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User Acceptance of Assistive Electric Motorcycles for Physical Disabilities: An Analysis of the Technology Acceptance Model in the Context of Special Education

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Abstract

This study aims to analyze user acceptance of assistive electric reverse trike motorcycles for individuals with physical disabilities within the context of Special Education in Higher Education using the Technology Acceptance Model (TAM) approach. This research employed a descriptive qualitative method with interview and observation techniques involving 16 informants consisting of users, lecturers, technicians, and members of the disability community. Data analysis was conducted through data reduction, data display, and conclusion drawing. The results indicate that perceived usefulness and perceived ease of use have a positive influence on attitudes toward use and the actual use of the assistive motorcycle. This vehicle is proven to enhance campus accessibility, learning independence, and academic participation of students with physical disabilities. However, acceptance is also influenced by external factors such as family support, university policies, and infrastructure. This study confirms that assistive mobility technology plays a crucial role in realizing inclusive higher education.

Introduction

Physical disability refers to impairments in bodily functions that affect motor abilities, including movement, walking, speaking, and limb coordination, caused by damage to the brain's motor centers or disorders of the muscular, skeletal, and joint systems (Nugroho, 2023; Ayub & Mallamaci, 2023). Individuals with physical disabilities generally require lifelong support and face continuous challenges in maintaining and redefining their level of independence (Dam et al., 2024). In the context of Special Education in Higher Education, mobility limitations directly affect access to education, learning attendance, independence in participating in instructional activities, and involvement in vocational programs. Therefore, assistive mobility technology becomes a crucial element in fulfilling the right to inclusive and high-quality educational services for individuals with physical disabilities (Cline et al., 2026; Padmadewi et al., 2026; Rahman et al., 2026).

Special education refers to instruction that is specifically designed to meet the unique needs of learners with disabilities through appropriate adjustments to objectives, content, methods, and learning environments so that their potential can be optimally developed (Albrecht et al., 2006; Marbun et al., 2023). Special education is understood as an individualized learning process, grounded in evidence-based methods and oriented toward achieving the highest possible levels of independence and academic success (Heward et al., 2017; Ramadan et al., 2026; Bakhytzhamal et al., 2026). At the higher education level, students with physical disabilities continue to face structural and cultural barriers despite increasing participation. In the United States, approximately 29% of students with disabilities have physical impairments; however, the employment rate of graduates with disabilities remains at only about 52–53%, compared to

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83% among nondisabled graduates, indicating the need for adapted career services and internship programs (DiYenno et al., 2019). A similar condition is found in Ecuador, where only 1.21% of persons with disabilities are enrolled in higher education and more than half have physical impairments, while nearly half of campus infrastructure remains classified as "barely accessible," thereby necessitating comprehensive adjustments based on principles of universal accessibility and the Sustainable Development Goals (Maldonado-Garcés et al., 2025).

The study by Zabala-Domínguez et al. (2024) demonstrates that sports activities play a significant role in improving health, personal development, and strengthening the social inclusion of individuals with physical disabilities. In line with this, Tjahjanti et al. (2024) developed the design of the DMI assistive electric motorcycle, which is more stable, comfortable, and safe for users with three-wheeled physical disabilities, to address issues of instability and lower back pain while simultaneously supporting independence and quality of life. In Indonesia, recognition of the rights of persons with disabilities has been strengthened through the ratification of the Convention on the Rights of Persons with Disabilities (CRPD) under Law No. 19 of 2011 (Arianto & Apsari, 2023), along with the high prevalence of disability, reaching approximately 15% of the population (Supartono et al., 2022) or more than 22 million individuals (Zayadi et al., 2024), which necessitates the availability of inclusive transportation such as three-wheeled electric bicycles. Persons with disabilities utilize bicycles for mobility, recreation, employment, education, and the strengthening of independence, while also actively participating in their adaptation and development (Norcliffe et al., 2022). Modified motorcycles can be legally operated on public roads as long as they comply with safety standards in accordance with Law No. 22 of 2009 (Dywananda & Chumaida, 2024). The use of assistive technology is regarded as a key element in promoting independence and social inclusion among individuals with physical disabilities and holds the potential to serve as a basis for policy recommendations aimed at improving accessibility and quality of life (Zen et al., 2025).

Universitas PGRI Argopuro Jember (UNIPAR), through its Special Education Study Program, demonstrates a commitment to inclusive education innovation by developing a prototype of an assistive electric reverse trike motorcycle for individuals with physical disabilities. This innovation was developed by Asrorul Mais, a lecturer in Special Education at UNIPAR Jember, in collaboration with PT Ilectra Motor Group (ALVA) as part of an emerging research partnership on assistive technology. This collaboration is further strengthened by a planned official visit from the ALVA executive team on November 20–21, 2025, to conduct documentation and product assessment of assistive vehicles based on ALVA electric motorcycles. This collaboration indicates that the development of mobility technology is not merely a technical innovation, but also an integral part of educational efforts to enhance learning access, independence, and educational participation for individuals with disabilities.

Furthermore, the selection of the reverse trike model represents a visionary design approach, as it offers high stability, Ackermann steering geometry, ergonomic comfort, and facilitates easier transfer for wheelchair users. The 2023 Alva Cervo electric motorcycle serves as a compatible platform for the development of this assistive design. The reverse trike design is directly relevant to the needs of students with physical disabilities who require safe mobility devices for commuting to school or university. A stable and intuitive design not only enhances safety and comfort but also supports learning independence, which is a core principle of inclusive education.

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This analysis is further strengthened through the application of the Technology Acceptance Model (TAM) as a framework for understanding how users perceive the usefulness and ease of use of this assistive technology. The TAM, introduced by Davis (1989) and rooted in the Theory of Reasoned Action (Fishbein & Ajzen, 1975 in Ma & Liu, 2005), asserts that technology acceptance is influenced by two primary factors: perceived ease of use and perceived usefulness. These two factors directly affect users' attitudes toward technology (attitude toward using), which subsequently shape behavioral intention to use and ultimately result in actual system use.

In the context of educational research, TAM is applied to assess the readiness and acceptance of individuals with physical disabilities toward the use of assistive vehicles as a means of accessing education. Perceptions of usefulness and ease of use influence their intention to utilize assistive motorcycles in learning routines and academic activities. In addition, external factors such as support from the disability community, inclusive education policies, and accessible campus infrastructure further reinforce the adoption of this technology. Therefore, this study does not merely examine the technical design of the vehicle but also integrates the dimensions of inclusive education, assistive technology, and user behavior through the TAM framework. The novelty of this research lies in its analysis of the acceptance of reverse trike–based assistive electric motorcycles within the educational context, particularly in how mobility technology supports access, independence, and academic participation among students with physical disabilities.

