

Article

User Priorities for Station Facilities and Related Attributes at Regional Rail Stations in Rural Peripheral Areas: A Seasonal Comparison from Austria

Dino Bakula ¹, Marcel Weber ^{2,*}  and Bernhard Rüger ² 
¹ Stoik & Partner ZT-GmbH, Fendigasse 8, A-1050 Vienna, Austria; dino.bakula@stoik.at

² Research Unit of Track-bound Transportation Systems, Institute of Transportation, TU Wien, Karlsplatz 13/230-02, A-1040 Vienna, Austria; bernhard.rueger@tuwien.ac.at

* Correspondence: marcel.weber@tuwien.ac.at

Abstract

Rural peripheral regional rail stations are important access points within everyday travel chains, yet their on-site facilities are often limited. This study examines the perceived importance of station facilities and related attributes and investigates seasonal and user-group differences. The dataset comprises 1820 questionnaires from 16 stations in Lower Austria and Upper Austria: 562 summer station-based responses, 868 winter station-based responses, and 390 winter household responses. To avoid confounding recruitment mode with season, the primary seasonal analysis compares only station-based respondents, while the household sample is analysed separately as a wider catchment area perspective. Weather shelter, toilets and reliable passenger information are the highest-rated attributes. The like-for-like seasonal comparison indicates a largely stable functional baseline, whereas selected supplementary attributes show only small to modest seasonal differences. Women assign higher importance to several supportive facilities, while the importance of several optional offers declines with age. The household sample differs substantially in station-use frequency from the station-based samples and therefore complements, rather than directly extends, the seasonal comparison. The findings support a planning hierarchy in which essential baseline facilities are secured before context-dependent comfort, supply and optional services are considered. This evidence is analytically transferable to comparable smaller regional stations in rural and peripheral settings beyond Austria.

Keywords: regional rail stations; rural peripheral areas; station facilities; user priorities; station accessibility; passenger information; seasonality; Austria



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1. Introduction

Rail transport has gained increasing importance in Austria in recent years, both in terms of passenger demand and passenger-kilometres travelled. Austria is among the leading European countries in rail use per capita and recent developments suggest that rail has further strengthened its role as a sustainable alternative to private car use [1–3].

At the same time, many regional rail stations in rural peripheral areas provide only a limited range of facilities despite their important function as access points to the public transport system. In such contexts, stations are not merely operational nodes but interfaces within everyday travel chains. Weather protection, passenger information, accessibility, waiting conditions, and access and egress conditions can influence the usability and perceived attractiveness of rail travel [4–6].

This challenge is particularly relevant in rural peripheral settings, where mobility options are often strongly shaped by private car availability and where public transport must respond to heterogeneous everyday needs. Diversity-sensitive planning further underlines that stations should accommodate different life situations, mobility patterns and functional limitations rather than relying on a uniform user profile [7–9].

The empirical work reported here builds on the Austrian research context established by the cooperative Station4All project, which investigated how smaller stations and stops in peripheral rural areas can be integrated more effectively into everyday life. The project was coordinated by netwiss OG and involved TU Wien, ÖBB-Holding, SPAR Österreichische Warenhandels-AG, the municipality of Neumarkt am Wallersee and behavioural researcher Elisabeth Oberzaucher and her team [10].

Subsequent winter surveys at eight stations in Lower Austria and eight stations in Upper Austria provided the comparative baseline for the present seasonal follow-up [11–13]. Against this background, the present paper asks which station facilities and related attributes are perceived as most important, whether their perceived importance differs between summer and winter when comparable station-based samples are used and how priorities vary across user groups. Service quality is not operationalised as an independent multidimensional construct; rather, it is treated as a broader planning implication of the observed facility priorities.

The study is guided by three research questions:

1. Which station facilities and related attributes are perceived as most important at smaller regional rail stations in rural peripheral areas?
2. To what extent do these priorities differ between summer and winter when comparable station-based samples are used?
3. How do priorities vary across user groups and between station-based respondents and the wider station catchment area, as represented by the winter household sample?

To answer these questions, the study analyses 1820 questionnaires from 16 stations. The primary seasonal comparison is restricted to 562 summer and 868 winter station-based responses, whereas the 390 winter household responses are analysed separately. Item-wise descriptive statistics, five-category distributional comparisons with false-discovery-rate correction, effect sizes and rank correlations are used to distinguish robust patterns from descriptive tendencies. Based on the literature, the main analytical expectation is that core functional attributes form a comparatively stable priority baseline, whereas supplementary facilities are more context-sensitive and may vary more strongly with season and user characteristics. The remainder of the paper is organised as follows: Section 2 reviews the literature and positions the research gap; Section 3 describes the study design, sample and analytical procedure; Section 4 presents the empirical results; Section 5 discusses their planning implications and transferability; and Section 6 summarises the conclusions, limitations and directions for future research.

2. Literature Review and Analytical Positioning

2.1. Station Facilities as Components of Rail Accessibility and Usability

Research on rail use has repeatedly shown that the station is part of the travel experience rather than a neutral point between access and train travel. Brons et al. [14] demonstrated for the Netherlands that satisfaction with station access contributes to overall rail journey satisfaction and that access improvements can be particularly relevant in peripheral parts of the network. Studies of interchange environments likewise identify information, security, waiting conditions, spatial organisation and access quality as important dimensions of passenger experience [15].

This perspective is important for smaller regional stations because investment choices are constrained by passenger volumes, staffing levels and local demand. The planning question is therefore not simply whether additional facilities are desirable, but which attributes constitute a functional minimum, and which should remain context-dependent. Existing Austrian work points to weather protection, passenger information, accessibility and basic waiting conditions as recurrent baseline requirements [4,11].

2.2. Passenger Information and the Waiting Environment

Passenger information is consistently identified as a central rail attribute. Eboli and Mazzulla [6] show that information and core operational characteristics contribute strongly to perceived rail service quality. For suburban rail in Madrid, Romero et al. [16] found that information remains a key attribute across passenger segments, even when preferred information channels differ. At the interchange level, information interacts with waiting, security and spatial legibility rather than functioning as an isolated service [15]. For the present study, these findings justify treating information provision, weather protection, sanitation and waiting-related facilities as concrete station attributes. Their perceived importance is measured directly; the study does not derive a latent service quality score from them.

2.3. Accessibility and Inclusive Station Design

Accessibility research shows that station design can create or remove barriers for a wide range of users. Step-free access has benefits beyond narrowly defined mobility-impaired groups and can influence station use [8]. Research in transport interchanges also identifies spatial compactness, dedicated accessibility measures, stop infrastructure and information as particularly relevant for persons with reduced mobility [17]. Perceived accessibility is additionally linked to safety and public transport quality [18,19]. These findings support a diversity-sensitive interpretation of station requirements. Age, gender, care responsibilities and mobility or sensory impairments may affect the importance assigned to particular attributes, while some baseline facilities may remain broadly relevant across groups.

2.4. Intermodality and Rural Peripheral Station Context

The attractiveness of rail stations depends on access and egress as well as on platform conditions. Bicycle–train integration can substantially affect public transport accessibility and rail use [9], while broader station-access research shows that access quality can be particularly important in peripheral network contexts [14]. For smaller rural stations, walking routes, bicycle facilities, Park-and-Ride, feeder services, wayfinding, weather protection and information therefore form an interconnected access system rather than a collection of isolated amenities.

The available international literature is nevertheless dominated by metropolitan systems, larger interchanges or general rail service satisfaction. Evidence that ranks a broad set of concrete facilities at smaller rural regional stations, distinguishes comparable seasonal samples and tests user-group differences remains comparatively limited [15–19].

2.5. Perceived Quality, Facility Use and Station Activities

Railway service research distinguishes between related but non-identical constructs: the perceived importance of an attribute, its perceived performance or quality, and overall satisfaction with the station or journey. The present study focuses on the first of these constructs. By contrast, much of the established service quality literature examines satisfaction and perceived performance. Research on station-based customer satisfaction demonstrates that perceived service quality can vary spatially across rail stations and

that the importance and evaluation of individual attributes depend on local context [20]. Importance–Performance Analysis provides a complementary perspective because it explicitly separates what passengers consider important from how well they believe it is provided. For example, Runkawee [21] identified restroom cleanliness and regular passenger information as high-importance but comparatively low-performance attributes at two intercity railway stations. These findings are directly relevant to the interpretation of the present rankings: a high importance score indicates a user-reported priority but does not by itself demonstrate inadequate provision or dissatisfaction with the current performance.

