, while digital inclusive design may result in exclusion and digital inequity due to a lack of digital infrastructure or digital products [53]. DfDI addresses the factors of technology access and affordability that contribute to digital exclusion. It recognizes that the lack of internet access and the high cost associated with digital devices, internet service plans, and data packages, especially in rural or economically disadvantaged areas, limit individuals' ability to access online resources and services. Efforts are made to make these resources and services more accessible and affordable for individuals and families with limited financial resources. By addressing affordability, digital inclusion design aims to reduce barriers to digital participation. The presence of the keyword "computer access" in the co-occurrence keyword map indicated the significance of these factors in digital exclusion and inequity.

4.3. Research Gaps and Future Directions on DfDI

This study highlights four notable gaps in the research of DfDI based on the analysis of the bibliometric mapping and existing literature review (Table 4).

First of all, research regarding technology adoption by design receives less attention in the field of DfDI, as the co-occurrence keywords "adoption" or "technology adoption" appear with significantly smaller dots (Figure 4). Existing literature regarding technology adoption could be abundant [54–58], but research regarding how to foster adoption by design is still insufficient. Without promoting the motivation for adoption, there will be no further usage of inclusive digital products or services among users. Therefore, fostering technology adoption by design could be significant in the field of DfDI for future research. Potential research questions might include "What are the attitudes of a certain population (older adults/disabled persons) to the adoption of the technology (e.g., tablets, apps)?" or "How to foster the adoption of the technology (e.g., tablets, apps) by design?" and so on. To facilitate further exploration, the implementation of relevant theoretical frameworks such as the Technology Acceptance Model [59] and the Unified Theory of Acceptance and Use of Technology Model [58] might contribute to advancing knowledge in this domain, as numerous studies regarding technology adoption employ such models to effectively investigate the factors affecting technology use and acceptance.

Secondly, scarce literature investigates the desirability aspect of DfDI, as there is a lack of co-occurrence keywords indicating research on desirable or emotional design for digital inclusion. The included studies (e.g., [60–62]), especially the top-cited article [20], which develops ability-based inclusive design guidelines, support this statement by less indicating the desirability or emotional aspect of design guidelines. However, existing research regarding inclusive design suggests that the psychological aspect of promoting

inclusion is also important [8,63]. The literature also indicates limited research regarding such aspects. Therefore, future research could also explore the desirability dimension of DfDI. Considering such aspects could expand our understanding of DfDI, thus inspiring designers and researchers to develop better user experiences for the psychological aspect. Potential research questions might include "How to define desirability in the context of DfDI?" or "How to evaluate the desirability dimension of user experience in the context of DfDI?" and so on. Regarding theoretical support, it is expected that the Flow Theory [64] and James–Lange Theory of Emotion [65] might be supportive as they focus on psychological reward and desirability.

Thirdly, there is limited focus on providing ideation design support related to DfDI. According to the in-depth examination of the included studies, the current focus of design support is centred around the creation of principles and guidelines for evaluating inclusive designs, particularly in relation to accessibility and usability concerns. This viewpoint is reinforced by the findings of 92 papers that showcase the support for web evaluation in promoting digital inclusion from Ara et al. [66]. For example, online education research utilizes universal design for learning principles [67–69], which evaluate the accessibility and usability of DfDI. This might be due to the prioritization of ensuring diverse populations' access and use of the products and services through accessibility and usability aspects. Nonetheless, encouraging inspirational ideation could motivate designers to think from different perspectives. For example, researchers could develop ideational support for designers by incorporating the technology adoption and desirability aspects of DfDI, thereby motivating them to develop DfDI with varying considerations. In addition, the success of a new product development project depends on the level of ideas generated [70], highlighting the significance of supporting the ideation process. Therefore, it is suggested that future research could further develop ideation and design support. Possible research questions might include "How to support designers to generate ideas for inclusive digital design?" or "Which kind of ideation support do designers prefer in the context of DfDI?" and so on. Related cognition psychology theories and models, such as Wallas Model [71] and Koestler's Bisociation Theory [72], might serve as potential theoretical lenses to gain a deeper understanding of the ideation process [73].