Methods

This study uses a qualitative descriptive method with an interpretive approach based on the Technology Acceptance Model (TAM) to understand the acceptance and experiences of users with disabilities regarding the assistive electric motorcycle modified from Alva Cervo 2023 with a reverse trike design. The qualitative descriptive method is used to examine phenomena, behaviors, and specific conditions as objects of study through in-depth narrative descriptions (Leksono, 2013). The interpretive approach was chosen because it views reality as a result of social construction, which is interpreted by actors based on their experiences (Putnam & Banghart, 2017). This approach is relevant because mobility assistive technology functions not only as a means of transportation but also influences access to education, learning independence, and the academic participation of individuals with physical disabilities in the context of Special Education (PLB). The research was conducted from March to November 2025 at the Universitas PGRI Argopuro Jember (UNIPAR) as the prototype developer, as well as the community of individuals with physical disabilities in Jember Regency.

The informants, totaling 16 participants, were purposively selected to represent diverse perspectives involved in the development, use, and evaluation of assistive mobility technology. The informants consisted of seven assistive electric motorcycle users, two technicians, three lecturers involved in the development process, one representative from the disability community, and three students with physical disabilities. Data were collected through semi-structured interviews and participatory observation using a TAM-based interview guide, which incorporated the core constructs of *Perceived Usefulness*, *Perceived Ease of Use*, *Attitude Toward Using*, and *Actual System Use*. These constructs functioned as exploratory prompts to elicit participants' experiential narratives rather than as predefined analytical categories. To enhance transparency and analytical traceability, the distribution of informants and the coding system applied during data analysis are presented in Table 1.

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Table 1. Data and Informant Coding

Informant Category	Code	Interview Date
Assistive Electric Motorcycle Users (Trial Participants)	W-AH	09/09/2025
	W-EPP	09/09/2025
	W-BT	10/11/2025
	W-CN	10/11/2025
	W-S	22/11/2025
	W-A	29/11/2025
	W-HSH	29/11/2025
Technicians	W-TR	21/03/2025
	W-SR	14/08/2025
Development Lecturers	W-AM	11/09/2025
	W-AFY	11/09/2025
	W-IHZ	04/03/2025
Disability Community Representative	W-MZR	07/11/2025
Students with Physical Disabilities (Polio)	W-SG	10/11/2025
	W-ZM	29/11/2025
	W-RH	29/11/2025

Data analysis was carried out using the Miles and Huberman (2014) model, which includes data reduction, data presentation, and conclusion drawing and verification. Data validity was maintained through triangulation, member checking, and audit dependability, while adhering to research ethics principles such as informed consent, confidentiality of identities, and the use of data for academic purposes.

Results and Discussion

Interpretation of Findings within the Framework of the Technology Acceptance Model (TAM)

Technological Innovation for Inclusive Mobility: Acceptance and Application of Assistive Electric Motorcycles

Innovation is an interdisciplinary object of study that encompasses behavioral changes in the application of actions within society (Kochetkov, 2023). Innovation is understood as a result, process, and mindset that are interconnected (Kahn, 2018), with applications that are specific to each organization (Morelos-Gómez et al., 2023). In the context of assistive electric motorcycles, Pradana et al. (2017) developed a three-wheeled electric trike for individuals with physical disabilities, integrated with a wheelchair, using a Brushless DC motor, battery power, and solar energy, along with features such as a seat lock, seatbelt, and automatic reverse system to support safe and efficient independent mobility.

The Technology Acceptance Model (TAM) developed by Davis (1989), based on the Theory of Reasoned Action by Ajzen and Fishbein, is a key model used to explain the acceptance and usage behavior of technology. TAM has been widely used to analyze the adoption of new technologies and electronic services (Aljarrah et al., 2016). In this model, technology acceptance is mainly determined by two core perceptions, namely perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which users believe that a technology can improve their performance, while perceived ease of use refers to the extent to

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which users believe that the technology can be used with minimal effort. Therefore, TAM is relevant for understanding why individuals decide to accept, reject, or continue using a particular technology, especially in digital service environments.

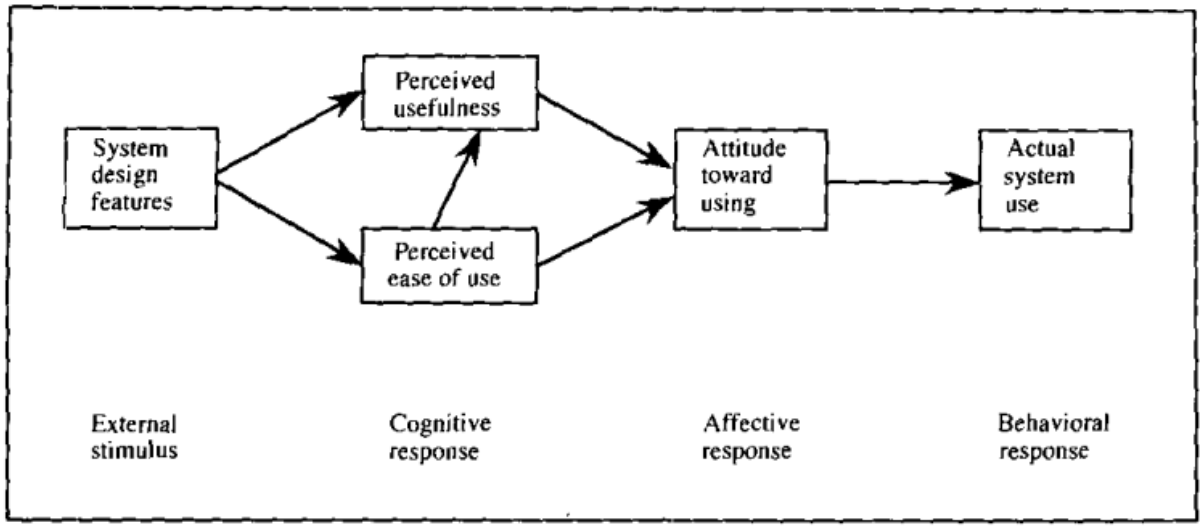

Figure 1. Technology Acceptance Model (Davis, 1993)

Figure 1 shows that in the Technology Acceptance Model (TAM) developed by Davis (1989), there are four main variables in technology acceptance: Perceived Usefulness (PU) as the belief in the system's benefits for performance, Perceived Ease of Use (PEOU) as the perception of ease of use, Attitude Toward Using (ATU) as the user's attitude, and Actual System Use (ASU) as the actual usage behavior. PEOU not only influences attitude but also strengthens PU, while ATU serves as the basis for the emergence of actual usage behavior. The findings of this study show that the acceptance of the reverse trike assistive electric motorcycle by individuals with physical disabilities at UNIPAR aligns with the theoretical structure of TAM (Davis, 1989), where the four variablesPU, PEOU, ATU, and ASU mutually reinforce each other in shaping the intention and behavior of using the assistive motorcycle in an academic context.

Perceived usefulness refers to an individual's belief that the use of a system enhances performance and delivers tangible benefits in accomplishing daily tasks (Verástegui et al., 2025; Kılıç & Çelik, 2025; Bolodeoku et al., 2022). In the context of the reverse trike assistive electric motorcycle, perceived usefulness is prominently reflected in improved campus accessibility, enhanced safety, reduced transportation costs, and increased participation in academic and vocational learning activities.

