A Study of Mobility as a Service for Mobility Management System in the Education Sector

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Abstract

The initiative of the Peru provides robust assistance for promoting mobility to facilitate the discovery of training or employment prospects. It is imperative to discover solutions for limited mobility during widespread disease outbreaks. A practical approach would be establishing a collaborative platform that facilitates cooperation in both professional and educational domains. This research seeks to determine the essential elements to develop a new ecosystem to promote Peru's academic mobility. This research utilized qualitative and quantitative techniques, specifically interviews, to gather data from 150 participants. The researchers employed the NVivo applications, notably its Word Frequency Query tool, to discern pertinent attributes within the four primary groups: competency acquisition, teaching methods, organization, and technologies. The results indicate that focusing on acquiring skills relevant to the future job marketplace is essential. Learners show a preference for activities that incorporate gamification. The platform ought to be designed to facilitate effortless searching for jobs and training opportunities. In general, learners have a good perception of material that focuses on the future, motivates them, and includes various technical activities. The

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user experience study might be expanded to encompass a cohort of educators and administrative staff involved in educational Mobility as a Service (MaaS) endeavors.

Keywords: Mobility as a Service, Mobility Management, Education, Students.

1 Introduction

Amidst disruptions, pandemics, and emergencies, it is necessary to develop technologies that can serve as alternatives to commuting for employment, education, job applications, or commercial operations (Yolvi et al., 2023). Involvement in Erasmus programs, encompassing learning, instruction, and job, should be unrestricted and devoid of physical or communicative barriers (Kavitha & Balasubramanian, 2022). The research discusses the concept of virtual mobility without the need for natural movement.

Education Mobility as a Service (MaaS) refers to delivering digital and online resources that facilitate education and improve learners' ability to access, adapt, and move through their learning process in virtual movement (Butler et al., 2021). MaaS utilizes cutting-edge digital technology, including instructional management systems, simulated classrooms, and online communication platforms, to offer students a variety of digital learning choices that are readily available, adaptable, and engaging. MaaS seeks to provide learners with an extensive and seamless digital environment that caters to their requirements for learning and empowers them to engage with educational possibilities at any time, from any location, and at their preferred speed. A digital ecosystem encompasses many resources and services, including online course substances, online libraries, virtual instructors, and social learning platforms. The worldwide acceptance of the idea of MaaS in the setting of virtual movement is increasing, mainly due to the COVID-19 pandemic (Llopiz-Guerra et al., 2024; Hensher, 2020; Akbulut & Yalniz, 2022). This crisis has expedited the use of digital tools in education and emphasized the significance of guaranteeing students have access to education during times of emergency.

It is challenging to locate a tool that effectively surmounts obstacles related to travel and integrates several practical features. Both free and paid programs and websites are available, but they do not exclusively cater to these specific requirements. While it is indeed feasible to incorporate particular features, they are temporary measures and only consistently fulfill some user requirements in Peru. It is imperative to create innovative tools for education and mobility that include advanced features derived from cutting-edge solutions (Azomahou & Yitbarek, 2021).

The research utilizes data from a bespoke survey to examine individual tastes and the impact of MaaS bundles. The research used this data to construct a MaaS bundled choice approach to determine the modes of transportation consumers in the study would or would not choose in their MaaS bundles (Ho et al., 2021). This will aid in comprehending individuals' inclinations towards various communal models. A secondary bundle selection model is constructed exclusively for users who genuinely intend to purchase their selected MaaS package rather than merely stating their choice among the available possibilities in Peru. By analyzing the outcomes of the two designs, the research can examine if the preferences identified in the original model remain unchanged for those who would genuinely buy their package. The study analyzes whether people who buy their MaaS program will begin utilizing shared methods due to their MaaS programs and the impact this would have on the total utilization of shared methods (Linder et al., 2022).

2 Background

Mobility management, often known as demand management or soft measures, seeks to change individuals' perceptions of travel alternatives rather than making actual changes to available options (Trombin et al., 2020). Complex measures alter the physical environment by improving infrastructure or implementing restrictions on specific streets for automobile usage. Soft measures aim to influence people's views of their options. The ability of passengers to utilize a particular mode of transportation is contingent upon its accessibility and individual limitations. Information, thinking, and subjective choice influence the desire to use a specific mode (Agung et al., 2024; Mo et al., 2021). This implies that it is possible to impact people's actions without physically altering the objective circumstances. Mobility management solutions are categorized into two approaches: carrot and stick. The carrot approach rewards individuals with desired travel habits, while the stick approach uses disincentives to deter undesired travel habits. Empirical studies have demonstrated that using both positive and negative incentives, sometimes called carrots and sticks, is often employed in tandem due to its enhanced efficacy (Tian et al., 2022). Examples include educational campaigns, travel promotions, cheap travel goes by, travel planning, and travel feedback tools (Arasu et al., 2024).

