The Eurasia Proceedings of Science, Technology, Engineering & Mathematics (EPSTEM)
ISSN: 2602-3199

The Eurasia Proceedings of Science, Technology, Engineering & Mathematics (EPSTEM), 2023

Volume 23, Pages 11-18

ICRETS 2023: International Conference on Research in Engineering, Technology and Science

Perception of Public Transport Megaprojects through a User Perspective

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Abstract: One of the biggest challenges of the 21st century is to manage population growth and the resulting impacts. Population numbers that exceed the earth's carrying capacity are placing huge environmental pressures on the environment. This is not only reflected in waste management, energy consumption and the use of fossil fuels, but also in a deteriorating quality of life. The millions of people living in metropolises around the world, with their given road networks, create huge transport anomalies that need to be addressed at national and international level. Road congestion, drastic increases in journey times and the rising cost of travel have highlighted the importance of improving public transport. However, for public transport to be attractive, it is essential that the transport alternative itself is fast, comfortable and modern. In the present study, two metro construction projects in cities with high populations (Mumba, Ryadh) are examined, with particular attention to the scale of the project and its usability. The study aims to highlight the visible objectives expressed by the end-users and their reflection in the project based on the results of a primary survey in 2022 and a primary survey in 2023. We will focus on the different phases of project management that lead to the success of the project.

Keywords: Transport, Sustainability, Project, Project scope

Introduction

Defining sustainability is not an easy thing. Many people define its concept in the most different ways, while there are also many people who are not fully aware of the meaning of the concept. Nowadays we say that many things are sustainable and many people consider themselves to be sustainable, but is this really true? Are we aware of what it means to be sustainable? Sustainability has become a popular term today. If you search the internet for sustainability, you will get 2.2 billion results in 0.55 seconds. This shows that sustainability is a much sought-after and popular topic for many people, but it is not the only reason why we need to address it. Indeed, the planet has undergone a major transformation and the last decades have seen an unprecedented explosion in many ways. The world's GDP or the volume of world trade has risen at an unprecedented rate since 1960, as has been seen in the change in population numbers, among other things. In a very short space of time, we have witnessed large-scale increases that have shed new light on the finite capacities of our planet. We have finite resources and opportunities in the face of infinite growth, so it is only a matter of time before the two are finally separated. Sustainability has become not only a fashionable term, but also a concept that increasingly affects our lives. It indicates a major problem, behind which we can assume that something is not working very well and that major change is needed. Meanwhile, globalisation and increasingly intense change are placing new challenges on the shoulders of humanity. Globalisation and digitalisation have significantly changed market and consumer expectations, generating new needs, new services, new strategic solutions and new consumer competences (Garai-Fodor, et al., 2023; Garai-Fodor 2022; 2023). The question rightly arises: in what ways can we sustainably maintain or improve our quality of life? Today, our lives are hampered by many problems. Rising energy prices, population growth and dwindling resources are all pushing us to look at sustainability in a new light. We also need to be clear that sustainability is no longer just about our consumption, but also about

being sustainable in areas such as public transport, which is used by many people. In the case of public transport, too, the increasing number of passengers, the drastic rise in energy prices or the shortage of raw materials and commodities that are important for transport can cause problems on a daily basis. From this perspective, sustainability must also be interpreted and even examined in relation to public transport, given that we are talking about a system that offers a significant proportion of humanity a choice of alternatives and services. However, while we are striving for sustainability in transport, we must not lose sight of the fact that we must at the same time be able to provide a service that is of the right quality, up-to-date and that offers maximum passenger satisfaction. We must provide a sustainable, economical, efficient and high-quality service, which is often not easy, but the challenges of the 21st century have made such demands on transport.

