



Residents' needs and perspectives on the European City of science: A study of Katowice

Artur Strzelecki ^{a,*}, Robert Wolny ^b, Magdalena Jaciow ^b, Monika Klimontowicz ^c, Agata Austen ^d

^a Department of Informatics, University of Economics in Katowice, 1 Maja 50, 40-287 Katowice, Poland

^b Department of Digital Economy Research, University of Economics in Katowice, 1 Maja 50, 40-287 Katowice, Poland

^c Department of Banking and Financial Markets, University of Economics in Katowice, 1 Maja 50, 40-287 Katowice, Poland

^d Department of Human Resource Management, University of Economics in Katowice, 1 Maja 50, 40-287 Katowice, Poland

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ABSTRACT

The European City of Science (ECS) is a prestigious designation awarded by EuroScience to a city. The study employed a qualitative methodology, conducting four focus group interviews with 33 residents of Katowice to derive strategic directions for engaging residents in scientific processes and urban development. The findings indicate that residents perceive knowledge positively and stress the importance of its acquisition and expansion through various scientific events, including interactive exhibitions, city games, science centers, and cultural and sports events. The study results showed that most participants were unaware of the ECS Katowice 2024 initiative. Those who were aware had positive associations with the project. The results highlighted the importance of tailored communication strategies to enhance economic literacy and social engagement in science within the urban context. The findings provided valuable insights for city policymakers, aiding them in making informed decisions regarding investments in education, science, and innovation. The study highlights the role of participatory research methods in understanding public attitudes towards science and urban development, contributing to the broader discourse on science communication and public engagement.

1. Introduction

The concept of a “city of science” refers to a city that has a strong focus on science, technology, research, and innovation. Such a city has established itself as a center for these activities (Barry, 1995). A city of science is typically home to a number of universities, research institutes, and other organizations that are engaged in science and technology, and it often has a thriving startup and entrepreneurial ecosystem as well (Zhang and Fu, 2013). There are a number of benefits resulting from becoming a city of science (Shao, 2015). For one, it can help attract and retain talent, as many people are drawn to cities known for their scientific and technological achievements (Kitagawa et al., 2022). It can also help to boost the local economy, as the presence of a strong science and technology sector can result in the creation of high-paying jobs and the growth of new businesses (Liu and An, 2023). Additionally, being a city of science can help to position a city as a leader in the global economy, as it can become a hub for research and innovation that attracts attention from around the world (Leon, 2008).

All those activities support achieving the title of the European City of Science (ECS). This title is awarded periodically to a city located within a member state of the Council of Europe (Norlin, 2005). This designation is given to cities that demonstrate innovative concepts for integrating science and higher education into their local ecosystems. The aim is to foster greater engagement between citizens and the scientific community (Strzelecki et al., 2024). The ECS label seeks to cultivate a diverse, open, inclusive, and innovative class of citizens who not only generate and own knowledge but also invent new ideas and products. This initiative encourages cities to embrace science and education as central elements of urban development. On the local level, the ECS designation aims to foster the inclusion of scientific and higher-education institutions into a city's urban development strategy. It promotes interaction, dialogue, and co-creation between the scientific community and the wider citizenry, ensuring that science becomes an integral part of everyday life in the city. At the regional and national levels, the ECS title helps establish or reinforce the city as a flagship and ambassador of its regional scientific tradition, system, and community. This recognition

* Corresponding author.

E-mail address: artur.strzelecki@ue.katowice.pl (A. Strzelecki).

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enhances the city's reputation and positions it as a leader in scientific innovation and education. On the European level, the ECS title raises the profile of the city within the broader context of European research. It highlights the diversity present in the European research landscape and contributes to the development of a common European culture in science. Furthermore, it aims to increase cohesion in research efforts across the European continent, fostering greater collaboration and shared progress in scientific endeavors.

The European Association for the Advancement of Science and Technology (EuroScience) announces the call for applications for candidate cities to be awarded the title of ECS (Wüning Tschol, 2012). Applications are evaluated by European and international experts representing key stakeholders in European science and urban development. Each application is evaluated based on several key criteria (Lombardi, 2018). First, citizen involvement is paramount; the ECS program should prioritize the engagement of all city residents, regardless of their scientific background or experience (Nilsson, 2005). Second, the proposed ECS program should emphasize co-creation, dialogue, and mutual learning. It should offer numerous opportunities for meaningful exchange and collaboration between the scientific community and other urban stakeholders. Innovation is the third critical criterion. The program should incorporate new and creative concepts to maximize its impact and appeal. It should push the boundaries of traditional scientific and educational approaches (Pinholster and O'Malley, 2006). Fourth, while the ECS is fundamentally a local event centered in the awardee city, it should also include elements that appeal to a European and international audience. This can be achieved through scientific conferences, exhibitions, and twin-city events, ensuring the program has a broad and diverse reach. Fifth, the ECS title is awarded for a full calendar year, from January to December. Therefore, the program should be designed to span the entire 12-month period, providing a continuous and evolving series of events and activities (Cunningham, 2012). Finally, sustainability and lasting impact are crucial. The ECS program should be designed to leave a lasting legacy beyond the designated year, ensuring that the benefits of the initiative continue to influence and enhance the city and its residents long after the title year has concluded (Winter, 2004). Since 2006, the title has been awarded biennially, and to date, the recipient cities include: Munich, Barcelona, Torino, Dublin, Copenhagen, Manchester, Toulouse, Trieste and Leiden. The planned "ECS Katowice 2024" event, which will be held in Katowice, a city in southern Poland, aims to promote various fields of science and to stimulate the local economy through scientific research and innovation. The group of organizations involved in preparing Katowice to play the role of the ECS in 2024 include the University of Silesia in Katowice, the University of Economics in Katowice, the Medical University of Silesia in Katowice, the Silesian University of Technology, the Jerzy Kukuczka Academy of Physical Education in Katowice, the Academy of Fine Arts in Katowice, the Karol Szymanowski Academy of Music in Katowice, and the City of Katowice. This strategic alliance aims to plan and carry out scientific, science communication, and educational projects related to topics such as the role of science in addressing climate change and other global challenges, the role of science in the energy, social, and digital transformation of the region, and the role of science in the development of new technologies and artificial intelligence. The partnership also aims to increase interdisciplinarity in addressing social, technological, and regulatory issues and to enhance international and intercultural cooperation and the relations between the academic communities of the partner institutions and their foreign partners.

Referring to the criteria presented by EuroScience, the program should place citizens at its core, engaging both those with and without scientific backgrounds. The initiative should include opportunities for dialogue, exchange, and mutual learning between the scientific community and other urban stakeholders, and the proposed program should incorporate innovation. Moreover, issues such as governance, decision-making, and implementation structures must be included in the proposal. The literature offers research that links science to the city context.

Cities are increasingly seen as hubs for innovation, where interdisciplinary approaches combine data science with social sciences to address urban challenges. This integration fosters sustainable urban transformations that consider both technological advancements and the human elements of city living (Mora et al., 2023; Roig et al., 2020). There is a significant exploration into how cities use educational programs and public engagement initiatives to boost science literacy. This involves a wide range of activities, from formal education settings to community-based learning, emphasizing the role of cities in fostering a culture of innovation and learning (Feinstein and Baram-Tsabari, 2024). Finally, the economic implications of cities are well-documented, particularly how such cities attract businesses and talent, contributing to job creation and economic diversity (Morgan et al., 2019). Yet, the literature on city of science initiatives is limited. Among others, there is a need to understand the issues of engaging citizens in scientific activities and decision-making processes, ensuring inclusivity and broad participation, and the aspect of innovative practices and technologies that can be integrated into the ECS program, promoting urban sustainability and scientific advancement.

Thus, the research's key objective is to provide policymakers with strategic directions for engaging residents in scientific processes and urban development during the celebration of the ECS. Achieving this goal requires answering the following research questions:

RQ1. What are the residents' needs and preferences of Katowice residents regarding the ECS Katowice 2024 program in economic sciences?

RQ2. What are the residents' perceptions of knowledge and its association with Katowice city?

RQ3. What are the residents' awareness and perceived benefits of the ECS initiative?

RQ4. What kind of activities and communication strategies do residents prefer?

The qualitative research method was applied to answer the research questions and achieve the study's objective. Group interviews were conducted with city residents to identify the needs and preferences regarding the ECS Katowice 2024 program in economic sciences. The interview process and the focus study group used in the research are described in more detail in the method section.

The study contributes to the literature in several ways. By employing qualitative research methods, specifically focus group interviews and the projective technique of collage, this approach enriches the literature on qualitative research methodologies. Second, the findings provide evidence of how major scientific events like ECS can influence public perceptions and engagement levels. The varied understanding of economic sciences across different age groups and the public's suggestions for future ECS events reveal societal expectations and readiness for scientific engagement, offering a predictive look at potential changes in public science interaction. The research fills a gap in the literature where the intersection of local economic development, science communication, and public engagement is explored, underscoring the complex interaction between these fields when a city prepares to host a significant scientific event. This interdisciplinary approach enriches the understanding of how science and technology-driven events can serve as catalysts for urban and educational development.

Answering these research questions will contribute to the literature on the role of science in society and practice by gathering insights to inform policy and investment decisions, ensuring the program aligns with community expectations and enhances its overall impact. Understanding the expectations and desired areas of focus of these key stakeholders is essential for the successful planning and organization of the ECS Katowice 2024 event. This information can help organizers tailor the program to the interests and needs of the local community and maximize the event's impact and benefits. As a result, the research findings will also contribute to practice. They provide valuable insights

for other cities, policymakers, academics, and other stakeholders who are interested in promoting science and technology in urban areas' local communities.

