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MEASURING ECONOMIC BENEFITS OF ACCESSIBLE SPACES TO ACHIEVE 'MEANINGFUL ACCESS' IN THE BUILT ENVIRONMENT: A REVIEW OF RECENT LITERATURE

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***Abstract*:** The level of accessibility in the built environment in most cities is still far from optimal. To enable people with a wide range of abilities to fully participate in social and economic activities, a more holistic change is needed in all spaces in which people interact on a daily basis. Building industries—developers, construction companies, and building owners—play a crucial role in accelerating this change. However, without a way to benchmark clear, more direct, and comprehensive economic benefits for these industry stakeholders, the effort of making our built environment more 'meaningfully accessible' will not get far. The purpose of this paper, therefore, was to learn how economic benefits of accessibility-related to the built environment has been conceptualized and measured in the empirical literature. Building on the findings, a clearer cost-benefit analytic framework for creating accessible buildings and outdoor spaces may be formulated. Our literature scan of studies published in the last two decades yielded 19 papers, all but two of which are from tourism and transportation research. We found three main approaches to conceptualizing economic benefits: 1) as market potential of accessible sites and services projected at the population-level (mainly in tourism); 2) as cost saved from having accessible infrastructure (mainly in transportation); and 3) as hypothetical return of creating accessible spaces (transportation, housing and urban design) based on users' willingness-to-pay. The papers ubiquitously agree that there are far-reaching overall benefits of making

products and services more accessible for society. But many also acknowledged the data and methodological limitations in current cost-benefit analysis frameworks. Efforts of improving data availability and methodology through cross-disciplinary dialogues are strongly desired. Similarly, a strong voice of public demand for change in the built environment will be critical in fostering the dialogues.

Keywords: economic benefits, built environment, meaningful access, cost-benefit analysis framework.

Introduction

A WHO report in 2011 showed that about 15% of the world's population is said to have some type of disability, which is well over a billion people. Newer reports estimate that possibly 2 billion people have some type of disability (Wagner, 2019). Many countries are also experiencing rapid population ageing, and persons with disability will increase at an accelerating rate. As individuals age, they will have reduced physical strengths and dexterity, limiting their ability to live an independent life and participate in civic activities as members of society. Our built environment—generally understood as human-made spaces in which people live, work, and play (Glanz et al., 2016)—needs to adapt to such population change.

However, the level of accessibility in the built environment in most cities is still far from optimal. To achieve accessibility that enables people with a wide range of abilities to fully participate in social and economic activities across private and public spheres, a more holistic change in the built environment is necessary. Such an ambitious aim can only be achieved if both public and private sectors work together to increase spaces in the private (home) as well as public realms (outside of home). The public realms span across streets, parks and recreational spaces, and commercial and institutional buildings.

Despite the crucial role of private sectors (particularly building industries such as developers, construction companies, and building owners), few benchmarking frameworks exist for the industries to gauge a broader range of costs and benefits in incorporating designs beyond minimum guidelines for

accessibility in buildings and surrounding outdoor spaces. In particular, there is a dearth of evidence that demonstrates tangible benefits to the building industries in achieving accessibility beyond minimum standards. Without a clear benchmarking framework, there can continue to be limited buy-ins from the industries to create beyond minimally accessible buildings and spaces that meet the standards, as it is difficult to gauge their financial risks and benefits.

Therefore, the purpose of this paper is to learn from empirical literature how an analytic framework for the economic benefits of creating accessible buildings and other spaces may be formulated. In particular, this paper asked: 1) how are the economic benefits of accessibility conceptualized and measured in empirical studies? and 2) what conclusions were drawn from these studies about the economic benefits of accessibility?

Background

Accessibility, universal design and meaningful access

Accessibility means different things to different people. As for the accessibility concept specifically related to the built environment, Iwarsson and Stahl (2003, 58) define it as "the simplicity with which activities in the society can be reached, including needs of citizens, trade, industries and public services". Winance (2014, 1334) conceptualizes accessibility as "a process of adjustment and practical arrangements between the persons and her/his environment". Similarly, Andersson and Skehan (2016, 102) consider it as "the meticulous work of adjusting every detail of the built space to a large and varied group of potential users, with a focus on details of importance in relation to cognitive, physical and sensory abilities".

The term Universal Design (Story, Mueller, & Mace, 1998) has probably had the largest traction in the recent accessibility discourse, helping promote understanding of the need for a built environment inclusive of populations with a wide range of physical, cognitive, and mental abilities. Universal Design is sometimes coined with another term, Design for All (Aslaksen, Steinar, Rand, & Edel, 1997; Barnes, 2011). To a certain extent, the term universal has also helped reduce the sense of stigma for any specific group. However, there

is still a perception that Universal Design is another, less stigmatizing term for an effort to increase accessibility for only a small segment of society in a severe end of the ability spectrum (Odeck, Hagen, & Fearnley, 2010).

Notwithstanding, Raviselvam, Wood, Hölttä-Otto, Tam, and Nagarajan (2016, 131) define Universal Design as "designs that enable the users and not disable them irrespective of their age or ability." They further state, "(A) good design accommodates a user's existing abilities rather than highlighting what they lack; designs that fail to fulfil this requirement leave the user feel disabled" (Raviselvam et al., 2016, 132). The functionality of space by people is not solely determined by individuals' characteristics associated with disabilities but also their life stage (e.g., children, older adults) and circumstances (e.g., carrying luggage, a stroller, being pregnant) (Bringolf, 2011). In other words, Universal Design aims to cater to the widest range of groups possible, and considers equity among them in a more holistic way (Odeck et al., 2010).

Increasingly, questions on accessibility in the built environment in research has shifted from whether different types of spaces meet regulatory requirements addressing a few, more visible types of disability needs, to whether they are 'meaningfully accessible' (Rick Hansen Foundation, 2017). Meaningful accessibility is a concept that views accessibility as not just about physical features of buildings and spaces, but about how the built environment enables people of all ages and abilities "to participate equally in social and economic life while creating healthy and socially sustainable communities" (Rick Hansen Foundation, 2017). As such, meaningful accessibility and universal design go hand in hand—meaningful accessibility is a goal of universal design.