Literature Review

The issue of lifestyle is closely related to sustainability. Sustainable living defines important conditions for everyday people. We really need to think differently about life, we need to change our perception of life, our relationship with nature and our role on the planet. Sustainability is most often associated with consumption (Tseng et al, 2016; Csutora et al., 2022), where it is often thought that all that is needed to have a sustainable world is to consume more consciously or less (Harjato et al, 2021; Wang et al, 2019). If we want to understand sustainability in this dimension for transport, we could say that sustainable transport means travelling less. Most definitions associate sustainability with the finite resources and potential of our planet, but again this implies a consumption-centred approach (Dolan, 2002; Pogutz & Micale, 2011). However, sustainability cannot be linked to consumption alone, as the pursuit of sustainability has a well-defined purpose. Namely, to protect the condition and quality of our environment so that we can live in an environment that provides a suitable living space for all. Defining sustainability is still a challenge today, as many things can be sustainable. Sustainable systems, sustainable cities, sustainable budgets, sustainable tax systems, sustainable entrepreneurship (Győri - Ócsai, 2013), sustainable business environments, sustainable finance and banking (Győri et al., 2021) sustainable tourism (Borzán & Szekeres, 2019; Borzán & Szekeres, 2021), sustainable education (Borzán et al, 2022) and so on. Sustainability could be an important issue in project management as well (Blaskovics, 2016; 2018; Blaskovics et al., 2023). We also hear a lot about sustainable transport or transport systems. It is safe to say that sustainability has a slightly different meaning everywhere, as it means something different in economic, ecological or even transport terms (Morelli, 2011). It was mentioned earlier that sustainability actually requires a complete change of consciousness and lifestyle from humanity. Despite this, we often associate the issue of sustainability only with consumption. However, sustainability covers more than that, it can really require a change of lifestyle. Sustainable life refers to a lifestyle and way of living that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. It involves making conscious choices and adopting practices that minimize negative impacts on the environment, society, and economy. A sustainable life prioritizes resource conservation, social equity, and economic viability, aiming to create a balanced and harmonious relationship between human activities and the natural world. This encompasses actions such as reducing waste and consumption, promoting renewable energy sources, supporting local communities, practicing eco-friendly habits, and fostering a deeper connection with nature. Sustainable living is the practice of adopting habits and behaviors that promote long-term environmental, social, and economic well-being (Livermore, 2012). It involves conscious efforts to reduce one's ecological footprint by making choices that are less resource-intensive and environmentally damaging. Sustainable living encompasses various aspects of daily life, including housing, transportation, food choices, energy consumption, waste management, and consumer behavior. It emphasizes the use of renewable resources, responsible consumption, recycling, reusing, and supporting ethical and eco-friendly products and services. Sustainable living encourages individuals and communities to take active roles in preserving the Earth's ecosystems, biodiversity, and natural resources for future generations (Butters, 2021). A sustainable lifestyle is a way of living that incorporates sustainable practices and values into all aspects of life. It involves making deliberate choices aligned with environmental and social consciousness to reduce one's impact on the planet. A sustainable lifestyle embraces simplicity, mindfulness, and a sense of interconnectedness with nature and fellow human beings (Dimitrova et al, 2021). Key elements of a sustainable lifestyle include reducing waste, conserving energy, opting for sustainable transportation, supporting local and organic products, engaging in environmental activism and advocacy, and promoting social equity and justice. By adopting a sustainable lifestyle, individuals strive to be responsible global citizens, actively contributing to the preservation and regeneration of the Earth's ecosystems and fostering a more equitable and thriving world (Böhme, 2022). However, all definitions of sustainability have something in common. Wherever sustainability is pursued, it is always aimed at having a positive impact on the environment. We want to strive for sustainability in order to make a positive change and a positive impact on our environment. The definition of transport and sustainable transport, which is the subject of this study, is a perfect example of this. The OECD links sustainability and transport. It mentions that transport faces

