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Article

Fairness and Inclusion for Users of Surface Transport—An Exploratory Thematic Study for Irish Users

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Abstract: This paper explores the conditions of public transport with respect to user accessibility, design of infrastructure, and safety from a gendered perspective. Our investigation aims to understand the factors that direct a citizen's choice of whether or not to use public transport. Our discussion is focused on gender disparities among user experiences, so we confine our focus to that of women's perspectives and their experiences with public transport use. A framework for our discussion was formed with consideration of the theoretical aspects of fairness, justice, and gender in transport, as well as user statistics. We identified several spaces where public transport policy planning and implementation may be improved in order to balance gender disparity of access, safety, and security across the gender divide. (We acknowledge that both distinct and interchangeable definitions of safety and security exist. In this work, we err to the latter, while also recognising from user-based qualitative data that safety concerns are not limited to infrastructure, but also relate to other unwanted sources of physical, mental, or emotional harm experienced within the transport system.) Primary among these was the necessity of both the acknowledgment and appreciation of the issues disproportionately experienced by women. A one-size-fits-all approach was found to ill-recognise the societal minutiae of constant caring responsibilities, income limitations, ability/disability, or the effects of past negative experiences faced by women. We conclude that improvements may be achieved by targeting and meeting actual, not just perceived need.

Keywords: fairness; justice; gender; public transport (PT); safety and security; accessibility; women

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1. Introduction

There has been a significant increase in research on the issues relating to fairness and inclusion (equity) in the transport sector. While past decades looked to economic development and environmentalism for successful implementation of PT projects research shows [1] equitable user engagement as a prominent issue. There is an ever-present need to understand the consistently created patterns of social inequality [2]. Meeting targets for passenger uptake and engagements with service improvements rely on users' acceptance of network developments and r realizing passengers' expectations [3]. Studies in a variety of urban centres [4–6] have shown proportionality between increased public transport ridership and the successful integration of network attributes for which users' engagement are nuanced, and not experienced equitably.

The global movement towards sustainable development can only be achieved with a system that is inclusive for all. The United Nations Sustainable Development Goals (UNSDGs) offer a baseline for globally recognised principles to challenge social, environmental, and economic inequity [7]. The UNSDGs specifically target the orderly and safe mobility of people in fighting inequality [8] and aim to cement women's "*full and effective participation*

and equal opportunities" in all aspects of life [9]. The goals "*are integrated and indivisible*" [7]; fair and inclusive mobility promotes equitable opportunities for women to access and engage with educational, economic, social, cultural, political, and wellbeing endeavours. The measure of such sustainable and effective transport systems and policies lies in their suitability for improving quality of life and standards of living that are equitable for all [1]. Where quality of life falters, sustained social and economic development are threatened by diminished equality [8,9]. The attributes viewed as of primary importance to policy makers do not necessarily reflect the demands and priorities of passengers. Insufficient and/or inaccurate analysis of user needs, especially regarding disaggregation of user demographics [10], leads to barriers to public transport access—financial, physical, temporal, and organizational [11]. Such barriers, either real or perceived, may discourage and/or prevent use of public transport. Park [12] discusses these barriers as experienced by users of varying ability, highlighting a commonly reported lack of awareness among operators and other passengers of any additional needs. Similarly, Ait Bihi Ouali [13] reports that there are significant gaps with respect to perceptions of safety on PT between women and men, with women feeling less safe. Passenger demographics, economic trends, and community concerns are shaping both the meaning of transport and issues highlighted in this area. This shift moves public transport analysis methods from system performance metrics towards that of interconnected multi-modal services and impact and improvement options that compel inclusive demand management solutions [14].

In line with fairness and inclusion, this study explores social justice, distributive justice, and procedural justice. To understand the reasoning behind justice in society, implemented procedures and outcomes form the groundwork for user-established assessments of what is deemed fair. The concept of social justice helps evaluate the levels of fairness. Appreciation of PT users' experiences and perceptions from firsthand accounts, reports, and statistics helps establish a context for the gender disparities and a gap in equal treatment that exist in the transport system. We form a "modern status quo" of primary mobility obstacles limiting equitable PT use from information and statistic in reports and current literature. Although fairness applies to a multitude of such inequalities and barriers, we focus on three key themes—safety and security, accessibility, and infrastructure. These were identified as prominent themes from the DIAMOND project scoping literature review and fundamental focus group [15] for characteristics influencing women as users of PT. We present quantitative and qualitative user data; interrogation of the fairness characteristic (FCs) hierarchy from the data set enables formation of user profiles. This allows us to flesh out the humanistic model of the PT users with an enhanced picture of their lived experiences, concerns, and considerations regarding interactions with the service infrastructure, personnel, and other users.

2. Fairness in Transport

Fairness is central to users' acceptance of services provided. Policy implementation and its outcomes are more likely to be accepted by users when the decisions guiding them are viewed as fair. Tyler [16] argues that the altruistic nature of procedural justice plays an important role in whether policy measures are perceived as fair or not, and how readily they are adopted. Fairness is the embodiment of equal treatment for all and is influenced by people's understanding of their own experiences relative to others, in addition to factors such as social demographics, equity of outcomes and opportunity, social justice, etc. [17].

In a hierarchical framework, fairness is both governed by and is a characteristic of justice. The credibility of a fair system should be influenced by standards of justice drawn from plausible analysis [18]. While understanding how fairness is distributed in the transport sector is complex, impartiality is a requirement when examining its broad implementation [1,17]. Matters of inequality have no definite path to improvement, especially given the positive and negative nature of the effect of the varying needs and the effects of transport engagement on users [19]. There is no one-size-fits-all approach regarding fairness; fairness varies depending on applicability to issue, circumstances, and group [17].

Moving beyond fairness as a theory and toward assessing its presence in PT, we apply the adoption of equity as a key indicator. In measuring justice and fairness, fairness may be used as a reciprocal for justice, with the perception of fairness and equity regarded as catalysts [20]. Fairness may be considered applicable to gauging if its presence is perceived to "*adherence to rules (that) reflect appropriateness in decision*" [19]. Regardless of varying conceptions, central to fairness is the avoidance of bias and the absence of obstructions, unless unambiguously justifiable [1,17]. Justice in society allows "*interactions without social breakdown*" [16]. Concerning justice and society, the users' sense of fulfillment and self-worth can be encouraged with policies that are focused on their needs [11,17].