The paper is structured as follows. The second section presents the theoretical research background. Next, the research method is presented, followed by the results and discussion. The paper concludes with a summary of the study and implications for further research and practice.

2. Theoretical background

Examining the strategic directions for engaging residents in scientific processes and urban development requires a thorough exploration of relevant theoretical frameworks. The research is grounded in the stakeholder theory, public participation theory, and science communication.

Stakeholder theory, originating from the work of Freeman in 1984 (Freeman et al., 2020), offers valuable insights into how entities, including cities, explore the diverse interests of stakeholders in their decision-making processes. Stakeholder theory focuses on considering the interests and needs of all groups affected by the ECS. It is a framework for analyzing and managing an organization's interactions with its various stakeholders. This theory posits that businesses and other organizations should prioritize the interests of all stakeholders—not just shareholders—to achieve greater success and sustainability. Stakeholders include any group or individual who can affect or is affected by the organization's objectives, such as employees, customers, suppliers, communities, and the environment. The core aspect of stakeholder theory is engagement in dialogue with stakeholders to gather insights and understand their perspectives, which can guide strategic decisions (Harrison et al., 2019). Considering stakeholder perspectives leads to more informed and balanced decision-making processes. This approach can help organizations anticipate and mitigate potential conflicts and align their strategies with broader societal expectations (Bridoux and Stoelhorst, 2022; Harrison and van der Laan Smith, 2015).

Public participation theory relates to public engagement, which is a crucial theoretical framework for understanding the interaction between scientific endeavors and societal impacts. At its core, public engagement refers to the various strategies and the involvement of the general public in the scientific process and decision-making. It is a deliberative process; public participation in a facilitated dialogue is meant to rectify power imbalances that produce predetermined, unjust outcomes (Amirkhanyan et al., 2024; Clark, 2021). Contemporary approaches emphasize a two-way interaction, where the public is not only a recipient of scientific knowledge but also a contributor to the dialogue. This paradigm shift recognizes that public values, needs, and preferences are essential in shaping scientific research and technological advancements (Nabatchi and Amsler, 2014). Public engagement initiatives seek to foster a culture of curiosity, critical thinking, and informed decision-making among citizens, thereby enhancing societal support for scientific endeavors (Bucchi, 2008; Jo, 2024). Among other methods, focus groups may be used as a method of public participation.

The conducted research underscores the importance of effective science communication. Science communication refers to the various ways in which scientific information is shared with the public (Bucchi, 2008). This can include activities such as presenting research findings at conferences and in scientific journals, communicating research results through the media, and engaging with the public through events and educational programs. It encompasses a wide range of communicators who engage with various audiences. Given the diversity of both communicators and audiences, the objectives of science communication can vary based on the context (Intemann, 2022). One key aim is to generate interest in science to enhance and maintain scientific literacy within communities. Involving the public and promoting scientific literacy are essential for maintaining ongoing interest in science (Master and Resnik, 2013). This not only enables individuals to make informed decisions but

also helps them understand the options available to policymakers and the reasons behind certain decisions. By sparking enthusiasm and interest in science, laypersons become more scientifically informed and engaged.

A primary goal of science communication is to empower decision-makers, which include i.e. policymakers and funding agencies to make well-informed decisions regarding science and technology (Priest, 2013). Decision-makers need to be able to make predictions about future developments based on current knowledge. Investors and funding agencies must identify the most promising research areas or strategies to allocate limited research funds effectively. Policymakers need to anticipate which regulations might be necessary to minimize risks, maximize benefits, or ensure equitable distribution of the benefits from scientific or technological advancements (Weingart et al., 2000). Science communication helps to ensure that the results of scientific research are widely available and accessible to the general public, and it also plays a role in promoting the value of science and technology to society (Burns et al., 2003).

3. Method

The research presented in the article was conducted using the qualitative research method in the form of Focus Group Interviews (FGI). The groups in the studies are “focused” in the sense that all participants engage in a collective activity (conversation), with the idea of using group interaction as research data (Guest et al., 2017b). Focus groups were first used by market researchers and were developed in sociology (Liamputtong, 2011). Today, they are increasingly being used as a research tool in the social sciences. There is an expanding body of literature on the creation and administration of focus groups for social scientists, as well as some of their advantages and disadvantages (Acocella, 2012; Massey, 2011; Smithson, 2000).

FGI is defined as a research technique that collects data through group interaction on a topic predetermined by the researcher (Guest et al., 2017a). Focus study research is a qualitative method that focuses on understanding a specific group of people in a specific context (Gill et al., 2008). It is used to gain a deeper understanding of how people think, feel, and behave within a particular environment. Researchers can benefit from this because it shows that people's expectations and attitudes are not entirely captured in their rational answers to straightforward questions (Guest et al., 2017b; Hydén and Bülow, 2003). Interaction during FGI often takes unexpected turns and can provide researchers with surprising insights and unexpected findings, often ones they did not anticipate (Skop, 2006). In a broader sense, focus groups give the chance to comprehend the needs and perspectives of participants and enable the exploration of unexpected but crucial issues (Carlucci, 2018).

During FGI, the moderator plays an important role. The moderator is a person with appropriate substantive preparation for conducting this type of research. They must possess qualities such as the ability to learn quickly, good memory, listening skills, empathy, and the ability to synthesize information. The moderator must ensure that all participants have an equal opportunity to speak (Scott, 2011). The task of the moderator is to guide the discussion in such a way that encourages all participants to speak freely while preventing the discussion from being dominated by one person. Focus group facilitation requires a lot of “talent, skill, and knowledge regarding group dynamics, communication methods, and the study's most effective strategies” (Adler et al., 2019).

In qualitative research, the focus is not on measuring a phenomenon but on its deeper analysis. This type of research aims to understand the underlying mechanisms governing a particular issue. Research conducted using the FGI method is not representative, which is partly due to the sampling method used. The sample selection in focus group research is based on the relationship of the participants to the subject of the study. In focus group research, the sample is not random, and as a result, the findings are not representative (Babbie, 2020). As shown in Fig. 1, the

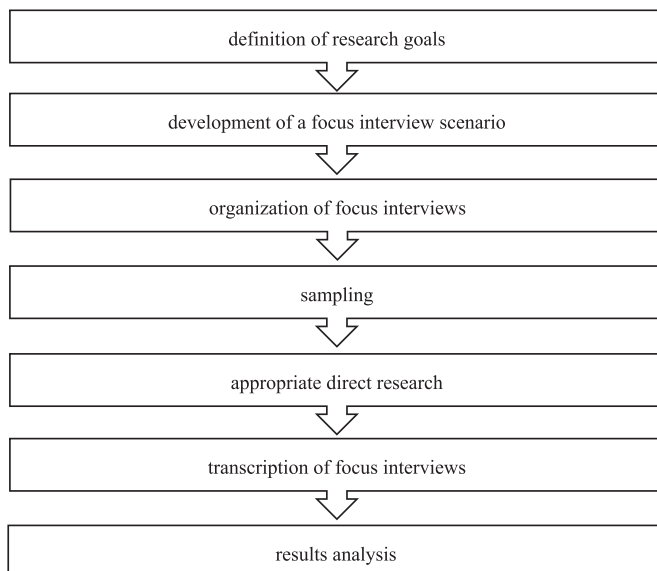


Fig. 1. The research procedure.

research procedure involves seven stages.

The research aimed to provide policymakers with strategic directions for engaging residents in scientific processes and urban development during the celebration of the ECS by identifying the needs and preferences of the residents of Katowice and the Metropolis GZM in terms of expectations regarding the organization and program of the ECS Katowice 2024 in the field of economic sciences (RQ1). To achieve this goal, the research set detailed objectives, including understanding the perception of knowledge by residents (RQ2), analyzing the level of awareness of ECS Katowice 2024 and its benefits (RQ3), and determining the most effective ways to communicate the ECS Katowice 2024 initiatives (RQ4).

The FGI study requires the preparation of an interview scenario – a discussion guide, which contains a select group of questions or discussion points that are meant to spark a conversation between participants and guide their comments to the most fruitful areas of discussion (Massey, 2011). The interview scenario for the focus groups was organized around five topics. These include economic knowledge in the awareness of residents (I); awareness of ECS Katowice 2024 among residents (II); benefits of ECS Katowice 2024 according to residents (III); residents' needs regarding the ECS Katowice 2024 program (IV); and the portrait of a resident in ECS Katowice 2024 - poster session (V). The set of questions in the focus interview is presented in Fig. 2.

Considering the issues related to conducting FGI, the authors utilized the assistance of a professional research unit at the University of Economics in Katowice, The Research and Development Center (CRD, the Polish acronym: CBiR). The CRD staff prepared an appropriate room for conducting the focus group interviews and provided all necessary materials, recording equipment, refreshments, and gifts for the respondents.

Participants were recruited in accordance with the assumptions adopted by the Academic Consortium of the European City of Science ECS Katowice 2024. The assumptions indicated that the planned events would be targeted at different age groups. The recruitment process for the focus group interviews followed a purposive sampling strategy, targeting people living, working or spending their free time in Katowice, and originating from Katowice or the GZM Metropolis. Potential participants were identified through local communities, educational institutions, employees of companies and cultural facilities, ensuring representation in specific age groups (15–18, 19–26, 27–65 and 66+). Recruitment activities included disseminating invitations to participate in the discussion via social networks and targeted email campaigns. In

addition, pre-screening questionnaires were used to verify eligibility and ensure that the sample met the demographic criteria of the study. Participants who expressed their willingness to participate in the research signed consent to the processing of necessary personal data and recording of the interview. A total of 33 residents participated in the focus group interviews, divided into four age groups (15–18 years - eight people, 19–26 years - six people, 27–65 years - eight people, and over 66 years - 11 people). Among the interview participants, those with secondary education, employed, and actively engaged in educational activities were predominant. Most of the focus group participants were residents and workers in Katowice. The majority of participants represented two-person households without children under 18 years of age. The participants more often rated the material situation of their households as 'good' or 'average'. A detailed characterization of the interview participants is provided in Table 1.