Lastly, the review reveals that research on DfDI occurs less frequently in developing countries compared to developed countries, such as the UK and the USA, according to Tables 1 and 2, and manual screening of the included studies. These countries (UK and USA) have set up more research funding to promote the development of this field, as they pioneered the concepts of inclusive design [74] and universal design [75], respectively. Therefore, it is advised that future research pay more attention to DfDI in developing countries and conduct comparative research among different countries to promote digital equity and bridge the digital divide. Such research could shed light on the unique challenges and opportunities for digital inclusion in diverse socio-economic contexts. Potential research questions might include "How to improve digital equity in developing countries?" or "What is the current development of DfDI in developing countries?" and so on. Related theories that might be applied to this research direction could include the Diffusion of Innovation Theory [63] and the Transtheoretical Model [64], as they could support digital inclusion or digital adoption from a communication theoretical lens.

Table 4. Future research directions.

Research Direction in DfDI	Potential Research Questions	Theories that Might Be Applied
Technology adoption by design	What are the attitudes of a certain population (older adults/disabled persons) to the adoption of the technology (e.g., tablets, apps)? How to foster the adoption of the technology (e.g., tablets, apps) by design?	Technology Acceptance Model [59], Unified Theory of Acceptance and Use of Technology Model [58]
Desirability for digital inclusion experience	How to define desirability in the context of DfDI? How to evaluate the desirability dimension of user experience in the context of DfDI? What are the designers' perspectives regarding improving the desirability in the context of DfDI?	James–Lange theory of emotion [65] Flow Theory [64]
Ideation support development	How to support designers to generate ideas for inclusive digital design? Which kind of ideation support do designers prefer in the context of DfDI? What are the existing ideation support in the field of DfDI?	Wallas Model [71] and Koestler's Bisociation Theory [72]
DfDI studies in developing countries	How to improve digital equity in developing countries? What is the current development of DfDI in developing countries? What are the barriers and needs to promote DfDI in developing countries?	Diffusion of Innovation Theory [76] The transtheoretical model [77]

4.4. Research Limitations

However, it is also essential to acknowledge the limitations. Firstly, although Scopus is an extensive database compressing peer-reviewed articles and reviews in English, there is still a possibility that data from other databases may have been overlooked. Due to the technical issue, only one database could be imported into VOSviewer. Secondly, despite efforts to include all relevant studies regarding design for digital inclusion in the search string, some studies employing other terminology might have been unavoidably excluded. Lastly, bibliometric studies offer short-term projections, and their impact may diminish over time [78]. Therefore, the findings, especially the future research directions, serve as a temporary guide.

5. Conclusions

In conclusion, this review employs rigorous bibliometric methods, including descriptive and network mappings, to provide a thorough understanding of the current state of DfDI. By examining publication trends, influential studies, key researchers, and institutions in the field, critical research themes, including information technology, online education, digital health, and assistive technology, are identified. The review distinguished the DfDI and inclusive design with three aspects and also highlighted the significance of the COVID-19 pandemic in shaping the field's rapid development. Furthermore, this study identifies the research gaps and potential research directions in DfDI. To the best of our knowledge, no previous reviews have focused on this aspect. This review, therefore, addresses this gap in the literature and serves as an overview guide for researchers seeking to gain a comprehensive understanding of DfDI efficiently. Further, the potential research directions outlined in this review provide a valuable reference for researchers aiming to delve deeper into the field.