A second strand of recent research focuses on how passengers use travel time and how activity opportunities contribute to perceived quality. A recent study by Fabre et al. [22] examines satisfaction among regional railway users in relation to perceived service evolution and on-board activities. This activity-oriented perspective has subsequently been extended in peer-reviewed work, showing that comfort conditions affect passengers' ability to undertake activities on board and that these activity opportunities are associated with overall travel satisfaction [23]. The focus of these studies, however, is primarily the in-vehicle part of the journey. Drouet et al. [24] broaden the perspective by conceptualising railway passenger experience across multiple touchpoints, including stations, passenger information, staff, parking and bicycle facilities. At the station level itself, Paquier et al. [25] show, through observations and interviews at two major Paris railway stations, that waiting time is filled by activities such as consumption, working, digital communication, movement, observation and social interaction. Their concept of the railway stationscape therefore supports treating the station not only as an access node but also as an activity environment.

Comparable station questionnaires also increasingly connect actual facility use with satisfaction and unmet needs. The Rail Customer Experience Survey conducted by Transport Focus, for example, records which station facilities passengers used, their satisfaction with those facilities and whether there were activities they wanted to undertake at the station but were unable to perform [26]. This differs from the present survey, which measures the stated importance of a predefined set of facilities, irrespective of actual use. Taken together, the literature therefore confirms that station-focused studies exist but also reveals a specific gap: little evidence combines a broad facility-priority battery at smaller rural regional stations with actual station activities, facility use, perceived performance, unmet activity needs and seasonal variation. The present study addresses the priority side of this gap; linking these priorities to observed use and experienced quality is a logical next step for future research.

2.6. Research Gap and Analytical Positioning

The present study addresses this gap by focusing on the perceived importance of specific station facilities and related attributes at 16 Austrian regional rail stations. Its contribution is threefold: it derives a hierarchy of baseline and supplementary attributes, isolates seasonal differences through a like-for-like station-based comparison and analyses the winter household sample separately to capture the wider station catchment area. Accordingly, the paper does not claim to measure service quality as a multidimensional construct. Instead, facility priorities are interpreted as an evidence base for station planning and as one set of determinants that may contribute to perceived station quality. This distinction also limits the conclusions to the attributes measured in the questionnaire.

3. Methodology

3.1. Research Design

This paper applies a quantitative empirical design combining a summer follow-up survey with previously collected winter data. The winter database originates from station

and household surveys conducted in 2023/2024 at the same 16 locations, while the summer campaign in 2025 repeated data collection at those stations through station-based online recruitment [11–13]. Because recruitment mode and season are partly confounded in the pooled database, the revised analysis distinguishes three analytical groups: summer station-based respondents ($n = 562$), winter station-based respondents ($n = 868$) and winter household-based respondents ($n = 390$). The primary seasonal comparison is restricted to the first two groups; the household sample is analysed separately to provide a catchment area perspective. The analytical design is summarised in Figure 1.

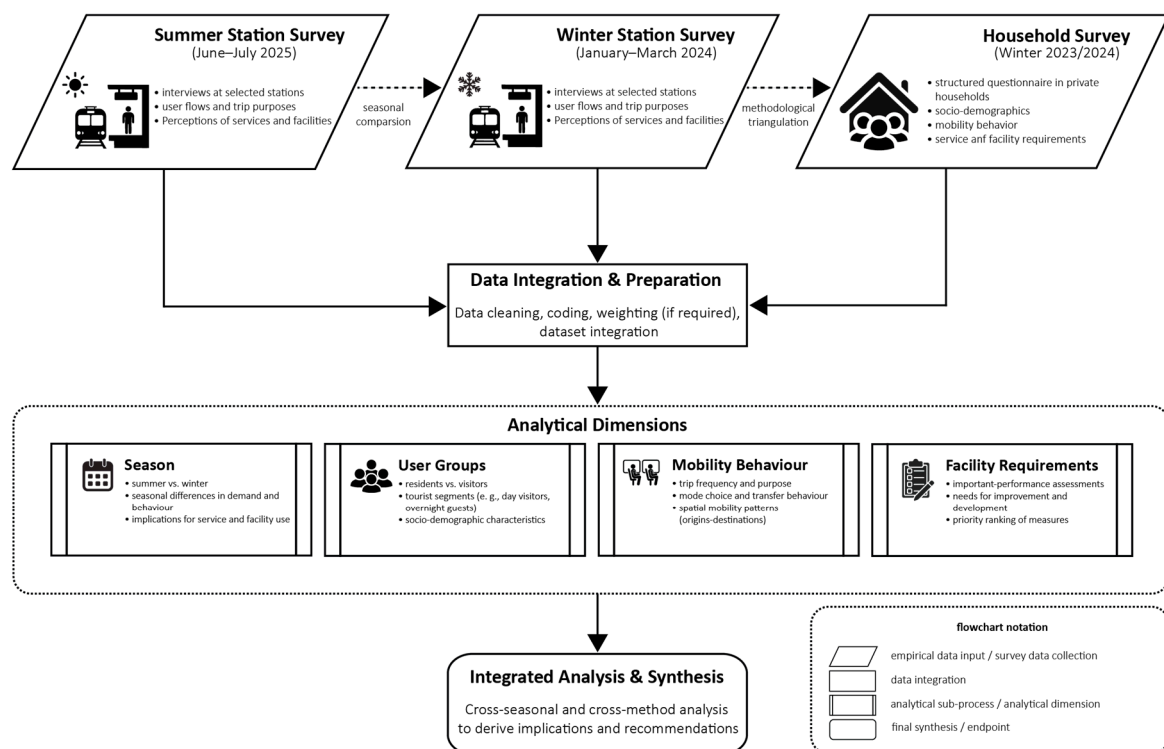


Figure 1. Analytical design of the study. Arrows indicate the flow from the three survey sources through data integration and the analytical dimensions to the integrated analysis and synthesis.

3.2. Study Area and Station Sample

The study covers 16 regional rail stations, with eight in Lower Austria and eight in Upper Austria. The geographic scope follows directly from the pre-existing winter surveys: Wagner examined eight stations in Lower Austria and Hochradl eight stations in Upper Austria and the summer follow-up retained the identical station set to enable seasonal comparison. Within each federal state, the selection intentionally combined four category C and four category D stations, focused on electrified lines, limited single-track sections to one station per line and distributed locations spatially to capture different regional settings [11–13]. According to the ÖBB-Infrastruktur station–service classification, category D represents the lowest of four service levels and includes basic access, wayfinding, passenger information, timetable/public-notice areas, replacement bus support, space for ticketing equipment, cleaning/winter maintenance, seating and weather protection. Category C includes all category D services and adds dynamic acoustic/visual passenger information and at least one lift, escalator or security service [27]. Categories C and D were therefore used as a sampling frame for smaller, less complex stations; they were not used as the sole definition of rurality. “Rural peripheral” is defined here using the functional–spatial context of the station and the Austrian urban–rural typology. Statistics Austria distinguishes rural areas in the surroundings of centres and rural areas proper

and classifies peripheral municipalities by travel time thresholds to urban and regional cores [28]. The sampled stations and their service categories are summarised in Table 1.

The sample stations are predominantly embedded in these rural classes; where an administrative classification is more urban, the station was retained only when its functional catchment and surrounding settlement structure were rural in character. Thus, station category, settlement context, line characteristics and catchment function were considered jointly. Figure 2 shows the location of the sampled stations and their position within the ÖBB rail network.



Figure 2. Study area and sample stations. ÖBB denotes Austrian Federal Railways.

Table 1. Sampled stations by federal state and ÖBB service category.