Several participants emphasized the functional benefits of the assistive motorcycle in facilitating safe and efficient access to campus. One user explained:

> *"This vehicle allows me to reach the campus without fear of slipping or falling, which makes my journey safer and more efficient." (W-AH-09/09/2025).*

Economic advantages were also perceived as a significant benefit, particularly in relation to daily commuting expenses:

> *"My transportation costs have decreased considerably because I no longer need to rely on paid transportation services every day." (W-EPP-09/09/2025).*

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Beyond mobility and cost efficiency, the assistive motorcycle contributes to increased independence and improved academic attendance. A participant who previously depended on peer assistance stated:

> *"I can now travel to campus independently and no longer depend on my friends for mobility support." (W-BT-10/11/2025).*

Students with physical disabilities caused by polio further reported that the vehicle enables sustained engagement in practical and vocational courses by reducing physical fatigue:

> *"Using this motorcycle allows me to attend more practical classes without experiencing excessive physical exhaustion." (W-ZM-29/11/2025).*

A similar experience was expressed by another participant:

> *"My mobility has become more stable, so I do not expend excessive energy before participating in laboratory-based classes."(W-RH-29/11/2025).*

From the developers' perspective, the perceived usefulness of the assistive motorcycle extends to broader academic participation. One developer noted:

> *"This assistive motorcycle has the potential to increase student engagement in laboratory courses because mobility becomes more consistent and secure."(W-AM-11/09/2025).*

In addition to functional benefits, psychological outcomes were also identified as an integral component of perceived usefulness:

> *"The benefits are not only functional but also psychological, particularly in enhancing users' self-efficacy and sense of safety."(W-MZR-07/11/2025).*

Analytically, these findings demonstrate that perceived usefulness of the reverse trike assistive electric motorcycle extends beyond mobility efficiency. It exerts a systemic influence on academic sustainability by strengthening independence, reducing physical and economic barriers, and supporting sustained participation of students with disabilities in higher education.

Perceived ease of use refers to the degree to which an individual believes that a system can be operated with minimal physical and cognitive effort (He et al., 2018; Denovan & Marsasi, 2025; Palumian et al., 2021). In this study, perceived ease of use emerges as a critical factor reinforcing user acceptance of the reverse trike assistive electric motorcycle, particularly among students with physical disabilities.

One participant emphasized that the Ackermann steering system contributes to intuitive vehicle control, comparable to operating a small car rather than a conventional motorcycle:

> *"The steering feels very intuitive, almost like driving a small car, and I do not need to maintain body balance like on a regular motorcycle." (W-A-29/11/2025).*

For users with physical limitations, the availability of full hand control was identified as a decisive feature supporting ease of use:

> *"All the controls can be operated using my hands, which makes riding much easier given my physical condition." (W-ZM-29/11/2025).*

Another participant highlighted the short adaptation period required to operate the motorcycle, attributing this to its ergonomic design and stable seating position:

> *"The adaptation process was very quick because the seat is low and the motorcycle feels stable from the beginning." (W-SG-10/11/2025).*

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From a technical perspective, the design elements of the assistive motorcycle were intentionally developed to minimize learning barriers for new users. One technical expert explained:

> *"The low center of gravity, dual suspension system, and evenly distributed braking make this motorcycle easy to learn, even for first-time users." (W-TR-21/03/2025).*

The customization of hand controls for users with limited muscle strength further enhances operational simplicity:

> *"The hand controls are specifically adjusted for users with limited muscle strength, so they do not require excessive physical effort." (W-IHZ-04/03/2025).*

Beyond technical usability, ease of use was also perceived as pedagogically significant. One informant noted that reduced physical strain during mobility allows students to allocate more energy to academic engagement:

> *"Because riding does not physically exhaust the students, they can focus their energy on learning activities once they arrive on campus." (W-IHZ-04/03/2025).*

Analytically, these findings indicate that perceived ease of use functions not merely as a technical attribute but as a foundational prerequisite for sustaining the learning process of students with disabilities. By reducing physical effort, shortening adaptation time, and accommodating diverse physical conditions, ease of use directly supports continuous academic participation and learning sustainability in higher education contexts.

Attitude toward using refers to an individual's overall affective and psychological evaluation of a technology, which shapes their interest and tendency to adopt and continue using it (Ajzen & Fishbein, 1980; Firdaus et al., 2022; M & Ali, 2021). In this study, students' attitudes toward the reverse trike assistive electric motorcycle demonstrate a strongly positive orientation, manifested through feelings of enjoyment, comfort, pride, confidence, and perceived safety.

Several participants reported increased self-confidence when using the assistive motorcycle in daily campus mobility. One student stated:

> *"Riding this motorcycle makes me feel more confident when moving around campus." (W-AH-09/09/2025).*

Comfort and sensory experience also played a role in shaping positive attitudes. A participant highlighted the smooth engine sound and vehicle stability as contributing factors:

> *"The ride feels very comfortable because the engine is quiet and the motorcycle is stable." (W-CN-10/11/2025).*

Psychological empowerment emerged as a dominant theme, particularly in relation to independence and social equality. One participant explained:

> *"I feel more equal to other students now because I no longer depend on others for my daily mobility." (W-RH-29/11/2025).*

Another participant emphasized the emotional significance of the motorcycle's modern design, which helps reduce stigma associated with assistive mobility devices:

> *"I feel proud using this motorcycle because it looks modern and does not carry the stigma of old-fashioned disability vehicles." (W-HSH-29/11/2025).*

Perceived safety was identified as a core determinant of positive attitudes toward continued use. As one participant noted:

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"The feeling of safety is what makes me enjoy using this motorcycle every day." (W-AFY-11/09/2025).

In addition, modern assistive mobility technology was perceived as strengthening users' self-image and sense of belonging within the academic environment:

"Using modern mobility technology makes me feel more confident and more connected to the campus environment."(W-MZR-07/11/2025).

Analytically, these findings indicate that attitude toward using the assistive electric motorcycle is shaped not only by utilitarian considerations but also by emotional and symbolic dimensions. Positive affect, reduced stigma, enhanced self-confidence, and a strengthened sense of belonging collectively reinforce technology acceptance and contribute to the empowerment and identity formation of students with disabilities in higher education.

Actual system use refers to the extent to which users employ a technology in real-life contexts and reflects the level of sustained and long-term acceptance (Davis, 1989; Hossain et al., 2024; Wang et al., 2025). In the context of the reverse trike assistive electric motorcycle, actual system use demonstrates a strong tendency toward continued and routine adoption beyond the trial phase.

Several participants reported consistent daily use of the assistive motorcycle due to its practical and economic advantages. One participant stated:

"I intend to use this assistive motorcycle every day because it significantly reduces my transportation expenses." (W-EPP-09/09/2025).

Beyond routine commuting, actual system use extended to a wide range of academic and organizational activities. A participant explained:

"I have used the motorcycle not only during the trial period but also for organizational activities and trips to the library." (W-A-29/11/2025).