The qualitative research among residents was conducted from November 15 to 21, 2022. Four focus group interviews were held. Each interview lasted approximately 110 min and was recorded for later transcription and analysis. During the interview, in addition to the moderated discussion, participants created a collage titled "Me in the City of Science Katowice 2024". Collage allows for understanding the abstract point of view of the respondents towards a given product, phenomenon, or idea and reveals their narrative world. This technique also helps to eliminate the influence of the "internal censor" and reveal needs that would be difficult to express directly. "Collage portraits provide qualitative researchers with a variety of approaches to support more conventional techniques in order to gain a more thorough and genuine understanding of people and their struggles within cultural and societal contexts" (Gerstenblatt, 2013; Phillips and Bellinger, 2011). In the collage technique, we are dealing with intentional expression. The resulting creative act (poster) is an expressed, captured in behaviour result of a multitude of images, fantasies, visions and thoughts. "Collage portraiture has the potential to support and enliven the analysis of interview data, thus producing new knowledge and interpretation" (Lawrence-Lightfoot, 2005). The group interviews followed a partially structured format, with a list of open-ended questions provided to guide the discussion.

The data collected from the group interviews was transcribed and coded for analysis using a qualitative data analysis method. The data was analyzed using a thematic analysis approach, with themes being identified and developed from the data. The themes were developed iteratively, with the researchers reviewing and discussing the data to identify patterns and commonalities. The resulting themes were used to organize and interpret the data and to identify the needs and preferences of the participants for the ECS Katowice 2024 program in economic sciences.

Ethical considerations were taken into account throughout the study. Informed consent was obtained from all participants prior to their participation in the group interviews. The participants were informed of the purpose of the study and were assured of their right to withdraw at any time. The confidentiality of the participants was respected, and all data was collected and stored anonymously. The participant's confidentiality was ensured by presenting aggregate information by age groups and while quoting, anonymity of the respondents was kept. The study was approved by the ethics committee of the University of Economics in Katowice. As a gesture of gratitude for their time and contribution, the focus group participants were given non-monetary gifts, including notes, umbrellas, and sweets. There was no financial reward for their participation in the study.

4. Findings

The FGI scenario was designed to find the answers to research questions. It was organized around five topics, which enabled the spark of a conversation between participants and guided their comments related to their needs and expectations regarding the ECS Katowice 2024

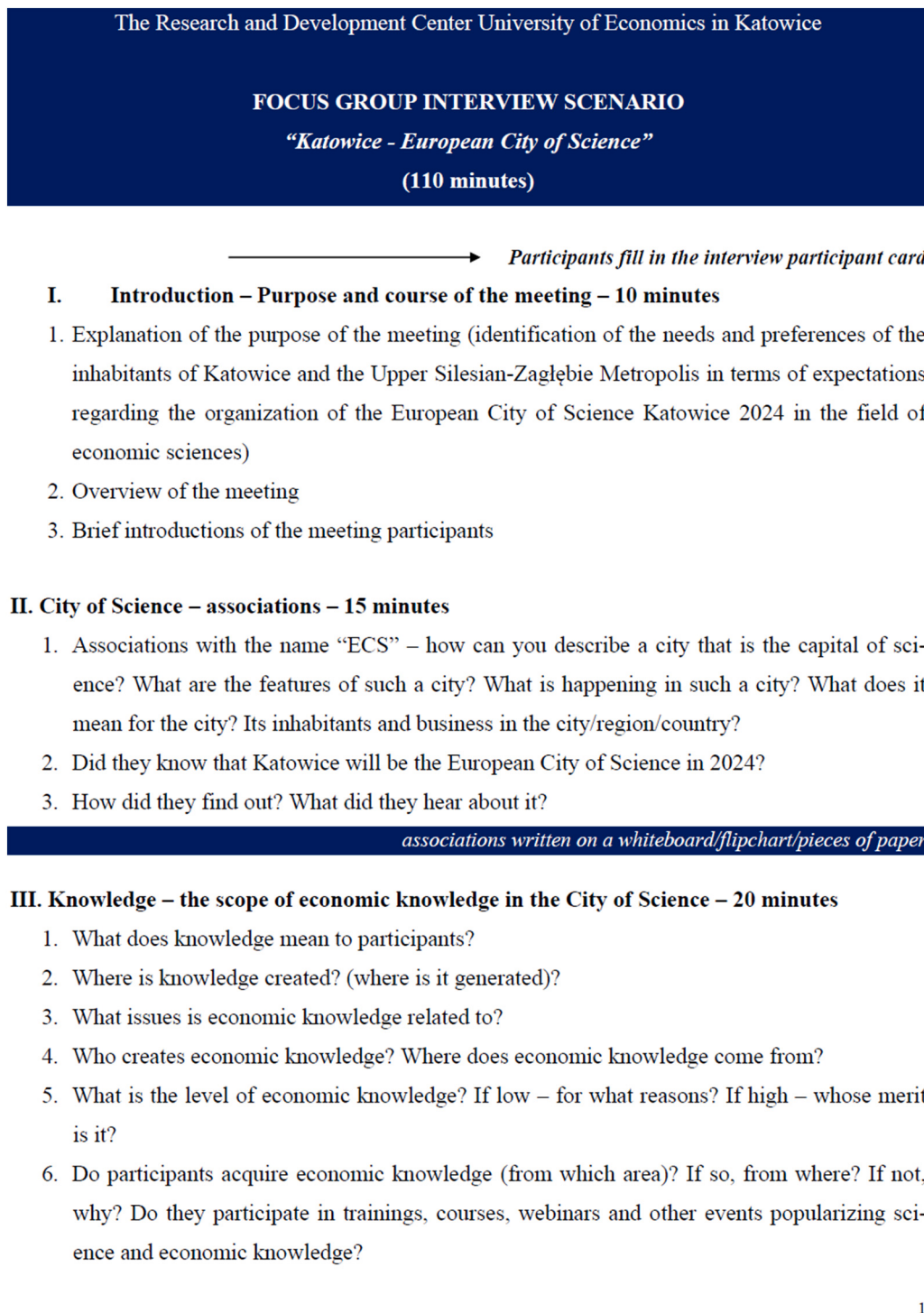


Fig. 2. FGI Scenario.

organization and program, awareness of knowledge, perceived benefits, as well as activities and communication strategies.

4.1. Knowledge in the awareness of residents

Knowledge is perceived differently by each age group studied (Fig. 3). The age group 15–18 years associates knowledge primarily with “information”, “awareness of facts”, “experience”, “the ability to do something”, and “something that may be useful in the future”. This

approach can be linked to the stage of secondary socialization, where adolescents absorb school knowledge and develop practical skills necessary for functioning in adult life. According to Piaget's cognitive development theory, young people in this age group are in the formal operations stage, where they begin to develop abstract thinking skills but still focus on concrete, tangible aspects of knowledge (Babakr et al., 2019).

For the 19–26 age group, knowledge is “a resource that facilitates daily life”, “a reservoir of information and facts in the brain”,

IV. Events in the City of Science popularizing economic knowledge – generating ideas – 20 minutes

1. Katowice's status as the European City of Science 2024 is a great distinction and prestige for the city and the country. What city can benefit from this (in 2024 and beyond)? What benefits can residents have? What benefits can business have (in 2024 and beyond)?
2. How can you celebrate this distinction? What initiatives/events/scientific meetings should take place in the city? For residents? For business?

suggestions written on a whiteboard/flipchart/cards

→ *Participants create a ranking of ECS events*
- 15 minutes

Each participant distributes 100p. on event suggestions by creating your own ranking

V. “Me in the European City of Science Katowice 2024”

→ *Participants create a collage entitled “Me in ECS Katowice 2024”*
- 20 minutes

The group, divided into 2 parts (regardless of gender), creates a poster of how they imagine themselves at ECS Katowice 2024. The work is carried out with the use of sheets of flip paper, colored newspapers, markers (four colors) for each group.

Work overview

- 10 minutes

VI. Acknowledgments and gifting

Fig. 2. (continued).

“awareness”, and “something that helps develop the world”. In this group, we observe a more complex understanding of knowledge as a tool supporting personal and social development. Erikson, in his psychosocial development theory, describes this stage as a time of searching for identity and intimacy, which may explain the emphasis on the practical application of knowledge and its role in daily life (Maree, 2021).

The age group 27–65 perceives knowledge as “freedom”, “wealth (both material and immaterial)”, “efficiency in action”, “self-confidence”, “common good”, “independence”, and “open doors”. These associations reflect a more mature and diversified approach to knowledge, encompassing its economic, social, and individual value. Gary Becker's human capital theory indicates that investing in knowledge and skills benefits not only individuals but also society as a whole, which is reflected in the responses of this group (Weiss, 2015).

For individuals over 66 years old, knowledge is “a treasure”, “a gift”, “freedom of discussion”, “development”, “wisdom”, “broadening horizons”, and “the ability to navigate life”. This perception of knowledge aligns with Erikson's psychosocial development theory, where older individuals go through the stage of ego integrity, striving to find meaning and coherence in their lives. In this group, knowledge is valued not only as a practical tool but also as a source of spiritual and intellectual enrichment. The results reflect the changing approach to knowledge depending on the life stage, consistent with theories of socialization, cognitive development, and psychosocial development.