Benefits of creating meaningfully accessible spaces

Meaningful accessibility is achievable only when a larger portion of the built environment, beyond homes, is made accessible. Some benefits of making accessible public spaces are apparent, though not easily quantifiable. For example, it will reduce barriers to using services and amenities, increase the range of day-to-day activities persons can conduct more independently (Carr, Weir, Azar, & Azar, 2013; Joines, 2009; MacLachlan et al., 2018), and enhance users' health and well-being through increased physical activity-level. A

higher degree of accessibility in public spaces facilitates a greater level of participation in society (Darcy et al., 2008; Hartje, 2017; Kadir & Jamaludin, 2013; Lyche & Hervik, 2002; Maynard, 2009; Aslaksen, 2016), which can lead to greater social equity. These benefits are also discussed as factors that lead to better mental health (Demiris & Hensel, 2008; Joines, 2009; MacLachlan et al., 2018).

However, what has not been well understood is the kind of benefits accessible buildings and public spaces may bring to the very industries that create them. A few pieces of information regarding the potential benefits of Universal Design for the building industry exist. For example, the Global Universal Design Commission in New York State (in Steinfeld & Smith, 2012) claims that creating spaces according to Universal Design principles increases a consumer base and customer loyalty, reduces operating and renovation costs, and increases tenants' productivity. The Commission also stated that developers and building owners will benefit from user satisfaction and increased productivity resulting in higher rates of visitors, social branding opportunities, broadening markets, and lower renovation and operation costs (ibid.).

The National Disability Authority in Ireland also adds that the businesses located in the buildings can retain customers and enhance a positive public image (Centre of Excellence in Universal Design and Ireland National Disability Authority, 2014). Siperstein's (2006) survey of consumer attitudes towards companies that hire employees with disabilities also supports the idea that a company's public image as accessibility-friendly is likely to lead to greater loyalty and patronage by consumers, leading to higher profits.

These claims are consistent with a contemporary corporate social responsibility theory (Pirsch, Shruti, & Grau, 2007) that posits co-dependency between profit maximization and quality of stakeholder relations (Jensen, 2002) or "what is good for business is also good for society and vice versa" (Loosemore & Lim, 2017, 93; Porter & Kramer, 2011). Some studies also suggest that early adoption of practices associated with social responsibility could prevent the creation of harsher regulations that would be more costly (Hirose, Lee, & Matsumura, 2017).

Need for a benchmarking framework

However, these claims are not always substantiated by evidence via empirical studies. Much of the space in which people interact through day-to-day life—streets, parks, buildings containing services such as shops, schools, and healthcare services—are public goods, built, owned and managed by private sectors. As such, the building industry plays a vital role in increasing meaningfully accessible spaces in a community. Despite this, the role of the building industry in creating accessible spaces in the built environment is often overlooked, and "(f)ew efforts have been made to quantify benefits of universal design in public buildings and outdoor areas" (Aslaksen, 2016, 654). To date, it is unclear how the actual costs and benefits attainable from building and maintaining accessible buildings and other spaces can be compared, resulting in discouraging interest from the building industry in investing its resources to create spaces beyond complying with minimum design standards. Lack of measures quantifying benefits for the building industry has also prevented governments from being able to determine strategies to increase meaningfully accessible buildings and public spaces in a community.

Methodology

We conducted a scoping review of academic literature as well as reports and working papers by governmental and non-governmental organizations that were published in the last two decades (2000-2019). We used Dalhousie University's Library database to collect academic journals using sets of the following keywords: "accessibility", "accessible", "universal design", "barriers", "barrier-free", "inclusive design", "access for all", "disability", "disabling", "built environment" and "benchmarking" in combination with terms including "evaluation framework", "valuation", "benefits", "measure", "assessment", and "cost-benefit analysis". Other types of literature were collected through the Google engine using the same keywords.

Our screening of titles and abstracts resulted in 19 papers, which were found to inform our interests—how economic benefits of accessibility in the built environment were conceptualized and measured. Many papers initially

collected were excluded because they focused on the design of devices, assistive technologies, or visual materials rather than accessible features in the built environment. Papers were also not included if the type of accessibility they were referring to was not accessibility for persons experiencing impairments. For instance, the spatial accessibility of a pedestrian or transit network refers to the time and space travelled to reach destinations rather than what barriers may impede someone's navigation to a destination. There was also a myriad of papers that measured the level of accessibility of services and amenities themselves (e.g., accessibility design audits). These were excluded. Finally, papers that solely looked at user benefits for accessible spaces, instead of industry benefits, were not included. Some of these were used to understand the context of the findings and included in Discussion.

Results

The results from our literature search confirmed that there is a dearth of evidence for benefits to building accessible spaces, particularly that of economic benefits. The search terms used yielded many papers from various fields, but only a small percentage informed measures of economic or non-economic benefits. A majority of the 19 papers come from transportation (10) and tourism (7) fields. Of the two other articles, one was from housing, and another was from urban design discussing costs and potential benefits of design features in and outside of buildings. Most (15) of the articles found have been published in the last decade (2009-2019). There were eight sources from Europe, four from Australia and New Zealand, three from Norway, one from South America, and one from South Korea. The remaining two sources took an international perspective. Table 1 shows the summary of the 19 papers reviewed. The numbers below refer to the identification numbers of the papers in the table.

According to these papers, economic benefits of accessibility have been largely conceptualized in three ways: 1) as market potential of accessible sites and services projected at the population-level (mainly in tourism) [3, 4, 7, 8, 17]; 2) as cost saved from having accessible infrastructure (mainly in

transportation) [5, 12, 14, 15]; and 3) as hypothetical return of creating accessible spaces (transportation, housing and urban design) based on users' willingness-to-pay [1, 2, 6, 9, 11, 13, 15, 16, 18]. There were a few papers that employed hybrid approaches.

1. Benefits as market potential of accessible sites and services

One of the most common research areas investigating the economic benefits of accessibility is tourism [3, 4, 7, 8, 9, 17, 19]. Five papers [3, 4, 7, 8, 17] included in this review estimated the market potential of attracting tourists with accessibility needs. For example, Darcy et al. (2008) calculated the gross economic contribution of persons with disability to tourism in Australia using data from Australia's National Visitor Survey, which reports on the number of inbound and outbound tourists with disabilities and their estimated spending. They summarised patterns of consumption from overnight trips and day trips, finding that the total expenditure by tourists with accessibility needs for the year 2003-04 was between $8 and $11 billion overall, resulting in $3 - $4.5 billion in gross value added to Australia's tourism market. Pavkovic, Lawrie, Farrell, Huuskes, and Ryan's (2017) report similarly outlined economic incentives for tourism businesses that offer accessible services and environments in New South Wales enumerating the "untapped market" (Pavkovic et al., 2017, 31) of persons with disabilities, older people, and young families using demographic data. Based on the estimation using recent travel data (i.e. how often trips are taken by those groups) and expenditure data showing how much was spent by those groups on tourism services, they concluded that spending by persons with disabilities accounted for 17% of the overall expenditure of the Australia tourism sector ($3.3 billion over the first quarter of 2017). Similarly, Bowtell's (2015) study forecasted potential revenue from implementing accessible tourism standards to the year 2025, using 2005 data on numbers of consumers with disabilities and recorded spending by travellers with accessibility needs. He found that an estimated market potential of €88.6 billion could be anticipated for companies in the tourism industry over the next two decades, representing a 65% increase in revenue from 2005. These studies all conclude that there is substantial economic growth potential by making tourism sites and services accessible for persons with disabilities.