Research shows the involvement of numerous attributes across a variety of situations and modes may be viewed to justify personal differences on the concept or reach of fairness [17,21]. The move towards a subjective understanding of people's lived experiences, in considering what they thought and felt, alongside how it influenced their social experience, molds their views of justice and fairness [18]. Assessing the presence of justice involves comparison to recognized standards of justice principles or, *"rules that will govern people's coordination of their social interactions"* [16]. Concerning justice and society, strong correlations with social psychology are reported; [18] users' sense of fulfillment and self-worth can be encouraged with policies that are focused on their needs [11,18].

Justice matters to people in a social setting; subjective justice is rooted in what is fair or unfair to people and the justification or understanding of their stance [18]. This concept has implications for users' public transport engagement decisions and perceptions, which are influenced by their experience with the service provided. Ridership, travel behaviours, and decision making are correlated with a user's perception or judgment of justice and fairness [18,21], a relevance revealed when the ethical standards of an organization are considered. An understanding of what is deemed right and wrong can outweigh organisational goals or external societal pressures [18]. The justification of actions viewed to be moral are constructed to fit people's judgment; strong social consequences arise from what people feel, resulting in views of fairness being a function of people's reaction to change [18]. Reasons for particular actions and behaviours from users are empowered by fairness, what is deemed just, and the consequences of injustice [18]. Deficiency in the delivery of justice is intertwined with negative feelings, mental health issues, indignation, offense, etc. Adhering to the justice standard creates a social reality: *"justice standards are a socially created reality . . . the 'grease' that allows groups to interact productively without conflict and social disintegration"* [18].

Public transport users' behaviours, experiences, and the resulting emotional impressions are formed by what is thought of as fair, embodied in the experience with the service and mediated by the judgment of justice. Acceptance of a service offering may be initiated by adopted procedural justice in an ideal system; the travel behaviours of women are often bounded by practicalities of economy, dependents, or time. Their experiences within and without these boundaries influence perceptions of fairness [16,18].

3. Social Justice, Procedural Justice, and Distributive Justice

In a globally accepted movement towards necessary sustainability, transport planning is strongly Influenced by social justice or equity [1]. Social justice has evolved to normalise the kind of methods used to solve issues, collective self-interest and self-preservation aiding to identify "*reasonable solutions*" [16]. This kind of justice for the greater good is manifested by social decisions which prioritize social good above personal gain and societal *needs* ahead of personal *want* [18].

The societal justice movement came into sharp focus after 1945, with a dearth of global resources following World War II. It was pioneered by the concept of relative deprivation where allocated resources intertwined with peoples' needs and desires, and economic elasticity affected (dis)satisfaction. The concept of fairness from distributive outcomes—distributive justice—evolved from this subjective understanding and the effect of societal experiences and limitations [18]. This is in line with the theory of equity [18], which views

the perception of fairness and behaviours correlated to people's subjective comparison of their indulged goods and services or service outcomes to those of others; fair resource distribution is a function of people's perception of what is expected, i.e., social norms as a fair outcome [16]. Thus, the movement is centred on a willingness to accept these norms, even in the absence of holistic desires [16,18]. Considered a form of distributive justice, the concept of fairness is intricate, and its nuances across cultures and among dynamic and evolving societal norms does not favour a straightforward definition [1]. In a world of limited resources, distributive justice represents an approach that could warrant a superior distribution of resources.

The impact of transport on society comes at a cost which is not always evenly distributed [22], yet research highlights that the adoption of fair procedures exhibits a positive impact on exchange relationships. Procedures of the decision-making process are viewed to assist with shaping and bridging gaps of conflict relating to outcome satisfaction and views of procedural fairness [18]. The transport users' understanding of fairness within a system is graded by their evaluation of the decision makers legitimacy in implementing fair procedures. By this legitimacy, authority could be enacted as an avenue that influence passenger decisions, perceptions, behaviours, and expected value of an existing system. To understand if the distributed outcome in the transport sector is viewed as just, especially in line with the implemented policies of procedural justice, Tyler [18] argues that people's experiences and perceptions serve as a vital foundation for concerns of justice. Satisfaction erodes with assessment of justice as debased or tainted. Where fairness is observed to be lacking, the importance of understanding user-collated views of justice is key.

Considerations as to whether people deem an outcome just, and the related behavioural reactions to it [18], is an area that needs addressing, as responses include behaviour change prompted by the delivery of distributive and procedural justice. The issue of just allocations is present in social justification, yet the involvement of policies that are perceived as fair are accepted by people, even when direct benefits are lacking [18]. Implementing sustainable practices in PT will reduce long-terms cost and allow sustainable cities with functional networks that cater to the needs of both current and future users. Fulfilling passengers' needs encourages improved economic activity, quality of life, and the environmental r [23]. Continued dynamic engagement from society and policymakers in adopting social justice is necessary in providing a platform for diffusion and implementation of fairness [16]. Involving fairness in procedural processes legitimizes authorities' decisions in the eye of the user. Procedural elements which instigate the judgment of fairness promote opportunities for users to have a *voice* [16], or expression, providing the feeling of being treated more fairly, a sense of control, and an agency in outcomes that reflect a sense of value in the process.

Addressing impartial impacts, decisions need to be based on the views of those affected by the outcomes or situation. Therefore, to promote inclusion, an understanding of behaviours, perceptions, and habits among key users of public transport—women and vulnerable users—is essential.

4. Literature Context of Gender and Transport

It is acknowledged that the path that forms gender differs given societal, cultural, and other influences [24]. The abilities of people change over the course of their lives. Their needs and requirements of public transport [22] reflect these changes and are influenced by a number of variables. These changes include age, family situation, health, employment, caring responsibilities, motherhood, changes in location, etc., all of which affect the equilibrium of travel decisions, behaviours, and mobility [17,25–28]. The implication of such a dynamic differs between men and women [25,29]. Commuting times for men are typically longer than women, though this may be influenced by social and cultural considerations linked to gender [28]. Women face complexities of daily commitments involving compressed travel times given home care responsibilities, trip chaining between different modes, often across multiple locations, in order to fulfill duties regarding vary-

ing care obligations, children, household responsibilities, family responsibilities, leisure, etc. [25,30]. Other gender differences are entwined with factors which are weighted in favour of men [28], such as proximity to desired location and access to public transport.