the same challenges of resource scarcity or increasing demand for services as other productive or service sectors. Moreover, public transport is often under an even greater burden, often having to provide a sustainable service to millions of people on a daily basis. Sustainable transport, according to the OECD, is transport that does not endanger public health and the ecosystem, but provides a service that meets transport needs at the right quality (OECD, 2022). Sustainable transport is expected to use renewable resources at a slower rate than the time it would take to recycle them. And resources that cannot be renewed are used much more slowly than renewable resources. All this points to the need for sustainable transport in this sense to have a positive impact on people's environment, but also to ensure an adequate level of service. The significant positive and negative impacts of transport systems on both the sustainability of cities and people's lives have been demonstrated in several cases. In order to promote sustainability, a number of transport improvement projects are being launched, often with technical or financial constraints. This makes it difficult to implement such projects (Mahmoudi et al, 2021). Creating sustainable transport can be important not only at regional, state or city level. The European Union itself has set significant climate targets, one of the most important of which is the decarbonisation of the transport sector. The EU has pledged to reduce emissions to 0% by 2050 and achieve a form of climate neutrality. This requires a significant reduction in greenhouse gas emissions, but still providing services and solutions that are affordable for citizens (EC, 2022). Among these initiatives, we can assume a significant transformation, with a large number of investments and projects (Varga – Csiszárik-Kocsir, 2019; Dobos et al, 2022). Achieving zero emissions in the transport sector will require replacing, upgrading or adapting many of the technologies or devices that have been in place in the past. But transport cannot be left out of the continuous improvement and regular investment. Public transport is seen as a key element in building sustainable cities and should therefore be central to the sustainability of cities and regions (Miller et al., 2016; Kovács et al., 2020). Sustainable transport is not just about the environmental quality of the means of transport themselves. It means at the same time environmentally sustainable transport, sustainable transport system and sustainability of transport processes (Cheba & Saniuk, 2016). A sustainable transport system should enable mobility for all inhabitants, but in a way that is safe and environmentally friendly. This is not an easy task, as the needs and demands of people from different income groups are different, and it is not always possible to provide this at the same level (Mohan & Tiwari, 2000). However, transport sustainability in this interpretation is also strongly linked to its impact on the immediate environment. The positive relationship between transport sustainability and quality of life has also been clearly confirmed (Steg & Gifford, 2005). Sustainable transport also seeks to maintain a balance. This balance should not only be between transport and quality of life, but should also focus on environmental, economic and social aspects. Sustainable transport must therefore be able to provide environmental, economic and social benefits at the same time (Gilbert & Tanguay, 2000). The relationship between transport and the environment is very closely linked, and this includes the development of transport infrastructure or the modernisation of transport facilities in such a way that transport itself becomes more environmentally friendly and environmentally aware. Challenges in implementing sustainable transport programmes and projects include the complexity of transport problems in the urban environment, conflicts of interest or lack of adequate resources (Fernandez-Sanchez et al, 2020). There is also a strong link between sustainable transport development and project management. While it has become essential to apply sustainability criteria to public transport, economic aspects cannot be ignored. Development projects often have significant cost and time requirements, in addition to the scarcity of other resources in the transport sector. In most cases, development takes the form of major projects or programmes, all with a single objective: to achieve a positive impact that safeguards environmental assets without depriving citizens of transport services. In this way, public transport projects try to achieve the desired impact by maximising resource constraints and, while at the same time being cost and time-constrained, by trying to produce an outcome that meets citizens' expectations while at the same time having a positive impact on their quality of life and the environment.

Material and Methods

The megaprojects presented in this study are included in the top 50 projects list published by the Project Management Institute (PMI, 2021), an organisation that develops project management standards and selects each year the most inspiring and exemplary projects of the year to be used as a model for future similar initiatives. In this study, we would like to present two projects that aim to improve public transport, educate people about the use of cars and reduce the time and safety of transport. The modernisation of public transport will encourage more people to choose surface or underground solutions rather than driving and generating congestion. The two projects presented are metro projects in cities with very high populations (Ryad and Mumbai). The two projects under study are analysed from a user perspective, so no filtering criteria were applied in the selection of the sample of respondents, i.e. educational qualifications, previous project management knowledge were not criteria, i.e. anyone could fill in the questionnaire as a basis for the evaluation. Respondents were asked to rate the selected projects on the basis of some factors related to the scope of the

project. Respondents rated the factors on a scale of 1 to 4, with a score of 1 indicating a very weak factor and a score of 4 indicating a very strong factor. The characterisation of project scope is presented using a word cloud. 39.5% of the sampled respondents have a tertiary education, while 60.5% have a secondary education. 12.2% of respondents are Generation Y, 23.3% are Generation X and 64.5% are Generation Z. The survey was conducted in April and May 2022.