Soft actions can bolster various transport policy efforts and can be adopted in conjunction with or independently of complex actions (Balsas, 2024). An essential objective of soft measures is to reduce reliance on private vehicles and encourage sustainable modes of transportation. Mobility management efforts should focus on societal incentives and establishing sustainable transportation behavior as the standard to achieve success in promoting long-term viability (Zhu et al., 2023). It strives to make alternate possibilities more enticing for individuals who rely on their automobiles. A comprehensive analysis of 19 research determined that implementing soft measures consistently leads to a significant shift in transportation behavior, with individuals opting for active transportation over autos. Once individuals have experienced the comfort of driving a car, it becomes challenging to change this habitual behavior (Balsas, 2024).

These steps are crucial in preventing those who have yet to rely on private cars from getting so. While many contend that relying solely on soft approaches does not impact reducing personal automobile usage and, thus, greenhouse gas emissions, others present compelling evidence to the contrary (Amatuni et al., 2020). Research has demonstrated that implementing mobility management strategies can decrease automobile trips by 5-20%.

Ticketing schemes, which allow passengers to purchase multiple tickets, passes, or cards for public transportation, and sometimes across other modes of transport, are sometimes seen as methods for mobility control (Clifford Ishola et al., 2023; Kuncara et al., 2021). These technologies, in conjunction with intelligent cards, have influenced the utilization of public transportation methods. Following the introduction of the new inter-modal Travelcard annual ticket in London, there was an 8% fall in automobile usage, while bus and tube trips increased by 11%. This indicates a transition from using cars to utilizing public transportation methods. Comparable patterns were noted in several regions, with a 31% rise in total riding. Göddeke et al., discovered a negative correlation between the quantity of season passes and automobile ownership in Peru (Göddeke et al., 2022). There is significant interchangeability between these forms of transportation. The use of smart cards has had a significant beneficial impact on public transportation usage by simplifying the process of transferring between stations and making payments.

The literature demonstrates that several facets of managing mobility have been previously examined. The MaaS idea possesses specific attributes that categorize it within the broader framework of mobility administration (Arias-Molinares & García-Palomares, 2020). The customized multimodal travel planner offers clients details on the many available alternatives while combining all modes, which presents a feasible and appealing alternative to using private automobiles (Wang et al., 2022). The primary focus is on the MaaS subscription schemes, which incorporate several means of transportation to change customers' perspectives of what options are accessible to them.

3   Materials and Methods

1)   Survey Design

The data utilized for this report was gathered as a component of a broader transportation study on novel transportation services and notions in Peru. The study consisted of two data-collecting rounds, during which participants completed a self-administered web-based questionnaire on MaaS. The comprehensive study is known as the London Mobility Study (LMS). The purpose of creating LMS was to collect new insights into choices for MaaS plans and overall beliefs and opinions regarding MaaS. The survey can be summarized as follows:

Section 1 consists of an individual survey covering socio-demographic factors, current usage and possession of mobility instruments (such as licenses and vehicles), usage of app-based transportation services, and views and opinions towards these offerings in Peru.

Section 2 provides respondents with Stated Preferences (SP) scenarios for MaaS strategies. Section 3 compiles data on the anticipated influence of MaaS on transportation options, as well as the mindsets and opinions of participants regarding the service.

This study utilizes information gathered from all three parts, but not every constituent contained inside. Upon detailed examination of the stated choice test, participants were provided with a concise depiction of MaaS. The SP situations were devised to evaluate the significance of various components in MaaS strategies.

Two primary resources were utilized to determine the qualities and grades of the designs. An analysis was conducted on MaaS advancements, those indicated initially, to comprehend the prospective components that are incorporated into the plans. It was assumed that only pre-existing transportation options would be incorporated into the proposed designs. The already accessible transport facilities were gathered within the city under investigation in Peru. Several transportation options, such as ride communication, peer-to-peer vehicle sharing, and demand-reactive transportation, were not included in the analysis due to the complexity of their business structures. The SP attributes are categorized into transport mode particular characteristics and non-model specific characteristics. The primary characteristics of transportation modes, which are the central emphasis of this study, are the particular modes of transportation encompassed in each strategy: public transit, bicycle sharing, sharing a vehicle, and taxi. These modes were selected based on their widespread use and familiarity among users in the marketplace and their ability to accommodate spatial and cognitive limitations. The amount of public transit and bike sharing aligns with the existing options in the city. To enhance the data obtained through the SP, a pivot design was implemented for taxi and automobile sharing, allowing for customized levels. The amounts were adjusted based on the participant's actual travel behavior, namely the extent to which they now use certain forms of transportation in Peru. The data was accessible from previous sections of

the questionnaires, and the process of pivoting was carried out in real time as the participants advanced through the inquiries.