Station	Federal State	Category
Böheimkirchen	Lower Austria	Category C
Gloggnitz	Lower Austria	Category C
Herzogenburg	Lower Austria	Category C
Kirchstetten	Lower Austria	Category C
Bad Deutsch-Altenburg	Lower Austria	Category D
Enzersdorf bei Staatz	Lower Austria	Category D
Etsdorf-Straß	Lower Austria	Category D
Hohenau	Lower Austria	Category D
Bad Schallerbach-Wallern	Upper Austria	Category C
Lambach	Upper Austria	Category C
Schwanenstadt	Upper Austria	Category C
Vöcklabruck	Upper Austria	Category C
Breitenschützing	Upper Austria	Category D
Gunskirchen	Upper Austria	Category D
Haiding	Upper Austria	Category D
Lambach Markt	Upper Austria	Category D

3.3. Survey Design and Data Collection

The standardised questionnaire was derived from the winter instruments and retained the same core response structure for the summer follow-up [11–13]. It comprised four analytical blocks: travel purpose and station access; travel time, distance and station use frequency; perceived importance of station facilities and related attributes; and socio-demographic characteristics and mobility and/or sensory impairments. The facility block contained 23 listed attributes in the source questionnaire. In the original German-language instruments, the response categories were “very important”, “rather important”, “neutral”, “less important” and “not important at all”, with a separate “no answer” option. For the analyses reported here, valid responses were reverse-coded to a 1–5 scale (1 = not important at all; 5 = very important), so that higher values indicate greater perceived importance. The original German-language station-based and winter household survey instruments are provided as Supplementary File S1.

The summer survey was deliberately implemented as a station-based follow-up using QR-code flyers at the sampled stations. The winter database, by contrast, also contains household recruitment in nine municipalities through local newspapers, websites, QR codes and paper questionnaires [11–13]. This broader winter mode was not repeated in summer because the summer campaign was designed to add a station-based seasonal observation to the existing winter database rather than to reproduce every winter recruitment channel. The analytical consequences of this design difference are addressed by separating recruitment modes rather than interpreting the fully pooled winter sample as a direct seasonal counterpart.

3.4. Sample and Data Basis

The initial database contains 1820 questionnaires: 562 summer station-based responses, 868 winter station-based responses (486 online and 382 paper questionnaires) and 390 winter household responses. No questionnaire was removed globally solely because of missing answers. Instead, analyses use item-wise valid cases and report the valid “*n*” for each statistic. “No answer” and blank entries are treated as missing. The item “snack bar” (Imbiss) is excluded from cross-seasonal and pooled 22-item facility analyses because it is systematically unavailable in the summer dataset and therefore cannot support a comparable seasonal assessment. All other attributes are retained where valid responses are available. Table 2 summarises the descriptive characteristics of the three analytical survey groups.

Table 2. Descriptive characteristics of the three analytical survey groups. Entries are counts; travel-purpose items allow multiple responses.

Survey Group	<i>n</i>	Female	Male	Age ≤ 29 Reported	Regular Station Use	Never Uses Station	Mobility/Sensory Impairment	Work Trip	Leisure Trip
Summer station	562	269	274	302	456	0	42	260	146
Winter station	868	429	411	353	710	0	54	418	161
Winter household	390	222	161	69	169	13	28	141	250

All entries are counts. ‘Age ≤ 29’ combines the ‘up to 19’ and ‘20–29’ age categories. Mobility/sensory impairment denotes respondents reporting at least one specified impairment. Travel-purpose responses were multiple-choice and are therefore not mutually exclusive.

3.5. Measures and Analytical Procedure

Descriptive reporting includes valid “*n*”, “mean”, “median”, “standard deviation”, “variance” and the proportion rating an attribute as “important” or “very important”. Differences in five-category response distributions are tested using Pearson chi-square tests; where sparse expected cells occur, Monte Carlo estimation is used in IBM SPSS Statistics for Windows, version 30.0.0.0 (IBM Corp., Armonk, NY, USA). Cramér’s *V* is reported as an effect-size measure. Because multiple facility attributes are tested in parallel, Benjamini–Hochberg false-discovery-rate (FDR)-adjusted *p*-values are reported. Age gradients are evaluated using Spearman rank correlations. The primary seasonal analysis compares summer station-based with winter station-based respondents. User-group analyses are performed on the combined station-based sample to avoid confounding recruitment mode with gender, age, or impairment effects.

The analytical focus is the perceived importance of station facilities and related attributes. Results are interpreted in terms of a planning hierarchy between baseline facilities, quality-enhancing facilities and context-dependent additional offers. This hierarchy is an empirical planning interpretation of the rating pattern and is not intended as a normative technical standard.

For the winter household sample, an additional exploratory use frequency analysis distinguishes regular station users (daily/almost daily or several times per week; *n* = 169) from infrequent or non-users (several times per month, several times per year, once per year, or never; *n* = 218). Three household respondents with no station use frequency information are excluded from this comparison. The same five-category chi-square procedure, Cramér’s *V* and false-discovery-rate correction are applied. This sensitivity analysis is reported separately because self-reported use frequency and recruitment mode represent different analytical dimensions.

3.6. Methodological Limitations

The study has several limitations. First, the station sample is purposive rather than probability-based and is limited to two Austrian federal states. Second, the summer campaign did not repeat the winter household recruitment mode. The revised design addresses this by using only station-based respondents for the primary seasonal comparison and analysing the household sample separately, but unobserved differences between survey periods may remain. Third, subgroup analyses, particularly for respondents with mobility and/or sensory impairments, contain smaller case numbers. Fourth, the outcome is perceived as importance rather than observed use or causal behavioural response. These limitations constrain statistical generalisation but do not preclude analytical transfer to stations with comparable functional and spatial characteristics.

4. Results

4.1. Analytical Basis and Reporting Logic

The revised analysis distinguishes station-based seasonal evidence from the wider winter catchment area sample. Item-wise valid cases are used rather than a single listwise complete-case filter. Across the 22 comparable facility attributes, valid *n* therefore varies by item. Complete descriptive and inferential statistics are reported in Appendix A, while the main text focuses on the contrasts needed to answer the research questions. The three recruitment groups also differ in composition. Frequent station use (daily/almost daily or several times per week) characterises 81.1% of summer station-based respondents and 81.8% of winter station-based respondents, compared with 43.3% of winter household respondents. Conversely, the household sample contains substantially more occasional users and all 13 respondents who reported never using the station. This difference supports

treating the household sample as a complementary catchment area perspective rather than as part of the main seasonal contrast.

4.2. Overall Priority Structure of Station Facilities and Attributes

Across all available responses, the ranking is dominated by a small set of baseline attributes. Weather shelter has the highest mean importance rating (mean = 4.495; median = 5; 87.6% important or very important; $n = 1744$), followed by toilets (mean = 4.243; median = 5; 80.3%; $n = 1757$) and an information screen/information point (mean = 4.185; median = 5; 78.8%; $n = 1762$). Lockable bicycle boxes, ticket machines, grocery stores, bakeries, and real-time information on parking or bicycle space occupancy form an intermediate tier. At the lower end of the ranking, dry cleaning/laundry (mean = 2.073; 9.9% important or very important), childcare services (mean = 2.342; 18.3%), sports facilities (mean = 2.358; 19.8%) and public authority services (mean = 2.443; 19.1%) receive substantially lower ratings. The ranking therefore supports a planning distinction between essential baseline facilities and more context-dependent supplementary offers (Appendix A.1, Table A1).

The absolute ranking should not be read as a universal minimum standard: it reflects perceived importance in the present sample. Nevertheless, the concentration of high ratings around shelter, sanitation and information provides a robust empirical basis for prioritising basic functionality before adding lower-ranked services.

Figure 3 summarizes the item-wise priority ranking; the underlying descriptive statistics are reported in Appendix A.1, Table A1.