Adopting processes that promote sustainable systems for all needs strong consideration tailored to the vulnerable, women, and those of differing abilities [25,31]. Stagnation in services provided by transport systems traps vulnerable people by habit, necessity, and acceptance into tolerating services that are not sufficiently addressing their needs. Scheiner and Holz-Rau [25] note that travel patterns are linked to travel norms and stability and are strongly influenced by circumstances and processes presented to the user that are outside the confines of familiarity. Studies on the concept of fairness for women among all PT users show a disparity for women, particularly given their mobility intricacy and the differences in the applied idea of fairness [17]. Although equal opportunity is a fundamental human right, for women, this is a norm that does not exist throughout all of their lives [8]. Inequality may be considered unavoidable, as stratification exist in society [2]. To empower an evolving demographic, matters of health, environment, social, and economic issues need to be addressed [31]. Inequitable distribution of opportunities, especially among marginalised groups, limits the ability to maintain agency in positive life outcomes [22]. Economic or social opportunities are unfair if they are gated. A public transport sector where gender plays a role in whether a service is accessible, safe, or meets required need fails in providing equal opportunity to all and fails to recognize the limitations of a uniform service [18].

McDonald [2] argues that gender varies between and within societies, that it is a concept conscious of time, outweighing an absolute biological nature, and is a social construct combined with personality differences between men and women, allowing socially acceptable interactions. In a global move towards an inclusive and sustainable approach, the UN sustainable development goals [8,23] for gender equality and reduced inequalities note that:

> *"Inequality is growing for more than 70 per cent of the global population, exacerbating the risks of divisions and hampering economic and social development" and "Women and girls represent half of the world's population and therefore also half of its potential. But, today gender inequality persists everywhere and stagnates social progress."*

The well-being of society is implicitly linked with transport [22]. A sustainable approach for transport would include not just equity, but also environmental impact and efficiency [1]. This influence on society varies across different strata [3,22]. Stratification, e.g., race, gender, socioeconomic level, etc., far outweighs individual differences. It is a "*characteristic of society*" that is universally inconsistent, seen to persist over time, and embodies societal beliefs rather than just inequality [2]. Passenger routine and use of modes are highly correlated with their daily travel practices. These routines depend strongly on consistent social and spatial factors, with any deviations being detrimental for behavioural continuity [26].

Accessibility factors linked to caring responsibility and work are key to understanding differences between and within gender. There exist differences in commuting behaviours between men and women, even in situations where caring responsibilities were also handled by men [21,28]. Those with or without caring responsibilities differed with respect to how their travel patterns were affected. Men highlighted no change in travel patterns based on workload, while women with caring responsibilities or those who were first-time mothers saw a reduction in professional work—or a move to part time hours— with reduced earnings confounding their ability to afford fares [21,28].

The normalised involvement of women in undertaking the majority of family and care responsibilities, coupled with complex duties and life event triggers, result in travel decisions and factors that influence PT use that is eminently different from those of men [21,29,30]. Further effects on commuting include intermodal access, income, time spent commuting, mobility modes suited to caring duties, and mobility technology promoting efficiency [21,28]. The preceding authors note women also experience increased commuting times, especially in cases that altered travel patterns, such as a change in location for frequently accessed care, educational, or retail facilities.

Gender commuting patterns differ with caring responsibilities or diversified roles of the working stereotype [21,28]. Infrequency in commuting journeys are linked to lower wages. In cases where a larger percentage of the population is working, there is a higher uptake in commuting on public transport. Women with caring responsibilities work fewer hours, have lower wages, and commute less [21,28,29]. The inverse is typically true for fathers who undertake caring responsibilities [32].

5. A Modern Status Quo of Prevailing Barriers to Equal Opportunity in PT

It is appropriate to take stock of the current state of affairs with respect to female PT passengers and their travel and experience in comparison to male users. In consideration of the presence or lack, of equitable service for all, the gender disparity is clear when it comes to the specific issue of safety and security.

5.1. Safety

A Transport Infrastructure Ireland report, "Travelling in Women's Shoes", [33] identified that: "Safety (is) a primary concern for women and influences their daily travel choices." Gonzalez Carvajal, Alam [34] detailed the disproportionate effect on women from gender-blind policies in transport. Homogeneous approaches to all passengers may meet equality requirements, but do not recognize the imbalance in security needs among genders. The global #MeToo movement has highlighted the scale of unwarranted and unsolicited verbal and physical contact women encounter in comparison to men, with Loukaitou-Sideris [35] commenting that: "Trains and buses are ground zero for the kinds of incidents highlighted by #MeToo." Numerous surveys show the magnitude of these disparities. For example, when asked about travelling after dark and considering a variety of London-area transport settings, there was a greater than two-fold increase in reporting of unsafe feelings for women as compared to men [36]. Similar disparities were revealed by a safety and security report [37], and nearly identical values of 2.3 responses from women for every 1 from men were presented in a report compiled for the 2018 G7 [38]. The trend continues in 63% of San José University students surveyed reporting experiencing harassment [39]. The same findings, with a greater than 2-to-1 ratio of women to men, was also present for questions about feelings regarding being unsafe in transport situations. Disturbing statistics validate women's concerns for safety, with nearly 3 in 4 experiencing sexual harassment in a public space [40] and 85% on public transport in France [41]. The gravity of this issue becomes more pronounced due to under-reporting or incredulous responses from authorities [40].

5.2. Accessibility

Gender equality and equity is still in need of redress, with many historically gendered roles playing out globally today and contributing to molding and limiting equitable accessibility to PT. Women constitute 94% of those taking family and home care responsibilities [42]. Women's travel patterns and behaviours are often still centered around care-giving responsibilities, necessitating high frequency or multi-model trips [32]. Gaps exist in the planning of PT systems for such journeys caused by additional responsibilities. This results in limiting access to safe and reliable mobility modes. Planning and design's focus on primarily radial, single-mode, one-directional, commuter-centered working trips neglect the shorter multi-destination journeys, which may include trips to locations such as schools, grocery stores, or (health) care facilities [43]. The complex and dynamic "Mobility of Care" journeys [44] are the prominent factor in women's travel patterns [33]. Without considering additional service elements to meet the needs of mobility of care transport, accessibility is severely limited for large sections of the populous. Authorities' decision making has resulted in policies that, "for most countries remain unrelentingly gender-blind" [45]. Echoing the findings of Loukaitou-Sideris [46], it is incumbent on decisionmakers not only to recognise the gaps in provision of need for PT users, but also to promote and deliver infrastructural changes to close them.