The intention for long-term adoption was further reinforced by participants' willingness to invest in the technology if financial accessibility were improved:

"I would be willing to purchase this motorcycle if installment plans or subsidies were available." (W-ZM-29/11/2025).

A similar view was expressed by another participant:

"With financial support or a payment scheme, I would seriously consider owning this motorcycle for daily use." (W-SG-10/11/2025).

During the trial phase, the assistive motorcycle was utilized not only for academic mobility but also for social participation and everyday activities, indicating integration into users' broader life routines.

From a technical perspective, ongoing user engagement was reflected in requests for further customization. A technician noted:

"Several users requested additional modifications, which shows that they want this motorcycle to become their long-term mobility solution." (W-S-14/08/2025).

Similarly, a developer emphasized that consistent real-world usage signals readiness for institutional integration:

"The consistency of actual use clearly indicates that students are prepared to integrate this technology into their regular educational routines."(W-AM-11/09/2025).

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Analytically, these findings suggest that actual system use of the reverse trike assistive electric motorcycle extends beyond experimental adoption and reflects genuine long-term acceptance. Routine utilization across academic, social, and personal domains, combined with users' willingness to invest financially and request further modifications, indicates that this technology has strong potential to function as a sustainable and permanent mobility solution for students with disabilities in higher education.

Overall, these findings confirm the consistent TAM flow, namely PEOU → PU → ATU → ASU, with inclusive education as an external factor that strengthens each stage. Thus, the reverse trike assistive electric motorcycle not only functions as a mobility tool but also as an instrument for independence, reduction of academic barriers, and enhancement of educational participation.

The Role of Behavioral Intention and Actual Use in the Context of Assistive Mobility Technology

Within the framework of the Technology Acceptance Model (TAM), behavioral intention functions as a critical mediating construct between attitude toward using and actual system use, explaining how favorable attitudes are translated into concrete usage behaviors, even though this construct is not explicitly depicted in all variations of the TAM framework. In the context of assistive mobility technology for individuals with physical disabilities, behavioral intention becomes particularly salient, as technology adoption is influenced not only by personal preference but also by considerations of safety, physical capability, environmental support, and academic demands. The findings of this study indicate that behavioral intention emerges from the interaction of perceived usefulness (PU), perceived ease of use (PEOU), and positive attitudes toward the assistive electric motorcycle. One participant expressed a strong intention for routine use based on perceived economic and efficiency benefits:

> *"I plan to use the assistive motorcycle every day because it saves transportation costs and significantly reduces my travel time." (W-EPP-09/09/2025).*

Another participant demonstrated behavioral intention through usage beyond the formal trial period, integrating the technology into broader academic and organizational activities:

> *"I continue to use the motorcycle outside the trial schedule, especially for student organization activities." (W-A-29/11/2025).*

These behavioral intentions reflect users' readiness to integrate the assistive motorcycle into their daily mobility practices, thereby increasing the likelihood of sustained and consistent use. Such findings are consistent with Davis (1989), who argued that behavioral intention is formed when users perceive a technology as providing tangible and meaningful benefits that directly support their activities. Analytically, the emergence of strong behavioral intention among students with physical disabilities indicates that assistive mobility technologies are most likely to be adopted when they simultaneously address functional efficiency, ease of operation, and affective acceptance. In this sense, behavioral intention serves as a pivotal mechanism through which technological design and user experience are transformed into long-term, sustainable system use within higher education environments.

In addition to utilitarian considerations, behavioral intention among individuals with disabilities is strongly shaped by emotional factors and self-efficacy. This dynamic is evident in the experience of one participant, who reported increased confidence, a stronger sense of equality with other students, and the ability to independently operate the assistive motorcycle without external assistance:

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> *"Using this motorcycle makes me feel more confident and equal to other students because I can control it on my own without relying on anyone." (W-RH-29/11/2025).*

The perceived sense of safety and comfort during operation fosters a belief in personal capability, which in turn strengthens the intention to adopt the assistive motorcycle as a permanent component of daily educational mobility. This finding is consistent with the technology acceptance literature that positions self-efficacy as a critical reinforcement of behavioral intention, particularly among individuals with mobility impairments, indicating that technology adoption is influenced not only by rational evaluations but also by psychological and affective dimensions.

Strong behavioral intention was subsequently translated into actual system use, as reflected in the intensity and diversity of usage reported by several participants. For instance, two informants described using the assistive motorcycle not only for commuting to classes but also for shopping, social participation, and vocational activities:

"I use the motorcycle not only to go to class but also for shopping and other daily activities." (W-ZM-29/11/2025).

> *"The motorcycle has become part of my routine for social and vocational activities, not just academic mobility." (W-SG-10/11/2025).*

These patterns suggest that the assistive motorcycle functions as an extension of both academic engagement and social independence. Such findings align with Hossain et al. (2024), who argue that actual system use increases significantly when behavioral intention is formed through consistent and positive user experiences. Moreover, behavioral intention appears to mitigate external barriers commonly associated with assistive technology adoption, including financial constraints, family skepticism, and infrastructural limitations. One participant explicitly stated a strong willingness to invest in the technology despite such challenges:

> "*I would definitely buy this motorcycle if it were available with a subsidy or an installment plan, because the benefits are worth it." (W-RH-29/11/2025).*

Analytically, these findings underscore behavioral intention as the primary determinant of actual system use in the context of assistive mobility technology. More importantly, behavioral intention emerges as a strategic variable in ensuring that assistive motorcycles function not merely as temporary aids but as long-term empowerment tools that support autonomy, participation, and inclusion within higher education environments.

Relevance and Limitations of TAM in Understanding the Acceptance of Assistive Electric Motorcycles

The Technology Acceptance Model (TAM) proves relevant in explaining the acceptance process of the reverse trike assistive electric motorcycle by individuals with physical disabilities, but this framework has several limitations when applied to the context of assistive mobility technology. The research findings show that although the four core variables of TAM perceived usefulness (PU), perceived ease of use (PEOU), attitude toward using (ATU), and actual system use (ASU) can explain most of the dynamics of acceptance, there are external factors not fully covered by this model.

First, the relevance of the Technology Acceptance Model (TAM) is evident in the empirical consistency of the relationships observed among its core constructs. The assistive electric motorcycle is perceived as useful (PU) because it enhances campus accessibility, reduces physical fatigue, lowers transportation costs, and supports improved academic attendance.

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These utilitarian benefits are illustrated by one participant who reported substantial savings in daily mobility expenses:

> *"Using the assistive motorcycle significantly reduces my transportation costs." (W-EPP-09/09/2025).*

Similarly, another participant emphasized increased independence and punctuality in academic activities:

> *"I am more independent now and can arrive on campus on time without relying on others." (W-BT-10/11/2025).*

Perceived ease of use (PEOU) also emerged as a central determinant shaping perceptions of usefulness. For instance, one participant reported feeling capable of operating the motorcycle independently using hand-based controls, despite physical limitations:

> *"I can operate the motorcycle using only hand controls, which makes it easy for me to use." (W-ZM-29/11/2025).*

These findings reinforce Davis's (1989) foundational assumption that perceived ease of use positively influences perceived usefulness, which subsequently shapes users' attitudes toward the technology and their actual system use. In this study, the empirical evidence demonstrates that when assistive mobility technology is perceived as both easy to operate and functionally beneficial, it is more likely to be accepted and integrated into the daily academic routines of students with disabilities.