2. Benefits as cost saved

A second type of economic benefit looked at cost saved for users and service providers from implementing accessible facilities [5, 12, 14, 15], rather than suggesting potential revenue of accessible services. Burdett, Locke, and Scrimgeour (2017) investigated the cost saved for pedestrians who gained mobility access through an improved crosswalk. Their study compared counts of the number of pedestrians using a mobility aid (e.g. walking stick, wheelchair, back or leg brace) who crossed an intersection before and after accessibility improvements to the crosswalk were implemented. They saw an estimated 147% increase in trips by persons using mobility aids through the improved site. Then, they estimated the cost saved for these users from not having to use an alternate means of reaching their destination, such as by taking a taxi, which they may have done if the accessibility features were not in place to allow them to cross the intersection. Using estimates for trip costs and the number of additional trips enabled by improvements, Burdett et al. (2017) propose that the net value of the cost saved from this project is $1.27 million.

Instead of direct cost savings, some studies calculated the time saved from the implementation of accessibility infrastructure, and then the time was converted to some monetary value. These papers typically come from transportation research, including Burdett et al.(2017), where reduced time spent for travel was converted into an amount of currency, based on a standard value typically derived from average employment income of service users, established and available from other empirical studies. For example, Karekla, Fujiyama, and Tyler (2011) considered a scenario of two improvements to a line in London's Underground rail system: widening all train doors to 1800mm and raising all platforms to be level with the train. By doing so, they suggested that dwell-time (i.e. the amount of time a train waits at a platform for passengers to get on and off) would be reduced by an average of 6 seconds for southbound trips and 5 seconds for northbound trips. It was assumed that all passengers would receive this time-saving benefit. Based on an empirical standard of time-currency conversion at the time of the study (Transport for London, 2010 in Karekla et al., 2011), they estimated that the time saved equalled £2,215,000 in savings. They also proposed that reduced

dwell time and, therefore, total journey time, would have economic implications for transportation operators, such as the frequency of train operation and maintenance. These factors, estimated over a 25-year project timeline, resulted in £52,162,000 in total estimated benefit.

3. Benefits as hypothetical return of creating accessible spaces

The third approach to measuring potential economic benefits of accessibility seen in the literature is directly asking people the monetary values they place, such as having some accessible features and services [1, 2, 6, 9, 11, 13, 15, 16, 18]. Most of the papers using this approach used a contingent valuation method (CVM), assessing potential users' willingness-to-pay for the hypothetical 'goods'. Willingness-to-pay is usually derived from responses from a survey asking participants what they feel is fair to pay in exchange for benefits they would receive. Surveys typically include a suite of monetary value choices accompanied by a description of accessible spaces—often with images—from which respondents will choose their most preferred option. Their choice will be the 'stated preference', hence this type of survey is also called a stated preference survey (Fearnley, Flugel & Ramjerdi, 2011). In a study by Fearnley et al. (2011), passengers of three Norwegian city transport lines were asked to choose between trip scenarios, each with different accessibility and cost attributes (e.g., choice between a transit stop without a shelter and with a lower ticket price, and a transit stop with a shelter and a higher ticket price). Using this method, Fearnley et al. (2011) found that respondents were willing to pay more (approximately 3.12 NOK) for transit stops with shelters and even more (approximately 5.10 NOK) for transit stops with shelters where seating is provided. Similarly, Aslaksen (2016) performed a stated preference survey of Norwegian citizens to identify the benefits of different Universal Design (UD) measures such as visual and tactile marking, automatic entrance doors, and ramps. Respondents were asked to answer a series of multiple-choice questions presenting accessible design options for various locations, such as entering a swimming pool or a movie theatre, and the cost of entry for each scenario. His study found that respondents were willing to pay the most for indoor and outdoor lighting improvements (17 NOK on average), visual and tactile markings of walkways (9 NOK on average), and handrails on stairways (7 NOK on average). Aslaksen (2016) also presented an example calculation of

potential benefits against the costs for installing an automatic door in the city hall based on the study's valuations and estimated there would be about 24% in net benefits. Alonso's (2002) willingness-to-pay survey represents one of a very few studies on the economic benefits of accessible housing, asking 1,104 homeowners in Madrid and Barcelona what they would pay for conventional, adaptable, and barrier-free housing. On average, respondents were willing to pay 12.5% more for adaptable and barrier-free dwellings than for conventional housing. By applying these numbers to Spain's housing market, Alonso (2002) suggested that building homes with greater accessibility could account for €6.3 to €8.3 billion in annual value-added.

Hybrid approaches

A few studies employed hybrid approaches. One such study by Pena Cepeda, Galilea and Raveau (2018) in Santiago, Chile, used extra travel time survey participants were willing to spend as the currency value equivalent, rather than currency value equivalent for time saved through implementation of accessible services. The survey presented sets of two bus stops, each with different accessibility attributes such as elevated floors at bus stops, access ramps, and audio-visual stop displays for the visually impaired, accompanied by associated travel times. They found that travellers were willing to lengthen their travel time in order to use these accessibility attributes. Then, the authors translated the extra time into US dollars considered as equal worth. For example, the US dollar equivalent of being able to use elevated floors at bus stop despite the additional length of time to get to them was an average of $0.44 per person. Maynard (2007) combined time as a component in her survey, asking their stated preferences for a combination of a rail ticket and the length of travel time between given accessibility design choices. In her study, respondents were willing to pay more for the ticket for the option of a lift with stairs (£0.48 per person) and ramps with stairs (£0.15 per person) at rail stations. However, her study used the travel time component as a way to assess if the monetary value choices aligned with established measure of currency equivalent for the time period, rather than to calculate the currency equivalent for the time chosen.

