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Applying Thematic Analysis to Understand Behaviour in Walking School Bus Programs: A Pilot Study in the City of Ferrara

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Abstract

This study applies insights from behavioural economics to examine the challenges surrounding the adoption of the Walking School Bus (WSB), a sustainable school transportation initiative. Using thematic analysis of interviews with schoolteachers in Ferrara, Italy, we identify three key themes influencing participation: Service Characteristics, Family Determinants, and School Context. Our analysis reveals that behavioural mechanisms—such as status quo bias and the collective action problem related to volunteer recruitment—pose significant barriers to adoption, even in the face of broad recognition of the program’s benefits. The findings suggest that addressing these behavioural obstacles requires targeted interventions aimed at mitigating cognitive biases and improving decision-making processes that currently hinder participation. This research offers empirical evidence that successful implementation depends on a nuanced understanding of the interaction between practical design features and deep-seated psychological barriers that shape family mobility choices. These insights contribute to behavioural theory and offer practical guidance for promoting sustainable transport behaviours in urban settings.

Keywords: *walking school bus, behavioural economics, thematic analysis, implementation challenges, sustainable mobility.*

1. Introduction

The transition to low-carbon lifestyles represents a critical component of global climate mitigation strategies. According to the Intergovernmental Panel on Climate Change, limiting global warming to 1.5°C above pre-industrial levels requires ambitious policy interventions that address both technological and behavioral dimensions of emissions reduction (IPCC, 2018). Within this context, the transportation sector offers significant opportunities for emission reductions through modal shifts toward more sustainable options.

Behavioral changes in transportation patterns, particularly the shift from private vehicle use to active mobility options, constitute approximately 55% of cumulative emissions reductions in net-zero scenarios (IEA, 2021). Among these behavioral changes, walking and cycling for urban trips that would otherwise be made by car represent crucial components of sustainable mobility transitions. This is particularly relevant for school transportation, where private vehicle use has steadily increased since the 1970s while walking and cycling rates have dramatically decreased (McDonald & Aalborg, 2009).

The Walking School Bus (WSB), initially proposed by Australian transport activist David Engwicht, has emerged as a promising intervention to reverse this trend. This system involves trained adults following assigned routes with specified stops and schedules to collect children for their school commute.

The European Union's binding target to cut greenhouse gas emissions by at least 55% below 1990 levels by 2030, coupled with its ambition to achieve carbon neutrality by 2050, underscores the urgency of identifying effective behavioral interventions. The Walking School Bus system represents one such intervention that aligns with both climate objectives and broader educational and health goals.

This study, indeed, investigates the behavioural economics underlying Walking School Bus implementation, with a specific focus on the motivational factors that shape its adoption and long-term sustainability. By applying behavioural science frameworks to this distinct mobility challenge, the research aims to inform the design of more effective policy measures aimed at promoting sustainable school transportation, thereby contributing to the wider transition toward low-carbon lifestyles.

The remainder of the paper is organised as follows: Section 2 provides a theoretical framework, reviewing the literature on the benefits and multifaceted challenges of WSB programs. Section 3 outlines the empirical strategy, including the use of semi-structured interviews as the primary method of data collection. Section 4 presents the findings derived from a thematic analysis of the interview data. Finally, Section 5 offers a discussion of the results, their implications for policy and practice, and suggestions for future research.

2. Theoretical Framework

This section reviews the existing literature on the Walking School Bus, structuring the analysis around its potential benefits and the intertwined operational and behavioural challenges that affect its implementation and long-term sustainability.

2.1. Benefits of Walking School Bus Programs

A growing body of academic literature highlights a compelling range of benefits associated with Walking School Bus (WSB) programs, which contribute to their broad appeal and policy relevance. One of the primary incentives for parental participation is the potential for time savings by reducing the need for individual chaperoning (Kearns & Collins, 2003). At the same time, one of the most consistently documented outcomes is the improvement of children's physical health through increased levels of daily activity (Collins & Kearns, 2005; Kearns & Collins, 2003; Kingham & Ussher, 2007).