The primary aspect that is not exclusive to any particular method is the cost of the strategy (Nasir et al., 2022). The research chose to display just the aggregate cost of the plan so that participants could assess their inclination toward purchasing the package as a whole rather than comparing the price of every element separately. The price was determined by adding up the accurate pricing of the services, and different discount rates were used.

2) Materials and Methods

The study aims to identify the distinct characteristics of new mobility platforms. The research hypothesized that this environment should have attributes in four groups: acquired competencies, education, organization, and technologies (Selvaprabu et al., 2024). In the "competencies" group, the research theorized that learners are focused on the job employment in the future. In the "pedagogy" group, the research presumed that learners would prefer to engage in gamified operations. In the "organization" group, the study determined that the website should be structured to enable pupils to search for employment possibilities pertinent to training. In the "technology" group, the research concluded that pupils would appreciate using 2D and 3D technological advances, making the structure an adaptable instrument.

To validate the hypotheses, the research employed a mixed-method study approach, which involved interviews with 140 students (ages 18-26) from two Polish universities: Lód University and the War Studies University in Warsaw. The questionnaire allowed respondents to respond unrestricted to four inquiries: competencies, education, organization, and technologies. The research inquired about the distinct characteristics of a recently developed platform for the responders from Peru. The responses were copied to four files: ability, education, the company, and the internet, and downloaded to the NVivo program. The research determined the most commonly utilized terms using this tool's Word Frequency Query (WFQ) feature. Before commencing the technique, the study detected and removed the stop words from the database.

The research established specific parameters for the WFQ, encompassing stemmed words and requiring a minimum duration of three letters. Following the reduction and establishment of criteria, NVivo generated a list of the top 25 most often occurring items for every group in Peru. The data was used to address the study inquiries and validate the assumptions. Figure 1 shows the design of this research.

It is essential to mention that the following issues on competencies, pedagogy, and organizational structure still need to be addressed. No mail addresses were collected throughout the study process. The methods and criteria for data analysis were chosen based on the research inquiries, goals, research specimen size, accuracy of the data, and ethical issues.
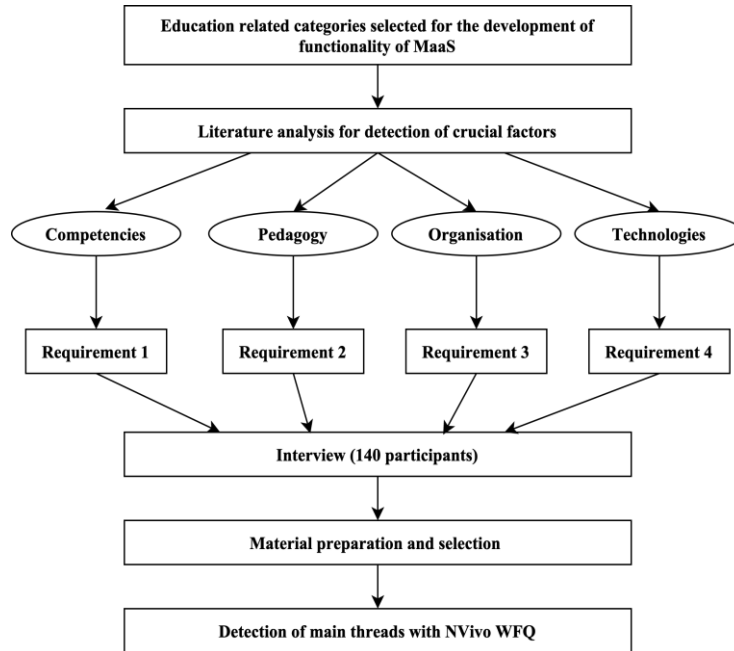
Figure 1: Research Design

4   Results and Discussions

Through the qualitative method, the research identified the most desirable characteristics of a recently developed mobility system. The initial inquiry focused on determining the specific material students anticipate seeing on the portal about their abilities in Peru. What kind of capabilities do they desire to acquire through the portal, such as expertise, abilities, or attitudes, and what are their preferences? The response obtained using NVivo is displayed in Figure 2.
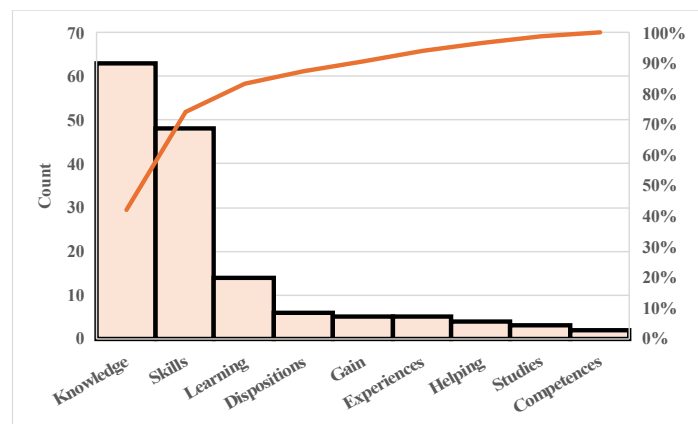