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
1	Alonso, F. (2002) The benefits of building barrier-free: A contingent valuation of accessibility as an attribute of housing [Housing Policy] Spain	To demonstrate potential economic profitability of barrier-free residential dwellings	Added economic value in euros (€) of barrier-free dwelling design measured by willingness to pay for accessible, adaptable, and conventional homes	A double-bounded contingent valuation survey was distributed to 1,104 households in Barcelona and Madrid asking what price they would be willing to pay for the three types of dwellings	Respondents are willing to pay 12.5% more on average for adaptable and accessible housing compared to housing with barriers. The value added by improved accessibility to the annual production of housing in Spain is estimated to possibly reach €6.3 to €8.3 billion

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
2	Aslaksen, F. (2016) Upgrading existing buildings to universal design: What cost-benefit analysis can tell us [Urban Design] Norway	To identify differential monetary benefits for select UD measures perceived by users with and without disability, and to suggest how the information can be used to generally support planning and implementation of UD measures, while prioritize different UD features	Economic value (in NOK) of the presence of universal design features in buildings as stated by survey respondents with and without disability	Stated-preference surveys to assess willingness to pay for entrance to public facilities with certain accessible design features; results were compared with cost of implementing universal design features derived from public sector database of accessible projects	Most UD features had some value for all users, while their value for the target group (persons with accessibility needs) was higher. For example, improved indoor and outdoor lighting were valued most highly on average at 17 NOK each, the target group valued them at nearly double the average. An example calculation is provided for installing at automatic door to city hall, where the valuation is 1 NOK per visitor over 25 years compared to installation cost, finding about 24% in net benefits.

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
3	Bah, Y.M. (2016) Economic incentive of a non-handicapping built environment [Tourism] Sweden	To demonstrate market potential for tourism targeting clientele with disabilities	Occupancy rates of places with accessible accommodations [indirect]	Questionnaires distributed to site owners and managers to obtain occupancy rates and information on what accessible facilities are offered at their tourism sites	There was general agreement that there is increased demand for accessible tourism sites
4	Bowtell, J. (2015) Assessing the value and market attractiveness of the accessible tourism industry in Europe: a focus on major travel and leisure companies [Tourism] Europe	To present market potential in targeting clientele with disabilities over time	Estimated revenue (in €) per consumer for accessible tourism services based on projection of number of disabled customers and per customer revenue	Revenue in 2025 was projected based on market analysis using 2005 data for per customer revenue and demographic forecasting	Potential revenue of tourism for 2025 is estimated to be €88.6B, 65% increase from 2005

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
5	Burdett, B., Locke, S., & Scrimgeour, F. (2017) The economics of enhancing accessibility: Estimating the benefits and costs of participation [Transportation] New Zealand	To demonstrate potential economic net value of investment in accessible pedestrian and transit infrastructure	Cost saved for pedestrians with mobility challenges by not having to opt for an alternate means of transportation	The paper compared the counts of pedestrians using a mobility aid crossing the intersection before and after the improvements were made, then estimated total economic benefit by summarizing the trip costs saved by the counts increased	Found increased pedestrian use of street crossing after accessibility improvements, with the number of trips for persons with mobility aids per year estimated to increase by 147% and 12% for persons without mobility aids. The net value of cost saved from the investment is estimated to be $1.27 million

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
6	Chang, I. (2019). Policy-feasibility study of vertical/horizontal moving assistant systems for the mobility-disabled using a contingent valuation method [Transportation] South Korea	To help policy-makers understand the benefits of a new vertical/horizontal moving-assistant system in subway stations by evaluating its economic value	Subway users' willingness to pay (in USD) in tax	One-on-one surveys, using a double-bounded question structure, asked subway users to respond 'yes' or 'no' to proposed tax amounts to pay for the installation of a vertical/horizontal moving-assistant system. This determined the minimum and maximum amounts users were willing to pay for the system. Responses from general users and users with mobility disability were examined	Most respondents (32.3%) opted to pay $1.67, while 30.3% were not willing to pay any amount. Average willingness to pay (WTP) was higher for general users, at USD 1.15, than for mobility-disabled users, at USD 1.04. Using statistically significant sociodemographic data on respondents (age, education level, income, etc.), WTP was modelled for a wider population of potential subway users, estimating total benefits ranging between $69.81 and $200.32 million

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
7	Darcy, S., & Dickson, T.J. (2009) A whole-of-life approach to tourism: The case for accessible tourism experiences. [Tourism] Australia ACA	To make a case for accessible tourism in Australia	Demand measured by the numbers of customers with disabilities, ageing persons, and young families [indirect]	Uses demographic data to determine the population of Australians (potential customers) with accessibility needs	Suggests that potential economic benefits can be calculated by applying spending estimates to demographic data based on existing studies
8	Darcy et al. (2008) Chapter 4 of Visitor Accessibility in Urban Centres [Tourism] Australia	To estimate the economic contribution of the accessible tourism market in Australia	Added economic potential for places and businesses in the tourism industry and its estimated contribution to GDP in Australia	Uses demographic data on persons with disabilities in Australia with Tourism Research Australia's statistics on average travel spending by persons with disabilities	The economic contribution of tourists with disabilities to tourism GDP in 2003-04 was between $8 and $11 billion. Revenue demonstrates the importance of making tourism more accessible

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
9	Fearnley, N., Flugel, S., & Ramjerdi, F. (2011) Passengers valuations of universal design measures in public transport [Transportation] Norway	To demonstrate the potential economic benefit of accessible improvements to public transit systems in order to integrate them into project appraisals	Reported willingness to pay (in NOK) by transport passengers for different trip scenarios including 13 different accessibility measures	Passengers of three transport lines in Norwegian cities were presented with a stated preference questionnaire with a contingent valuation question; respondents selected their preferences between trip scenarios with varying accessibility measures and trade-offs of access and costs	UD measures were valued highly by passengers, producing positive net values exceeding costs substantially with 2500 passengers or more per year. E.g. Estimated willingness to pay for bus stop shelters was 3.12 NOK while bus stop shelters with seating were valued higher, at 5.10 NOK. The results make a strong case for prioritizing investment in accessibility measures to improve public transport