Beyond health outcomes, WSBs also promote children's **social development**, enhancing interpersonal skills and fostering a sense of independence (Kearns & Collins, 2003; Kingham & Ussher, 2005; Smith et al., 2015; Hinckson, 2016). The communal nature of the WSB strengthens social cohesion and fosters a sense of community among participating families and neighborhoods (Collins & Kearns, 2010; Kingham & Ussher, 2005). From the child's perspective, the walk to school provides opportunities for environmental interaction and exploration that are absent in motorized transport (Smith et al., 2015). Furthermore, evidence suggests that children often prefer active travel and report feeling safer when walking as part of a group (Hinckson, 2016).

The widespread recognition of these health and social benefits by parents, children, and educators acts as a key enabler for the successful adoption of WSB programs (Neuwelt & Kearns, 2006). In addition, WSBs can generate positive externalities by alleviating traffic congestion and reducing pollution in school zones (Dirks et al., 2016), thereby contributing to broader environmental and public good goals.

2.2. Operational and Behavioural Challenges

Despite these advantages, the development, implementation, and long-term sustainability of WSB programs face considerable challenges (McKee et al., 2007), situated at the intersection of operational logistics and behavioural economics.

A core operational difficulty lies not in launching the service, but in sustaining its regular operation. Research indicates that program discontinuation often results from the natural turnover of participants as children age and become independent commuters (Kingham & Ussher, 2005). Moreover, the design of WSB routes plays a pivotal role in service efficiency. While routes are often designed intuitively, optimization studies highlight the potential for more effective outcomes through heuristic algorithms that minimize walking distances and enhance safety (Porro, 2015; Tanaka et al., 2016, 2018). Recent approaches propose personalized “door-to-school” services to accommodate dispersed demand, though these solutions introduce additional computational complexity in balancing walkability with driver availability (Malucelli et al., 2017, 2018; Tresoldi et al., 2021).

These operational challenges are compounded by key behavioural and structural vulnerabilities. A critical barrier is the programs' dependence on volunteer labour, which inherently lacks long-term stability and can lead to program dissolution once initial enthusiasm wanes (Kingham and Ussher, 2005). Long-term sustainability is often hampered by incomplete implementation, insufficient follow-up, lack of secure funding, and inadequate support from local governments (Larouche et al., 2018). Transitioning from volunteers to paid coordinators introduces substantial personnel costs that are often prohibitive without institutional financial support (Larouche et al., 2018). Ultimately, parental perceptions and decisions are a critical behavioural determinant of success. Factors such as distance to school, traffic safety concerns, fear of injury, and inflexible school schedules can significantly constrain participation rates, irrespective of the program's potential benefits (Stewart et al., 2012). The persistence of these challenges creates a landscape where many potentially beneficial service modifications remain unexplored, suggesting significant opportunities for interdisciplinary research.

3. Methodology

This study employs an exploratory qualitative research design, aimed at conducting an in-depth analysis of perceptions and experiences related to the Walking School Bus service in the context of Ferrara. The specific purpose of this research phase is to investigate the reasons behind the lack of widespread adoption or the failure of the Walking School Bus system, a service characterized by trained adults who follow predetermined routes with stops at specified times and locations to accompany primary school students to school.

The methodological approach was structured to ensure both scientific rigor and authenticity in data collection and analysis, combining a targeted sampling strategy with a rigorous thematic analysis process. The choice of a qualitative framework proved particularly suitable for investigating a complex and multifaceted phenomenon such as the implementation of a sustainable mobility service, where technical, social, and perceptual factors intersect significantly. This approach made it possible to capture not only the factual aspects of the service but also the subjective, cultural, and contextual dimensions that influence its adoption and sustainability.

The research focused specifically on collecting data and information through semi-structured interviews conducted with school coordinators and teachers responsible for the Walking School Bus service, with the aim of gaining a deeper understanding of the service's strengths and weaknesses from an operational and educational perspective.