Figure 2: Competency Analysis

Future users prioritize acquiring practical abilities and knowledge directly applicable to their prospects, particularly in securing employment. The system should also facilitate the acquisition of knowledge and the development of skills through studying and learning. The second inquiry pertains to the educational material students anticipate finding on the portal about teaching methods (such as interactive tasks like tests, games, case studies, and short films) in Peru. The responses that were obtained are displayed in Figure 3.
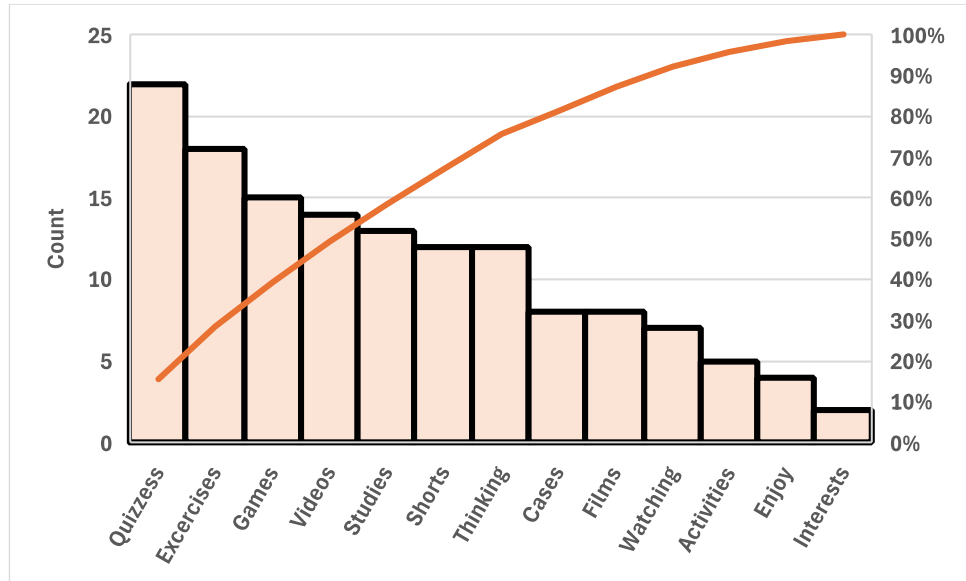
Figure 3: Pedagogy Analysis

The anticipated features mainly consist of examinations, games, short movies, case studies, and tasks or assignments that promote critical thinking among students. The platform should include interactivity and prioritize collaboration. The final question pertained to the business aspect of the portal, namely the essential tools it must offer in Peru. Participants were encouraged to consider talent evaluation, skill matchmaking, seeking employment, or other relevant features. The findings are displayed in Figure 4.
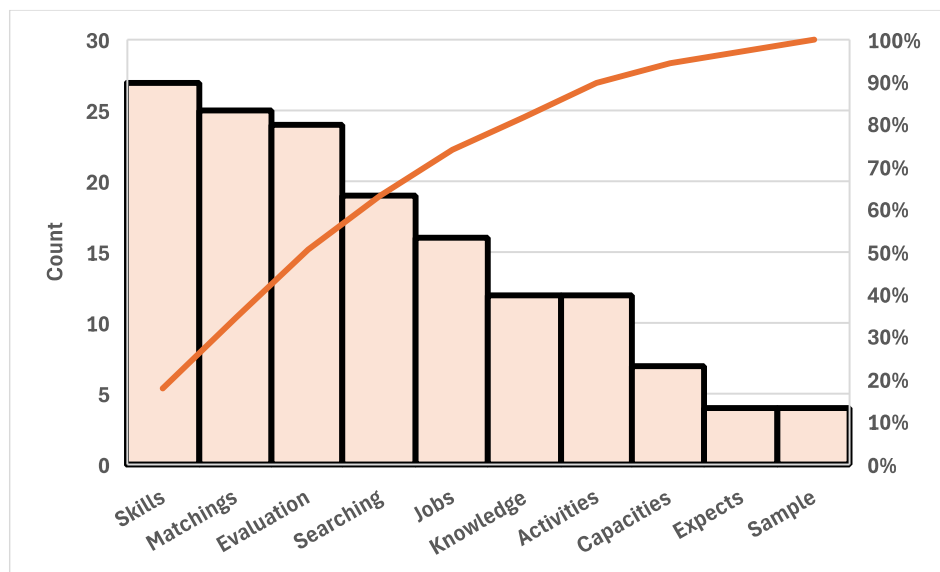