5.3. Infrastructure

A macroscopic picture of transport infrastructure, from first to last meter of a journey and not limited to time spent in direct interaction with a PT vehicle, sheds light on barriers to fair and equitable mobility for women. Safe and amenable spaces must exist from origin to station and throughout the journey to the final destination. These spaces display many common characteristics which can significantly improve the lived mobility experience of women. Sufficient lighting [47], stops, and walking or cycling routes that are properly integrated into the built environment, including such stops and routes close to residential areas and ensuring that pedestrian zones fully encompass key public spaces, such as school or healthcare facilities [48], allowing a clear line of site for other users and vehicles on transport routes and hubs; provision of walkways sufficient to accommodate children's buggies or strollers [43], and more, are needed to improve the transport experience for women. The lack of such infrastructure occurs because it is often viewed as an afterthought to the provision of PT along a specific single-use service corridor: "*Women's mobility needs are often not taken into consideration at the early stage of designing, planning and developing transport systems, services and infrastructure*" [49]. It is at the planning and decision-making stage of infrastructural projects that their considerations are necessary. Overlooking them or defaulting to land use that fails to meet a population's present and future needs deters multimodal, sustainable transit decisions while simultaneously adding risk to those with already limited mobility choices: "Well planned infrastructure is also vital for women's safety, with well-lit streets and transport plans that minimize risks for women and girls travelling alone and support decisions to commute" [50].

6. Methods

The DIAMOND Project—Use Case 1: Public Transport Infrastructure (Railways) formative focus groups and scoping literature survey helped mold an understanding of the meaning of fairness in relation to women in transport [15]. Fairness characteristics (FC) and fairness characteristic clusters (CFCs) were developed based on themes most prominently emerging from these works. Data collated from focus groups of PT users and issues of inequality, as identified from the literature review, collectively informed the categorization of cluster fairness characteristics (FCs) as illustrated in Figure 1 below.

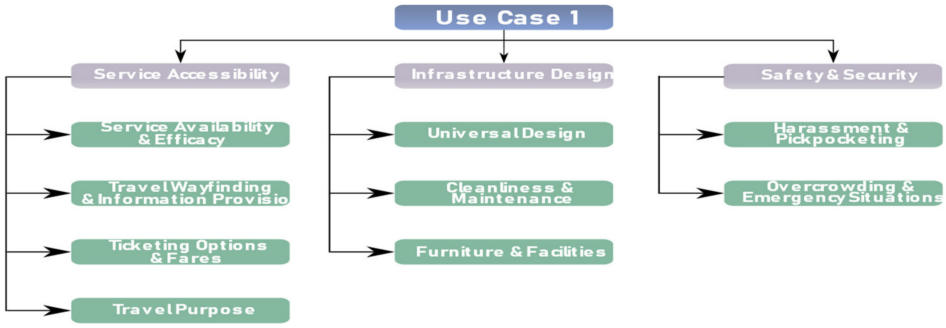

Figure 1. Hierarchical Thematic Fairness Characteristic (FC) Structure.

- The FCs were used as a guide to obtain key information, specifically [50]:
- Factors affecting women's travel choice;
- Relevant factors discriminating between different transport modalities.

Focus groups and literature context informed the classification of three main themes (Figure 1) which served as pillars of our methodology to allow the exploration of multi-modal PT adoption: service accessibility, infrastructure design, and safety and security. Studies in the DIAMOND project evolved via themes emerging from these to analyse safety and security, accessibility, and capacity to address basic mobility needs from a gender perspective.

6.1. Quantitative Design and Sample

To assess passenger characteristics and travel experiences, surveys were offered to Irish PT users. Information gained from qualitative data created an image of a typical passenger, their PT habits, experiences, barriers, and incentives. This image helped establish a framework of interrogation with respect to qualitative interviews.

Questionnaires were tailored towards inquiry on the needs of users in relation to railway transport services and infrastructure. Surveys were designed to access user satisfaction regarding FC classifications, their mobility patterns, and socio-demographic characteristics which allowed for the disaggregation of data. In parallel, the surveys aimed to reveal the scale at which PT organizations met the needs of users by identifying users' ability to travel in an appropriately designed transport system that met basic expectations and was environmentally sound. Prior to delivery, questionnaires were tested on a micro-sample of passengers to ensure clarity, understanding, and validity of the material.

Survey data were collected from 336 participants, aged 18 and above, on major intercity and suburban trains. The simple size collected was 336 due to the constrains of the pandemic, with a face to face survey used before the advent of COVID-19, which had to be halted during the pandemic. The quantitative data was used to highlight significant finding in relation to the actual sample collected and to prompt further qualitative investigations.

Data was collected during both peak and off-peak hours. Questionnaires were issued in person and via an online survey platform. Some two thirds of all participants were surveyed in person on commuting trains. The remaining survey participants were engaged via the online platform, which was available on the service providers' websites, the project website, and project partner websites. Information surrounding the study was clearly explained to participants beforehand, either online or with a physical brochure provided in person, to further detail the research and expectations from the survey. All information gathered from questionnaires was analysed.

Accessibility for users was assessed with questions querying the ability of all groups to access services and undertake activities that people have reason to value; it was judged in terms of equitable availability, design, and comfort provided, e.g., to those with children, in terms of fares and costs for those with lower income, for passengers of varying ability, considering distribution of costs and benefits, etc. Safety and security concerns for users was assessed by questions focusing on users' ability to transport themselves and their belongings without harm while engaging with a PT service. Experiences beyond time spent on PT service vehicles was also considered with questions addressing passenger engagement in and around stations, stops, and the surrounding environment and interlinking services. The state of the infrastructure and design was queried with questions considering the cleanliness and maintenance standards of the provided service, facilities made available for people with different abilities, e.g., those with caregiving responsibilities, the elderly, those with disabilities, etc., along with the environmental conditions and the extent to which the design of the service and interlinked environments addresses gender issues. Participants rated their responses on a Likert scale of 1 (strongly disagree) to 7 (strongly agree).