The sources of knowledge utilized by the residents of Katowice participating in the study are diverse. Participants, regardless of age, indicate that the key sources of knowledge are “life experience” and “the process of learning in school or university”. The process of experiential

learning is a fundamental element in cognitive and social development, which is reflected in Kolb (2015) experiential learning theory which asserts that knowledge is obtained by transforming experiences. Formal education plays a crucial role in building the knowledge base of individuals, emphasizing the role of educational institutions in shaping knowledge and skills. A participant responded:

“For me, knowledge is a set of competencies, and competencies are what humanity knows. Knowledge can be drawn upon and is created wherever it is recorded or registered.”

Differences in knowledge sources across different age groups can be interpreted in the context of their specific needs and developmental stages. The 15–18 age group uses books, observation, research, experiences, “their own mistakes”, and “meetings with friends”, which aligns with the stage of formal operations in cognitive development theory, where adolescents develop abstract thinking skills through experiments and observations. The 19–26 age group is guided mainly by a “spark of curiosity”, reflecting the search for identity and active exploration of new ideas.

Individuals in the 27–65 age group use a wide range of knowledge sources, from traditional books to modern media and the internet, which is consistent with human capital theory, suggesting that investment in various forms of education benefits both individuals and society. Older individuals over 66 years old primarily draw knowledge from “social relationships” and traditional sources like books while also adapting new technologies such as the internet. This is in line with the continuity theory of aging, which indicates that older people continue to use effective methods of acquiring knowledge throughout their lives.

The research results reflect the dynamic and varied approach to

Table 1
Characteristics of FGI participants (in numbers).

Specification		Total	Focus groups by age			
			15–18	19–26	27–65	66 and more
Total		33	8	6	8	11
Gender	Female	22	5	2	7	8
	Male	11	3	4	1	3
Education	Primary	9	8	–	–	1
	Vocational	1	–	–	–	1
	Secondary	14	–	4	5	5
	Higher	9	–	2	3	4
Professional activity	Working	14	2	4	8	–
	Not working	19	6	2	–	11
Educational activity	Not studying/not enrolled	13	–	2	7	4
	Pupil	8	8	–	–	–
	Bachelor's degree student	4	–	4	–	–
	Elderly students	8	–	–	1	7
Place of residence	Katowice	18	4	4	6	4
	Other locality	15	4	2	2	7
Place of work	Katowice	11	–	4	7	–
	Other locality	3	2	1	–	–
Number of household members	1 person	5	–	–	1	4
	2 persons	15	2	–	6	7
	3 persons	7	3	3	1	–
	4 persons	4	2	2	–	–
	5 persons and more	2	1	1	–	–
Including children under 18	1 child	8	4	1	3	–
	2 children	2	2	–	–	–
	3 children and more	1	1	–	–	–
Self-assessment of the material situation	Very bad	–	–	–	–	–
	Bad	1	–	–	1	–
	Sufficient	13	3	3	4	3
	Good	17	5	2	3	7
	Very good	2	–	1	–	1

acquiring knowledge at different stages of life, emphasizing the importance of tailoring educational and social programs to the specific needs and capabilities of different age groups.

Associations with economic knowledge among the study participants, regardless of age, pertained to finances. For the “average” person, economics equates to finances. Additionally, the results present varied associations with economic knowledge across different age groups, reflecting each individual's specific needs and experiences. The 15–18

age group focuses on basic aspects of economics, such as management, transactions, meeting market needs, supply and demand, and money. This indicates their early stage of economic education, consistent with socialization theory, which emphasizes the importance of basic skills in the initial phase of education.

The 19–26 age group expands their interests to include the economy, economic development, social issues, business, crises and ways to overcome them, “stability indicators”, and “selling scientific discoveries. This aligns with the stage of early adulthood, where individuals begin to engage with more complex economic aspects, especially since this group primarily consisted of students majoring in economics.

The 27–65 age group concentrates on practical aspects of economics, such as household budget, city/state budget, stock market, inflation, interest rates, and profitability of actions, reflecting their advanced knowledge and professional as well as life experience. Finally, the group over 66 years old focuses on the economy, trade, forecasting, business, “counting their own money”, “rational allocation of resources”, and budgeting, indicating their pragmatic approach to economics, derived from many years of life experience.

All study participants (regardless of age) agreed that the level of economic knowledge in society is low. There are several reasons for this state of affairs. Each age group pointed to something slightly different, but the main ones are that economic knowledge is difficult and poorly taught at every stage of education. In addition, the interviewees pointed out differences in the level of economic knowledge between generations (Fig. 4).

When asked about ways of acquiring economic knowledge, interview participants indicated both common and specific preferences. A common element for all age groups is the use of the Internet, which is widely accessible and provides a variety of economic information. Younger age groups, particularly those aged 15–18, use school classes, programs like the Children's Economic University, books, YouTube videos, and articles. The 19–26 age group additionally engages in training and webinars, takes advice from influencers, and gains knowledge “through work” and “participation in educational events”, indicating an active search for knowledge and development of practical skills. The 27–65 age group acquires knowledge from television, radio, conversations with children who are studying, and through their work, highlighting the importance of professional and family experience in building economic competence. People over 66 years old mainly gain knowledge from “family conversations”, the press, television, and participation in the University of the Third Age, reflecting the importance of social integration and continuous learning in later years of life.

In the research, we identified areas of economic knowledge that participants acquire depending on the age group. These areas are different and reflect their specific needs at different life stages. Participants aged 15–18 gather economic knowledge about inflation, the stock market, exchange rates, wages, taxes, prices, sources of income, and

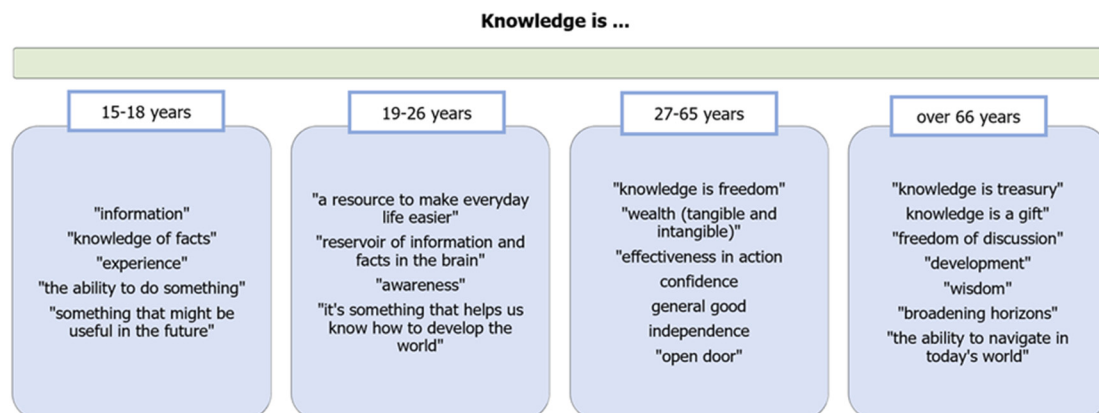


Fig. 3. Associations with knowledge (FGI research results).

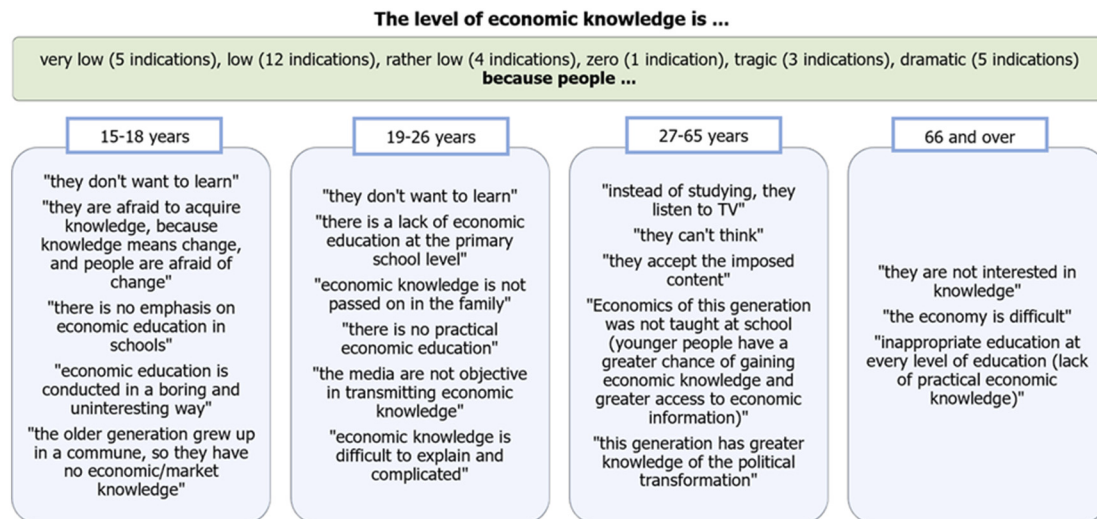


Fig. 4. Reasons for the low level of economic knowledge in society (FGI research results).

living costs. These topics correspond to their early stage of economic education, where basic market and financial mechanisms are crucial for understanding the fundamentals of economics. The 19–26 age group expands their interests to include human resource management, time management, personality development, online marketing, and developing leadership skills. This aligns with their early adulthood phase, where career development and management skills are key for them. Participants aged 27–65 are interested in bank credit offers, the stock market, the civic budget, social assistance, VAT, obtaining funds from the EU, and the economic situation in Poland and the world. These interests reflect advanced knowledge and life as well as professional experience, indicating a more practical approach to economics. The oldest group, over 66 years old, focuses on finance, the economy, budget management, banking news, and financial regulations, reflecting their pragmatic approach resulting from many years of experience. These diverse areas of economic knowledge underscore the importance of tailoring economic education to the specific needs and life stages of different age groups, which is crucial in social and economic development and also indicates directions for creating the ECS program for the residents of Katowice.