The specific objective was to analyse schools in which: (i) the service is active and operational; (ii) the service was activated but subsequently suspended; (iii) the service is in the activation phase.

The perspective of these school representatives proved essential to investigate the reasons for the success or failure of Walking School Bus, as they possess direct experience with its daily implementation and management challenges.

Data collection was carried out during June and July 2023, referring to the 2022/2023 school year. The choice of the Ferrara context is particularly significant given the renewed popularity of Walking School Bus as a short-term measure to facilitate the ecological transition toward sustainable mobility, as evidenced by numerous contributions in the literature (among others, Nikitas et al., 2019).

The following sections describe in detail both the sampling and recruitment strategy of participants and the analytical framework used for processing qualitative data, illustrating how these components were integrated to provide a comprehensive understanding of the phenomenon under examination.

3.1. Sampling and Recruitment Strategy

This study employed a purposive sampling approach to identify information-rich cases relevant to Walking School Bus implementation. The sampling strategy aimed to capture diverse perspectives from school representatives involved in coordinating or managing the service across different implementation contexts.

The recruitment process targeted all eight comprehensive institutes in Ferrara, encompassing thirty primary schools. We deliberately included institutes regardless of their current Walking School Bus status to ensure representation of successful implementations, discontinued services, and programs in development. This approach enabled examination of both barriers and facilitators across the implementation spectrum.

The recruitment procedure followed a structured multi-phase approach. Initial contact was made through formal email communications to institute directors, outlining research objectives and inviting participation in 30-minute interviews. The communication specified flexible participation modalities (in-person or remote) and requested identification of relevant Walking School Bus coordinators within each institution.

Following limited initial response, a follow-up email was sent to non-responding institutions, reiterating the research importance and participation request. Due to persistent low response rates and the approaching academic year end, we implemented a direct telephone contact phase with school secretariats. This personal approach facilitated direct assessment of participation willingness and enabled more effective communication of research objectives.

The multi-method recruitment strategy yielded a final sample of five school complexes representing the three implementation conditions of interest:

- Active service: "Bombonati" school
- Dismissed services: "Villaggio Ina," "Tumiati," and "Rossetti" school
- Interesting in starting service: "Mosti" school

The final sample (see Table 1), though limited in size, holds significant informational value as it enables a comparative analysis of the conditions that facilitate the initiation, maintenance, or discontinuation of the service. The inclusion of cases from all three categories of interest ensures the examination of the phenomenon from multiple perspectives, thereby enriching the depth and breadth of insights derived from the study.

Table 1 Sample characteristics of the study participants.

Id	gender	work position	school	service status
M m	female	teacher	Mosti	interested in starting
R t	male	teacher	Tumiati	dismissed
G v	female	teacher	Villaggio Ina	dismissed
D r	female	teacher	Rossetti	dismissed
D b	female	teacher	Bombonati	active

3.2. Method of Analysis

The interview data collected from five participants were analyzed using the six-step thematic analysis framework developed by Braun and Clarke (2012), as applied in transportation research by Nikitas et al. (2019). This structured approach enables the identification of themes and patterns within qualitative data while enhancing the transparency, reliability, and validity of the research process (Nowell et al., 2017; Braun & Clarke, 2021).

The six steps of the analysis included: (1) familiarization with the data, (2) generating initial codes, (3) developing themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report.

Interviews were first transcribed verbatim and cross-checked against audio recordings to ensure accuracy. The coding process was conducted manually through repeated reading and annotation of the transcripts. Initial codes and sub-codes were gradually organized into broader themes, which were iteratively refined into the final three themes presented in this study. NVivo 15, a computer-assisted qualitative data analysis software (CAQDAS), was used to support the organization and analysis of the data.

The resulting themes are described in detail in the following section.