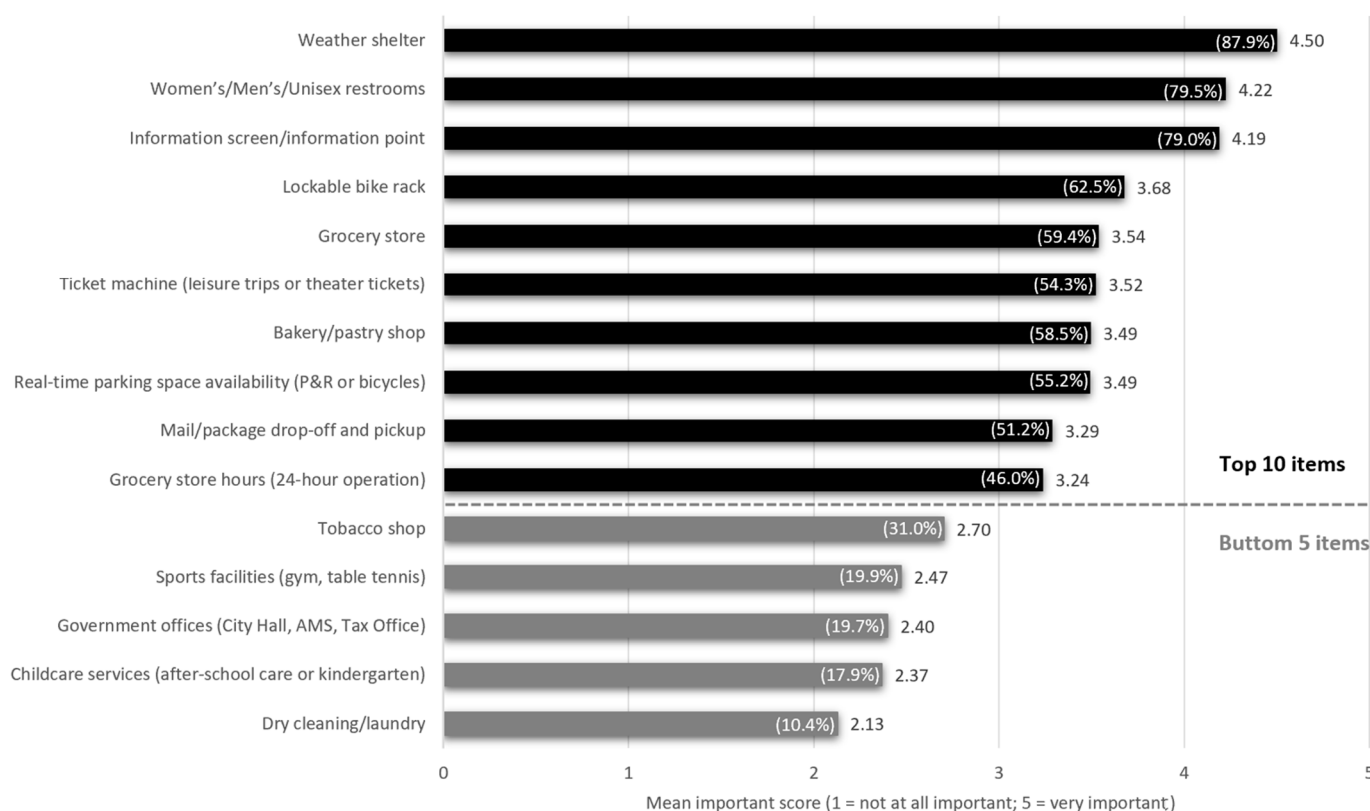


Figure 3. Prioritised station facilities and related attributes based on item-wise valid responses; valid n varies by attribute (see Appendix A.1, Table A1).

4.3. Seasonal Differences

When the seasonal comparison is restricted to station-based respondents (summer $n = 562$; winter $n = 868$), the core baseline is highly stable. Weather shelter is rated 4.555 in summer and 4.536 in winter ($p = 0.811$; Cramér's $V = 0.034$), while toilets are rated 4.231

and 4.253, respectively ($p = 0.834$; $V = 0.033$). The information screen/information point is also highly rated in both samples (4.267 vs. 4.110); its unadjusted distributional difference is small and becomes borderline after false-discovery-rate correction ($p = 0.018$; $q = 0.050$; $V = 0.092$). The clearest seasonal difference concerns ticket machines for additional or leisure-related tickets, which receive a lower mean rating in summer (3.311) than in the winter station sample (3.646; $p < 0.001$; $q < 0.001$; $V = 0.135$). Several lower-priority attributes—including dry cleaning/laundry, sports facilities, bikesharing, childcare services, public authority services and carsharing—also show statistically detectable distributional differences, but effect sizes remain small (V approximately 0.10–0.14; Appendix A.2, Table A2).

By contrast, grocery stores (3.566 vs. 3.615) and bakeries/pastry shops (3.554 vs. 3.520) show no substantively meaningful seasonal difference in the like-for-like station-based analysis. This revises the interpretation obtained from the previously pooled winter dataset and demonstrates why recruitment mode must be separated from season.

Figure 4 visualises selected station-based seasonal contrasts; the full inferential results are reported in Appendix A.2, Table A2.

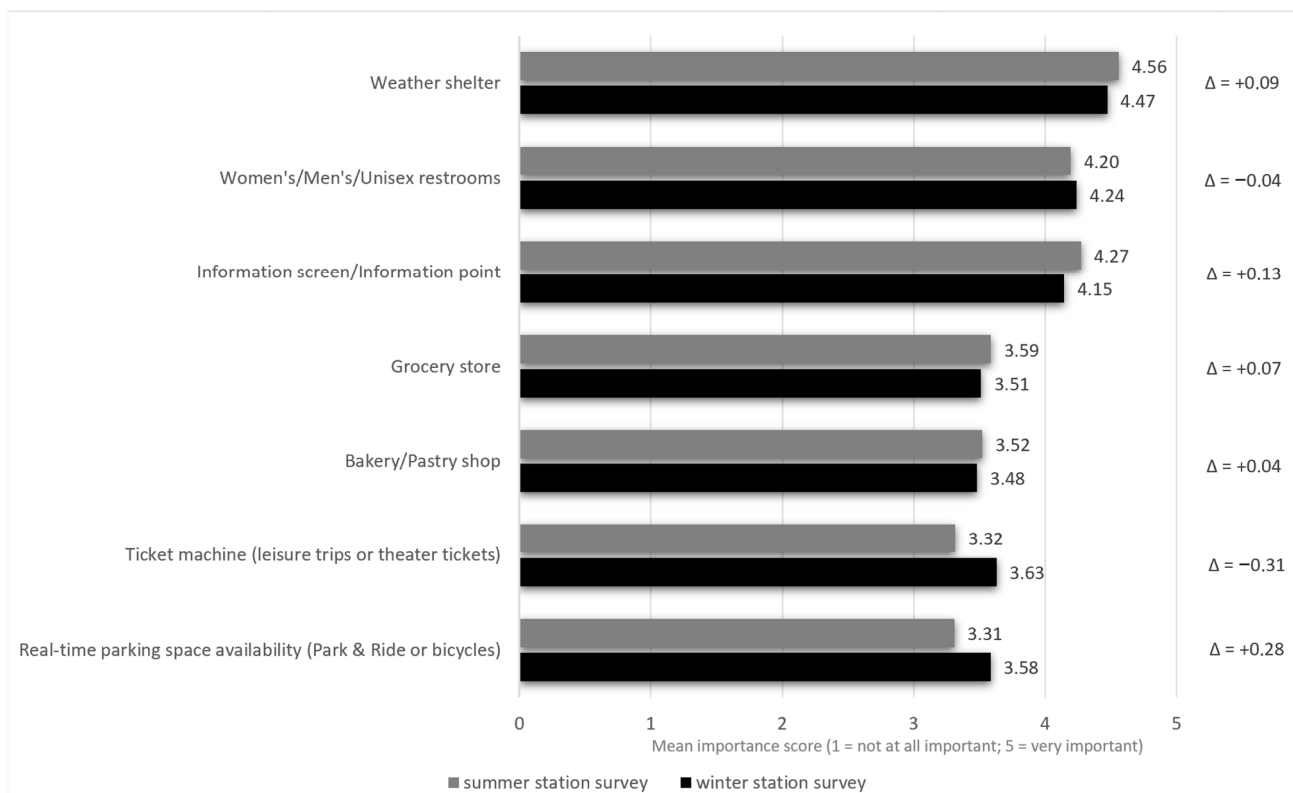


Figure 4. Selected station-based seasonal contrasts in perceived importance of station facilities and related attributes (summer $n = 562$; winter $n = 868$).

4.4. Winter Household Sample as a Catchment Area Perspective

The winter household sample differs markedly from the station-based samples in station use frequency: 43.3% of household respondents report using the station daily/almost daily or several times per week, compared with more than 81% in both station-based samples. The household group therefore contains a substantially larger share of occasional users and all respondents who report never using the station. This composition confirms that household recruitment should be treated as a complementary catchment area perspective rather than as a direct seasonal comparison group.

Comparing winter household respondents with winter station respondents reveals several small to moderate distributional differences (Appendix A.3, Table A3). The largest

occurs for grocery stores, which are rated lower in the household sample (mean = 3.147) than in the winter station sample (3.615; $q < 0.001$; Cramér's $V = 0.210$). Conversely, real-time parking/bicycle occupancy information is rated higher by household respondents (3.833 vs. 3.444; $q < 0.001$; $V = 0.154$). Smaller adjusted differences occur for weather shelter, lockable bicycle boxes, extended grocery opening hours, childcare, bakery provision and selected other attributes. These contrasts should be interpreted as recruitment- and catchment-related differences, not as seasonal effects.