6.2. Qualitative Design and Sample

A total of 22 participants were interviewed. A semi-structured question set was designed to cover the macro-themes that exemplified the classification and definition of the factors influencing participant experience with PT. Firmly informed by FCs, interviews allowed for extraction within the confines highlighted by the theoretically defined categories [32]. Questions were informed by the quantitative study to further understand the motivations and barriers for user engagement in PT. Sample collection included both a user satisfaction questionnaire and socio-demographic information. Interviews were conducted on an online platform. Participants were selected from survey sampling, newsletter invitations, and the adoption of a snowball effect approach. Our content-driven process distributed pertinent materials electronically, including consent forms, socio-demographic

questionnaire, and documents regarding the study. Dates were offered pre-interview for the convenience of participants. Interviews were transcribed verbatim. Joint analysis of materials was adopted, allowing for a bilateral process and analysis that embodied different perspectives to reduce subjective interpretation, as promoted by Bazely [51]. Data was analysed separately, with findings exchanged between analysts, allowing for data clusters to be re-examined and re-interpreted. Progression involved discussion and questioning approaches to coding clusters, i.e., what assumptions were made, how data was analysed, and why particular decisions were adopted. Analyses were applied, paying consideration to both manifest and latent content [52], enabling a depth in the understanding of data [53,54]. Materials were divided into equal clusters upon established confines for coding on NVIVO data analysis software and cross-checked to highlight inconsistencies and/or disagreement in relation to interview data. Interviews recorded with consent allowed for nuanced communications to be extrapolated from the data. These approaches collectively informed a combined analytical process, allowing for exhaustive evaluation [55].

7. Results

7.1. Descriptive Statistics

Quantitative survey data helped provide a baseline for the demographic overview of Irish PT users. Distributions of key characteristics appear in Figure 2A–E below.

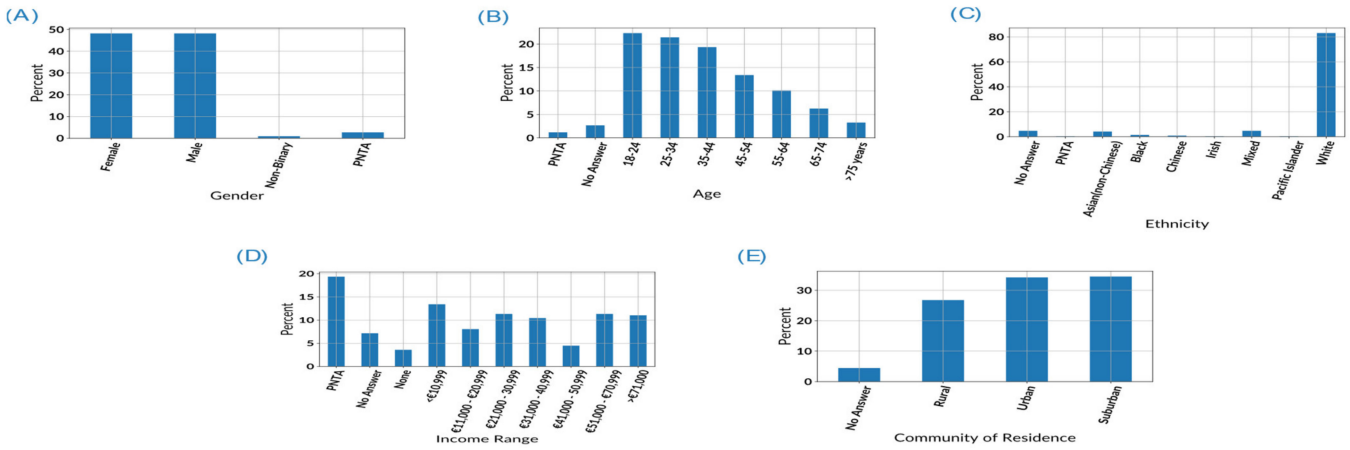

Figure 2. Distribution of Key Demographics for Surveyed Passengers—(**A**) Gender, (**B**) Age range, (**C**) Ethnicity, (**D**) Income, (**E**) Environment.

The mode participant was a white, college-educated, urban dwelling heterosexual young person in full time paid employment.

Some 30% of women and 20% of men reported undertaking caring duties for children, with a frequency of "sometimes", "often", or "very often".

7.2. ANOVA Statistics

A series of one-way ANOVA tests using SPSS V28 were conducted to examine whether men and women differed significantly in their responses to the survey.

Regarding "capability of the service to meet user's needs", there was no significant differences for men and women, except in regard to the question: "The frequency (number of trains) and service efficiency (being on time) at this station is adequate for my needs", with women (M = 5.33, SD = 1.62) agreeing more with this statement than men (M = 4.9, SD = 1.56), F(1, 320) = 6.067, p = 0.014, d = 0.27.

For "Accessibility", there were no significant differences, except in regard to the following statement, "I can easily get to my destination from the station by walking or using other means of transport", with women (M = 5.38, SD = 1.32) agreeing more than men (M = 4.99, SD = 1.66), F (1, 310) = 5.36, p = 0.021, d = 0.26.

For "Safety and Security", there were no significant differences for women and men, except regarding the question, "When arriving at or leaving the station I feel safe at any time of the day", with women (M = 4.30, SD = 1.64) disagreeing more with this statement than men (M = 4.93, SD = 1.44), F (1, 311) = 12.88, $p < 0.000$, d = 0.41.

Note 1: Due to small number of non-binary (N = 3) and prefer not to say participants (N = 9), it was not possible to include these groups in the analysis.

Note 2: Original themes were derived from focus group and literature review (Figure 1). Where infrastructure is prior, factor analysis informed the emergence of capability to meet required needs, based on factor analysis and the re-categorizing of initial clusters of fairness characteristics. The project was built using work packages (WP) involving concurrent contribution from different working groups independent of each other. For such reasons, the qualitative outcome holds initial categorization, differing from that of the quantitative outcome, where the analysis included "capability to meet required needs." Nevertheless, this does not take away from the outcomes of the study.

Note 3: A priori power analyses using G*power 3 (Faul, et al., 2007) indicated that achieving 95% power to detect a medium effect size (f = 0.25) at $\alpha = 0.05$ would require 210 participants in a one-way ANOVA; sufficient data were subsequently collected.