4. Findings

The adopted methodological procedure identified three themes essential to understanding Walking School Bus dynamics. **Service Characteristics** encompass the operational framework, including management, communication strategies, cost structure, service frequency, and identified strengths and weaknesses. **Family Determinants** capture household-level influences, particularly parental and children's interest, availability for chaperoning, and prevailing transportation habits. **School Context** assesses how the school's institutional environment shapes Walking School Bus viability through its environmental practices, motivations for engagement, service awareness channels, and geographic suitability for safe implementation. Each theme consists of distinct dimensions, represented by codes and subcodes (see Figures 1 and 2).

Figure 2 Three themes and codes

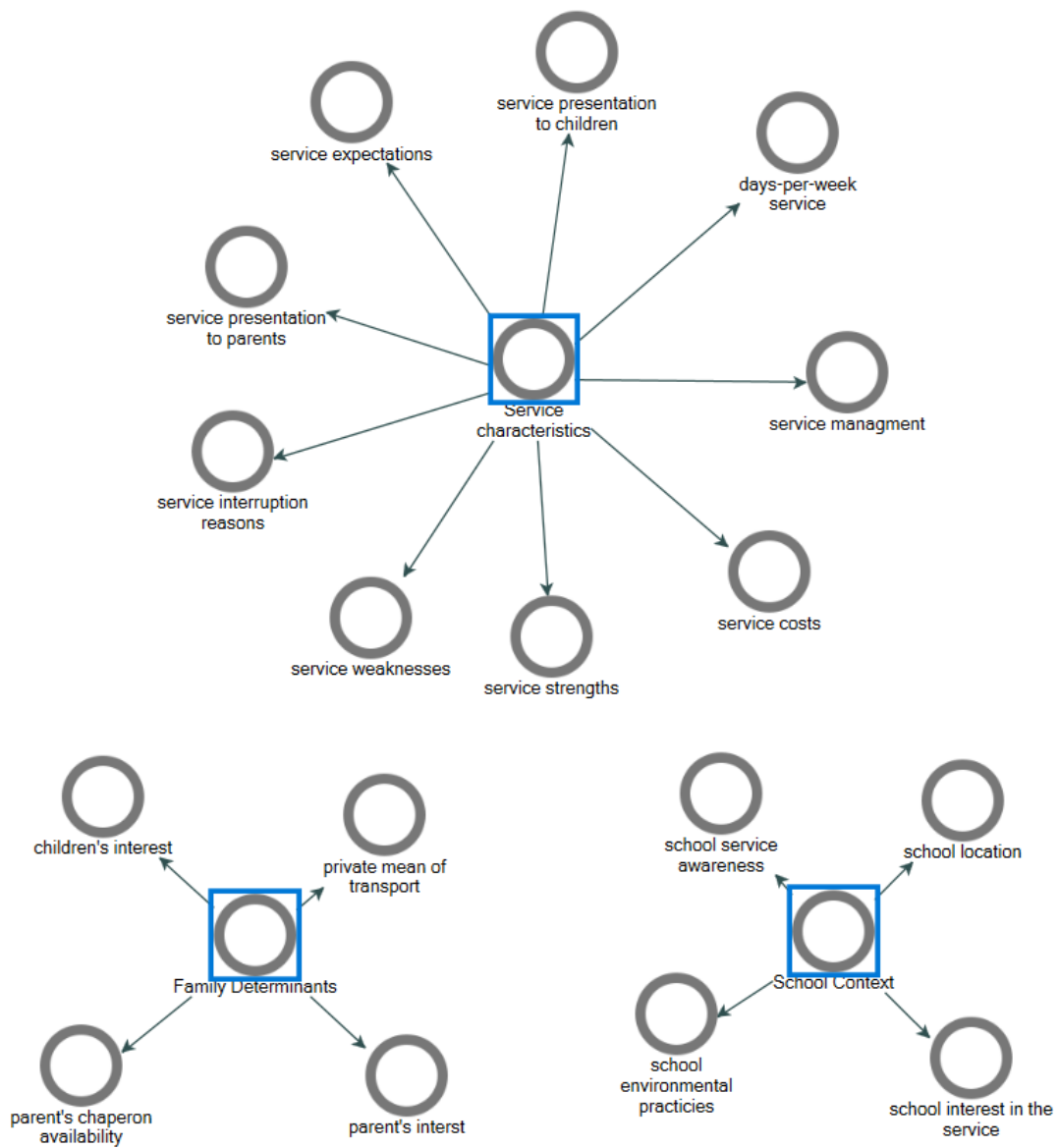
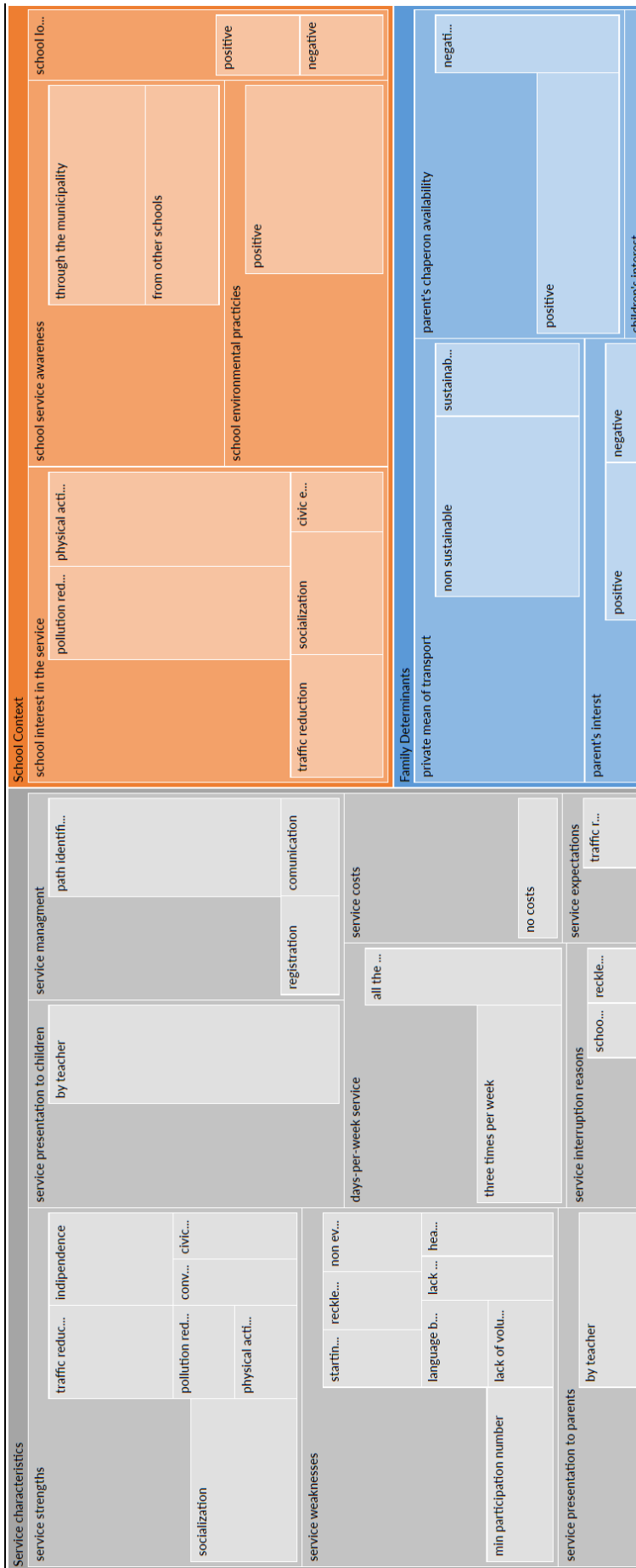


Figure 3 Three themes and codes



4.1. Service Characteristics

The Walking School Bus service is **managed** by the municipality, with an operational structure that includes **route identification, registration management, and institutional communication.**

R t: "with the support of the Municipality of Ferrara, and they find the guidelines for the ... , based on the registrations we had received, and to find the best route to take."