Author Contributions: Conceptualization, T.T.; methodology, G.L. and D.L.; software, G.L.; validation, G.L. and D.L.; formal analysis, G.L.; data curation, G.L.; writing—original draft preparation, G.L.; writing—review and editing, T.T. and D.L.; visualization, G.L.; supervision, T.T. and D.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Mariën, I.; Prodnik, J.A. Digital inclusion and user (dis)empowerment: A critical perspective. *info* **2014**, *16*, 35–47. [CrossRef]
2. Brennen, J.S.; Kreiss, D. Digitalization. In *The International Encyclopedia of Communication Theory and Philosophy*; Wiley Online Library: Hoboken, NJ, USA, 2016; pp. 1–11.
3. Torres, P.; Augusto, M. Digitalisation, social entrepreneurship and national well-being. *Technol. Forecast. Soc. Chang.* **2020**, *161*, 120279. [CrossRef]
4. Altameem, T.; Zairi, M.; Alshawi, S. Critical Success Factors of E-Government: A Proposed Model for E-Government Implementation. In Proceedings of the 2006 Innovations in Information Technology, Dubai, United Arab Emirates, 19–21 November 2006; pp. 1–5.
5. Hasselblatt, M.; Huikkola, T.; Kohtamäki, M.; Nickell, D. Modeling manufacturer's capabilities for the Internet of Things. *J. Bus. Ind. Mark.* **2018**, *33*, 822–836. [CrossRef]
6. Galindo-Martín, M.-Á.; Castaño-Martínez, M.-S.; Méndez-Picazo, M.-T. Digital transformation, digital dividends and entrepreneurship: A quantitative analysis. *J. Bus. Res.* **2019**, *101*, 522–527. [CrossRef]
7. Office for National Statistics. Internet Users, UK: 2020. Available online: https://www.ons.gov.uk/businessindustryandtrade/itandinternetindustry/bulletins/internetusers/2020#toc (accessed on 17 April 2023).
8. Tsatsou, P. Is digital inclusion fighting disability stigma? Opportunities, barriers, and recommendations. *Disabil. Soc.* **2021**, *36*, 702–729. [CrossRef]
9. NHS Digital. What We Mean by Digital Inclusion. Available online: https://digital.nhs.uk/about-nhs-digital/corporate-information-and-documents/digital-inclusion/what-digital-inclusion-is (accessed on 17 April 2023).
10. United Nations. Sustainable Development Goals. Available online: https://sdgs.un.org/goals (accessed on 17 May 2023).
11. Reisdorf, B.; Rhinesmith, C. Digital Inclusion as a Core Component of Social Inclusion. *Soc. Incl.* **2020**, *8*, 6. [CrossRef]
12. Adam, I.O.; Dzang Alhassan, M. Bridging the global digital divide through digital inclusion: The role of ICT access and ICT use. *Transform. Gov. People Process Policy* **2021**, *15*, 580–596. [CrossRef]
13. Nielsen Norman Group. Inclusive Design. Available online: https://www.nngroup.com/articles/inclusive-design/ (accessed on 17 May 2023).
14. Coleman, R.; ClaRkSON, J.; Cassim, J. *Design for Inclusivity: A Practical Guide to Accessible, Innovative and User-Centred Design*; CRC Press: Boca Raton, FL, USA, 2016.
15. Levey, J.A. Universal Design for Instruction in Nursing Education: An Integrative Review. *Nurs. Educ. Perspect.* **2018**, *39*, 156–161. [CrossRef]
16. Moore, A.; Boyle, B.; Lynch, H. Designing public playgrounds for inclusion: A scoping review of grey literature guidelines for Universal Design. *Child. Geogr.* **2023**, *21*, 422–441. [CrossRef]
17. Moore, A.; Boyle, B.; Lynch, H. Designing for inclusion in public playgrounds: A scoping review of definitions, and utilization of universal design. *Disabil. Rehabil.-Assist. Technol.* **2022**, *9*, 1–13. [CrossRef]
18. van Eck, N.J.; Waltman, L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* **2010**, *84*, 523–538. [CrossRef] [PubMed]
19. Donthu, N.; Kumar, S.; Mukherjee, D.; Pandey, N.; Lim, W.M. How to conduct a bibliometric analysis: An overview and guidelines. *J. Bus. Res.* **2021**, *133*, 285–296. [CrossRef]
20. Wobbrock, J.O.; Kane, S.K.; Gajos, K.Z.; Harada, S.; Froehlich, J. Ability-based design: Concept, principles and examples. *ACM Trans. Access. Comput.* **2011**, *3*, 1–27. [CrossRef]
21. Kim, H.N. The phenomenon of blogs and theoretical model of blog use in educational contexts. *Comput. Educ.* **2008**, *51*, 1342–1352. [CrossRef]
22. Wu, Y.-H.; Wrobel, J.; Cornuet, M.; Kerhervé, H.; Damnée, S.; Rigaud, A.-S. Acceptance of an assistive robot in older adults: A mixed-method study of human–robot interaction over a 1-month period in the Living Lab setting. *Clin. Interv. Aging* **2014**, *9*, 801. [CrossRef] [PubMed]
23. Abascal, J.; Nicolle, C. Moving towards inclusive design guidelines for socially and ethically aware HCI. *Interact. Comput.* **2005**, *17*, 484–505. [CrossRef]
24. Ferro, E.; Helbig, N.C.; Gil-Garcia, J.R. The role of IT literacy in defining digital divide policy needs. *Gov. Inf. Q.* **2011**, *28*, 3–10. [CrossRef]
25. McCrickard, D.S.; Chewar, C.M. Attuning notification design to user goals and attention costs. *Commun. ACM* **2003**, *46*, 67–72. [CrossRef]
26. Stephanidis, C. Adaptive techniques for Universal Access. *User Model. User-Adapt. Interact.* **2001**, *11*, 159–179. [CrossRef]