4.2. Knowledge of ECS Katowice 2024 among residents

During the research, information about Katowice being awarded the

title of ECS appeared in the urban space. A participant responded:

"I knew Katowice would be the City of Science; I learned about it from the City Council's Facebook page."

However, the reach of this information was limited. Most participants in the study were not aware of this fact. Despite the lack of knowledge, the youth aged 15–18 had positive associations with the City of Science (Fig. 5), describing it as "modern", "developed", "innovative", "open to people", "open to new opportunities", "important", "popular", "educated", with a "high standard of living", "richer in knowledge", and "able to deal with problems". In the City of Science, "we learn", "new technologies emerge", and "new places for learning are created". According to young residents, the benefits include the "development of the city and region", a higher standard for "universities, schools, and libraries", easier access to European funds, a higher level of education, and the development of the real estate market. These conclusions indicate the potential impact of granting the status of ECS on the social and economic development of Katowice, which aligns with regional development theories that emphasize the importance of investment in education and innovation for sustainable urban development. However, to fully leverage these benefits, it is crucial to effectively inform and engage the youth in initiatives related to science and education.

Participants in the 19–26 age group knew that Katowice had been given the status of ECS 2024 (Fig. 6). They found out about it during the academic year's inauguration from information shared on social media

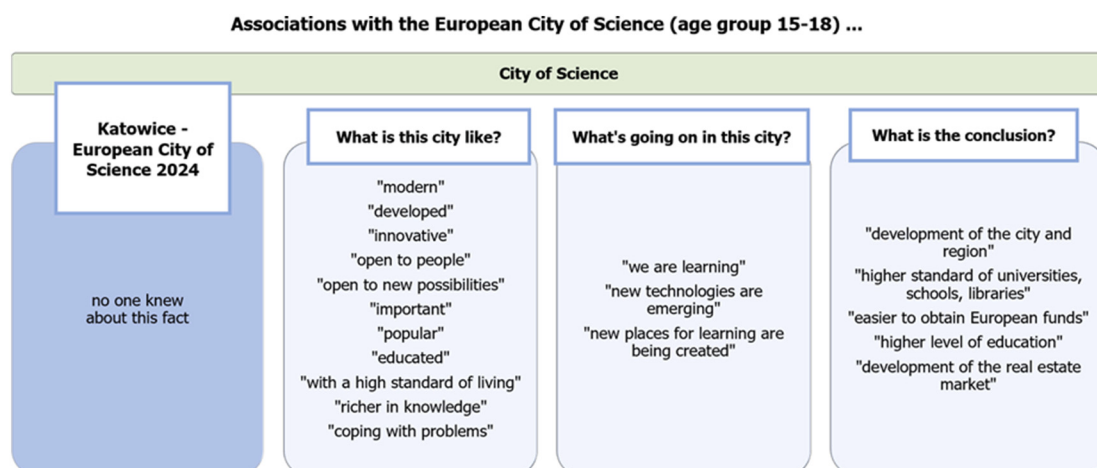


Fig. 5. Associations of the 15–18 age group with ECS (FGI research results).

and various online information services. When asked about associations with a City of Science, they listed a range of characteristics such a city would have and the benefits it could bring to the hosts. The youth describe the City of Science as modern, innovative, attentive, engaged, responsible, full of opportunities, and “shifting from industry towards technology, automation, and ecology”. According to their perception, a lot happens in the City of Science: “access to knowledge is facilitated”, “events are organized in urban spaces and universities”, and “webinars are held”. The benefits of the ECS status include the development of the city and the academic community, increasing residents' awareness and knowledge, “adapting the city to modern trends”, and creating opportunities for education, cooperation, and investment. These associations and expectations of the youth align with regional development theories, which emphasize the importance of innovation, education, and international cooperation for sustainable urban development. Granting Katowice the status of the ECS is seen as a catalyst for positive changes, enhancing the standard of living and the attractiveness of the city for investors and residents.

The results of the focus group studies in the 27–65 age group revealed that six out of nine participants knew that Katowice had been awarded the status of ECS 2024 (Fig. 7). They learned about it mainly from the Internet, online services, radio, banner advertising in the city center, and during the academic year's inauguration. Participants describe the City of Science as attractive, multicultural, “challenging the stereotype that science is only for the young”, and “open to new areas of cooperation”. In their perception, science in the City of Science “goes beyond the walls of universities”, with many events, meetings, and discussions where science is integrated with business and residents. The benefits of this status, according to the respondents, include recognition in Poland and Europe, prestige and financial benefits for the city, development of education, an influx of students, tourists, and investors, “an opportunity for the young not to leave”, “changing the city's image from industrial to cultural and scientific”, development of infrastructure, and better communication and mobility.

Over half of the participants in the age group over 66 knew that Katowice had been given the status of ECS 2024. They found out about it from websites, television, and social media. When asked about associations with a City of Science, they listed positive characteristics such a city would have (modern, friendly, tolerant, open, vibrant), activities (a city filled with lectures, meetings, sports and cultural attractions, students from other cities and countries), and the benefits it could bring to the organizers as a result of this status (including prestige, new investments, development of communication, infrastructure, the job market, and hotel services) - Fig. 8.

4.3. Benefits of ECS Katowice 2024

The results of the focus group studies indicate a wide range of benefits that Katowice can obtain from the ECS status in 2024. This status will contribute to increasing the city's prestige, reputation, and promotion both nationally and across Europe. Investments in infrastructure and city development can attract new residents, which will, in turn, change Katowice's image from an industrial city to a more ecological and green one, fitting into the concepts of sustainable urban development (Jeurissen, 2000).

Katowice residents will also benefit from the city's prestige. According to the focus group participants, these benefits are associated with emotions such as pride and satisfaction from living in a city that will be recognized worldwide. The scientific events planned for 2024 will raise the level of knowledge in the local community, offering numerous opportunities to participate in lectures and workshops conducted by prominent speakers, which is in line with the theory of life-long learning (Jarvis, 2010) and is an essential element for the development of individuals and communities. However, the youngest residents expressed concerns about the inconveniences in daily life, such as increased traffic and higher service prices, indicating the need for sustainable urban management and a challenge for city authorities.

Business benefits include a better-educated workforce and increased demand for goods and services, including transportation, tourism, gastronomy, and more customers in grocery stores. According to the respondents, there is a chance that new companies will emerge, resulting in more jobs and job seekers in the city, and businesses “will exchange best practices” during many ECS events. Speakers will be “an inspiration to implement innovations”, it will be easier to attract investors, “business will connect with science”, and sales revenues will increase. Combining all potential benefits, an interdisciplinary approach to organizing ECS is necessary, aiming to integrate local economic development, scientific communication, and public engagement. Scientific events can serve as catalysts for urban and educational development, creating a dynamic economy and a more integrated community. Therefore, granting Katowice the ECS status is seen as an important factor supporting the long-term economic and social development of the city. A participant responded:

“If these science events are not only for residents but also for visitors, everyone who comes here spends money, and this drives the market. This will benefit the micro-level economy.”

4.4. Residents' needs regarding the ECS Katowice 2024 program

During the interviews, participants were asked to generate ideas for celebrating the ECS Katowice 2024, and then to create individual rankings of events. Generating ideas for celebrating the ECS Katowice



Fig. 6. Associations of the 19–26 age group with ECS (FGI research results).

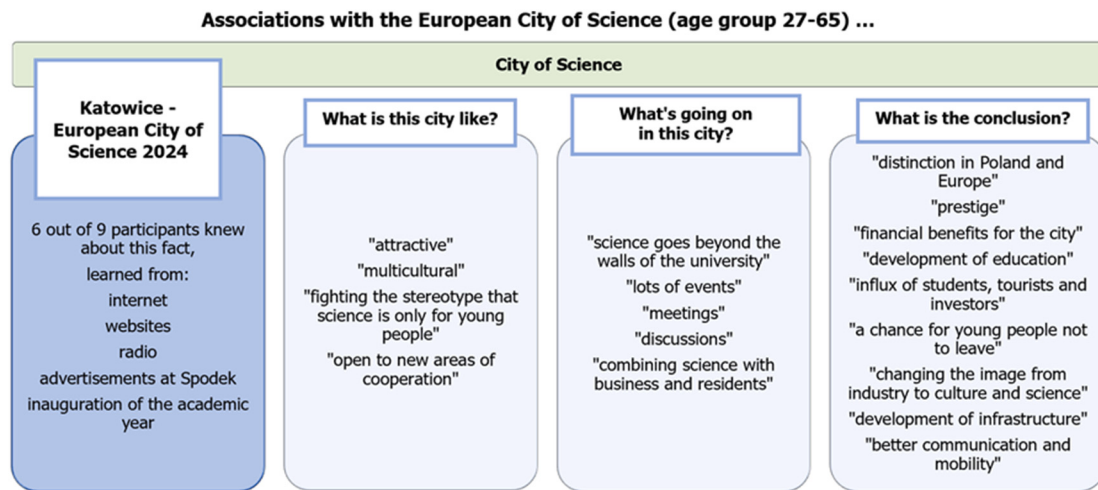


Fig. 7. Associations of the 27–65 age group with ECS (FGI research results).