G v: "They collected the sign-ups in the classes and then, based on the number of sign-ups, I gave them the forms. They filled them out, I had them bring them back to school signed, and then I took them by hand to Via Guido d'Arezzo (the municipal office)."

D r: "Then they created a chat group with the parents and the two educators so they could exchange information."

The **service strengths** highlighted by participants primarily concern **socialization**, the development of children's **independence, civic education, compatibility with working hours, pollution reduction and traffic reduction**, as well as the promotion of **physical activity.**

D b: "strength is certainly that the children know each other outside the school context"

G v: "especially for autonomy because they perhaps became more autonomous because they came to school in a group with friends"

D b: "also to manage signposting on site and thus to learn about pedestrian rules in the field"

D r: "Parents who maybe have to go to work, they also put them down at one point and so they get to work earlier. Otherwise, they would have to wait for the bell to ring"

D b: "In the morning, we remove quite a few polluting cars from the road."

D b: "Another highlight is that traffic in front of the school is relieved"

D b: "Then it is also good for their health because they walk"

The **service presentation to parents** occurs mainly **through teachers**, as does the **service presentation to children.**

D r: "it was through e-mail, through the municipality and school website, and on the spot, that is, through assemblies."

R t: "I know that information has been organised to parents certainly in this assembly; to teachers in teachers' colleges; and to children, the teachers' spin-off to classes directly"

Operational **weaknesses** include **heavy backpacks, language barriers, insufficient number of participants, non-daily service, lack of service knowledge, lack of volunteers**, perceived insecurity due to **reckless drivers**, and **schedule incompatibility.**

R t: "on certain days maybe they were heavier and so dragging them over a distance of almost a kilometre, let's say it was a bit difficult for them."

G v: "The lack of communication with the families, but because they are foreigners. there at the INA village where I work there are only foreign families. There is not one Italian."

G v: "And there were no more than 15 because the municipality, with the fact that they put cooperatives by providing two educators, it could not be more than 15 children. "

D b: "when we organised it as a school, the Walking School Bus was there every morning, every day. Now this year it was three times a week, so Monday, Wednesday and Friday."

G v: "the first classes that don't know about the service. They don't know..."

D r: "A bit with the hectic life and families, it was a bit hard to have staff available"

D b: "motorists who, when they see a school group anyway, have to stop and not interrupt it, because many, if there is a child slowing down and leaving a little space, they will pass your scooter in the middle. They pass you in the middle. They don't wait, but they don't get to realise that there is a school group crossing."

G v: "Let's say for the timetable. Maybe they can't always stick to the timetable."

Service interruptions are mainly caused by **failure to meet the minimum subscription requirement**, in addition to logistical issues related to **school location** and **road safety**.

R t: "They cancelled it. No... In the end, even though there were people signed up, attendance wasn't actually... , there were only two children. One child, two, three. Too few to justify the whole organisation."

D r: "the school is located next to a path on Baluardi street that you cannot walk on unless you are on the altamura, but when you get to the bottom to go down to the school, the path disappears. So if a child falls on it and then there were a bit too many dangers"

D r: "there is a lot of traffic there, and then the crossing of the street towards the bridge there of the river, which is a not very visible crossing. People from the roundabout jump on this left turn a bit too fast and so it was also a dangerous road, i.e. exposing children"

Service costs are generally covered by the municipal structure, with most users not incurring direct expenses.

M m: "a completely free service. Reflective jackets are also provided. What I understood. They remain with each child. So, there should be no charge for the parents."

The **days-per-week service** varies from **three times per week** to **all week**.

M m: "The service will take place three days a week."

R t: "was implemented every day from Monday to Friday morning."

Service expectations focus on **civic education**, **pollution reduction**, and **traffic reduction**.

M m: "I hope the project will involve preparation in terms of civic education."

M m: "first of all we expect pollution to decrease as a result of reduced car use"

M m: "less traffic during school entrance hours."