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
10	Federing, D., & Lewis, D. (2017) Towards a framework for identifying and measuring the benefits of accessibility [Transportation] International	To propose a comprehensive framework for quantifying the holistic benefits of accessibility to apply in cost-benefit analysis	Discusses economic and social benefits that can be monetized including those for the agency (worker safety), users (mobility, quality of life, safety) non-users (cross-sector economic benefits, option value, and existence value) and values of increased capability with people with disabilities	Lists a variety of methods including demand analysis, input-output analysis, stated preference analysis, in combination of willingness to pay, quality-adjusted life years, value of time, saving, and productivity (income) as potential methods to monetize the indicators; none was actually measured	The framework is proposed as a narrative tool to incorporate quantification of a wide range of non-economic benefits, to make more robust estimates of overall benefits of accessibility. The framework is key to triggering self-sustaining investment in accessible technology and design

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
11	Gassiot Melian, A., Prats, L., & Coromina, L. (2016) The perceived value of accessibility in religious sites - do disabled and non-disabled travellers behave differently? [Tourism] France	To demonstrate the potential economic benefit for the tourism industry in France through enhancement of accessibility in religious sites	Degree of satisfaction for accessible elements of a religious site as a proxy for potential economic benefit for the tourism industry	Structural equation modelling to test the hypothesized relationships between perceived value of accessibility and tourist satisfaction measured by levels of loyalty to the site, tourists' intention to recommend the site to others, and return to the site themselves based on survey responses by adult visitors to Lourdes, a well-known religious tourism site	Perceived value of accessibility has a higher positive effect on satisfaction for both disabled and non-disabled people. The disabled group makes up a broad market at religious sites, therefore it is important to take into account the fact that persons with disabilities place more satisfaction and loyalty on accessible religious sites

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
12	Karekla, X., Fujiyama, T., & Tyler, N. (2011) Evaluating accessibility enhancements to public transport including indirect as well as direct benefits [Transportation] United Kingdom	To demonstrate an example method of comparison between the costs of implementing accessibility features at public transport stops with the economic benefits from travel-time reduction	Travel-time saved from reduction of the dwell-time of the train at platforms (i.e. more efficient loading of passengers), converted to a monetary value	Performed cost analysis of raising the platform of all stations along a line in London's Underground to be level with the train and widening all train doors, and compared it with the potential monetary saving from dwell-time reduction, based on empirical studies that assigned currency values to minutes	Average dwell time saved for southbound journeys was 6 seconds and 5 seconds for northbound journeys, resulting in about £2,215,000 in passenger time saving benefit per year. This, with the recommended discount rate, results in an estimated total of £52,162,000 over a 25-year infrastructure project, which is 1.16 times more than the general cost of constructing the proposed improvements

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
13	Lyche, L., & Hervik, A. (2002) A cost-efficiency approach to universal access for public transport for disabled people [Transportation] International	To demonstrate types of economic benefits that can be compared with the cost of replacing old infrastructure to be accessible	Economic return of replacing old features in the public transport system measured by fees from additional ridership, willingness to pay more by existing riders, value of having travel options, reduced travel by family and friends to drive persons with accessibility needs, and increased labour participation [indirect/partial]	Hypothetical calculation of returns in the indicators suggested	It is difficult to monetize many benefits of making public transport accessible. Costs will likely exceed benefits. However, it is found to be more cost-effective to invest in new construction that is accessible, rather than to retrofit existing public transit infrastructure

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
14	Maynard, A. (2009) Can measuring the benefits of accessible transport enable a seamless journey? [Transportation] United Kingdom	To demonstrate the importance of quantifying benefits of accessible features throughout a journey into monetary units using an example of her previous study	Monetary value of time saved by being able to use an accessible feature in a railway station [indirect/partial]	Summary of monetary values assigned for saving time per person using an established standard of currency values per given time period in transportation economics	Lack of information on how to appraise cost-benefits for accessible public transit is limiting attention to the need of making it accessible by the transport sector. Calculation of the holistic benefits of making a door-to-door journey accessible will require assessments of other benefits such as reduced private vehicle use, social inclusion, reduced negative environmental impacts, improved health, and land-use efficiency

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
15	Maynard, A. (2007) Monetising the benefits of disabled access in transport appraisal [Transportation Economics] United Kingdom	To determine monetary benefits of accessibility improvements to public transportation	Willingness to pay (in £) for ticket prices for rail transport with different accessible features hypothetically applied to rail stations	Stated preference survey using discrete choice modelling asking passengers to choose willingness to pay rates of ticket prices for combinations of mobility accommodations to platforms of heavy rail stations	Results demonstrate that access by persons with mobility disability can be valued in a similar way to other non-market impacts. Willingness to pay for lift with stairs (£0.48 per person) and ramp with stairs (£0.15 per person) significantly increase the benefit-to-cost ratio.

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
16	Odeck, J., Hagen, T., & Fearnley, N. (2010) Economic appraisal of universal design in transport: Experiences from Norway [Transportation Economics] Norway	To demonstrate what types of benefits and costs should be considered, and how they can be valued in monetary terms, in order to assess the economic merits of UD projects in transportation	Benefit-to-cost ratio	Monetary values of non-economic benefits estimated using data from other CV studies for transportation and costs of implementation and maintenance estimated from external data sources for three UD transport projects: low-floor bus, high curbstone at the bus stop, and enhanced lighting. Comparison of benefits against the cost of investment to estimate net value of UD projects over 25-year appraisal period	The inclusion of social benefit values of UD features in monetary appraisal of transportation projects demonstrates that UD projects are actually profitable. Projected benefit-to-cost ratio of three example projects examined range 0.31 (high curbs/tone at a bus stop) to 25 (enhanced lighting at bus stops)

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
17	Pavkovic, I., Lawrie, A., Farrell, G., Huuskes, L., & Ryan, R. (2017) Inclusive Tourism: Economic Opportunities [Tourism] Australia	To make a business case for accessible tourism in New South Wales	Potential total spending by the numbers of tourists with disabilities, ageing persons, and families with young children	Average travel spending by persons with disabilities based on Tourism Research Australia's statistics was multiplied by the number of persons with disabilities from census and projections for an ageing population in Australia	Demonstrates sizable potential markets in Australia and internationally. For example, in the first quarter of 2017 in Australia, people with disabilities spent $3.3 billion and account for 17% of overall expenditure in tourism, and seniors (60 and over), who make up 22% of total visitors to Australia, spent over $15 billion on tourism activities

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
18	Pena Cepeda, E., Galilea, P., & Raveau, S. (2018) How much do we value improvements on the accessibility to public transport for people with reduced mobility or disability? [Transportation Economics] Chile	To demonstrate the potential economic benefit from implementing accessibility improvements in public transport	Monetary value assigned to the extra time people are willing to spend on transit trips for the availability of accessible (UD) features	Asked persons with and without reduced mobility (including those with visual impairment) to answer a stated preference survey considering the following UD elements with discrete choices of travel time increases: audio-visual information at bus stops, elevation of stops, and buses' access ramps. Monetary value equivalent of travel time was then calculated based on another study	The attribute found to be valued the highest is the elevation of floors at bus stops: USD $0.44 for all people, $0.73 for people with reduced mobility and $0.35 for people without reduced mobility. The study demonstrates the increased time spent for accessible features as an alternative to willingness to pay in the form of fees to use for economic valuation.