Figure 4: Organization Performance Analysis

The system's most notable capabilities are skill matching, job searching, and evaluation. The final question pertained to technology, specifically if learners anticipate 2D features, such as utilizing the portal like a web page, or whether they would rather have 3D components experienced through goggles in a virtual environment. The question inquired about the potential use of Artificial Intelligence (AI) to enhance and customize learning and include social network components from Peru. Figure 5 displays the responses obtained by NVivo.
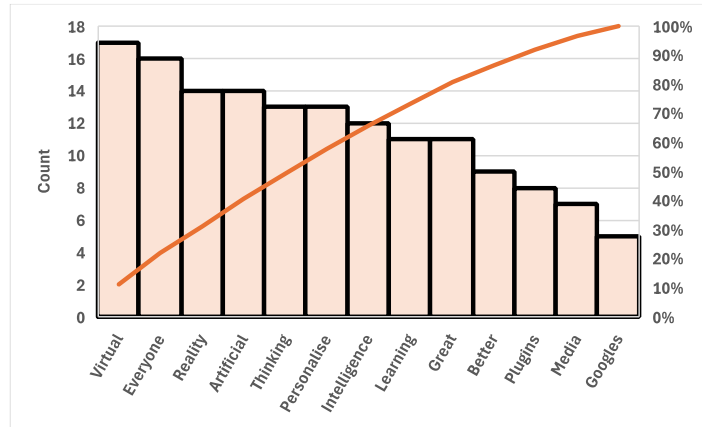
Figure 5: Technology Performance Analysis

The WFQ suggests the system's functionality should incorporate augmented reality, AI (in fragmented form), and website elements. The research inquired about the factors that incentivize learners to utilize the site. Based on the information in Figure 6, the website should offer engaging and informative material while being user-friendly, straightforward, intuitive, and uncomplicated. The research accepts courses assessed and certified, which means they provide credentials upon completion.
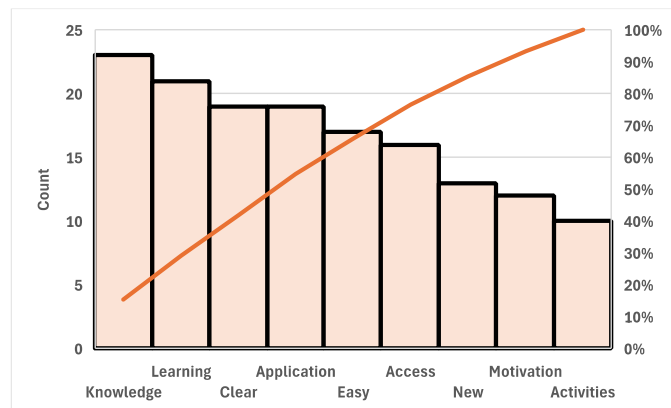

Figure 6: Motivation Analysis

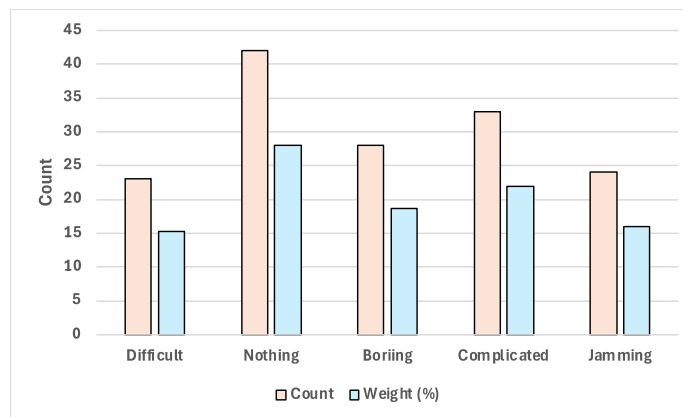The research inquired about factors that could deter learners from utilizing the site Figure 7.