Within the household sample itself, 169 respondents are classified as regular station users and 218 as infrequent or non-users. An exploratory comparison of these two groups shows no facility attribute that remains statistically significant after correction for multiple testing (Appendix A.5, Table A5). The smallest unadjusted p -value occurs for sports facilities ($p = 0.042$), but the corresponding FDR-adjusted q -value is 0.555. Accordingly, the household data do not provide robust evidence that the perceived importance hierarchy differs systematically between regular and less frequent or non-users. This result supports treating the household sample primarily as a broader catchment area perspective while retaining recruitment mode, rather than use frequency alone, as the key distinction for the seasonal analysis.

4.5. Differences by Gender, Age and Mobility/Sensory Impairments

Within the combined station-based sample, women rate several attributes more highly than men. The largest robust contrasts occur for toilets (women mean = 4.375; men mean = 4.102; $p < 0.001$; $q < 0.001$; $V = 0.151$), drop-off/pick-up services for children (3.228 vs. 2.924; $q = 0.005$; $V = 0.126$), carsharing (3.219 vs. 2.932; $q = 0.006$; $V = 0.120$), bakeries/pastry shops (3.624 vs. 3.443; $q = 0.016$; $V = 0.110$), childcare services (2.517 vs. 2.272; $q = 0.017$; $V = 0.112$) and food-sharing boxes (2.935 vs. 2.708; $q = 0.020$; $V = 0.107$). Figure 5 illustrates these station-based female–male contrasts, with full statistics reported in Appendix A.4, Table A4a.

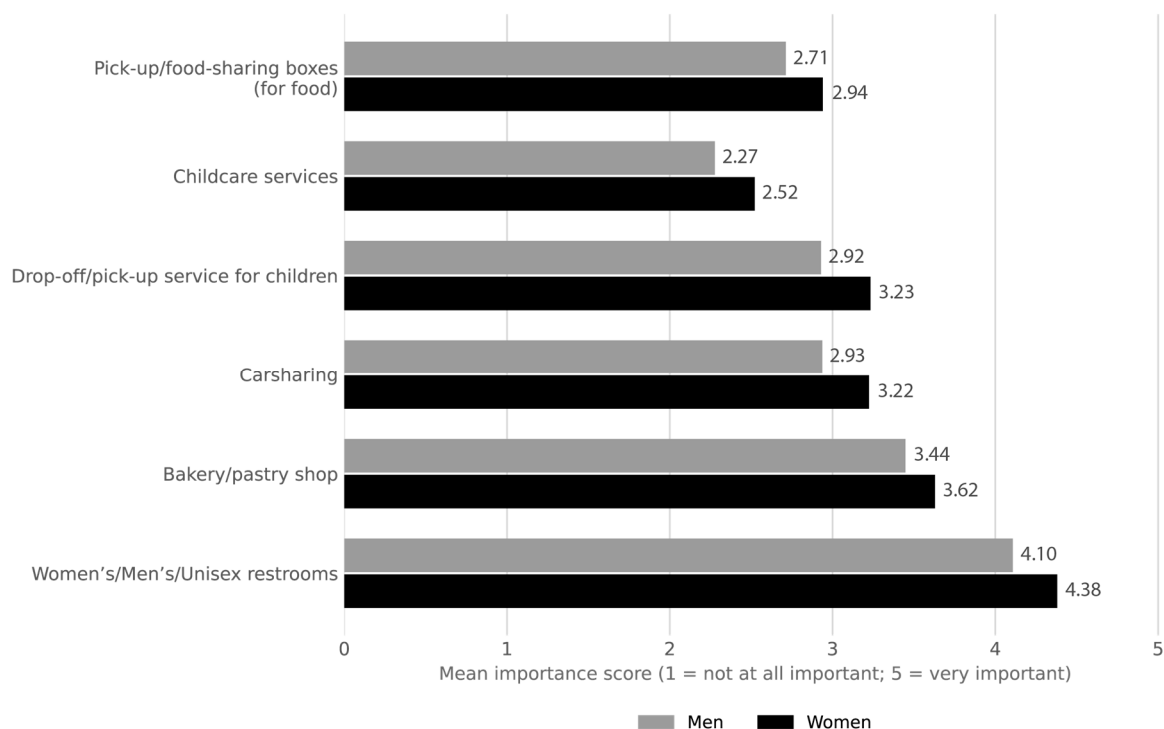


Figure 5. Selected gender differences in station facility ratings among station-based respondents (male $n = 576$; female $n = 632$).

Age-related patterns are concentrated among supplementary attributes. Extended grocery opening hours show the strongest negative monotonic association with age (Spearman's $\rho = -0.282$; $q < 0.001$), followed by sports facilities ($\rho = -0.209$), food-sharing boxes ($\rho = -0.190$) and grocery stores ($\rho = -0.102$). These results indicate that younger respondents tend to assign greater importance to multifunctional, consumption-oriented and convenience-related station offerings, whereas older respondents evaluate these supplementary functions more selectively.

At the same time, the observed correlations remain small to moderate in magnitude. Age therefore contributes to explaining differences in facility priorities, but it does not determine them independently. This is particularly evident for the central baseline attributes, whose importance remains comparatively stable across age groups. Weather protection, sanitary facilities and passenger information continue to receive high ratings irrespective of age, suggesting that the functional core of a regional rail station is largely age-independent.

The differentiation by age is therefore most relevant for the planning of supplementary facilities rather than for defining the basic equipment of a station. In practical terms, this suggests that optional or additional offers should be assessed in relation to the demographic composition of the station catchment area instead of being implemented as universal requirements. Stations serving a comparatively younger population may, for example, benefit more strongly from extended retail availability, food-sharing services, or complementary activity-related offers, whereas such facilities appear less decisive for older user groups. This does not imply that individual age groups should be addressed through separate station standards; rather, demographic structure can be used as one contextual parameter when prioritising additional investments.

Figure 6 illustrates the most pronounced age gradients among selected supplementary attributes, while the corresponding rank correlations and adjusted significance levels are reported in Appendix A.4, Table A4b. Overall, the findings reinforce the distinction between a broadly stable baseline of essential station functions and a more differentiated layer of supplementary facilities whose perceived relevance varies with user characteristics.

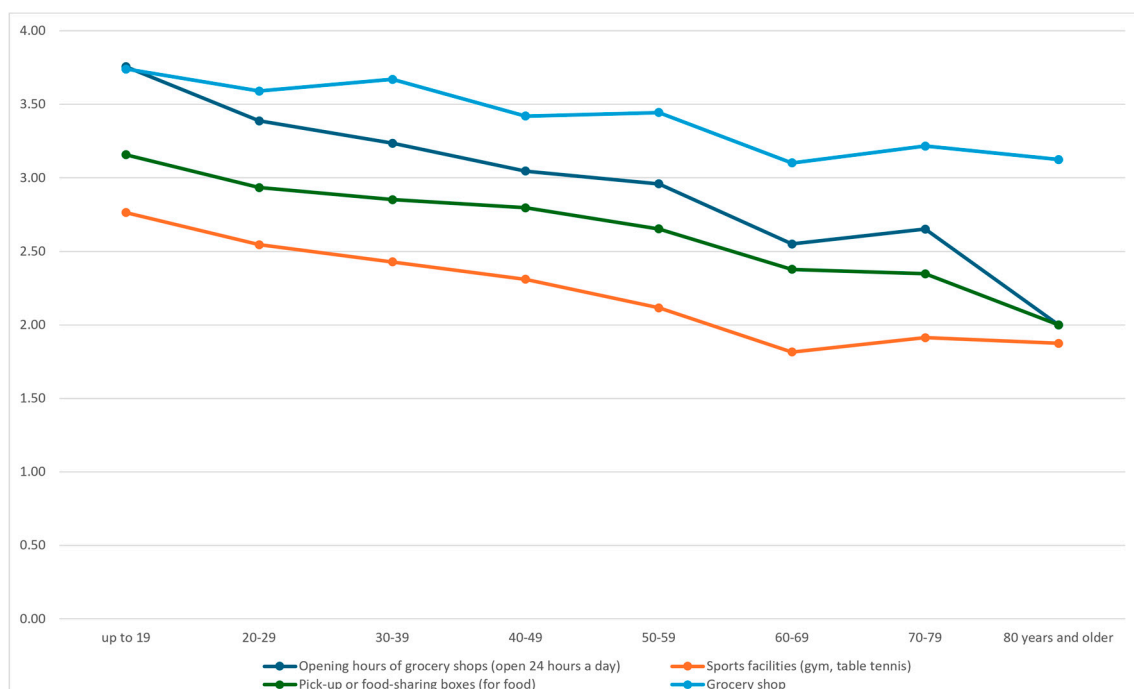


Figure 6. Age gradients of selected station attributes among station-based respondents.