27. Hill, R.; Beynon-Davies, P.; Williams, M.D. Older people and internet engagement. *Inf. Technol. People* **2008**, *21*, 244–266. [CrossRef]
28. Malinverni, L.; Mora-Guiard, J.; Padillo, V.; Valero, L.; Hervás, A.; Pares, N. An inclusive design approach for developing video games for children with Autism Spectrum Disorder. *Comput. Hum. Behav.* **2017**, *71*, 535–549. [CrossRef]
29. Huggins, J.E.; Wren, P.A.; Gruis, K.L. What would brain-computer interface users want? Opinions and priorities of potential users with amyotrophic lateral sclerosis. *Amyotroph. Lateral Scler.* **2011**, *12*, 318–324. [CrossRef] [PubMed]
30. Proctor, C.P.; Dalton, B.; Uccelli, P.; Biancarosa, G.; Mo, E.; Snow, C.; Neugebauer, S. Improving comprehension online: Effects of deep vocabulary instruction with bilingual and monolingual fifth graders. *Read. Writ.* **2011**, *24*, 517–544. [CrossRef]
31. Nedungadi, P.P.; Menon, R.; Gutjahr, G.; Erickson, L.; Raman, R. Towards an inclusive digital literacy framework for digital India. *Educ.+ Train.* **2018**, *60*, 516–528. [CrossRef]
32. Burke, R.V.; Allen, K.D.; Howard, M.R.; Downey, D.; Matz, M.G.; Bowen, S.L. Tablet-based video modeling and prompting in the workplace for individuals with autism. *J. Vocat. Rehabil.* **2013**, *38*, 1–14. [CrossRef]
33. Vanderheiden, G.C. Universal design and assistive technology in communication and information technologies: Alternatives or complements? *Assist. Technol.* **1998**, *10*, 29–36. [CrossRef]
34. Brennan, D.M.; Barker, L.M. Human factors in the development and implementation of telerehabilitation systems. *J. Telemed. Telecare* **2008**, *14*, 55–58. [CrossRef]
35. Garety, P.A.; Ward, T.; Freeman, D.; Fowler, D.; Emsley, R.; Dunn, G.; Kuipers, E.; Bebbington, P.; Waller, H.; Greenwood, K.; et al. SlowMo, a digital therapy targeting reasoning in paranoia, versus treatment as usual in the treatment of people who fear harm from others: Study protocol for a randomised controlled trial. *Trials* **2017**, *18*, 510. [CrossRef]
36. van Eck, N.J.; Waltman, L. *Manual for VOSviewer Version 1.6.15*; Univeristeit Leiden: Leiden, The Netherlands, 2020.
37. Abascal, J.; Arrue, M.; Fajardo, I.; Garay, N.; Tomás, J. The use of guidelines to automatically verify web accessibility. *Univers. Access Inf. Soc.* **2004**, *3*, 71–79. [CrossRef]
38. Hall, T.E.; Cohen, N.; Vue, G.; Ganley, P. Addressing Learning Disabilities with UDL and Technology: Strategic Reader. *Learn. Disabil. Q.* **2015**, *38*, 72–83. [CrossRef]
39. Periša, M.; Kuljanić, T.M.; Cvitić, I.; Kolarovszki, P. Conceptual model for informing user with innovative smart wearable device in industry 4.0. *Wirel. Netw.* **2021**, *27*, 1615–1626. [CrossRef]
40. Holst, C.; Isabwe, G.M.N.; Sukums, F.; Ngowi, H.; Kajuna, F.; Radovanović, D.; Mansour, W.; Mwakapeje, E.; Cardellichio, P.; Ngowi, B.; et al. Development of Digital Health Messages for Rural Populations in Tanzania: Multi- and Interdisciplinary Approach. *JMIR Mhealth Uhealth* **2021**, *9*, e25558. [CrossRef] [PubMed]