Figure 7: Discouragement Result Analysis

Confident respondents assert that they could handle any challenges associated with the platform. Many responses revolve around challenges, mistakes, issues, congestion, sluggish performance, lethargy, and lack of coherence in the material and organization. Based on the data, it can be inferred that the mobility platform must have the following characteristics:

1. Integrate 2D and 3D features with social media platforms to enhance communication possibilities. It is possible to offer plugins or direct connections to educational resources in Peru.
2. Having a mobile version of the software would be advantageous.
3. The system should provide access to online resources.
4. AI-based systems for recommendations would provide strong evidence of having an advanced platform in Peru.
5. Specialized tools for generating assignments tailored to individual learners.
6. The system should be free from obstructions, operate quickly, offer engaging material, be user-friendly, and have a straightforward interface.
7. Courses that have grades and result in certification are encouraged.
8. The system's most notable features are skill matchmaking, job searching, and evaluation in Peru.
9. Kids and adults prefer learning rather than being taught. The educational system should be designed to align with student interests and cognitive desires, enabling them to engage in self-directed learning. It should include a more manageable array of sophisticated instructional resources.

Learning is the result of mental, social, and personal involvement. The medium of instruction should offer students the chance to acquire knowledge about all of these aspects. To summarize, a mobility structure should have a combination of 2D/3D components and social media pathways, mobile-friendly online resources, AI-based suggesting structures, distinguished task development tools, smooth operation with fast, engaging, intuitive, and explicit written material, evaluated and authorized classes, skill corresponding and job searching capabilities, and educational content that caters to the hobbies and interests of students in all their intellectual, social, and emotional measurements in Peru.

1) Discussion

The research findings indicate that the essential elements necessary for developing a mobility platform are classified into four distinct groups: competence appropriation, pedagogy, company, and technologies. To gain competencies, it is essential to use a forward-thinking strategy. Learners show a preference for gamified tasks within the pedagogy area in Peru. The platform should be structured to enable learners to quickly locate career possibilities and training programs pertinent to their preferences. Integrating both 2D and 3D technologies to enhance the platform's versatility is advisable.

The view of students toward technology-diverse and future-oriented events is a significant trend in the development of such purposeful instruments. The study is subject to many constraints. The factors encompass the selection of the study's methodology, the approach to analyzing the study data, and the geographic distribution of the participants. Concerning the study methodology, data collection involved structured conversations with open-ended inquiries. The resulting study material was then analyzed using the NVivo WFQs for more insights from Peru. This data analysis method, which focuses on the statistical occurrence of crucial phrases, aims to uncover a typical pattern in how people think about many aspects of a new mobility system, such as skills, teaching methods, organizational structure, and technologies. The investigator's assessment of the research findings was constrained by their perspectives and the implications of the identified terms. The research might be constrained by the physical location of those who participated. Learners from two colleges within the same country might

receive a comparable experience with distance learning, potentially due to shared restrictions mandated by the national legislative framework in Peru. The researchers want to examine the consequences of the capacity to apply the findings to a broader population and propose potential areas of future investigation to overcome these constraints.

In terms of future study objectives, applying the same user experience study technique to a cohort of instructors and administrative staff engaged in distance learning is possible. The study methodologies can be expanded. In addition to interviews and NVivo evaluations, research on usability qualities, eye-tracking study of usability, and internet user navigation behaviors might provide further assistance for such investigations.

The equipment includes AI for personalized learning and starting, an information grid model for efficient distribution and management of knowledge assets, and virtual reality facilities for immersive learning experiences in Peru. The solutions above can be seen as an expansion of existing technological advances. The outcome is contingent upon the accessible resources, stipulations, and educational demands.

The outcomes of adopting education MaaS have substantial ramifications for governments and educational institutions in terms of improving access, adaptability, and quality of learning. MaaS offers policymakers a chance to tackle educational inequalities and advance continuous education by granting learners increased access to educational possibilities, especially in impoverished or rural regions. Policymakers can facilitate the advancement and execution of MaaS efforts by forging relationships and collaborations with multiple stakeholders, including schools, carriers, and technology vendors. Legislators can allocate funding and offer rewards to promote the creativity and acceptance of MaaS remedies.

Policymakers can mitigate regulatory obstacles associated with MaaS by implementing regulations and laws that safeguard the well-being, confidentiality, and protection of students while also fostering the compatibility and uniformity of MaaS services.

MaaS offers educational institutions the chance to improve the quality and efficacy of education by providing students with a customized and interactive educational experience specifically designed to meet their requirements and interests in Peru. Academic institutions utilize MaaS to broaden their scope and communicate with a wide range of students by providing a variety of digital learning opportunities that are easily accessible, adaptable, and engaging.

5   Conclusion

This study sought to determine the key elements necessary for establishing a new ecosystem to facilitate educational mobility, particularly in light of the ongoing epidemic and limitations on travel. A MaaS platform provides several advantages to colleges and enterprises from various nations involved in its functioning, such as:

1. **Enhanced Student Mobility and Validation of Learning Achievements:** The platform facilitates the validation of learning achievements and the transferring of credits, streamlining the process for students to pursue education and employment opportunities in many countries and enabling institutions to admit students from different nations.