The impairment-related comparison should be interpreted with caution because only a small number of station-based respondents reported at least one mobility and/or sensory impairment. Nevertheless, several descriptive contrasts are noteworthy. Respondents with impairments rated restrooms more highly, while higher mean values also emerged for grocery stores, childcare options and public authority services. These patterns are illustrated in Figure 7. However, none of the impairment-related contrasts remained statistically significant after correction for multiple testing. Figure 7 should therefore be interpreted as a descriptive illustration, with the corresponding statistical evidence reported in Appendix A.4, Table A4c.

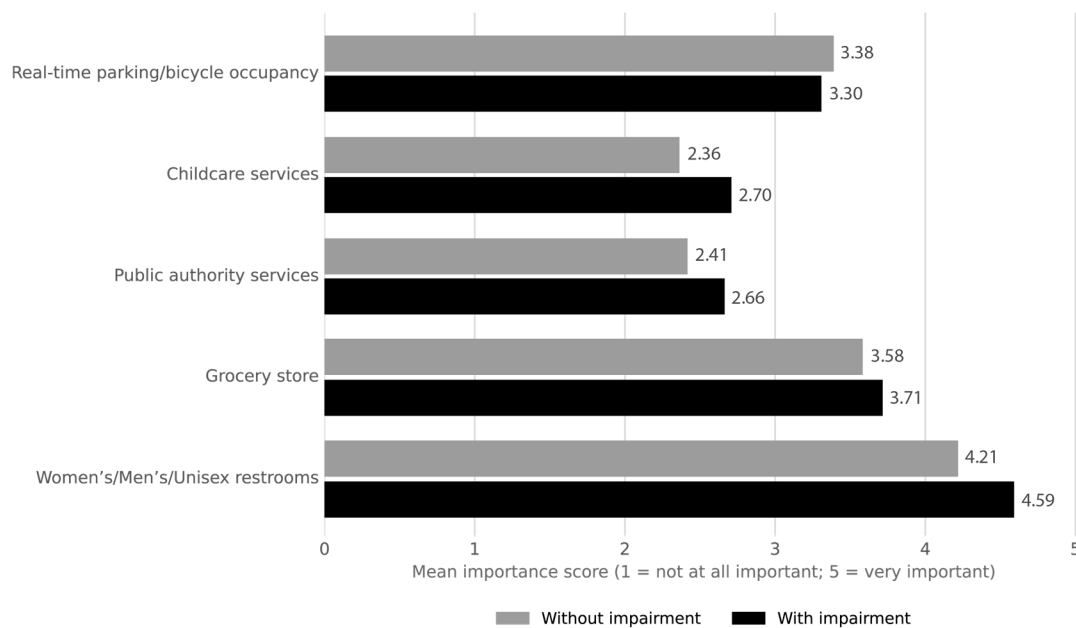


Figure 7. Selected descriptive contrasts in perceived importance of station facilities by mobility and/or sensory impairment status among station-based respondents.

From a planning perspective, these tendencies may indicate which functions deserve closer attention in accessibility- and inclusion-oriented station planning. They do not provide sufficient empirical evidence to derive separate facility standards for respondents with impairments. The stronger rating of restrooms is particularly relevant because this attribute already forms part of the broadly prioritised baseline. By contrast, childcare and public-authority-related services remain context-dependent supplementary functions. Overall, impairment status may influence selected station priorities, while the core hierarchy of essential facilities remains stable.

4.6. Interim Synthesis of the Empirical Findings

The revised analyses strengthen the central result while narrowing some earlier claims. A stable baseline of shelter, sanitation and passenger information is evident across recruitment modes and seasons. Seasonal effects are limited when comparable station-based samples are contrasted, whereas the household sample reveals a broader catchment area perspective with different use patterns and some different facility priorities.

Accordingly, the paper distinguishes three analytical levels: baseline attributes with consistently high importance, supplementary attributes whose relevance varies with context or user-group and lower-priority offers that should not be generalised as station-wide requirements. The full statistical basis for these statements is provided in Appendix A.

This structure avoids interpreting recruitment-mode differences as seasonal effects and separates statistical significance from practical relevance through the reporting of effect sizes and adjusted p -values.

5. Discussion

5.1. Interpreting the Hierarchy of User Requirements

The revised results support a clear hierarchy of station attributes. Weather shelter, toilets and reliable passenger information remain at the top of the ranking even after the analysis is changed from a listwise complete-case approach to item-wise valid cases. Their high and comparatively stable ratings suggest that smaller rural regional stations depend primarily on reliable basic functionality rather than on broad service diversification.

This finding is consistent with international research that treats access, information, waiting conditions, safety and accessibility as interconnected parts of the rail or interchange experience [6,14–19]. The present study extends the literature by ranking a broad facility battery at smaller regional stations, a context less frequently addressed than major urban interchanges. The three-layer interpretation—baseline, quality-enhancing and optional attributes—should therefore be understood as a prioritisation framework rather than a prescriptive standard. Its value lies in making trade-offs transparent where passenger volumes, budgets and local service markets constrain the feasible station programme.

5.2. Seasonal Stability and Selective Seasonal Sensitivity

The like-for-like seasonal analysis changes the interpretation of seasonality. Once winter household respondents are separated, weather shelter, toilets, grocery-related facilities and most other baseline or mid-tier attributes differ little between summer and winter station samples. The strongest seasonal differences occur for selected supplementary attributes and remain small in effect size.

This result is important methodologically: a pooled comparison would partly mix seasonal variation with recruitment-mode composition. The revised design therefore provides a more defensible estimate of seasonal differences while retaining the household sample for a separate planning question.

The household sample is substantively valuable because it represents the wider station catchment area and includes more occasional and non-users. Its lower frequency of station use confirms that it should not be treated as equivalent to a platform-recruited sample. At the same time, the separate winter comparison indicates that some facility priorities—such as grocery provision and real-time parking/bicycle occupancy information—differ between household and station respondents. This suggests that planning aimed at attracting potential or occasional users may require a broader perspective than surveys of current station users alone.

5.3. Differentiated Requirements Across User Groups

The station-based subgroup analysis confirms that user requirements are not socially neutral. Women assign higher importance to several supportive and care-related attributes, while the strongest age gradients concern optional or convenience-oriented offers. These differences are statistically detectable but generally small, which argues against designing completely different facility packages for each demographic group.

Instead, diversity-sensitive planning should preserve a robust common baseline and use subgroup evidence to refine supplementary provision. The comparatively high toilet rating among respondents with mobility or sensory impairments is substantively plausible in light of inclusive design research [8,17–19], but the small impairment sample and non-significant adjusted tests require caution. The results therefore support targeted differ-

entiation around a common functional core rather than a one-size-fits-all catalogue or fully segmented station concepts.

5.4. Planning and Management Implications

For planning and management, the empirical findings support a sequential decision logic. First, basic functionality—especially weather protection, sanitation, and reliable passenger information—should be secured, alongside applicable accessibility requirements. Second, comfort, supply and intermodal-support attributes should be assessed against station role, catchment characteristics, existing local provision and user composition. Third, optional services should be considered only where demand and implementation conditions justify them.

This logic is particularly relevant for smaller regional stations, where extensive service portfolios may be economically unrealistic. It also offers a transparent basis for prioritising investment: high perceived importance alone does not determine implementation, but it can be combined with technical feasibility, lifecycle cost, regulatory requirements and local service availability. The findings thus connect user-priority evidence with a broader systems view of station planning. Access and egress, information, waiting quality, safety and accessibility jointly shape whether rail is a usable alternative, especially in peripheral contexts where competing public transport options may be limited [9,14–19].

5.5. Limitations and Transferability

The study does not claim statistical representativeness for all Austrian or European railway stations. Its purposive sample is restricted to 16 category C and category D stations in two Austrian federal states, and national differences in regulation, climate, station governance, retail structures, accessibility requirements and feeder-mode availability may alter the ranking of individual attributes. Transferability should therefore be understood analytically rather than numerically. The findings are most relevant to smaller regional stations with limited on-site provision, modest staffing, lower functional complexity and a strong dependence on access, waiting, information and accessibility conditions. Under these conditions, the central planning logic—a reliable functional baseline followed by context-specific supplementary provision—provides a testable framework for studies and station-modernisation programmes beyond Austria. International replication should use comparable station typologies and explicitly document local regulatory and spatial conditions before transferring individual item rankings.