7.3. Qualitative Analysis (NVIVO Stats)

A total of 22 participants were interviewed. The demographic breakdown showed a population comprised of more women (68%) than men (32%). A majority were living in urban (59%) and suburban (32%) areas. Of the total sample size, only 9.1% were of the age of 75 years or above. Ethnic composition was primarily White European (68%), leaving a minority (32%) of Asian, Black, and Mixed ethnicity backgrounds. The participant demographics were broadly in line with those of a mode user as identified from the quantitative data. Only a small portion of those interviewed reported having caring responsibilities or frequently travelling with dependents. The thematic analysis focused on the previously defined (See Figure 1) Hierarchy of Primary Fairness Characteristics: accessibility and safety and security, plus emerging themes. Cumulative passenger responses to these overarching considerations are presented in Table 1 below.

Table 1. Respondents Cumulative Frequencies for Accessibility (left) and Safety and Security (right) Fairness Characteristics (FC).

Accessibility		**Safety and Security**	
FC	**Response Frequency**	**FC**	**Response Frequency**
Availability and Efficiency	>75% all users	Police or Security Staff	>75% all users
Operational Hours and Frequency	>75% all users	Overcrowding and Emergencies	>75% all users
Travel and Wayfarer Information	>75% all users	Sense of Place	>60% women
Service Convenience	>66% all users	Harassment and pickpocketing	>50% all users
Ticketing and Fares	>66% all users	Visibility of Surrounding Area	>50% women
Location of Station	>60% women	Personal Space	>50% women
Service Reliability	More women than men	Boarding Protocol	0% men
Multimode Integration	More women than men		

The frequency of responses to secondary FC themes were identified. Figure 3 presents the percentages of male and female participants responding with considerations of these secondary theme together with the distribution of total male and female responses. This data highlighted an overall weighting of FC considerations toward female respondents. A

set of three accessibility-related FCs—multimodal service integration, service reliability, and station location—were considerations scarcely expressed by men.

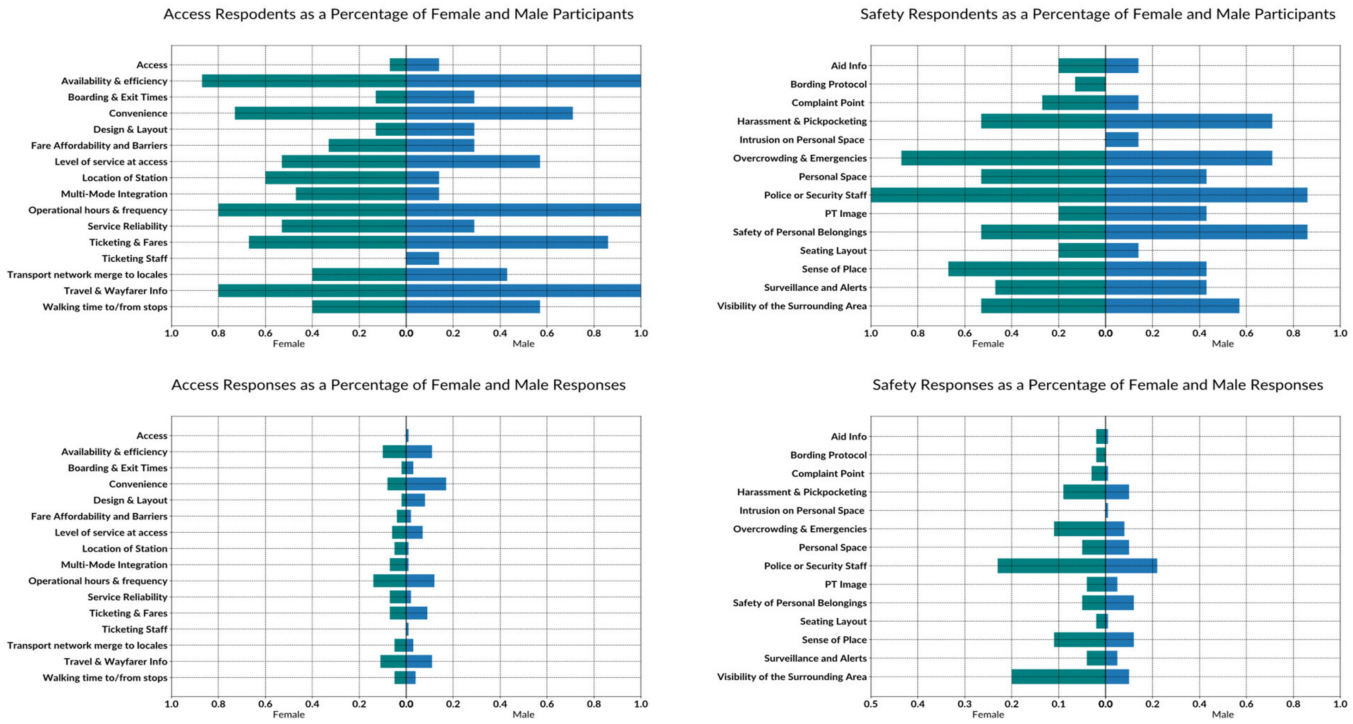

Figure 3. Fairness Characteristic (FCs) Respondents (**upper**) and as Percentage of Total Responses (**lower**) for Access (**left**) and Safety and Security (**right**).

Table 2 below presents the hierarchy of the importance of FC from our participants based on frequency of responses.

Table 2. Hierarchy of Fairness Characteristic (FCs) Clusters Combined Frequency; High (**top**), Medium (**middle**), and Low (**bottom**).

	Safety and Security	Accessibility of the Service	Infrastructure and Design
High	Police force, security, or staff personnel Visibility of the station's surroundings	Operational hours and intervals Convenience of travel system and process Travel and wayfinding information Service availability and efficiency Ticketing options and fares	Furniture and facilities Universal design
Medium	Sense of place Overcrowding and emergency situations Harassment and pickpocketing Safety of personal belongings Offering adequate personal space	Level of service at access point Reliability of available service mode Walking time from points of interest to access Integration with other modes of public transport Transport network merge to locales Design or layout of transport mode Location of station Fares, affordability, and exclusion Exit time and boarding of service	Cleanliness and maintenance
Low	Surveillance and emergency alert systems Social image and perception of PT Violation complaint information point Improved layout of seating Display of campaign and help line numbers Boarding measures or protocols *	Accessibility of modes Available staff at ticket office	Ventilation and air condition

Only mentioned by women (*).