2. **Improved Student Job Prospects:** The system can facilitate the growth of transferable skills, such as technological literacy, reasoning, and problem-solving, enhancing students' job prospects and equipping them with the necessary skills for the contemporary job market.

3. **Enhanced Global Cooperation:** The website enables learners, educators, and educational organizations to collaborate and develop a community, fostering greater comprehension and collaboration across nations.

4. **Enhanced Access to Various Educational Options:** The platform allows learners to access multiple academic possibilities, such as blended learning and online events, to facilitate learning and growth.

5. **Enhanced Data Collecting and Analysis:** The platform utilizes advanced technology and information to monitor and evaluate learners' progress, offering immediate feedback. This leads to better outcomes for pupils and increases the efficiency of educational organizations.

6. **Knowledge Sharing and Research Sharing:** The website facilitates the exchange of knowledge, efficient procedures, and studies related to the field of education, hence promoting the ongoing enhancement of education in the area.

7. **Enhanced Synchronization of Educational Offers with Employer Demands:** The platform gives companies insights into learners' proficiencies and capabilities, enabling them to more effectively coordinate their recruiting and training endeavors with the requirements of the labor market.

A regional MaaS system can offer additional advantages to other attendees besides the benefits it provides students. These attendees can include:

- **Educators:** The platform allows instructors to expand their business connections, exchange knowledge, and obtain fresh educational tools and materials.
- **Colleges:** The platform facilitates universities in recruiting highly skilled and competent professors and fostering their staff growth.
- **Companies:** The platform allows companies to access a broader range of highly skilled and talented individuals. It also assists in enhancing the necessary competencies required for success in an evolving workforce.
- **Job seekers:** The site facilitates finding suitable positions, improving their skills and abilities, and expanding their professional connections.

Researchers utilize the website to gain vast knowledge and data on schooling and job creation, which can assist them in their study in these fields. The results indicate that skills development should be focused on the job marketplace, as this will enhance students' readiness for employment following graduation. Pupils preferred gamified tasks in the instructional category, suggesting that integrating aspects of play and involvement might improve the entire learning experience.

The website should be organized to facilitate effortless job and training searches, therefore serving as a valuable resource to learners seeking to acquire new competencies and get work. The researchers suggest integrating 2D and 3D technologies to provide a flexible platform for various purposes.

The study suggests that pupils perceive future-oriented material, such as digital competencies, analytical thinking, and security. Motivation and engaging in technically diversified activities are significant trends in developing comparable technologies. This style of user experience study might also be expanded to encompass a cohort of educators and administrators involved in remote learning endeavors, enabling a more thorough comprehension of how to develop efficient and captivating platforms for learning.

The research emphasizes the need to consider the future job marketplace, employ effective teaching methods, ensure user-friendly organization, and utilize adaptable technology when developing an

educational platform for movement. The results are used to create an enhanced platform that fulfills the requirements of the learners and proves advantageous for both learners and instructors in the future.

References

[1]   Agung, T., Rima, T.A., & Sumiati, S. (2024). New Framework of Educational Data Mining to Predict Student Learning Performance. *Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications (JoWUA), 15*(1), 115-132.

[2]   Akbulut, G., & Yalniz, Ş. Ç. (2022). Impact of Covid-19 Pandemic on Public Aquariums in Turkey. *Natural and Engineering Sciences, 7*(3), 260-270.

[3]   Amatuni, L., Ottelin, J., Steubing, B., & Mogollón, J. M. (2020). Does car sharing reduce greenhouse gas emissions? Assessing the modal shift and lifetime shift rebound effects from a life cycle perspective. *Journal of Cleaner Production*, *266*, 121869. https://doi.org/10.1016/j.jclepro.2020.121869.

[4]   Arasu, R., Chitra, B., Anantha, R.A., Rajani, B., Stephen, A.L., & Priya, S. (2024). An E-learning Tools Acceptance System for Higher Education Institutions in Developing Countries. *Journal of Internet Services and Information Security, 14*(3), 371-379.

[5]   Arias-Molinares, D., & García-Palomares, J. C. (2020). The Ws of MaaS: Understanding mobility as a service from the literature review. *IATSS Research, 44*(3), 253-263.

[6]   Azomahou, T. T., & Yitbarek, E. (2021). Intergenerational mobility in education: Is Africa different?. *Contemporary Economic Policy, 39*(3), 503-523.

[7]   Balsas, C. J. (2024). Expanding the legal common good via sustainable urban mobility. *Journal of Place Management and Development, 17*(3), 237-256.