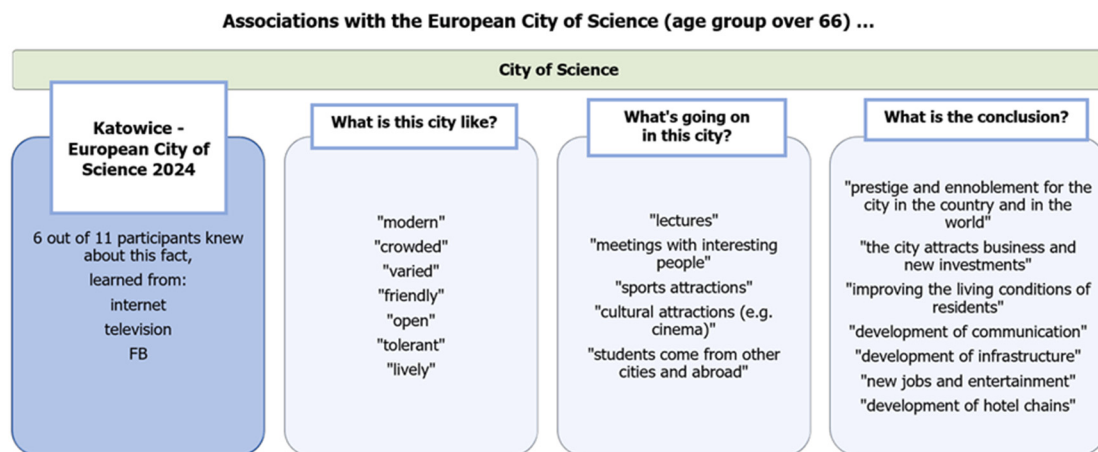


Fig. 8. Associations of the 66 and older age group with ECS (FGI research results).

2024 took place in a group discussion. The generated ideas were discussed in the group and recorded on a board. Each participant created their own ranking of events by selecting the ones in which they would most like to participate. The ranking was created by distributing 100 points among the preferred events (with no less than 10 points being assigned to a selected event). Table 2 shows the overall ranking of events (as a sum of points).

During the interviews, the youngest participants generated 16 ideas for various types of events they would like to participate in as part of the celebrations for the ECS Katowice 2024. The most popular idea among all the proposals was the creation of an interactive exhibition on economic topics. The participants in the 19–26 age group generated 12 ideas for events they would like to participate in as part of the celebrations for the ECS Katowice 2024. The most popular idea among all the proposals was the creation of a Science Center (a consortium of seven universities that, like the Copernicus Science Center in Warsaw, would develop science and cooperation with scientists and teachers, inspire observation, experimentation, questioning, and seeking answers). The participants in the 27–65 age group generated 12 ideas for events they would like to participate in as part of the celebrations for the ECS Katowice 2024. The most popular idea among all the proposals was the creation of economic-themed performances. The participants in the oldest age group generated 10 ideas for events they would like to participate in as part of the celebrations for the ECS Katowice 2024. The most popular idea among all the proposals was the creation of an

economic city game.

4.5. Results of the poster session

During a focus group interview, the collage projective technique was used. In order to properly interpret the meanings of collages, they were subjected to semantic and formal analysis. The research material, in the form of posters, is an interesting source of information about the preferences of the respondents and their expectations of the event of granting the title of ECS to Katowice in 2024. Most of the respondents react to the project of the ECS in Katowice in 2024 in a positive way, on a continuum from moderate joy to great enthusiasm. The older the group, the more the idea of ECS is seen as an opportunity for the city and the whole region. There was quite a lot of agreement on the areas that events related to the celebration of the ECS in Katowice in 2024 should cover. These areas include broadly understood ecology, human relationships (family and non-family), economics, education, and science. This agreement is even visible through the choice of similar newspaper clippings on different posters. The following drawings show the collages created by the participants in the focus group interviews, along with their detailed psychological analysis.

Fig. 9 shows the collage where, in the space of the described poster, its closed, "framed" composition stands out. In the central place, a fragment of a human figure (a man) with a drawn and highlighted brain was placed. The symbolism of the brain is quite clear - development,

Table 2
Ranking of proposed science events.

Rank	15–18 years	19–26 years	27–65 years	66 and more
1	Interactive exhibition (140 p.)	Science Center (150 p.)	Economic performances***** (160 p.)	City economic game (230 p.)
2	“Got Talent” Economy (80 p.)	IEM (Intel Extreme Masters**) Economy Edition (120 p.)	“Touch Economy” (140 p.)	Economic Video Game (160 p.)
3	Economic fairs (80 p.)	Extreme economics*** (80 p.)	University visits (80 p.)	Economic experiences (150 p.)
4	“Exempt from theory”* economic (80 p.)	Celebrity events (60 p.)	Thematic events (70 p.)	Economic publications/brochures (thematic for seniors) (130 p.)
5	Museum of Economics (80 p.)	Economic consulting points (50 p.)	Meet the economic staff (70 p.)	Game shows and competitions with prizes (100 p.)
6	Economy for the youngest (70 p.)	Hackaton**** (40 p.)	Extreme economy (50 p.)	Concerts (90 p.)
7	Economic performances (50 p.)	Outdoor game (30 p.)	“University in the open air” (50 p.)	Sports and Economy Day (80 p.)
8	Festival of Economic Sciences (40 p.)	Quizzes (30 p.)	Economy for seniors (50 p.)	Meeting with economics for families (80 p.)
9	Economic knowledge tournament (40 p.)	Concerts (30 p.)	Programs on TV, radio, podcasts, YT (40 p.)	University Open Days (60 p.)
10	“Coffee with the Professor” (40 p.)	Economics workshops (10 p.)	“Teach teachers how to teach” (30 p.)	Mini-seminars on the basics of economics for different age groups (20 p.)
11	University Open Days (30 p.)	Marathon (0 p.)	Offers for children, youth, graduates, seniors (30 p.)	
12	Economic Congress (20 p.)	Festival of economic songs (0 p.)	Meetings with graduates “Success in business” (30 p.)	
13	Economy without borders (20 p.)			
14	Economic summer camps (20 p.)			
15	Science Parade (10 p.)			
16	Economic startup (0 p.)			

* A program aimed mainly at high school students, where the participants are asked to come up with and implement a social project in a team, which brings something good to others in real life.

** International e-sport tournaments organized in many countries around the world.

*** Extreme Economics is an orienteering race enriched with extreme tasks, general knowledge questions and intelligence tasks.

**** A hackathon is an event that involves brainstorming ways to solve difficult problems.

***** Economic performance is a type of theater performance on the economics topic.



Fig. 9. Collage in the age group of 15–18.

knowledge, mind, intellect. This man is probably a resident of Katowice, as indicated by the inscription “Katowice!” placed in both the brain and the heart - the city logo. Therefore, the images placed around this main figure indicate what this resident of Katowice expects, what is important to him, what has meaning, and what he desires and wants to make his world (the inscription: “Wszystko czego tak naprawdę potrzeba” – “Everything you really need”). For him, the following issues are important: nature, which “the city attracts like a magnet”, ecology, aesthetics, health, modernity, humor, culture, science, family, education, significance in the world. And these areas should be the focus of events in the ECS. Changes for the better should also take place in these areas. Science, its discoveries and achievements, should therefore serve the specific needs of the city and region. The message is predominantly positive; the poster exudes hope and highlights opportunities.

The vertical layout of the poster suggests that the inscriptions “Our Katowice” and “Everything you really need” placed at the top of the poster are in the sphere of ideas, something that has value for the creators of the image. The bottom of the poster, slightly overloaded compared to the top, may suggest an unconscious feeling of difficulties and obstacles on the way to realizing this idea. The compact and closed composition of the poster, as well as the thematic order of the images, expresses a certain static perception of the problem by the respondents. The images placed around the outer edges of the poster form a shape resembling a smile, confirming the positive attitude of the respondents and their joyful excitement about the events that will take place in connection with ECS Katowice 2024. The form of the message is mainly images; the words appearing on the poster are rather related to a specific press cut. Despite leaving a large white area on the poster, its color scheme is rich and once again confirms the positive attitude of the

respondents.

Fig. 10 shows that poster space has been mainly organized in the central sphere - the most conscious and controlled by reason. The strongly highlighted phrase “Me in the European city of science” suggests the adoption of a subjective perspective of the problem. Attention is drawn to the relatively large (larger than the others) photo of a man whose face expresses excitement and joy. The gesture he performs can be interpreted as an invitation to engage, an encouragement, or an expectation of activity from the other side.

Interpreting the poster's content message, attention focuses on the word “chance”. The authors explain below that this is a chance for the city, culture, art, family development, and innovation. Each of these elements has been reinforced by an appropriate press cutout associated with a given category by the respondents. These associations are simple, using common symbolic meanings. However, in no way has it been explained how these chances should be realized.

In the organization of the space, attention is drawn to the large, white, empty spaces. This confirms that the respondents found it difficult to relate to the posed problem or that the problem arouses in them a feeling of unease. Applying the principle of proximity or neighborhood in the field of vision, one can distinguish the figure as one figure, the titular inscription, and the figure of the smiling man. This suggests that the respondents are positively disposed to the described undertaking, and pleasant emotions associated with play accompany them. None of the means of expression used has a negative connotation. Most of the cutouts have intense colors that contrast sharply with the white background, thus reinforcing their meaning. The symmetry of the poster is slightly disturbed, with a shift to the left. Perhaps this is an expression of an unconscious defensive tendency and confirms the thesis of the respondents' uncertainty in relation to the problem. Most of the cutouts are

rectangular, which gives the viewer the impression of a certain rhythm and order. This conclusion corresponds to the observed placement of the figure elements in the central zone of the background. An element that attracts attention on the poster is also a drawing of a heart, which, through its color and size contrast, is like a dot in the respondents' statement, additionally emphasizing their positive attitude.