6. Conclusions

This study shows that user priorities at smaller regional rail stations are concentrated around a stable functional baseline. Weather shelter, toilets and passenger information consistently receive the highest ratings, while many supplementary services are substantially more context-dependent. Restricting the seasonal analysis to comparable station-based respondents demonstrates that seasonality changes this hierarchy only modestly. Separating the winter household sample is a substantive improvement: the household respondents use the station less frequently and reveal a wider catchment area perspective that should not be conflated with seasonal effects. For planning, the evidence supports a sequential approach in which core functionality is secured first and supplementary facilities are then matched to station role, local provision, user composition and implementation feasibility.

The numerical rankings are not directly generalisable to all countries or station types, but the underlying prioritisation logic is analytically transferable to comparable small regional stations. Future research should replicate the design with symmetrical seasonal recruitment, larger samples of respondents with mobility and/or sensory impair-

ments and explicit links between perceived importance, observed use, technical feasibility and lifecycle costs.

Building on the distinction between perceived importance, experienced quality and actual station use identified in the literature [20–26], future research should extend the present facility-priority approach in four directions. First, importance ratings should be combined with facility availability, perceived performance and overall station satisfaction in an Importance–Performance Analysis framework. Second, surveys should record which facilities passengers actually use, which activities they undertake during waiting times and whether desired activities are prevented by missing or unsuitable facilities. Third, qualitative interviews, observations or diary methods could explain why facilities are valued differently across age, gender, mobility status and travel purpose. Fourth, future seasonal comparisons should use symmetrical recruitment procedures and repeated measurements, ideally before and after station improvements. Such research would clarify whether highly prioritised facilities also influence station satisfaction, station choice, rail use and the attractiveness of regional rail for occasional or potential users.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/futuretransp6050192/s1>, File S1: Original German-language survey instruments used in the study, including the station-based questionnaires for Lower Austria and Upper Austria and the winter household questionnaire.

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Institutional Review Board Statement: Ethical review and approval were not required for this study because it consisted of voluntary, anonymous, non-interventional questionnaire surveys on mobility-related preferences and station requirements. No health data, biological material, experimental interventions, audio or video recordings, or directly identifiable personal data were collected. Data were analysed and reported only in anonymised and aggregated form.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. Before participation, respondents received information on the study purpose, voluntary participation, anonymous data processing and the intended scientific use of the results. Completion of the questionnaire was considered informed consent.

Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable data protection requirements. The original German-language survey instruments used for data collection are provided as Supplementary File S1. The data are not publicly available because they contain survey microdata collected under data-protection conditions that do not permit unrestricted public release.

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Appendix A. Statistical Results

Appendix A reports the descriptive and inferential statistics supporting Sections 4.2–4.5. Item-wise valid cases are reported because ‘no answer’ and blank responses were treated as missing. Unless otherwise stated, ratings refer to the reverse-coded 1–5 scale described in Section 3.3, with higher values indicating greater perceived importance.

Appendix A.1. Overall Facility Priorities

Table A1. Descriptive statistics for the 22 comparable station attributes (item-wise valid cases).

Attribute	<i>n</i>	Mean	Median	SD	Variance	Important/ Very Important (%)
Weather shelter	1744	4.495	5.000	0.921	0.848	87.56
Women’s/Men’s/Unisex restrooms	1757	4.243	5.000	1.077	1.160	80.25
Information screen/information point	1762	4.185	5.000	1.056	1.115	78.83
Lockable bicycle box	1748	3.682	4.000	1.182	1.396	62.41
Ticket machine (additional/leisure tickets)	1715	3.570	4.000	1.360	1.849	55.63
Grocery store	1752	3.502	4.000	1.273	1.621	58.56
Bakery/pastry shop	1741	3.493	4.000	1.245	1.550	58.64
Real-time parking/bicycle occupancy	1739	3.479	4.000	1.269	1.611	54.23
Parcel drop-off/pick-up	1717	3.250	4.000	1.282	1.642	50.26
Extended grocery opening hours	1733	3.238	3.000	1.325	1.757	45.35
Drop-off/pick-up service for children	1665	3.123	3.000	1.300	1.691	40.96
Bikesharing	1697	3.110	3.000	1.197	1.433	39.36
Carsharing	1703	3.096	3.000	1.236	1.528	38.87
Restaurant/catering	1754	3.066	3.000	1.257	1.581	40.59
E-car/e-bike charging station	1706	2.889	3.000	1.362	1.854	35.23
Tools/spare parts for minor bicycle repairs	1701	2.881	3.000	1.246	1.552	32.80
Pick-up/food-sharing boxes	1671	2.838	3.000	1.272	1.617	31.18
Tobacco/newsagent shop	1712	2.688	3.000	1.386	1.920	32.07
Public authority services	1606	2.443	2.000	1.236	1.528	19.12
Sports facilities	1663	2.358	2.000	1.265	1.599	19.84
Childcare services	1615	2.342	2.000	1.288	1.659	18.33
Dry cleaning/laundry	1646	2.073	2.000	1.113	1.238	9.90

Note: “Important/very important” denotes response categories 4 or 5 on the recoded scale. The item “snack bar” (Imbiss) is excluded from cross-seasonal analyses because it was not available in the summer questionnaire.

Appendix A.2. Like-for-Like Seasonal Comparison

Table A2. Summer versus winter comparison among station-based respondents.

Attribute	<i>n</i> (S)	Mean (S)	<i>n</i> (W)	Mean (W)	χ^2	<i>p</i>	qFDR	V
E-car/e-bike charging station	533	2.747	809	2.915	7.004	0.136	0.249	0.072
Childcare services	496	2.339	777	2.423	14.606	0.006	0.025	0.107
Parcel drop-off/pick-up	543	3.282	814	3.274	2.681	0.613	0.709	0.044
Tobacco/newsagent shop	540	2.563	812	2.788	11.604	0.021	0.050	0.093
Restaurant/catering	550	3.058	835	3.103	4.057	0.398	0.491	0.054
Grocery store	553	3.566	832	3.615	5.622	0.229	0.355	0.064
Weather shelter	551	4.555	821	4.536	1.590	0.811	0.874	0.034
Women’s/Men’s/Unisex restrooms	554	4.231	830	4.253	1.459	0.834	0.874	0.032
Ticket machine (additional/leisure tickets)	546	3.311	828	3.646	24.892	<0.001	<0.001	0.135
Extended grocery opening hours	548	3.272	829	3.293	4.030	0.402	0.491	0.054
Tools/spare parts for minor bicycle repairs	546	2.886	810	2.884	5.472	0.242	0.355	0.064
Pick-up/food-sharing boxes	529	2.771	797	2.866	4.055	0.399	0.491	0.055
Real-time parking/bicycle occupancy	545	3.290	822	3.444	8.280	0.082	0.180	0.078
Drop-off/pick-up service for children	517	3.093	796	3.064	5.687	0.224	0.355	0.066
Information screen/information point	550	4.267	836	4.110	11.852	0.018	0.050	0.092
Lockable bicycle box	542	3.635	833	3.660	1.150	0.886	0.886	0.029
Carsharing	530	2.949	808	3.152	13.255	0.010	0.032	0.100
Bikesharing	532	3.019	802	3.122	16.066	0.003	0.016	0.110

Table A2. *Cont.*

Attribute	<i>n</i> (S)	Mean (S)	<i>n</i> (W)	Mean (W)	χ^2	<i>p</i>	qFDR	V
Dry cleaning/laundry	526	1.863	776	2.165	27.050	<0.001	<0.001	0.144
Sports facilities	530	2.308	785	2.414	19.823	<0.001	0.004	0.123
Bakery/pastry shop	547	3.554	827	3.520	7.390	0.117	0.233	0.073
Public authority services	526	2.300	777	2.529	14.146	0.007	0.025	0.104

Note: S = summer station-based respondents; W = winter station-based respondents. Pearson χ^2 tests compare the five response categories. qFDR denotes the Benjamini–Hochberg adjusted *p*-value; V denotes Cramér’s V.