Second, the relevance of the Technology Acceptance Model (TAM) is further demonstrated by its capacity to capture the psychological and affective dimensions of users' experiences. This study reveals that positive attitudes manifested through increased confidence, comfort, pride, and a sense of security play a decisive role in shaping both behavioral intention and actual system use. These affective responses extend beyond functional evaluations and reflect users' emotional engagement with the assistive mobility technology.

One participant articulated a profound psychological shift associated with the use of the assistive motorcycle, emphasizing a heightened sense of equality and autonomy:

> *"I feel more equal to other students now because I can move independently without relying on assistance." (W-RH-29/11/2025).*

Such affective experiences function as significant predictors of continued technology use, as they reinforce users' motivation to integrate the assistive motorcycle into their daily academic routines. In line with TAM, positive attitudes toward the technology strengthen behavioral intention, which subsequently translates into consistent and sustained usage. In the context of assistive technology for individuals with disabilities, these findings highlight that acceptance is not solely driven by rational assessments of utility and usability but is also deeply embedded in psychological processes related to identity, self-worth, and social inclusion.

However, TAM has important limitations when used to understand the acceptance of assistive mobility technology for individuals with physical disabilities, as the context of users differs from that of general technology users:

Despite its explanatory strength, the Technology Acceptance Model (TAM) exhibits several limitations when applied to the context of assistive mobility technology for individuals with physical disabilities.

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First, TAM does not fully capture the influence of social factors, including family support, disability community norms, and institutional facilitation. Empirical evidence from this study indicates that acceptance of assistive motorcycles is significantly shaped by social validation and emotional support. Family members reported feeling safer when users adopted the assistive motorcycle:

> "Our family feels more secure knowing that this motorcycle is safer for daily mobility." *(W-SG-10/11/2025)*

In addition, disability communities play an important role in legitimizing technology use and reinforcing confidence:

> "Support from the disability community makes users feel validated and more confident in using this technology." *(W-MZR-07/11/2025)*

Furthermore, lecturers in special education contexts (PLB) contribute to psychological safety by encouraging adaptive mobility solutions. These social dynamics fall outside the scope of the classic TAM, although extended frameworks such as TAM2 and UTAUT attempt to incorporate social influence as a core construct.

Second, TAM does not sufficiently account for variations in users' physical conditions and bodily capabilities, which are critical determinants of assistive technology acceptance. Participants with polio, wheelchair users, and individuals with muscle weakness reported differing experiences in evaluating both perceived ease of use and perceived usefulness. Variables such as hand strength, ability to transfer between positions, and overall health condition substantially affect user interaction with the technology, yet these embodied factors are absent from the original TAM formulation.

Third, TAM overlooks contextual factors related to risk perception, safety, and physical infrastructure. In the case of assistive motorcycles, acceptance is strongly dependent on environmental compatibility, including road conditions, parking availability, and campus accessibility. One participant expressed concern regarding infrastructural constraints:

> *"Narrow and steep roads make me hesitant to use the motorcycle in certain areas." (W-S-22/11/2025).*

This finding highlights the importance of perceived risk and environmental fit in shaping both behavioral intention and actual system use dimensions that are not explicitly addressed in TAM.

Fourth, economic considerations and financial support mechanisms are not incorporated into TAM, despite their critical role in assistive technology adoption. Several participants expressed strong willingness to adopt the assistive motorcycle on a long-term basis if financial barriers were reduced:

> *"I would definitely buy this motorcycle if there were subsidies or installment options available."(W-RH-29/11/2025).*

> *"With financial assistance, owning this motorcycle would be very possible for me." (W-ZM-29/11/2025).*

These findings suggest that cost, affordability, and access to financial support are decisive factors influencing acceptance, particularly for users with disabilities who often face structural economic constraints.

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Analytically, these limitations indicate that while TAM provides a valuable foundation for understanding technology acceptance, it requires contextual expansion to adequately explain the adoption of assistive mobility technologies. Integrating social, embodied, environmental, and economic dimensions into TAM—or combining it with inclusive and disability-centered frameworks—would offer a more comprehensive and context-sensitive model of technology acceptance in inclusive higher education settings.

Overall, TAM remains relevant as a core framework for understanding the acceptance of assistive electric motorcycles, especially in explaining the role of benefits, ease of use, and attitudes. However, for the context of assistive mobility technology, TAM needs to be supplemented with additional variables such as social support, users' physical characteristics, risk perception, environmental compatibility, and economic factors. This integration is necessary for a more comprehensive understanding of technology acceptance that aligns with the realities of individuals with physical disabilities.

Assistive Electric Motorcycles, Mobility Independence, and Access to Special Education

The reverse trike assistive electric motorcycle is a form of mobility technology that directly addresses the physical, structural, and psychosocial barriers that have long hindered individuals with physical disabilities from accessing equal education. In the framework of Special Education (PLB), physical access to schools or campuses is a fundamental factor that determines learning success, in line with the understanding that special education is instruction specifically designed, individualized, and facilitated by an environment that allows students to develop their potential optimally (Albrecht et al., 2006; Heward et al., 2017). This section discusses how assistive motorcycles contribute to educational access, enhance academic independence, and their implications for the design of inclusive education services in higher education.

Contribution of Assistive Technology to Campus Access

Physical access is a fundamental prerequisite for the implementation of inclusive education. Without the ability to reach the learning environment, the principle of specially designed instruction cannot be fully realized. Mobility barriers are one of the major factors causing the absence of students with disabilities, which then impacts their academic performance, class participation, and psychological well-being. This is in line with the findings of Maldonado-Garcés et al. (2025), which emphasize that physical access is the foundation of higher education rights for individuals with disabilities.

Prior to the development of the reverse trike assistive electric motorcycle, students with disabilities at UNIPAR encountered substantial barriers in their daily mobility to and from campus. These challenges were primarily related to physical safety, technological limitations, and financial constraints.

One participant reported frequent balance loss when navigating sloped roads using a modified conventional motorcycle:

> *"When I used a modified motorcycle, I often lost my balance, especially when crossing inclined roads." (W-AH-09/09/2025).*

Technological limitations of existing mobility devices also disrupted academic participation. Another participant explained that their electric bicycle frequently failed to complete the journey to campus:

> *"Sometimes I had to stop halfway because the battery of my electric bike ran out before I reached campus." (W-CN-10/11/2025).*

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In addition to safety and technical challenges, financial barriers posed a significant burden on students' ability to attend classes regularly. One informant revealed the high monthly costs associated with relying on online motorcycle taxi services:

> *"I spent almost one million rupiah every month on online motorcycle taxis just to attend classes."(W-EPP-09/09/2025).*

Collectively, these pre-intervention conditions illustrate the structural and systemic obstacles faced by students with disabilities in accessing higher education. The lack of safe, reliable, and affordable mobility options not only limited physical access to campus but also threatened academic continuity and participation, underscoring the urgent need for inclusive and sustainable assistive mobility solutions.