8. Discussion

The quantitative data presents a characteristic outline of the PT user. The interview data demonstrates a marked difference in how women and men engage with transport services. Emergent themes (ET) identified in the analysis of qualitative data present diverging needs between genders. The understanding of ET and how they relate to travel considerations from service function to safety and security, interactions with staff, and service infrastructure are not experienced equally. A PT service is viewed through a very different lens for women and men, resulting it an antithetical meaning of what mobility on a public service means [56]. A more tangible contrast becomes possible when we allow the data to develop profiles typifying the female and male user. The perceptions and user-experiences of the service as revealed by these profiles also allows for the formation of a profile of the PT service itself.

Our male user engages in a pragmatic, functional mobility transaction of A-to-B transit. A service disconnected from its surroundings, dissociated from the user populous, accommodates this approach. Our female user is prompted to approach the service in a deliberately meticulous fashion, driven by critical attributes of a journey being overlooked by the service provider, or navigating transit where these attributes are absent. In order to sufficiently illustrate the disparities between the experiences of women and men while interacting with PT, we flesh out these profiles from our data, revealing the kind of variation in concerns of importance related to their journeys and forming a personalized user experience. The disparate priorities and travel requirements are exposed by our user profiles. Their wants and needs and how they are or are not met exposes the limits of universal inclusivity, access, and fairness.

8.1. The Male User

The male user is service-driven and approaches PT from the perspective of a functional mobility transaction (FMT). The traveller is practical, and he reflects the stereotypical urban/suburban working commuter. Many service aspects are tailored to accommodate such a customer, most notably high-capacity, high-frequency services, which are naturally concentrated at morning and evening times. Male users do not often consider travel parameters beyond an FMT; aspects of comfort, aesthetics, illumination, seating arrangements, wayfarer information, service availability to choice destinations comprise service amenities that are sufficient for this user. Our male passenger does not consider these issues, as they are provided by default to meet this user's needs. Specific comments regarding provision of signage and audio information reinforce this, as this user is primarily interested in FMT with a highly efficient service focused on A-to-B transit.

The travel parameters which are nearly absent from comments and considerations of this user are noteworthy. A user who does not at all consider difficulties during boarding, reveals a passenger who is fully able-bodied and travelling independently. The location of the station is not important to this user, as long as the transit mode services a chosen destination. Absent also is any factor in determining travel choice related to harassment. The typical user here does not experience unwanted attention, contact, or harassment; it is an issue that does not exist for him. This male is nevertheless mindful of safety and security on PT and empathizes with potential hazards that female and older users may encounter when travelling after dark. He is aware that anti-social behaviour, particularly drug use, adds to perceived risk in and around services and stations. Their recognition of problems that other users encounter is, however, primarily theoretical. Sexual harassment or unwarranted attention that their female counterparts endure is not a characteristic our male user experiences [57], but rather witnesses, or is aware of through news reports. The male user expresses concern for the risk of night-travel for passengers, but it comes from a conceptual perspective that additional security personnel may act to deter anti-social behaviour or harassment, and not from a lived experience of the personal need for such security measures. Our male user does not consider safety and security beyond additional staff visibility to add to an overall perception of safety for a service.

Our overall profile points to a user that approaches PT in a dedicatedly practical manner. His trip is not typically affected by unwanted harassment, although he is aware that other users are vulnerable to anti-social behaviours. Factors of the journey apart from those pertaining to a FMT are not at the forefront of consideration; while sometimes recognized on a cognitive level, they often do not exist for the male user.

8.2. The Female User

The profile shaped by our female user data not only shows a user with markedly contrasting PT concerns, but also a user interacting with services in a fundamentally different fashion. A holistic approach is essential for our female user to navigate PT, where comprehensive attention is paid to a multitude of travel parameters. Considerations of ill-supported safety and security, insufficient personal space, distrust in reliability or punctuality, or onerous interconnectivity modes necessitate our female user to interact strategically [32,33]. The user concerned with a multiplicity of travel parameters beyond A-B transit plans the trip with interrogation of the ET as a prerequisite for instigating engagement with the service [58], with questions such as, "Is it safe?", "Does it have enough space for my dependent and me?", "Is it accessible, economically, or accessible from extra-model connections?" and so forth. The FMT is insufficient for this user. Considerations of accepting a functional transit need of destination or schedule are necessarily preceded by those questions which determine if the service is accessible on a fundamental level: is the service offering fit for the purpose?

Our female urban/suburban PT user is provided with sufficiently broad destinations and service offerings, especially for services terminating close to a major urban center. This female passenger plans her trip as a matter of course. Real time, dynamic service information is important to this user in aiding with journey plans. She identifies modes that are logistically accessible, with appropriate operational hours and service frequency that serves the destination of choice, that offer sufficient space for the passenger, dependents, or personal belongings, and that also allow reasonable connectivity to additional services and transit modes, including walking [33,43,44,48]. As with the male, the female user tends to travel alone, although they often do so as a result of the potential impediments in easily boarding a service with an accompanying dependent. This specific accessibility limitation disincentives the user from travelling with, for instance, a schoolchild, and instead choosing a personalized mode, such as a taxi or private vehicle [32]. Disjointed, inconvenient, or onerous connections to ancillary travel modes, including long walks to or from stations, can discourage her from engaging with a service. Changes in mobility behaviour are also prompted by inconvenient, unreliable, or infeasible scheduling. This can result in knock-on effects of their availability to undertake the morning or afternoon school run or, for the longer distance commuter, to impose working hour constraints due to impractically early starts. We already see a stark contrast in the travel considerations of the female user in comparison to her male counterpart, with a more nuanced, acute sense of how various mobility parameters affect her journey and choice to engage with a service.

If and when a decision is made to undertake a journey on PT, the overarching ET of safety and security becomes paramount for this user. The outstanding issue of personal safety is borne from firsthand victimization or witnessing verbal or physical abuse [35]. This woman travels with an acute understanding of the risk of the potential for attacks, abuse, or other unwanted encounters, such as anti-social behaviour or intimidation [59]. Staffing and visibility, both environmental and interpersonal, are dominant factors in her measure of safety and security. Quieter, dimly lit, or isolated areas trigger an underlying vulnerability for this user; a background intimidation is present due to an uncertainty about the environment and about what might be in the shadows [36,39]. This creates a travel experience dominated by feelings of isolation, fear, and anxiety, which are exacerbated by low-density, lonely, night-time travel modes. This female user sees these after dark journeys as presenting additional risk of unsolicited interaction from men, from unwanted attention to sexual harassment [36]. Excess time spent on a journey, for example, due to long walks

to or from an isolated station or excessive waiting time due to infrequent services, elicit a sense of being especially exposed to these dangers.