Appendix A.3. Winter Recruitment-Mode Comparison

Table A3. Winter household respondents versus winter station-based respondents.

Attribute	<i>n</i> (HH)	Mean (HH)	<i>n</i> (W-st.)	Mean (W-st.)	χ^2	<i>p</i>	qFDR	V
E-car/e-bike charging station	364	3.038	809	2.915	3.481	0.481	0.529	0.054
Childcare services	342	2.164	777	2.423	16.726	0.002	0.013	0.122
Parcel drop-off/pick-up	360	3.150	814	3.274	11.636	0.020	0.045	0.100
Tobacco/newsagent shop	360	2.647	812	2.788	6.346	0.175	0.226	0.074
Restaurant/catering	369	2.992	835	3.103	8.871	0.064	0.101	0.086
Grocery store	367	3.147	832	3.615	53.117	<0.001	<0.001	0.210
Weather shelter	372	4.315	821	4.536	13.779	0.008	0.029	0.107
Women’s/Men’s/Unisex restrooms	373	4.239	830	4.253	3.299	0.509	0.533	0.052
Ticket machine (additional/leisure tickets)	341	3.798	828	3.646	10.915	0.028	0.055	0.097
Extended grocery opening hours	356	3.059	829	3.293	12.899	0.012	0.032	0.104
Tools/spare parts for minor bicycle repairs	345	2.867	810	2.884	7.885	0.096	0.141	0.083
Pick-up/food-sharing boxes	345	2.878	797	2.866	9.470	0.050	0.085	0.091
Real-time parking/bicycle occupancy	372	3.833	822	3.444	28.135	<0.001	<0.001	0.154
Drop-off/pick-up service for children	352	3.301	796	3.064	11.661	0.020	0.045	0.101
Information screen/information point	376	4.231	836	4.110	4.561	0.335	0.398	0.061
Lockable bicycle box	373	3.802	833	3.660	13.389	0.010	0.030	0.105
Carsharing	365	3.186	808	3.152	4.488	0.344	0.398	0.062
Bikesharing	363	3.215	802	3.122	2.508	0.643	0.643	0.046
Dry cleaning/laundry	344	2.186	776	2.165	6.813	0.146	0.201	0.078
Sports facilities	348	2.307	785	2.414	10.384	0.034	0.063	0.096
Bakery/pastry shop	367	3.343	827	3.520	16.541	0.002	0.013	0.118
Public authority services	303	2.472	777	2.529	14.492	0.006	0.026	0.116

Note: HH = household respondents; W-st. = winter station-based respondents. These contrasts are interpreted as recruitment- and catchment-related differences rather than seasonal effects.

Appendix A.4. User-Group Analyses

Table A4. (a) Ten strongest gender contrasts among station-based respondents. (b) Ten strongest age gradients among station-based respondents. (c) Selected impairment-related facility contrasts corresponding to Figure 7.

(a)					
Attribute	Mean Women	Mean Men	<i>p</i>	qFDR	V
Women’s/Men’s/Unisex restrooms	4.375	4.102	<0.001	<0.001	0.151
Drop-off/pick-up service for children	3.228	2.924	<0.001	0.005	0.126
Carsharing	3.219	2.932	<0.001	0.006	0.120
Bakery/pastry shop	3.624	3.443	0.003	0.016	0.110
Childcare services	2.517	2.272	0.004	0.017	0.112
Pick-up/food-sharing boxes	2.935	2.708	0.006	0.020	0.107
Real-time parking/bicycle occupancy	3.430	3.343	0.035	0.111	0.088
Extended grocery opening hours	3.335	3.219	0.050	0.136	0.084
Ticket machine (additional/leisure tickets)	3.604	3.405	0.078	0.192	0.079
Grocery store	3.671	3.518	0.098	0.216	0.076

Table A4. Cont.

(b)						
Attribute	<i>n</i>	Spearman ρ	<i>p</i>	qFDR		
Extended grocery opening hours	1362	−0.28	<0.001	<0.001		
Sports facilities	1301	−0.21	<0.001	<0.001		
Pick-up/food-sharing boxes	1312	−0.19	<0.001	<0.001		
Grocery store	1370	−0.10	<0.001	<0.001		
Weather shelter	1358	0.09	<0.001	0.003		
Bakery/pastry shop	1359	−0.08	0.005	0.019		
Drop-off/pick-up service for children	1298	−0.07	0.011	0.034		
Lockable bicycle box	1361	0.07	0.014	0.038		
E-car/e-bike charging station	1327	0.07	0.016	0.040		
Carsharing	1323	0.06	0.037	0.067		
(c)						
Attribute	Mean with Impairment (<i>n</i>)	Mean Without Impairment (<i>n</i>)	Δ Mean	<i>p</i>	qFDR	V
Women’s/Men’s/Unisex restrooms	4.586 (87)	4.213 (1219)	+0.373	0.012	0.264	0.101
Childcare services	2.704 (81)	2.358 (1126)	+0.346	0.207	0.755	0.070
Public authority services	2.659 (85)	2.412 (1144)	+0.247	0.155	0.689	0.074
Grocery store	3.711 (90)	3.578 (1218)	+0.133	0.327	0.755	0.060
Real-time parking/bicycle occupancy	3.303 (89)	3.385 (1204)	−0.082	0.853	0.853	0.032

Note: Means refer to the reverse-coded 1–5 importance scale. qFDR denotes the Benjamini–Hochberg adjusted *p*-value; V denotes Cramér's V. For panel (b), Spearman's ρ is calculated using ordered age groups; negative values indicate declining perceived importance with increasing age. For panel (c), 'Impairment' denotes respondents reporting at least one specified mobility and/or sensory impairment; item-wise valid sample sizes are shown in parentheses. Δ Mean = mean with impairment minus mean without impairment. *p* denotes the unadjusted *p*-value from the five-category Pearson chi-square comparison. The five attributes correspond to Figure 7. Across all 22 comparable attributes, no impairment-related contrast remained statistically significant after FDR correction.

Appendix A.5. Winter Household Sample by Station Use Frequency

Table A5. Facility ratings among regular versus infrequent/non-users in the winter household sample.

Attribute	<i>n</i> (reg.)	Mean (reg.)	<i>n</i> (inf./non)	Mean (inf./non)	χ^2	<i>p</i>	qFDR	V
Parcel drop-off/pick-up	158	3.196	199	3.116	1.549	0.818	0.961	0.066
Pick-up/food-sharing boxes	155	2.865	187	2.882	1.394	0.845	0.961	0.064
Public authority services	139	2.460	161	2.472	1.824	0.768	0.961	0.078
Childcare services	151	2.159	188	2.160	5.268	0.261	0.961	0.125
Bikesharing	161	3.273	199	3.171	2.874	0.579	0.961	0.089
Drop-off/pick-up service for children	153	3.242	196	3.342	1.339	0.855	0.961	0.062
Bakery/pastry shop	163	3.466	201	3.239	8.357	0.079	0.555	0.152
Carsharing	160	3.219	202	3.163	1.550	0.818	0.961	0.065
Women's/Men's/Unisex restrooms	163	4.245	207	4.227	1.344	0.854	0.961	0.060
Restaurant/catering	163	2.896	203	3.069	3.424	0.490	0.961	0.097
Grocery store	160	3.188	204	3.118	3.075	0.545	0.961	0.092
Real-time parking/bicycle occupancy	164	3.799	205	3.878	9.091	0.059	0.555	0.157
Dry cleaning/laundry	157	2.146	184	2.217	0.965	0.915	0.961	0.053
Lockable bicycle box	163	3.877	207	3.744	4.627	0.328	0.961	0.112
Sports facilities	155	2.387	190	2.242	9.891	0.042	0.555	0.169
Ticket machine (additional/leisure tickets)	153	3.843	185	3.757	1.254	0.869	0.961	0.061
Tobacco/newsagent shop	159	2.591	198	2.682	1.547	0.818	0.961	0.066
Tools/spare parts for minor bicycle repairs	152	2.882	190	2.858	0.300	0.990	0.990	0.030
Weather shelter	163	4.429	206	4.223	6.003	0.199	0.961	0.128
Information screen/information point	165	4.242	208	4.231	1.524	0.822	0.961	0.064
Extended grocery opening hours	158	3.044	195	3.077	2.251	0.690	0.961	0.080

Note: Regular users = daily/almost daily or several times per week; infrequent/non-users = several times per month, once per month, several times per year, once per year, or never. No contrast remains statistically significant after FDR correction.

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