The reverse trike assistive technology addresses these barriers through three main contributions:

Increased Mobility

Safety Equipped with two front wheels, an Ackermann steering system, and a low center of gravity, the assistive motorcycle offers enhanced stability compared to conventional or modified two-wheeled vehicles. One participant described the vehicle as resembling a small car in terms of balance and control:

> *"This motorcycle feels like a small car because it remains stable even on uneven roads." (W-HSH-29/11/2025).*

This high level of stability significantly increases users' perceived safety and reduces the risk of falls, particularly when navigating uneven or sloped terrain. Such features align with the principles of universal design and reasonable accommodation as articulated in the Convention on the Rights of Persons with Disabilities (CRPD), emphasizing safety, accessibility, and dignity in mobility.

Time and Energy Efficiency

The assistive motorcycle substantially improves travel efficiency for users with physical disabilities. For students with polio, travel time was reported to be reduced by nearly half:

> *"My travel time to campus is almost half of what it used to be."(W-ZM-29/11/2025).*

This time efficiency has direct implications for improved class attendance, greater consistency in academic engagement, and reduced physical fatigue, thereby enabling students to allocate more energy toward learning activities rather than mobility.

Reduction in Transportation Costs

The use of the electric motorcycle eliminates the dependency on paid transportation services. This is significant given that economic and mobility barriers often intertwine as factors contributing to educational exclusion (Doc. UNIPAR Profile, 2025).

Analytically, these three contributions demonstrate that the reverse trike assistive electric motorcycle functions not merely as a technical innovation but as an inclusive mobility intervention that enhances safety, efficiency, and affordability. In doing so, it supports equal access to higher education and reinforces the institutional commitment to inclusive and rights-based educational environments.

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Empowerment of Mobility Independence and Academic Participation for Individuals with Physical Disabilities

Mobility independence is a key pillar in Special Education because it is directly related to self-efficacy, self-esteem, and the opportunity for full participation in the learning process. From the TAM perspective, this independence arises from the combination of perceived usefulness (PU), perceived ease of use (PEOU), and positive attitudes (ATU), which in turn drive actual system use (ASU) behavior (Davis, 1989). The data from this study shows that the reverse trike assistive motorcycle plays a significant role in strengthening all of these dimensions.

First, independence increased because the use of the assistive motorcycle eliminated users' dependence on friends or family members. A manual wheelchair user explained that before using the assistive motorcycle, they had to wait for help from their dormitory friends to attend classes, stating:

> *"Before this motorcycle, I always had to wait for my friends in the dormitory to help me go to class. Now I can go by myself without depending on anyone" (W-BT-10/11/2025).*

This newly gained independence not only improved punctuality but also strengthened self-confidence and psychological comfort, as students were able to manage their own study schedules without relying on others.

Second, academic participation increased because students no longer expended excessive physical energy on commuting. One informant described how fatigue from daily travel previously caused them to miss afternoon classes:

> *"I often skipped afternoon classes because I was already exhausted just from going back and forth to campus" (W-RH-29/11/2025).*

After testing the reverse trike assistive motorcycle, the same student reported improved energy efficiency that enabled greater academic engagement:

> *"With this motorcycle, I still have energy left, so I can attend extra classes and even laboratory activities" (W-RH-29/11/2025).*

This finding aligns with Davis's (1989) Technology Acceptance Model, which emphasizes that perceived usefulness increases when technology significantly enhances task performance.

Third, the ease of use of the assistive motorcycle supported independence among users with diverse physical conditions. Students with polio highlighted the importance of the hand control system:

> *"I don't need to use my legs at all. Everything can be controlled by hand, so it feels much safer and easier for me" (W-ZM-29/11/2025).*

Similarly, users with muscle weakness emphasized the role of the dual suspension system in ensuring comfort and safety:

> "*The suspension really helps. The road is uneven, but the motorcycle stays stable, so I don't feel scared" (W-S-22/11/2025).*

These experiences reflect the Perceived Ease of Use (PEOU) construct in TAM, which strengthens users' motivation to adopt and continue using the technology.

Fourth, the assistive motorcycle also expanded the social participation of students with disabilities beyond academic activities. One informant reported using the motorcycle not only for attending lectures but also for engaging in campus life more broadly:

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> *"Now I can go to student organization meetings and the library on my own. I don't just go to class anymore" (W-A-29/11/2025).*

This demonstrates that assistive technology has a multidimensional impact, extending mobility, widening social interaction spaces, and fostering a more inclusive campus experience. Overall, the reverse trike assistive motorcycle significantly contributes to independence, academic participation, and the overall learning experience of students with physical disabilities.

Implications for Designing Inclusive Education Services in Higher Education

The findings of this study have several strategic implications for the development of inclusive education services in higher education. First, assistive mobility technology should be viewed as an integral part of campus accessibility policies. The UNIPAR Disability Studies and Services Center document (2025) shows the institution's commitment to compensatory services, but assistive motorcycles provide a new dimension in sustainable mobility support. Universities must incorporate mobility technology as part of an inclusive campus design, in line with CRPD principles.

Second, institutions need to provide a supporting ecosystem that includes accessible parking, ramps, vehicle service areas, and safety training for assistive motorcycle users. This infrastructure not only facilitates the use of technology but also eliminates environmental barriers that often hinder the effectiveness of assistive technologies.

Third, universities should consider inclusive financing schemes—such as subsidies, low-interest installment plans, or partnerships with industry—to ensure that assistive motorcycles are financially accessible to students with disabilities. Interview data indicate that affordability is a decisive factor in adoption intentions. One student explicitly stated:

> *"I am willing to buy this motorcycle, but only if the price is affordable or if there is a subsidy or installment system" (W-RH-29/11/2025).*

This finding highlights that economic considerations play a critical role in assistive technology adoption, a dimension that is not sufficiently addressed in the classic Technology Acceptance Model but is crucial in the context of disability and higher education inclusion.

Fourth, assistive technology should be integrated with academic and vocational services rather than treated as a standalone mobility aid. The assistive motorcycle was reported to significantly increase participation in laboratory-based and practical learning activities. As one informant explained:

> *"Since using the assistive motorcycle, I can attend laboratory and practical sessions more consistently because I can manage my time and energy better" (W-AM-11/09/2025).*

This integration strengthens learning outcomes and supports the development of professional competencies among students with disabilities. By aligning assistive mobility technology with academic and vocational services, universities can enhance both educational access and long-term employability, reinforcing the role of assistive technology as a strategic component of inclusive higher education systems.

Thus, the reverse trike assistive electric motorcycle is not just a technological innovation, but a key element in the design of inclusive education services in higher education institutions that aim to realize equal access, full participation, and academic success for individuals with physical disabilities.