Results and Discussion

The Mumbai-Metro Project

Mumbai is one of the world's most populous cities. The city's rail system moves more than 7 million people commuting daily, which means that situations that endanger passengers are very common. Due to the large crowds, passengers often fall in front of trains or get injured in the crowd. This is why the city authorities decided to modernise the public transport network. The construction of metro line 3 was a huge challenge for the contractors. The first step was to create one of the longest tunnel systems in the world, 33.5 km of underground tunnels with 27 stations. This was a huge challenge, as the line ran through highly populated parts of the city, passing under many tall and listed buildings, and was complicated by overpasses, metro viaducts and railway lines. Getting the tunnel boring machine to the starting point was also a major challenge. During the construction, 8,000 workers and 17 drilling machines worked 24 hours a day to ensure that the plans could be kept on schedule. (PMI, 2021). However, an outbreak of the coronavirus made it very difficult to complete the work on time. Every time a worker fell ill, a team was quarantined, resulting in huge delays to the project. In addition, the works were scheduled during the monsoon season, which meant that flooding also posed a risk to the people working in the tunnel. This project was also specifically designed with the environment in mind. The basic mission of the project is also to reduce the city's carbon dioxide emissions, both by reducing the number of vehicles and by the forest development associated with the project.When respondents were asked to characterise the project scope along the given characteristics, it was seen that it was rated as being of public interest, useful and usable with a much higher ratio compared to the previous project, as the average score for these three characteristics was above 3.6 in all cases. This was followed by a markedly lower average score (around 3.2) for relevance, future focus and feasibility. Respondents ranked the project scope as the least cost-efficient and innovative, with the uniqueness and uniqueness of the project ranking third.

Table 1. The ranking of the scope elements of the Mumbai-Metro project

	Mean	Std. Deviation
novelty	2,517	0,834
usefulness	3,669	0,530
interesting	2,616	0,926
future focus	3,227	0,795
sustainability	3,023	0,823
relevance	3,273	0,742
feasibility	3,221	0,699
usability	3,610	0,653
public interest	3,721	0,544
profit orientation	2,523	0,927
uniqueness	2,523	1,011
cost-effectiveness	2,448	0,887
environmental awareness	3,006	0,921

Source: own research, 2022, N = 172

The research also assessed the average evaluation of the project from the users' perspective. It can be seen that more than 75% of the respondents rated it as good or better, which is definitely a sign of user acceptance.

Table 2. The overall evaluation of the Mumbai-Metro project

	Percent
satisfactory	4,070
medium	19,767
good	50,581
excellent	25,581

Source: own research, 2022, N = 172

We also wanted to investigate the impact of the overall project evaluation on the rating of each element of the project scope. To do this, we carried out an analysis of variance and considered the relationship to be significant where the significance value was below 5%. The results in the table below show that virtually all elements are influenced by the average project perception, which implies that winning the end-user in the first round is a very important factor.

Table 3. Correlation between the Mumbai-Metro project scope perception and average project rating

	F	Sig.
novelty	1,932	0,126
usefulness	5,546	0,001
interesting	4,049	0,008
future focus	7,747	0,000
sustainability	6,791	0,000
relevance	6,064	0,001
feasibility	3,658	0,014
usability	5,296	0,002
public interest	9,897	0,000
profit orientation	4,943	0,003
uniqueness	6,010	0,001
cost-effectiveness	12,321	0,000
environmental awareness	18,592	0,000

Source: own research, 2022, N = 172 (One-way ANOVA, sig = 0,05)

The Riyadh-Metro Project

Saudi Arabia's largest city, Riyadh, previously had no culture of public transport use. With a population of 8.3 million expected by the end of the decade, the vast majority of people in the city will be travelling by car, causing huge environmental damage, congestion and air pollution, and degrading the quality of life of the people living there. The metro project to be unveiled consists of six autonomous lines totalling 176 km, making it the largest public transport project in the world. This is complemented by an extensive network of bus lines, which will cover a further 1150 km (PMI, 2021). The project had a budget of USD 23 billion and was planned to be completed in seven years. The project has a constant focus on a greener approach to a more sustainable future. The design has also taken care of cooling and shading the surrounding areas, using innovative solutions (irrigation channels, canopy, internal and external vegetation). Respondents were then asked to rate one characteristic of project scope on a four-point scale. Here, the highest average scores were given for usefulness, public interest, usability and future focus. The four attributes were all rated above 3.5. In addition, a very high proportion considered the project to be environmentally friendly, sustainable, relevant and feasible, as indicated by average scores above 3.0. The project was considered least profit-oriented, as it received the lowest average rating. Similarly, cost-effectiveness was also rated low, with the uniqueness and uniqueness of the project ranking third from the bottom. The latter is not surprising as the public transport infrastructure is not particularly unique in itself, but the technology used, the architectural solutions and the solutions to protect the environment fall into this category. However, this is not something that the survey respondents have seen from the outside at this stage of the project.