41. Starks, A. Serving students with disabilities in K-12 online learning: Daily practices of special educators during the COVID-19 pandemic. *Distance Educ.* **2022**, *43*, 596–620. [CrossRef]
42. Pérez-Escolar, M.; Canet, F. Research on vulnerable people and digital inclusion: Toward a consolidated taxonomical framework. *Univers. Access Inf. Soc.* **2022**, 1–14. [CrossRef]
43. Chadwick, D.; Ågren, K.A.; Caton, S.; Chiner, E.; Danker, J.; Gómez-Puerta, M.; Heitplatz, V.; Johansson, S.; Normand, C.L.; Murphy, E.; et al. Digital inclusion and participation of people with intellectual disabilities during COVID-19: A rapid review and international bricolage. *J. Policy Pract. Intellect. Disabil.* **2022**, *19*, 242–256. [CrossRef]
44. Lazar, J. Managing digital accessibility at universities during the COVID-19 pandemic. *Univers. Access Inf. Soc.* **2022**, *21*, 749–765. [CrossRef] [PubMed]
45. Rosen, R.; Wieringa, S.; Greenhalgh, T.; Leone, C.; Rybczynska-Bunt, S.; Hughes, G.; Moore, L.; Shaw, S.E.; Wherton, J.; Byng, R. Clinical risk in remote consultations in general practice: Findings from in-COVID-19 pandemic qualitative research. *BJGP Open* **2022**, *6*, 1–11. [CrossRef]
46. The Office of the National Coordinator for Health Information Technology. The ONC Cures Act Final Rule. Available online: https://www.healthit.gov/sites/default/files/page2/2020-03/TheONCCuresActFinalRule.pdf (accessed on 19 April 2023).
47. Morte-Nadal, T.; Esteban-Navarro, M.A. Digital Competences for Improving Digital Inclusion in E-Government Services: A Mixed-Methods Systematic Review Protocol. *Int. J. Qual. Methods* **2022**, *21*, 16094069211070935. [CrossRef]
48. Waller, S.; Bradley, M.; Hosking, I.; Clarkson, P.J. Making the case for inclusive design. *Appl. Ergon.* **2015**, *46*, 297–303. [CrossRef]
49. Radcliffe, E.; Lippincott, B.; Anderson, R.; Jones, M. A Pilot Evaluation of mHealth App Accessibility for Three Top-Rated Weight Management Apps by People with Disabilities. *Int. J. Environ. Res. Public Health* **2021**, *18*, 3669. [CrossRef]
50. Gonçalves, V.P.; de Almeida Neris, V.P.; Seraphini, S.; Dias, T.C.; Pessin, G.; Johnson, T.; Ueyama, J. Providing adaptive smartphone interfaces targeted at elderly people: An approach that takes into account diversity among the elderly. *Univers. Access Inf. Soc.* **2017**, *16*, 129–149. [CrossRef]
51. Corbett, E.; Weber, A. What can I say? Addressing user experience challenges of a mobile voice user interface for accessibility. In Proceedings of the 18th International Conference on Human-Computer Interaction with Mobile Devices and Services, Florence, Italy, 6–9 September 2016; pp. 72–82.
52. Bhattacharjee, P.; Baker, S.; Waycott, J. Older adults and their acquisition of digital skills: A review of current research evidence. In Proceedings of the 32nd Australian Conference on Human-Computer Interaction, Sydney, NSW, Australia, 2–4 December 2020; pp. 437–443.
53. Park, S.; Humphry, J. Exclusion by design: Intersections of social, digital and data exclusion. *Inf. Commun. Soc.* **2019**, *22*, 934–953. [CrossRef]