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Factors of Acceptance: Social Support, Policies, and Infrastructure

The acceptance of assistive mobility technology, such as the reverse trike assistive electric motorcycle, is influenced not only by perceptions of usefulness and ease of use as described in TAM (Davis, 1989), but also by contextual factors surrounding the users. In the context of individuals with physical disabilities, the adoption of technology is strongly influenced by family and community support, inclusive transportation policies, campus environmental readiness, and social norms that shape feelings of safety and social acceptance of new technologies. This section outlines how the social and institutional ecosystem plays a crucial role in the successful implementation of assistive mobility technology in higher education settings.

The Role of Family, Disability Community, and PLB Lecturers in Assistive Technology Adoption

In inclusive education literature and assistive technology adoption research, social support is a crucial predictor of technology acceptance, often stronger than individual psychological variables (Zen et al., 2025; Norcliffe et al., 2022). The findings of this research confirm that family, the disability community, and PLB lecturers play key roles in providing a sense of security, social validation, and technical knowledge for users of the reverse trike assistive motorcycle.

Family support plays a decisive role in the decision-making process of students with physical disabilities regarding the use of assistive mobility vehicles. Beyond practical assistance, families function as a source of psychological security an element not explicitly captured in the classical Technology Acceptance Model (TAM), yet highly relevant in mobility technologies that involve physical safety risks. This was clearly articulated by one participant:

> *"At first, my family was worried. However, after seeing how stable the motorcycle is with its two front wheels, they felt calmer and allowed me to use it."* (W-SG-10/11/2025).

This sense of reassurance provided by the family acts as a risk buffer, reducing perceived danger and increasing users' confidence in adopting the technology. Within the framework of the *Theory of Planned Behavior* (Ajzen, 1991), family members function as normative referents whose approval significantly influences behavioral intention.

In addition to family influence, the disability community in Jember plays a critical role in fostering trust toward assistive mobility technology. The community serves as a collective space where safety, usability, and reliability are evaluated through shared observation and experience. One informant emphasized this dynamic:

> *"When people see other persons with disabilities using the technology safely, their level of acceptance increases significantly."* (W-MZR-07/11/2025).

This finding indicates that the disability community operates as a collective evaluator, strengthening technology adoption through discussion, shared experiences, and the exchange of technical knowledge. Such a role aligns with Norcliffe et al. (2022), who argue that mobility technologies for persons with disabilities develop most effectively when collective support exists for their use, modification, and adaptation.

Lecturers in Special Education (PLB) at UNIPAR occupy a dual role as educators and facilitators of assistive technology adoption. Their involvement includes providing basic training, trial-use guidance, safety education, and pedagogical explanations regarding the importance of mobility for academic participation. One lecturer explained:

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> *"We do not only introduce the device; we also provide guidance on safe use and explain why mobility is essential for students' academic participation."*(W-AM-11/09/2025).

Another informant reinforced this perspective:

> *"Initial assistance is crucial so that students are not discouraged or stop using the technology after their first difficulties."* (W-AFY-11/09/2025).

This institutional support generates psychological safety, reinforcing positive user attitudes and accelerating the adoption process. From a TAM perspective, lecturers function as external facilitating agents who strengthen Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), while simultaneously preventing early technical challenges from becoming long-term adoption barriers. Thus, the support from family, the disability community, and PLB lecturers work together as a social ecosystem that strengthens the acceptance and sustainable use of the reverse trike assistive motorcycle.

Inclusive Transportation Policies and Vehicle Modification Regulations

The acceptance of assistive technology cannot be separated from the regulatory framework that governs vehicle modifications, road safety, and the mobility rights of individuals with disabilities. Public policies are a critical external factor that validate the legal and operational use of assistive motorcycles.

National policy framework: CRPD, Disability Law, and mobility access. The ratification of CRPD through Law No. 19 of 2011 mandates the provision of mobility accessibility as part of fulfilling the educational and employment rights of individuals with disabilities. The principles of reasonable accommodation and universal design within CRPD support the use of assistive technologies like the reverse trike as a personal mobility device. Research by Arianto & Apsari (2023) also indicates that Indonesia is moving from a charity-based approach to a human rights framework, including in transportation policies.

Regulations on vehicle modifications in Indonesia, Law No. 22 of 2009 and its derivatives, regulate that modified vehicles for individuals with disabilities can be used legally if they meet technical and safety standards. Findings by Dywananda & Chumaida (2024) show that vehicle modifications for persons with disabilities are increasingly accepted, provided they are technically safe and registered. The reverse trike assistive motorcycle from UNIPAR aligns with these regulations because: 1) The two-front-wheel stability enhances safety; 2) Hand controls are classified as minor modifications that can be adapted; 3) The reverse trike design falls within the three-wheeled vehicle category, which is already regulated under technical standards.

With this regulatory basis, users do not need to worry about the legality of using the vehicle for academic activities or daily mobility. UNIPAR's campus transportation policy has an inclusive policy that supports the use of mobility technology through the provision of: 1) Accessible parking; 2) Ramps leading to academic buildings; 3) Ground-floor classrooms specifically for students with disabilities; 3) Complementary services from the disability study and service center.

This campus internal policy reinforces the acceptance of assistive technology by providing formal validation and a sense of legitimacy for students. Thus, the existence of public and institutional policies creates a regulatory ecosystem that allows the reverse trike assistive motorcycle to function optimally in supporting academic mobility.

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Accessible Infrastructure and Campus Culture as an Ecosystem for Technology Acceptance

The acceptance of mobility technology is heavily determined by the physical environment and campus culture where the technology is used. Poor infrastructure can negate the benefits of assistive technology, while an inclusive campus culture can strengthen motivation for use and social participation for individuals with disabilities.

The role of accessible infrastructure for the reverse trike assistive motorcycle requires a supportive environment, especially: 2) Flat campus paths; 2) Spacious parking areas; 3) Ramps leading to classrooms; 4) Accessible navigation signs; 5) Battery charging stations.

Adequate campus infrastructure plays a significant role in reinforcing Actual System Use (ASU) among students with disabilities. At UNIPAR, the availability of sufficient and accessible parking facilities contributes to users' sense of safety and comfort when utilizing assistive vehicles. This condition was expressed by one participant:

> *"I feel safe parking my vehicle on campus because the parking areas are spacious and easy to access."(W-ZM-29/11/2025).*

This finding suggests that physical infrastructure functions as an enabling environmental condition that supports sustained technology use. It aligns with *environmental fit theory* in inclusive education, which emphasizes the importance of aligning physical environments with users' functional needs to promote participation and continuity of use.

Beyond physical infrastructure, campus culture at UNIPAR operates as a critical social context that facilitates technology acceptance. The campus culture, institutionalized through the Disability Study and Services Center, fosters an inclusive environment in which assistive technology is perceived as a tool for empowerment rather than a marker of limitation. One informant highlighted this cultural dimension:

> *"Because the campus is already disability-aware, students are not embarrassed to use assistive motorcycles. The environment supports them socially and academically."* (W-AM-11/09/2025).