Fig. 11 shows that the authors of the poster decided to use a comparable amount of pictorial and verbal material. In the collage space, there were several photos and captions intended to further define and indicate the direction of interpretation. The graphic operation used in the form of circles connected to each other with slogans introduces a certain order in the seemingly chaotic arrangement of images.

The semantic analysis of the described poster should take the caption “Our Katowice” – “The city attracts like a magnet” as a starting point. The use of a vertical poster layout places it as an idea to which the respondents refer in the lower parts of the collage. Keywords were used there, illustrated with images to reinforce the message. According to the respondents, the city of Katowice should attract with culture, spatial investments, and appropriate urban infrastructure. It should be a place of dialogue, a city where knowledge and science will count. In connection with the ECS Katowice 2024 project, various events (“iwenty”) are also expected, although they have not been specified. The words “Vat”, “eco” and “business” are marked with “+” and “-” signs, which probably indicates the ambivalence and uncertainty of the respondents in relation to these categories. These words may be, in the perception of the poster authors, areas in which there are both opportunities and perhaps threats to the city.

The poster is characterized by great dynamism, achieved through diagonal lines, the variety of images used, and asymmetry. This



Fig. 10. Collage in the age group of 19–26.

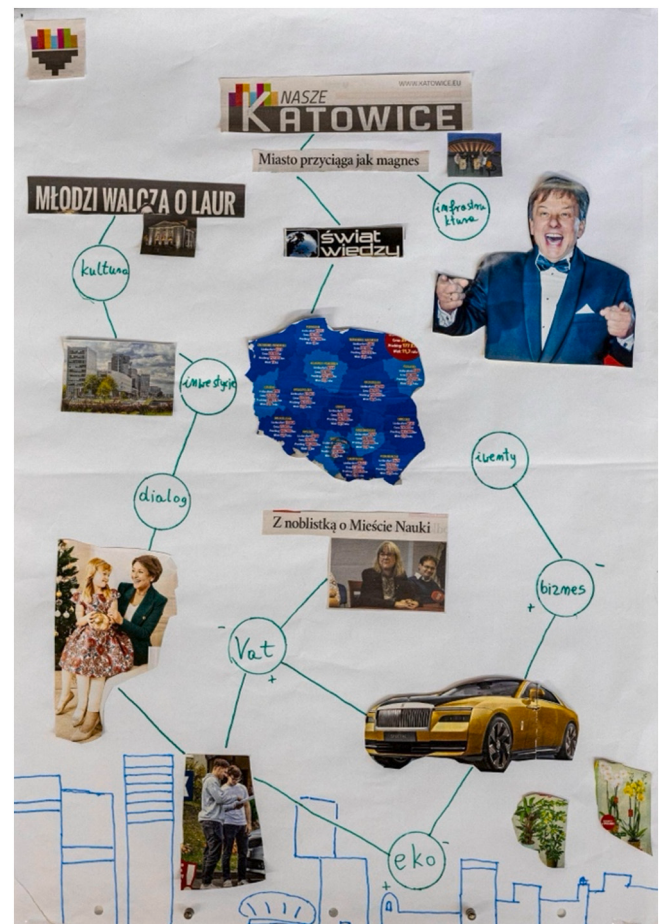


Fig. 11. Collage in the age group of 27–65.

technique disrupts the simplicity of the vertical layout and brings animation. This surely reflects the feelings of the surveyed, for whom the event of ECS Katowice 2024 should be something dynamic, stirring, changing, and activating various environments. A wide range of colors was used in the collage, giving the described work expressiveness. The dynamics of the composition are additionally emphasized by the figures used in the poster, which are captured in interactions and present certain emotions with a pleasant hue. The effect is intensified by the figure of a man in the upper right corner of the page, which attracts attention and serves as an invitation to engage in the described event. The bottom of the page is occupied by a drawing (schematic and colorless) of the city - as if it were the real state, opposed to the ideal: a city that attracts like a magnet. A strong color spot in the described collage is also a map of Poland with Katowice marked. This is probably the expectation of the surveyed that the city of Katowice will gain significance on the national stage, gaining new connotations.

Fig. 12 shows that the central part of the card is occupied by a collage of a photo with the title “Nasze Katowice” and the subtitle “Open City Attracts Like a Magnet”. Around this title are placed images, captions, subtitles and drawings. All this gives the impression of movement, energy, liveliness, evoking pleasant emotions. The message of the collage is overwhelmingly positive, indicating gains and opportunities for Katowice, as well as expectations of positive changes. The respondents would like to see their city as an open world where everyone is a winner (“Medal for everyone!”). In this city there should be a place for young people, their enthusiasm, idealism, and energy (“Here comes youth!!”) as well as for the elderly, who should feel secure, taken care of, and supported (also financially). A prominent place should be occupied by learning, for which “it is never too late!” The respondents want Katowice to be truly a city of gardens, where new investments and infrastructure will appear, a city where families will have a good foundation for development. The authors of the poster also expect interesting events (also sports) that will be directed to different groups of recipients, so that there will be “something super for everyone”.

The composition of the poster takes the form of an oval, delineated by the images included. It conveys the message of seeking harmony and perfection. The drawings and captions introduce dynamism, infuse energy, and act as a filling and complement to the image. The entire space of the page has been utilized, and the empty spaces do not give the impression of something missing but rather aesthetically blend in with the rest. The dominant color is green, expressing the desire for self-

confidence and security. It also expresses the need for self-respect, recognition and respect from others, perseverance and endurance, the will to act, material success and stability. The viewers are likely full of hope, perhaps even excited for the upcoming events. They look forward to the possibility of participating in the activities proposed by the city. They see them as a catalyst for positive changes that will make Katowice a city on a European level. Despite the fact that the term “we” was not used directly, it seems that the perspective of the poster's authors was indeed a perspective beyond “me”.

The analysis of the collages prepared by the FGI participants revealed several key needs and expectations of the residents. First and foremost, residents (regardless of age group) value intellectual development and education, desiring access to high-quality education and scientific innovations. Ecology and aesthetics are equally important to them, reflecting a desire to see the city as a green and ecological space. Interpersonal relationships, both familial and social, hold great significance, highlighting the need for social support and integration. Residents also emphasize health and modernity, wishing for modern infrastructure and high-quality healthcare. Culture and art are additional important aspects, with expectations for diverse cultural events. Lastly, economic stability and security, especially for the elderly, are crucial, indicating the need for investments in the economy and creating a safe and supportive urban environment. By addressing these needs in accordance with stakeholder theory and public engagement principles, the city can achieve sustainable development and meet the expectations of its residents.

5. Discussion

The research findings suggest that there is a need for more information about the ECS Katowice 2024 program among residents of Katowice. This may indicate that there is a lack of awareness or understanding of the program among the general public, which could hinder its success. In order to address this issue, it may be necessary to implement effective science communication and public engagement strategies that aim to increase awareness and understanding of the program among residents. These strategies could include the use of social media, the organization of public events and lectures, and the development of educational resources.

The findings also suggest that there is a need for better economics education in Katowice. This could be addressed through the



Fig. 12. Collage in the age group of 66 and more.

development of targeted educational programs and resources tailored to the needs and interests of different age groups. Addressing any perceived difficulties in learning about science and technology may also be necessary to increase engagement with these subjects.

The research findings indicate that there is a desire among residents of Katowice for more job opportunities in the science and technology sector. This highlights the importance of supporting entrepreneurs and small businesses in this sector, as well as investing in research and development, in order to create a thriving science and technology ecosystem in the city. By addressing the needs and perspectives of residents, it may be possible to develop a comprehensive strategy for science and technology that supports the success of the ECS Katowice 2024 program and positions the city as a leader in research and innovation.

The ECS Katowice 2024 program, science communication is likely to be an important factor in its success. By effectively communicating information about the program to the public, it will be possible to increase awareness and understanding of the initiative, and to build support and engagement among residents of Katowice. This may involve a range of activities, such as organizing public events and lectures, developing educational resources, and using social media to share information about the program. By engaging with the public in this way, it may be possible to foster a culture of curiosity and residents' critical thinking, and to promote the value of science and technology to the local community.

The success of the ECS Katowice 2024 program may depend on effective public engagement strategies. By including residents of Katowice in the design and execution of the program, it is possible to generate support and engagement from the local community. This may involve a range of tactics, such as consulting with the public about the development of the program, offering opportunities for the involvement of the general public in research projects, and organizing public events and lectures to promote the value of science and technology to the local community. Through such efforts, it is possible to cultivate a culture of curiosity and residents' ability to think critically and ensure that the program aligns with the needs and interests of the local community.