54. Pywell, J.; Vijaykumar, S.; Dodd, A.; Coventry, L. Barriers to older adults' uptake of mobile-based mental health interventions. *Digit. Health* **2020**, *6*, 2055207620905422. [CrossRef]
55. Lin, T.T.C.; Bautista, J.R.; Core, R. Seniors and mobiles: A qualitative inquiry of mHealth adoption among Singapore seniors. *Inform. Health Soc. Care* **2020**, *45*, 360–373. [CrossRef]
56. Huang, H.; Chen, Z.; Cao, S.; Xiao, M.; Xie, L.; Zhao, Q. Adoption Intention and Factors Influencing the Use of Gerontechnology in Chinese Community-Dwelling Older Adults: A Mixed-Methods Study. *Front. Public Health* **2021**, *9*, 687048. [CrossRef] [PubMed]
57. Abdelrahman, N.G.; Haque, R.; Polverento, M.E.; Wendling, A.; Goetz, C.M.; Arnetz, B.B. Brain Health: Attitudes towards Technology Adoption in Older Adults. *Healthcare* **2021**, *9*, 23. [CrossRef]
58. Venkatesh, V.; Morris, M.G.; Davis, G.B.; Davis, F.D. User Acceptance of Information Technology: Toward a Unified View. *MIS Q.* **2003**, *27*, 425–478. [CrossRef]
59. Davis, F.D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q.* **1989**, *13*, 319–340. [CrossRef]
60. Nedungadi, P.; Devenport, K.; Sutcliffe, R.; Raman, R. Towards a digital learning ecology to address the grand challenge in adult literacy. *Interact. Learn. Environ.* **2023**, *31*, 383–396. [CrossRef]
61. Kirkscey, R. Development and Patient User Experience Evaluation of an mHealth Informational App for Osteoporosis. *Int. J. Hum.–Comput. Interact.* **2022**, *38*, 707–718. [CrossRef]
62. Agarwal, Y. Accessibility information in New Delhi for "EasenAccess" Android-based app for persons with disability: An observational study. *Disabil. Rehabil. Assist. Technol.* **2019**, *14*, 645–662. [CrossRef] [PubMed]
63. Lim, Y. Psychosocial Inclusivity in Design: A Definition and Dimensions. Ph.D. Thesis, Brunel University London, London, UK, 2018.
64. Csikszentmihalyi, M. Play and intrinsic rewards. In *Flow and the Foundations of Positive Psychology: The Collected Works of Mihaly Csikszentmihalyi*; Springer: Berlin/Heidelberg, Germany, 2014; pp. 135–153.
65. James, W. What is an emotion? *Mind* **1884**, *19*, 188–205. [CrossRef]
66. Ara, J.; Sik-Lanyi, C.; Kelemen, A. Accessibility engineering in web evaluation process: A systematic literature review. *Univers. Access Inf. Soc.* **2023**, 1–34. [CrossRef]
67. Vie, S. Effective social media use in online writing classes through universal design for learning (UDL) principles. *Comput. Compos.* **2018**, *49*, 61–70. [CrossRef]
68. Sapp, W. MySchoolDayOnline: Applying Universal Design Principles to the Development of a Fully Accessible Online Scheduling Tool for Students with Visual Impairments. *J. Vis. Impair. Blind.* **2007**, *101*, 301–307. [CrossRef]
69. Hays, L.; Handler, K. Good Design is Universal: Using Universal Design Principles to Promote Self-Regulated Learning in Learning Management Systems When Teaching Information Literacy. *J. Libr. Inf. Serv. Distance Learn.* **2020**, *14*, 127–140. [CrossRef]
70. Sowrey, T. Idea Generation: Identifying the Most Useful Techniques. *Eur. J. Mark.* **1990**, *24*, 20–29. [CrossRef]
71. Wallas, G. *The Art of Thought*; Harcourt, Brace: San Diego, CA, USA, 1926; Volume 10.
72. Koestler, A. The act of creation. *Br. J. Philos. Sci.* **1964**, *16*, 255–257.
73. Shah, J.J.; Smith, S.M.; Vargas-Hernandez, N. Metrics for measuring ideation effectiveness. *Des. Stud.* **2003**, *24*, 111–134. [CrossRef]
74. Coleman, R. The case for inclusive design—An overview. In Proceedings of the 12 Triennial Congress, Toronto, ON, Canada, 15–19 August 1994.
75. The RL Mace Universal Design Institute. Available online: https://www.udinstitute.org/ud-history (accessed on 17 May 2023).
76. Rogers, E.M. *Diffusion of Innovations*, 4th ed.; Free Press: New York, NY, USA, 1995.
77. Prochaska, J.O.; DiClemente, C.C. Stages and processes of self-change of smoking: Toward an integrative model of change. *J. Consult. Clin. Psychol.* **1983**, *51*, 390–395. [CrossRef]
78. Kostoff, R.N. The use and misuse of citation analysis in research evaluation. *Scientometrics* **1998**, *43*, 27–43. [CrossRef]