#	Citation [Field of Study] and Location	Purpose	Indicators of Benefits	Method of Measurement	Findings
19	Rebstock, M. (2017) Economic Benefits of Improved Accessibility to Transport Systems and the Role of Transport in Fostering Tourism for All [Tourism] Europe	To outline possible economic and non-economic benefits of improved accessibility to transport systems in general and for the tourism sector	Psychological effects of "getting out and about", exercise benefits, community cohesion through building local support networks, greater number of and flexibility of trips and destinations, economic value from increased ridership of transit, and from greater number of tourism consumers [indirect]	None empirically measured	Accessible tourism has a big impact on the tourism market and the overall economy. It posits increased ridership, greater variation in destination, and comfort for all users and not just persons with disabilities

Discussion

Current state of research

The purpose of this study was to understand how the economic benefits of accessible space designs have been conceptualized and empirically assessed in order to establish a more comprehensive cost-benefit assessment framework for creating 'meaningfully accessible' built environments. The literature presented in this study does not comprise an exhaustive list. However, multiple research database search did not yield more papers that inform new insights or methodologies, and even those we did find tended to be either authored by the same group of researchers or compilations of some of the papers included in our study.

It is not suspiring that studies attempting to measure the economic benefits of accessibility are more prevalent in tourism, given that the return of the service provided is relatively easy to quantify by using consumer spending data. In transportation research, methodologies to evaluate economic return on investment in infrastructure renewal and repair are more advanced. It is also understandable as the transportation sector is accountable to the public, and the scale of investment coming from public funding is substantial. Transportation research has long utilized standardized algorithms to convert time saved by providing efficient services, or time as cost incurred from disruption of services, into some monetary value, typically using the average income of full-time employees in the region or country (US Department of Transportation, 2014).

In the 19 papers we reviewed, only two attempted to measure the economic benefits of accessibility in buildings and adjacent features, though studies on accessible transportation infrastructure have some overlaps. For example, costs saved for building users through the implementation of elevators or automatic doors can be calculated using the standardized algorithm of time-money conversion used in transportation research.

Many papers reviewed recognize the challenges of measuring broader economic benefits of investment in accessible infrastructure and services—

whether the recipients of the benefits are the industry that provides the service, individual users with (or without) disabilities, or the society as a whole. A range of non-monetary benefits of accessible buildings that could potentially be expressed in monetary forms discussed in the reviewed papers includes independence and dignity for persons with disabilities, option value (the value of having multiple destinations or methods of travel to choose from), and health and wellness, particularly from avoiding injury (Federing & Lewis, 2017; Gassiot Melian, Prats & Coromina, L., 2016; Lyche & Hervik, 2002). In fact, the very objectives of some of the papers were to advocate for advancing the methodologies to include these hard-to-measure variables in the cost-benefit analysis frameworks (Fearnley et al., 2011; Maynard, 2009, for example). While these papers demonstrate, conceptually, how a few of these benefits could be calculated, they were clearly faced with the challenge of data availability.

Parallel with the green building literature

While there is a dearth of literature demonstrating the industry benefits of creating accessible buildings and spaces, there are some parallels that can be drawn from green building research. Green building research has investigated the benefits (and costs) of building to enhance environmental sustainability via the promotion of green buildings. For example, a study on the impact of the LEED program on real estate market trends (Fuerst & McAllister, 2011) has shown that LEED-certified buildings had 5% higher rent and 25% higher sales prices than non-certified buildings. Another study (Devine & Kok, 2015, 162) demonstrated that green-certified buildings were statistically associated with "higher levels of tenant satisfaction and increased probability of lease renewals, and decreased tenant rent concessions." Liu, Guo, and Feiling's (2014) financial analysis of green buildings in China calculated savings of incremental costs (including materials and energy savings), finding that these buildings likely have both incremental financial and environmental benefits enough to attract private investment. A cost-benefit analysis of green buildings in Turkey (Uğur & Leblebici, 2018) revealed that the construction cost increases with gold and platinum LEED buildings was minimal +7.43% and +9.43%) while the reduction in energy costs were 31% and 40%—finding that the return of capital investment could be substantial.

Many of these measures are relevant to the building industries considering accessible buildings. For example, rent charged, vacancy rates for accessible lease space, and overall property values can be compared with those buildings without accessible spaces or with only minimally accessible spaces. Monetary benefits of enhanced health and well-being could also be measured using counts of reduced absenteeism and saved workers' compensation for employees working in an accessibility enhanced building, and compared with those of conventional (minimally accessible) buildings. The number and costs of lawsuits for injuries occurring in accessible buildings could also be compared with those of only minimally accessible buildings. Few of these measures have been incorporated in the studies we reviewed, likely due to the lack of data that is readily available for researchers.

Conclusion

Critical theories around disability have long urged the discourse to move beyond the notion of disability as something that is outside of 'normality' and needing special accommodation (Hamraie, 2016). Disability research has attempted to break down the artificial notion of dichotomous existence in society where there are those 'able' majority and those who are not, while the physical, mental and cognitive abilities of all people, in fact, vary along a continuum of scale, with the 'disabled' making up the largest minority in the world (Akinci, 2013). However, the creation of an accessible environment is still largely perceived as stemming from an altruistic intention rather than a viable business choice for the industry. "What is good for business is also good for society and vice versa" (Loosemore & Lim, 2017, 93) largely remains rhetorical.