Appropriate lighting is not an outright solution to her PT concerns. Deterrent surveillance measures and real-time access to security staff or personnel who are able to intervene in a timely fashion is essential for the female traveler. Discrete reporting channels are preferred, in order to ensure situations are not unintentionally escalated and to maintain privacy. Reporting alone is ineffective unless it is easily accessible to all, free from technological or economic barriers, and is properly balanced by appropriate response times. Preventing unwanted events being initiated, or intervention to minimize escalation, are the most desirable outcomes for the fearful situations worrying our female user. Present and accessible security staff are considered the primary mitigation tool when they can be notified of a situation and promptly intervene. When security personnel are available, complaints are at times met with incredulity or quashing of severity. Interventions are often perceived as insufficient or untimely, especially evident for women of colour. While intercession from a third party can also be welcome, a good Samaritan is not always available or willing, for fear of being a target themselves. The conformity to not challenge verbal or physical anti-social behaviours by fellow passengers is a further worry to our female passenger [60].

The female user profile shows a person approaching PT through a lens of misgivings and uncertainty. While she does engage with services regularly, there are accessibility issues in relation to comfort, space, or reliability. Certain modes present absolute barriers where operational hours and frequency or accommodation of dependents is concerned. There is also an underlying constant of apprehension and vulnerability to the perceived risks involved during transit. Harassment is experienced, and mitigation measures can be implemented to reduce occurrences or severity, primarily by readily accessible security staff able to intervene and sufficient lighting to ensure adequate visibility of others, of the service infrastructure, of the surroundings, and of interconnecting modes.

8.3. The Public Transport Service

Our two user profiles inform us of a PT service that does not provide equitable functionality to all of its user base. While the A-B mobility for a single mode provides value to users, the service is distant, overcrowded, unreliable and disconnected from both multi-modal options and from the users themselves. These characteristics compel elements of the target user base to avoid the service and use a private vehicle. The focus of the PT system is one of fundamental function, with staffing nearly exclusively focused on logistical and operational concerns, on the ticket and not the ticket holder, on the vehicle and not the journey. Operational hours are manifestly geared to provision of the morning and evening commuter with, at times, a dearth of service flexibility at other hours. The individual service is rarely agile enough to accommodate satisfactory multimodal interconnectivity, limiting a holistic interaction with destinations supplementary to the daily commute, including walking routes, leisure facilities, healthcare centers, satellite locations, etc.

There is a lack of trust in the safety and security offered by the PT service. Staff availability is inconsistent across modes, with a concentration on the high-density, high-frequency services, and when service personnel are present, their availability is sporadic. Not only is intervention capability and authority uncertain, the capacity to even report an issues of harassment or abuse is perceived as sorely lacking.

The PT service provides a direct A-B single mode FMT for many users but is lacking in a broad appreciation of the nuanced manner in which a user base patronises the service offering and of the disparate considerations of their journey parameters. The implication of these disparities is a perpetually disenfranchised portion of the user base. Policy makers require an understanding and appreciation of the barriers and inequities experienced by this group in order to address fuller inclusivity and user uptake [10,50].

9. Limitation and Opportunities for Future

This work is book-ended by demographic, societal, and practical limitations. Focus groups were a preferred method for sourcing as representative and demographically disparate qualitative data as possible. The global situation resulted in remote data collection being employed, which we used to navigate the everyday disruptions to our interview base, including caring, daily duties, spatial, and timing limitations effecting data collection. Remote 1-to-1 interviews allowed an intimate and fluid interrogation of participants, but impinged on gauging an unabridged latent participant response, diminishing contextual interpretation of the user's qualitative contribution. Primary rail transport users offered representation of a mode user: the young, professional commuter travelling alone. It naturally omitted several marginalized groups' assessment of PT, particularly those limited by economic disadvantages, the disabled, marginalized groups, migrants, members of itinerant communities, non-native speakers, etc.

Data analysis was guided by DIAMOND project motivations, work package deliverables, and definitions which evolved dynamically. Mixed method approaches present natural barriers to integration, but are "yet desirable to corroborate or integrate conclusions drawn from data generated through diverse perspectives" [51]. Bilateral data analysis offered redundancy checks for identifying ETs, but is asynchronous with investigators applying their individual skillsets, analytical approach, and analysis styles [52] in approaching conclusions.

While the goal of policymakers and the public alike is ostensibly higher passenger uptake, the parallel motivations and interests must be understood to allow for the development of tools to sufficiently bridge them. Our work does not reflect the disenfranchised user base. Addressing this gap is a natural focus for future work, aiming to help policymakers comprehend and enhance implemented procedures in the context of issues encountered from the lived experience of all PT users.

10. Conclusions

When looking into the concept of fairness in transport, inclusivity relating to users plays an important role. For a system to be both fair and inclusive, there is a need for valuable practices, implementation, and outcomes within the system that provide equitable access to transport resources for all abilities/disabilities. For PT, these resources are not limited to, but include the capability of the system to be accessible, safe, and meet the needs of its users without exclusions.

To understand the perspectives of the factors affecting women's use of public transport, it is important to acknowledge the existence of mobility disparities between men and women. Likewise, it is paramount to understand that genders vary in accordance to strata in society. With PT usage, there are more female than male users. Caring responsibilities, family duties, motherhood, lower income, age, and abilities/disabilities are more prevalent societal factors for women. For public transport to be inclusive and fair for all, there is need for it to embrace the needs of women and comprehend the factors that affect or discriminate against use.

For women, safety standards at the forefront for themes influencing their use of PT. This is particularly linked to the visibility of the surrounding area of the station and the need for the presence of security personnel. Characteristics of safety are not independent; rather, they are intertwined with the accessibility of PT. This creates a climate around PT for woman, dominated by feelings of isolation, vulnerability, anxiety, and fear, which affects PT behaviours for female users. To promote convenience and comfort, there is the need for better reliability and integration within the system, both within an across cities.

There is no one-size-fits-all when promoting the concept of fairness; rather, progression could be aided by looking into the granular effects of these characteristics and their interrelated existence.

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