Table 4. Evaluation of the scope of the Riyadh-Metro project

	Mean	Std. Deviation
novelty	2,866	0,851
usefulness	3,576	0,649
interesting	2,860	0,926
future focus	3,500	0,697
sustainability	3,297	0,725
relevance	3,180	0,618
feasibility	3,017	0,761
usability	3,529	0,644
public interest	3,547	0,678
profit orientation	2,401	0,934
uniqueness	2,657	0,951
cost-effectiveness	2,610	0,921
environmental awareness	3,442	0,751

Source: own research, 2022, N = 172

In this case, we also assessed the average evaluation of the project from the users' perspective. It can be seen that more than 75% of the respondents rated it as good or better, which is definitely a sign of user acceptance. However, this also includes potential end-users who rated the project as unsatisfactory and expressed their displeasure.

	Percent
unsatisfactory	2,326
satisfactory	5,233
medium	13,372
good	50,581
excellent	28,488

Source: own research, 2022, N = 172

We were also interested to see to what extent the average rating of the project influenced the perception of each element of the project scope. The data show that the rating of the vast majority of the factors is not affected by the overall rating of the users. The only factors that influenced were future focus, relevance, public interest and profit orientation. This is surprising because in the previous case almost all factors were influenced by the average rating. It should be noted, however, that in this case the rejection of the project has already appeared, as indicated by the average rating.

Table 6. Correlation between the Ryadh-Metro project scope perception and average project rating

	F	Sig.
novelty	2,622	0,052
usefulness	1,843	0,141
interesting	2,440	0,066
future focus	3,383	0,020
sustainability	1,215	0,306
relevance	10,408	0,000
feasibility	0,892	0,447
usability	1,013	0,388
public interest	6,106	0,001
profit orientation	4,313	0,006
uniqueness	1,829	0,144
cost-effectiveness	2,441	0,066
environmental awareness	1,352	0,259

Source: own research, 2022, N = 172 (One-way ANOVA, sig = 0,05)

Conclusion

If we evaluate the two projects as a whole, it can be said that the social utility of each of them is outstanding. Many cities, including Riyadh and Mumbai, have realised that while car transport is more convenient and practical in many cases than public transport, it still places a huge burden on cities and therefore the planet. Public transport offers an alternative to environmentally damaging car travel, by providing an efficient way to get large numbers of people where they need to go. By reducing air pollution, congestion and the negative impact on the environment. The evaluation of the projects shows that they were very positively received by the respondents, even though they may not be direct users. The message value of the projects was that they were perceived as being of most public interest, useful and usable, as these three main characteristics dominated the top three places in the respondents' opinion. In terms of cost-effectiveness, however, respondents had doubts. Obviously this is not a coincidence, as a project to improve public transport is implemented with a huge budget, the benefits of which will only be felt after several years or even decades. Adequate quality public transport and education can certainly be a solution to the environmental problems of our time. The two projects presented in this case and their evaluation by users are certainly a message for future developments, which can help to determine the purpose and direction of similar projects.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPSTEM journal belongs to the authors.

Acknowledgements or Notes

This article was presented as a poster presentation at the International Conference on Research in Engineering, Technology and Science (www.icrets.net) held in Budapest/Hungary on July 06-09, 2023.

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To cite this article:

Csiszarik-Kocsir, A., & Varga, J. (2023). Perception of public transport megaprojects through a user perspective. *The Eurasia Proceedings of Science, Technology, Engineering & Mathematics (EPSTEM), 23*, 11-18.