[8]   Butler, L., Yigitcanlar, T., & Paz, A. (2021). Barriers and risks of Mobility-as-a-Service (MaaS) adoption in cities: A systematic literature review. *Cities, 109*, 103036. https://doi.org/10.1016/j.cities.2020.103036

[9]   Clifford Ishola, B., Ojokuku, Y., Akpobasah-Amugen, S., & Eluyemi, O. (2023). Library Services Amidst the COVID-19 Pandemic: Study of Remotely Exploitable Electronic Academic Databases in Selected University Libraries in Nigeria. *Indian Journal of Information Sources and Services, 13*(1), 49–54.

[10]   Göddeke, D., Krauss, K., & Gnann, T. (2022). What is the role of carsharing toward a more sustainable transport behavior? Analysis of data from 80 major German cities. *International Journal of Sustainable Transportation, 16*(9), 861-873.

[11]   Hensher, D. A. (2020). What might Covid-19 mean for mobility as a service (MaaS)? *Transport Reviews, 40*(5), 551-556.

[12]   Ho, C. Q., Hensher, D. A., Reck, D. J., Lorimer, S., & Lu, I. (2021). MaaS bundle design and implementation: Lessons from the Sydney MaaS trial. *Transportation Research Part A: Policy and Practice, 149*, 339-376.

[13]   Kavitha, S. V., & Balasubramanian, P. (2022). Utilization of E-Resources among Women Faculty Members in Higher Educational Institutions in South Tamil Nadu. *Indian Journal of Information Sources and Services, 12*(1), 28–33.

[14]   Kuncara, T., Putra, A. S., Aisyah, N., & Valentino, V. H. (2021). Effectiveness of the e-ticket system using QR codes for Smart Transportation Systems. *International Journal of Science, Technology & Management, 2*(3), 900-907.

[15]   Linder, N., Giusti, M., Samuelsson, K., & Barthel, S. (2022). Pro-environmental habits: An underexplored research agenda in sustainability science. *Ambio*, *51*, 546–556 (2022). *https://doi.org/10.1007/s13280-021-01619-6*

[16]   Llopiz-Guerra, K., Daline, U.R., Ronald, M.H., Valia, L.V.M., Jadira, D.R.J.N., Karla, R.S. (2024). Importance of Environmental Education in the Context of Natural Sustainability. *Natural and Engineering Sciences, 9*(1), 57-71.

[17] Mo, B., Wang, Q. Y., Moody, J., Shen, Y., & Zhao, J. (2021). Impacts of subjective evaluations and inertia from existing travel modes on adopting autonomous mobility-on-demand. *Transportation Research Part C: Emerging Technologies, 130*, 103281. https://doi.org/10.1016/j.trc.2021.103281

[18] Nasir, M., Umer, M., & Asgher, U. (2022). Application of Hybrid SFLA and ACO Algorithm to Omega Plate for Drilling Process Planning and Cost Management. *Archives for Technical Sciences, 1*(26), 1–12.

[19] Selvaprabu, J., Arun, R.L., Saravanan, P., Abdul, A.A.K., & Javubar, S.K. (2024). OptCatB: Optuna Hyperparameter Optimization Model to Forecast the Educational Proficiency of Immigrant Students based on CatBoost Regression. *Journal of Internet Services and Information Security, 14*(2), 111-132.

[20] Tian, Y., Li, Y., & Sun, J. (2022). Stick or carrot for traffic demand management? Evidence from experimental economics. *Transportation Research Part A: Policy and Practice, 160*, 235-254.

[21] Trombin, M., Pinna, R., Musso, M., Magnaghi, E., & De Marco, M. (2020). Mobility management: From traditional to people-centric approach in the smart city. *Emerging Technologies for Connected Internet of Vehicles and Intelligent Transportation System Networks: Emerging Technologies for Connected and Smart Vehicles*, 165-182.

[22] Wang, Y., Lin, X., He, F., & Li, M. (2022). Designing transit-oriented multi-modal transportation systems considering travelers' choices. *Transportation Research Part B: Methodological, 162*, 292-327.

[23] Yolvi, J.O.F., Walter, G.G., Luis, A.V.F., Segundo, P.V.R., Huguette, F.D.Z., Jackeline R.H.F., & Marco, A.A.B. (2023). A Novel Approach to Predict the Early Childhood Special Education Learning Skills of Autistic Children Using Ensemble Machine Learning. *Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, 14*(2), 59-65.

[24] Zhu, J., Xie, N., Cai, Z., Tang, W., & Chen, X. (2023). A comprehensive review of shared mobility for sustainable transportation systems. *International Journal of Sustainable Transportation, 17*(5), 527-551.

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