The studies we reviewed ubiquitously agree that there are far-reaching overall benefits of making products and services more accessible for the society. Many advocated for better cost-benefit analysis frameworks to make a case for pursuing accessibility that can accommodate the needs for as many people as possible. However, reduced material costs and energy saving from accessible buildings are unlikely as substantial as green buildings, and therefore meaningful accessibility is a *harder sell*. From a human rights perspective

(United Nations, 2016), meaningful accessibility should not be an option; rather it is a fundamental requirement regardless of possible economic return to those who create the buildings and other spaces. In that sense, the unfavourable cost-benefit ratios for building industries should not matter. At an operational level, however, the implication of such a hardline approach means more detailed and stringent regulations, which will certainly face the industry's resistance and will not be realized without strong support from the public. Demonstrating more tangible economic benefits seems to be an effective strategy to increase the incentives for building industries to create buildings and other spaces beyond complying with minimum standards. Governments will also be better able to formulate policies and intervention schemes if they can more clearly gauge the benefits against the tax dollars they have to be accountable in spending. This paper was motivated by the urgent need to draw attention to the critical gap in research, particularly among disciplines such as planning, urban design, and architecture that have been relatively reticent in the discourse. A strong voice of public demand for change in the built environment will also be critical in fostering the effort to develop a better framework of cost-benefit analysis for creating more meaningful built environments.

References

[1] Akinci, Z. (2013). Management of Accessible Tourism and its Market in Turkey. International Journal of Business and Management Studies, 2(2), 413–426. Retrieved from https://www.researchgate.net/publication/261875914.

[2] Alonso, F. (2002). The benefits of building barrier-free: A contingent valuation of accessibility as an attribute of housing. European Journal of Housing Policy, 2(1), 25–44. https://doi.org/10.1080/14616710110120577.

[3] Andersson, J. E., & Skehan, T. (2016). Accessibility in Public Buildings: Efficiency of Checklist Protocols. In Universal Design 2016: Learning from the past, designing for the future, edited by Helen Petrie, Jenny Darzentas, Tanja Walsh, David Swallow, Leonardo Sandoval, Andrew Lewis, & Christopher Power, 101–110. Amsterdam, Netherlands: IOS Press BV. https://doi.org/10.3233/978-1-61499-684-2-101.

[4] Aslaksen, F. (2016). Upgrading existing buildings to Universal Design. What cost-benefit analyses can tell us. In Universal Design 2016: Learning from the past, designing for the future, edited by Helen Petrie, Jenny Darzentas, Tanja Walsh, David Swallow, Leonardo Sandoval, Andrew Lewis, & Christopher Power, 101–110. Amsterdam, Netherlands: IOS Press BV. https://doi.org/10.3233/978-1-61499-684-2-101.

[5] Aslaksen, F., Steinar B., Rand B. O., & Edel, K. (1997). Universal Design: Planning and Design for All. Oslo, Norway.

[6] Bah, Y. M. (2016). Economic incentives of a non-handicapping built environment (Case study: tourism sites). Business Research Review, 2(2), 60-89. Retrieved from: https://iiste.org/Journals/index.php/JTHS/article/view/34374.

[7] Barnes, C. (2011). Understanding disability and the importance of design for all. Journal of Accessibility and Design for All, 1(1), 55–80. https://doi.org/10.17411/jacces.v1i1.81.

[8] Bowtell, J. (2015). Assessing the value and market attractiveness of the accessible tourism industry in Europe: a focus on major travel and leisure companies. Journal of Tourism Futures, 1(3), 203-222.

[9] Bringolf, J. (2011). Barriers to Universal Design in Housing. PhD diss., University of Western Sydney.

[10] Burdett, B., Locke, S., & Scrimgeour, F. (2017). The economics of enhancing accessibility: Estimating the benefits and costs of participation. International Transport Forum Discussion Paper, Issue 1, 5-21.

[11] Carr, K., Weir, P.L., Azar, D., and Azar, N.R. (2013). Universal design: A step toward successful aging. Journal of Aging Research, 2013, 1-8.

[12] Darcy, S., & Dickson, T.J. (2009). A whole-of-life approach to tourism: The case for accessible tourism experiences. Journal of Hospitality and Tourism Management 16, 32-44.

[13] Darcy, S. et al. (2008). Chapter 4 – Economic contribution of disability to tourism in Australia. In S. Darcy, B. Cameron, L. Dwyer, T. Taylor, E. Wong, and A. Thomson (Eds.), Technical Report 90040: Visitor Accessibility in Urban Centres (pp. 15-21). Gold Coast: Sustainable Tourism Cooperative Research Centre.

[14] Demiris, G., & Hensel, B.K. (2008). Technologies for an aging society: A systematic review of “smart home” applications. IMIA Yearbook of Medical Informatic.

[15] Devine, A., & Kok, N. (2015). Green certification and building performance: implications for tangibles and intangibles. The Journal of Portfolio Management Special Real Estate Issue, 41(6), 151-163. Doi: https://doi.org/10.3905/jpm.2015.41.6.151.

[16] Fearnley, N., Flügel, S., & Ramjerdi, F. (2011). Passengers' valuations of Universal Design measures in public transport." Research in Transportation Business and Management, 2(2011), 83-91. https://doi.org/10.1016/j.rtbm.2011.07.004.

[17] Federing, D., & Lewis, D. (2017). Towards a Framework for Identifying and Measuring the Benefits of Accessibility. International Transport Forum, Discussion Paper 2017-03.

[18] Fuerst, F., & McAllister, P. (2011). "Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values." Real Estate Economics, 1(39), 45–69. https://doi.org/doi:10.1111/j.1540-6229.2010.00286.x.

[19] Gassiot Melian, A., Lluis, P., & Coromina, L. (2016). The perceived value of accessibility religious sites – do disabled and non-disabled travellers behave differently? Tourism Review, 71(2), 105-117.

[20] Glanz, K., Handy, S.L., Henderson, K.E., Slater, S.J, Davis, E.L, & Powell, L.M. (2016). Built Environment Assessment: Multidisciplinary Perspectives. Social Sciences & Medicine-Population Health, 2, 24–31. https://doi.org/doi:http://dx.doi.org/10.1016/j.ssmph.2016.02.002.

[21] Hamraie, A. (2016). Universal Design and the problem of "post-disability" ideology. Design and Cultural, 8(3), 285-309.

[22] Hartje, S.C. (2017). Universal design improves the quality of life for individuals, families, and communities. Universal Design: FCS Practices for the Well-Being of All, 109(4), 7-13.

[23] Hirose, K., Lee, S., & Matsumura, T. (2017). Environmental Corporate Social Responsibility: A Note on First-Mover Advantage Under Price Competition. Economic Bulletin, 37(1): 214–221.