4.2. Family Determinants

Parental interest is predominantly positive, although some reservations remain.

D b: "Parents like it. Also, because it is done in all weather conditions."

D b: "Some children would like to participate but raising awareness among some families a bit difficult because it is more convenient to use the car."

Availability as chaperones is generally positive but limited by work commitments.

R t: "There were quite a few of them. At least ten. At least ten. But they all took turns."

G v: "No parents were available due to their work schedules."

Children's interest shows a high propensity to use the service, with unanimously positive perceptions.

D r: "Children like it because when they walk around... , when you say the words "let's go to..." and we walk there, they already feel like they're on an outing."

The **primary means of transport** for school-home commutes remains the **private car**, with a predominant use of **non-sustainable** modes compared to active alternatives.

R t: "most of them come by car"

G v: "Most of them arrive on foot because they all live nearby."

4.3. School Context

School **environmental practices** are well-established, with unanimously positive feedback.

D r: "They also took part in Plastic Free. They teach road safety. The project is almost the same, you see. All the classes went out into the local area, we dedicated ourselves to one area and cleaned it up, clearing it of rubbish, and the children who take part in the Piedibus identified many areas. So the focus is also on the environment."

Interest in the service is motivated by the promotion of **physical activity**, **pollution reduction**, and **traffic reduction**, as well as **socialization** and **civic education**.

R t: "at the same time, encourage them to take a healthy morning walk to activate all our neurons, so to speak, so that they don't arrive at school still half asleep."

R t: "The choice was a matter of responsibility in terms of environmental sustainability."

M m: "reduce the number of cars near the school"

D r: "the motivation was precisely this, socialization"

D b: "And implement the rules for pedestrians and cyclists. In short, get back to civic road safety education."

Service awareness occurs mainly **through the municipality** and **word-of-mouth among schools**.

M m: "through the Mobilitiamoci project of the Municipality of Ferrara"

R t: "knowing that another school in Ferrara, Bombonati, had already implemented this walking bus service..."

The **school's geographical location** significantly influences service implementation, with both negative and positive perceptions regarding the suitability of pedestrian routes and road safety.

D r: "a different physical location... the school is in the center, below the walls, one-way streets, narrow streets. And getting there on foot with the children is difficult, it's a fairly busy area. In the morning it gets very congested, so..."

M m: "Yes, absolutely. The area is well suited for the operation of the service."

5. Discussion

The findings from the qualitative investigation outline a multifaceted framework in which **Service Characteristics, Family Determinants, and School Context** interact to determine the feasibility and success of the Walking School Bus service. The analysis allows for interpretations through the lens of behavioural economics principles, which help explain the gap between the recognition of the Walking School Bus's benefits and its actual adoption.

A first central element concerns service design. The analysis of **Service Characteristics** reveals that although the benefits are widely recognised (socialisation, autonomy, traffic reduction), they are often overshadowed by operational barriers that function as negative nudges (Thaler & Sunstein, 2008). Specifically, the non-daily frequency of the service fragments family routines, introducing a significant *planning overhead* and preventing the formation of a consolidated habit (Wood & Rüniger, 2016). Similarly, seemingly small obstacles, such as heavy backpacks and the perception of road insecurity, appear to have a disproportionate weight in family decisions, suggesting that immediate and salient costs tend to outweigh broader yet diffuse long-term benefits (Bordalo et al., 2012).

Secondly, the **Family Determinants** illustrate a clear intention-action gap. While positive interest is found among both parents and children, the dominant behavioural choice remains the private car, often justified in terms of pure "convenience." This behaviour can be interpreted as the result of a strong status quo bias and inertia (DellaVigna, 2009), where the immediate cost of change outweighs the willingness to adopt more virtuous behaviours. The limited availability of parents to act as chaperones, often linked to work commitments, further highlights a classic collective action problem (Ostrom, 2000): the benefit of the service is collective, while the cost (time) is individual, creating an incentive to free-ride.