This inclusive culture reduces stigma and enhances users' confidence, particularly in participating in practical and mobility-intensive academic activities. The findings indicate that a supportive campus culture acts as a social legitimizing mechanism, strengthening students' willingness to use assistive mobility technology consistently. In this sense, campus culture complements infrastructural support by embedding technology use within a broader framework of social acceptance and institutional commitment to inclusivity.

The technology acceptance ecosystem on campus, when infrastructure and campus culture work synergistically, creates an ecosystem of technology acceptance consisting of: 1) Adequate physical access (roads, ramps, parking, electricity); 2) Institutional support (disability services, academic policies); 3) Social normalization (minimal stigma, equal acceptance) 3) Inclusive pedagogical interaction (PLB lecturers as facilitators).

This ecosystem ensures that the benefits of assistive technology are not only technical but also socially and academically experienced by users.

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Comparison with Previous Studies and Theoretical Contributions

Compatibility and Differences with Studies on Technology Acceptance in Physical Disabilities

Research on the acceptance of assistive technology for individuals with physical disabilities generally focuses on traditional assistive devices such as electric wheelchairs, mobility scooters, smart prosthetics, and navigation applications (Norcliffe et al., 2022; Dywananda & Chumaida, 2024). A smaller portion of research highlights modifications to manual motorcycles, but without using a theoretical approach like TAM. Therefore, this study needs to be compared with two research groups: (1) TAM studies on general technology and (2) mobility studies in physical disabilities.

Compatibility with previous research The findings of this study are consistent with the core belief of TAM that:

PEOU enhances PU, as seen when users like (W-A-29/11/2025) assess that the Ackermann steering system makes the motorcycle "easy to learn," thus promoting the perception of usefulness.

PU shapes positive attitudes, as evidenced by (W-EPP-09/09/2025) discussing cost and time efficiency.

Positive attitudes drive actual use, as seen with students like (W-ZM-29/11/2025) who use the motorcycle for non-academic activities.

This relationship structure aligns with Verástegui et al. (2025) and Kılıç & Çelik (2025), who emphasize that technologies that are easy to use and beneficial are adopted more quickly by users. Significant differences with previous studies. There are several aspects that differentiate this study from the existing literature:

Focus on reverse trike, not electric wheelchairs or modified two-wheeled motorcycles Reverse trike technology offers different stability and safety, affecting risk perception and benefits factors that are rarely discussed in mobility technology adoption studies.

Context of PLB in higher education, not rehabilitation, hospitals, or public spaces This means technology acceptance is directly related to class attendance, laboratory participation, and academic experiences.

Strong influence of social factors, such as family and the disability community, which are not dominantly found in general technology adoption studies

Pedagogical dimension, where PLB lecturers are involved both as technical guides and psychosocial elements, almost absent in previous assistive technology studies

These differences show that mobility technology in the context of education has a more complex acceptance dynamic compared to general digital technology acceptance.

Implications for the Development of Assistive Mobility Technology in Higher Education

The findings of this study have important implications for the development of assistive mobility technology in higher education environments. The use of the reverse trike assistive electric motorcycle has proven not only to add comfort to transportation but also to become a fundamental element in creating an inclusive learning environment. This is seen in how the technology improves attendance frequency, participation in vocational activities, and the capacity of students with disabilities to manage their academic schedules independently. From a TAM perspective, these benefits strengthen perceived usefulness and drive the formation of

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consistent actual system use (Davis, 1989). Universities need to view assistive vehicles not just as individual assistive tools but as part of the "academic infrastructure" that facilitates the right to education. Therefore, campus internal policies should consider the availability of access pathways, disability-friendly parking, charging facilities, and technical support for assistive vehicles.

The empirical findings further underscore that assistive mobility technology should be developed through user-driven design mechanisms that directly respond to the lived experiences of users. Students with polio emphasized the need for technical features that accommodate their specific physiological conditions, including responsive hand controls, softer suspension systems, and stable seat height. As one participant explained:

> *"The hand controls need to be more responsive, and the suspension should be softer so it is more comfortable to use for a long time. Seat height is also important for stability."* (W-ZM-29/11/2025).

A similar concern was expressed by another participant:

> *"For users with polio, stability and comfort really matter. If the seat height and balance are not right, it becomes difficult to use the vehicle safely."* (W-SG-10/11/2025).

These insights highlight the necessity of designing assistive technologies that are not only technically functional but also physiologically adaptive. This approach is consistent with *universal design principles* as articulated in the Convention on the Rights of Persons with Disabilities (CRPD) and further elaborated by Albrecht et al. (2006), which emphasize inclusivity and responsiveness to user diversity.

Moreover, the findings point to the importance of institutional–industrial collaboration in ensuring the sustainability and affordability of assistive mobility technologies. Partnerships between universities and industry such as the UNIPAR–ALVA collaboration enable the translation of user-centered insights into scalable and economically viable products. Consequently, the development of mobility technology in higher education contexts must integrate technical innovation, accessibility-oriented policy frameworks, and a nuanced understanding of technology acceptance dynamics within the Special Education (PLB) ecosystem.

This study also has broader implications for the development of theory and practice in assistive technology, especially in the context of inclusive higher education. The combination of the TAM model, reverse trike technology, and the context of Special Education creates an analytical framework that captures the more complex dynamics of acceptance compared to previous studies. Assistive motorcycles are not only adopted for their instrumental benefits but also for their contribution to self-esteem, perceptions of equality, and users' social experiences dimensions rarely addressed in conventional TAM literature. These findings show that technology adoption in the disability community is greatly influenced by psychosocial factors, emotional support, and social validation from the surrounding environment, thereby expanding the concept of external variables in TAM.

Moreover, the integration of interview results shows that the success of assistive mobility technology in higher education depends on the institution's ability to design a support ecosystem that includes policies, infrastructure, technical services, and an inclusive campus culture. Thus, this study contributes to expanding TAM from a digital system-oriented model to a framework that is relevant for physical technology with direct impacts on educational independence. This approach provides practical implications that all higher education institutions should view mobility technology as part of an inclusion strategy, not just a

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supportive tool. From a theoretical perspective, this study can serve as the foundation for the development of an Assistive-TAM model, considering physical safety, universal design, and social support as central determinants in mobility technology adoption.

Conclusion

This study concludes that the reverse trike assistive electric motorcycle plays a crucial role in supporting access to education, learning independence, and academic participation for students with physical disabilities. The acceptance of this technology is shaped by perceptions of usefulness and ease of use, which foster positive attitudes and actual usage in academic activities. Assistive mobility technology has proven to be not only a means of transportation but also an instrument supporting learning success in inclusive higher education.

Higher education institutions are recommended to integrate assistive mobility technology into the inclusive education service system by providing accessible infrastructure, policy support, and affordable financing schemes for students with disabilities. Furthermore, future research should explore the long-term impact of mobility technology use on learning success, student retention, and employment readiness for graduates with disabilities.

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