[24] Iwarsson, S., & Stahl, A. (2003). Accessibility, usability and universal design-positioning and definition of concepts describing person-environment relationships. Disability and Rehabilitation, 25(2), 57–66. https://doi.org/10.1080/0963828021000007969.

[25] Jensen, M.C. (2002). Value maximization, Stakeholder Theory, and the Corporate Objective Function. Business Ethics Quarterly, 12(2), 235–256.

[26] Joines, S. (2009). Enhancing quality of life through universal design. NeuroRehabilitation, 25,155-167.

[27] Kadir, S.A. & Jamaludin, M. (2013). Universal design as a significant component for sustainable life and social developments. ASEAN Conference on Environment-Behaviour Studies.

[28] Karekla, X., Fujiyama, T., & Tyler, N. (2011). Evaluating accessibility enhancements to public transport including indirect as well as direct benefits. Research in Transportation Business & Management, 2, 92-100.

[29] Liu, Y., Guo, X. & Feiling, H. (2014). Cost-Benefit Analysis on Green Building Energy Efficiency Technology Application: A Case in China. Energy and Buildings, 82(2014), 37–46. https://doi.org/10.1016/j.enbuild.2014.07.008.

[30] Loosemore, M., & Lim, B.T.H. (2017). Linking Corporate Social Responsibility and Organizational Performance in the Construction Industry. Construction Management and Economics, 35(3), 90–105. https://doi.org/10.1080/01446193.2016.1242762.

[31] Lyche, L., & Hervik, A. (2002). A cost efficiency approach to universal access for public transport for disabled people. In Hensher, D.A., and Hauge, O. (Eds.) Competition and ownership in land passenger transport: The 7th International Conference. Transport Reviews: A Transnational Transdisciplinary Journal, 22(3), 335-370.

[32] MacLachlan, M., Cho, H. Y., Clarke, M., Mannan, H., Kayabu, B., Ludolph, R., & McAuliffe, E. (2018). Report of the systematic review on potential benefits of accessible home environments for people with functional impairments. In: WHO Housing and Health Guidelines. Geneva: World Health Organization, 2018. Retrieved from: https://www.ncbi.nlm.nih.gov/books/NBK535292/

[33] Maynard, A. (2009). Can measuring the benefits of accessible transport enable a seamless journey. Journal of Transport and Land Use, 2(2), 21-30.

[34] Maynard. A. (2007). Monetising the benefits of disabled access in transport appraisal. In TRANSED 2007, Montreal. http://www.transedconferences.com/Transed2007/pages/1218.htm.

[35] Odeck, J., Hagen, T., & Fearnley, N. (2010). Economic appraisal of Universal Design in transport: Experiences from Norway. Research in Transportation Economics, 29(2010), 304–311. https://doi.org/10.1016/j.retrec.2010.07.038.

[36] Pavkovic, I., Lawrie, A., Farrell, G. Huuskes, L., & Ryan, R. (2017). Inclusive Tourism: Economic Opportunities. University of Technology Sydney Institute for Public Policy and Governance, Sydney, NSW.

[37] Pena Cepeda, E., Galilea, P., & Raven, S. (2018). How much do we value improvements on the accessibility to public transport for people with reduced mobility or disability? Research in Transportation Economics 69, 445-452.

[38] Pirsch, J., Shruti G., & S. Grau. (2007). A Framework for Understanding Corporate Social Responsibility Programs as a Continuum: An Exploratory Study. Journal of Business Ethics, 70(2), 125–140. https://doi.org/doi:10.1007/s10551-006-9100-y.

[39] Porter, M. E., & Kramer, M.R. (2011). Creating Shared Value: How to Reinvent Capitalism-and Unleash a Wave of Innovation and Growth. Harvard Business Review, 63–77. https://doi.org/doi:10.1108/09600039410055963.

[40] Raviselvam, S., Wood, K.L., Hölttä-Otto, K., Tam, V., & Nagarajan, K. (2016). A Lead User Approach to Universal Design—Involving Older Adults in the Design Process. In Universal Design 2016: Learning from the past, designing for the future, edited by Helen Petrie, Jenny Darzentas, Tanja Walsh, David Swallow, Leonardo Sandoval, Andrew Lewis, & Christopher Power, 101–110. Amsterdam, Netherlands: IOS Press BV. https://doi.org/10.3233/978-1-61499-684-2-101.

[41] Rebstock, M. (2017). Economic benefits of improved accessibility to transport systems and the role of transport in fostering tourism for all. International Transport Forum Discussion Papers 2017/04 OECD Publishing.

[42] Rick Hansen Foundation. (2017). Rick Hansen Foundation Accessibility Certification (RHFAC) Ratings Reference Guide. Richmond, British Columbia.

[43] Siperstein, G.N. (2006). A national survey of consumer attitudes towards companies that hire people with disabilities. Journal of Vocational Rehabilitation 24, 3-9.

[44] Steinfeld, E., & Smith, R. O. (2012). Universal Design for Quality of Life Technologies. Proceedings of the IEEE, 100(8), 2539–2554. https://doi.org/10.1109/JPROC.2012.2200562.

[45] Story, M. F., Mueller, J.L., & Mace, R. L. (1998). The Universal Design File: Designing for People of All Ages and Abilities. Design Research and Methods Journal, 1(5), 165. https://doi.org/10.1073/pnas.95.12.6854.

[46] United Nations. (2016). United Nations Convention on the Rights of Persons with Disabilities. Retrieved from https://www.un.org/development/desa/disabilities/convention-on-the-rights-ofpersons-with-disabilities/convention-on-the-rights-of-persons-with-disabilities2.html.

[47] Uğur, L.O., and Leblebici, N. (2018). An examination of the LEED green building certification system in terms of construction costs. Renewable and Sustainable Energy Reviews, 81(1), 1476-1483.

[48] US Department of Transportation. (2014, July 9). The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations, Revision 2 (2014 Update). https://www.transportation.gov/sites/dot.gov/files/docs/USDOT%20VOT%20Guidance%202014.pdf

[49] Wagner, L. (2019). Disabled people in the world in 2019: facts and figures. Inclusive City Maker. https://www.inclusivecitymaker.com/disabled-people-in-the-world-in-2019-facts-and-figures/

[50] Winance M. (2014). Universal design and the challenge of diversity: reflections on the principles of UD, based on empirical research of people's mobility. Disability and Rehabilitation, 26(16), 1334-1343.

[51] World Health Organization. (2011). WORLD REPORT ON DISABILITY. Geneva, Switzerland. Retrieved from http://www.who.int/about/.

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