Finally, the **School Context** emerges as a critical enabling factor. The presence of well-established environmental practices provides a value-based foundation that facilitates adherence to the project, which is thus *framed* not as a mere transport service but as an extension of the school's educational offering. However, this positive impetus can be negated by the geographical context. The perception of insecurity related to traffic and road infrastructure represents a powerful perceptual barrier, acting as a salient warning signal for parents, who tend to overestimate immediate and tangible risks (e.g., an accident) compared to chronic and less visible ones (e.g., sedentariness, pollution) (Bordalo et al., 2012).

In summary, the results suggest that the low adoption of the Walking School Bus is not necessarily due to a lack of consensus on its goals, but rather to a misalignment between its current design and the architecture of family choices, which are influenced by behavioural frictions, inertia, and risk perception.

5.1. Implications and Future Research

In light of this analysis, it appears that promoting the Walking School Bus based solely on raising awareness of its benefits may be insufficient. Our findings suggest, instead, that interventions based on *nudging* and behavioural design (*choice architecture*) (Thaler & Sunstein, 2008) could be more effective. Specifically, action could be taken on several fronts. First, it would be crucial to minimise behavioural frictions, perhaps by making the service daily to anchor it to family routines and facilitate habit formation (Wood & Rüniger, 2016), and by providing practical solutions such as backpack trolleys. Second, to address the collective action problem of chaperones (Ostrom, 2000), clearer and "low-effort" rotation systems, possibly digitally coordinated, could be designed to make each individual's contribution feel more equitable and less burdensome. A third, perhaps more complex yet crucial, front for intervention concerns safety perception. Here, collaboration with the municipal administration to implement small infrastructural interventions (e.g., more visible signage or raised crossings) would be key to sending a tangible signal of safety, thereby reducing the negative salience of risk (Bordalo et al.,

2012) that currently deters many parents. Finally, working on the *framing* of the service, presenting it not as a transport option but as a genuine community educational project, could leverage the social capital already present in schools to increase uptake.

Providing, this study, a preliminary framework for understanding the behavioural dynamics of the Walking School Bus service, a future research direction could involve conducting in-depth qualitative interviews with parents to verify whether the perceptions of the Walking School Bus service, as reported by teachers in this study, are congruent with parental perspectives. This qualitative investigation would serve to identify which specific aspects and behavioural barriers require deeper examination. Subsequently, these insights could be further explored through a quantitative approach by developing a tailored survey to measure the relative weight of these factors on service adoption across a larger sample. Ultimately, controlled experiments could be designed to test the efficacy of the different behavioural economics-inspired interventions proposed here.

6. Conclusion

This study has identified the key factors influencing Walking School Bus adoption through a behavioural economics lens, revealing three interconnected themes: Service Characteristics, Family Determinants, and School Context. While stakeholders recognize the service's benefits, including reduced traffic, improved children's autonomy, and enhanced socialisation, these advantages are often overshadowed by behavioural barriers and operational constraints.

Our findings demonstrate that the intention-action gap stems from status quo bias, inertia, and the salience of immediate costs over long-term benefits. The collective action problem in chaperone recruitment further challenges program sustainability. Service design elements such as non-daily operation, heavy backpacks, and safety concerns create friction that discourages participation, while geographical constraints and institutional commitment levels significantly impact implementation success.

This research contributes to sustainable mobility literature by applying behavioural economics principles to school transportation in a European urban context. For policymakers, our results suggest that successful interventions must address behavioural barriers through nudges and choice architecture rather than relying solely on awareness campaigns.

The study's limitations, including its focus on educational staff perspectives within one municipality, indicate valuable directions for future research. Expanding investigation to include parental viewpoints and quantitative validation of these behavioural factors would strengthen understanding of participation dynamics. Ultimately, realizing Walking School Bus's potential requires addressing both operational design and the behavioural architecture surrounding family mobility choices. By applying these insights, municipalities can develop more effective strategies to support the transition toward sustainable school mobility and healthier urban communities.

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