5.1. Theoretical implications

The research's findings contribute to stakeholder theory, public participation theory and science communication in several ways. First, the study develops existing knowledge of the City of Science as an idea of how to deepen the changes that accompany social transformation towards science. The literature on this topic is limited. This study provides a detailed analysis of how different age groups perceive the concept of a City of Science. Exploring the interests, awareness, needs, and opinions of Katowice residents contributes to stakeholder theory, giving methodological inspiration. The study is a reflection of the impact of science communication and technology on social change. The ECS initiative aims to promote science and innovation, which can have a profound impact on the local economy and society. By investing in research and development, fostering collaboration between universities and organizations, and promoting science and technology to the public, the city can become a hub for science and technology and a leader in the global economy. This can lead to the creation of high-paying jobs, the growth of new businesses, and a culture of curiosity and critical thinking. The research enhances the stakeholder theory by illustrating how the identity of Katowice residents is intertwined with the city's scientific status. The association tests and focus group discussions reveal the symbolic meanings attached to Katowice as a City of Science, thereby enriching theoretical discussions on place identity and community cohesion.

By capturing different groups' perceptions, the research also adds depth to existing theoretical frameworks on public participation theory with science (Feinstein and Baram-Tsabari, 2024; Selin et al., 2017), highlighting the socio-cultural dimensions that influence how people relate to scientific initiatives within their city. The research validates existing theories by providing empirical evidence that supports

theoretical claims about inclusivity, communication, and tailored engagement. It also expands these theories by demonstrating how they apply in the specific context of ECS Katowice 2024. Many citizens and administrators "are interested in increasing public participation in public decisions" (Manaf et al., 2016). Examples of public engagement activities include public lectures, citizen science projects, and participatory research. These efforts are significant because they help to inform the general public about scientific research and its potential impacts, as well as foster trust and understanding between scientists and the general public.

By understanding how different age groups perceive and acquire knowledge, the study underscores the need for tailored public engagement activities that can effectively communicate scientific research and its impacts to a broad audience. Participation and engagement at the community level can foster social capital, which helps people better understand social issues and problems. Increasing public support for policy options, decreasing bounded rationality, and fostering policy consensus at the institutional level can improve the quality of governance and policymaking (Barrett et al., 2012; Fung, 2005; Kinney, 2012; Nabatchi and Amsler, 2014). The active participation of community members in discussing and providing insights on economic knowledge and the ECS Katowice 2024 initiative demonstrates how community engagement can build social capital. The discussions on economic knowledge and the anticipated benefits of ECS Katowice 2024 show that social capital helps residents understand and articulate social issues, supporting the theory.

The findings contribute to the theory of science communication by showing how economic knowledge is perceived and acquired differently across age groups. This age-specific understanding can refine theoretical models of lifelong learning and educational outreach, emphasizing the role of tailored communication strategies in enhancing economic literacy in urban populations. It is possible to analyze the city from a variety of points of view "due to its complexity, size, diversity (internal or external), and meanings", which are "references for the construction of knowledge about the urban space as well as the logic of apprehension and appropriation used by people and organizations in relation to the place they inhabit" (Lúcio, 2015). Establishing trustworthy two-way communication channels, translating scientific knowledge into terms that are relevant to decision-makers, assembling scientists with this knowledge, evaluating the process, and making necessary adjustments are all necessary for effective science communication (Bucchi and Trench, 2021; Davies and Horst, 2016; Fischhoff, 2019; Scheufele, 2013). Given that many scientists are looking for information on effective communication, Cooke et al. (2017) have created a list of topics for people interested in science communication to make it more effective. Our results develop the existing knowledge in this area by presenting several ways, in which science can be communicated.

The presented results provide additional support for the usefulness of focus groups as a method for achieving public participation goals (Carlucci, 2018; Pyrialakou et al., 2019). Moreover, the study enriched scarce literature presenting the application of collage as a method used for planning activities of the city (Iwaniec and Wiek, 2014; Laaksonen et al., 2006). Thus, by using focus groups and collages, the study demonstrates the value of participatory research methods in understanding public attitudes towards science cities. This methodological contribution can inform theoretical debates on the efficacy of participatory approaches in urban planning and public policy, suggesting that such methods can yield nuanced insights into community needs and aspirations.

5.2. Practical implications

The presented study is an attempt to analyze the preferences and expectations of the residents of Katowice in the field of economic sciences and how they can be addressed through the ECS initiative. By understanding the needs and interests of the residents, the city can plan

and organize the ECS Katowice 2024 program in a way that is relevant and attractive to the local community. This research can help inform city policy-makers by providing insights into the potential social impact of new technologies and programs, and by identifying areas for improvement. The use of focus groups in the research allows for the exploration of complex and nuanced topics related to the intersection of technology and society, providing valuable information for future initiatives.

Based on the qualitative research conducted among residents, key recommendations can be made for building metropolitan events related to the popularization of economic sciences within the ECS Katowice 2024 program. It is recommended to intensify efforts to promote the ECS Katowice 2024 initiative. Based on the sources of information indicated by the respondents, it is recommended to use social media, the websites of the City Office and universities, and appropriate positioning of the initiative in search engines. Additionally, it is worth considering using urban communication means and city spaces to promote events.

Tailoring content to demonstrate the practical applications and benefits of economic knowledge can enhance engagement and educational outcomes. Planned initiatives for residents should focus on basic economic knowledge related to finance and budget management of the household. Changing the perception of Katowice requires incorporating the academic aspect into the city's marketing strategy. When planning promotional activities, it is necessary to consider associations with the idea of the ECS, which in the opinion of respondents are positive, and build a message based on these associations adapted to the age groups of recipients.

By understanding the residents' level of knowledge and the sources they use to acquire information, policy, and decision-makers can be informed about the current state of technology adoption and dissemination in the region. The study's results provide a baseline for tracking changes in the residents' awareness and understanding of technological and scientific advancements, which can contribute to forecasting future trends in the region. Finally, by addressing these needs, the city can position itself as a leader in research and innovation and support the growth of a thriving science and technology ecosystem. These developments have the potential to bring about significant changes in the way people live and work and, thus, impact the social and technological landscape of the city.

Taking into account the number of proposals and ways of celebrating the ECS Katowice 2024, each proposal presented in the rankings should be considered in terms of the possibilities of their organization (financial and technical). It should be noted that some of these proposals are long-term investments with a high degree of attractiveness for residents and businesses (e.g. an economy museum). In addition to traditional activities popularizing science organized by universities (also in cooperation with the City Office or businesses) such as conferences, open lectures, or knowledge fairs, we recommend considering non-standard ways of transferring knowledge (e.g. field and educational games, knowledge pills on buses, hackathons) and creating spaces for the exchange of experiences between science and business and counseling. It is worth considering the proposals of residents regarding the places of organization of events not only in closed rooms but also in the open air (e.g., Square, Three Ponds Valley). In accordance with the expectations of both residents and businesses, the actions taken by the city should be long-term, which means the implementation of the best-rated initiatives not only in 2024 but also their continuation in subsequent years.

6. Conclusion

The study provided policymakers with strategic directions for engaging residents in scientific processes and urban development during the celebration of the ECS.

Residents' main need and expectation regarding the ECS organization and program (RQ1) is more information about the ECS Katowice 2024. The analysis of collages revealed additional needs and expectations as intellectual development, access to high-quality education and

scientific innovations, a desire to see a city's green and ecological space supporting interpersonal relationships and integration, and providing social and cultural events.

The results found that residents of Katowice have differing perceptions of knowledge (RQ2), with younger residents seeing it as useful information and skills for the future. In contrast, the elderly see it as a source of wealth and independence. All participants agreed that life experience and formal education are key sources of knowledge. Participants also identified various methods for acquiring economic knowledge, including the internet, books, and magazines, as well as attending lectures, participating in training and workshops, consulting experts, and asking specialists.

The need for more information is related to the lack of awareness or understanding of the ECS program (RQ3). Despite that, responders easily pointed out the benefits of the ECS initiatives, such as prestige (associated with pride and satisfaction), an increase in the city's attractiveness for investors, companies, and the workforce, increased demand for goods, urban and educational development, and others. The portrait of a resident in ECS Katowice 2024, as depicted in the poster session, includes characteristics such as being open-minded, curious, and proactive, with a desire for growth and development.

The research findings provide valuable insight into activities and communication strategies (RQ4) that policymakers may incorporate into the program. The survey participants proposed fifty ideas. According to their ranking, the most valuable ideas are the creation of scientific, interactive exhibitions, the establishment of a Science Center, organizing economic-themed performances, and economic city games. Planned events should take into account the age and perception capabilities of different age groups of recipients in their content. The research findings confirm responders' digital transformation regarding scientific communication. The majority of responders search for information using the Internet and social media.

The study is limited by its sample size, as it only includes participants from Katowice. The sample is also not representative of the entire population of Katowice, as it only includes individuals who were willing and available to participate in the study. Additionally, the results of the study may not be generalizable to other cities, as the perceptions and associations with knowledge, science, and technology may vary between different communities. The study only focused on a limited number of topics, and further research is needed to gain a more comprehensive understanding of the residents' perspectives on ECS Katowice 2024 and related topics.

Future studies could expand on the findings of this study by including a larger and more representative sample of residents from Katowice. This would help to increase the generalizability of the results and provide a more comprehensive understanding of the perceptions and associations of residents with knowledge, science, and technology. Additionally, future studies could explore the impact of the ECS Katowice 2024 program on residents, businesses, and the local economy, including any changes in residents' perceptions and associations with knowledge, science, and technology. Further research could also examine the effectiveness of science communication and public engagement strategies in increasing awareness and understanding of the program among residents, as well as the impact of targeted educational programs and resources in improving economics education in the city. Moreover, future research should explore the long-term impacts of ECS initiatives on local economies and community engagement in science. A comparative study of the attitudes of residents in other European cities that have been designated as ECS could provide useful insights into the broader context of the ECS program. Future studies could also explore the role of the local government, universities, and businesses in promoting economic and scientific development in Katowice and its impact on residents. Finally, a mixed-methods approach, combining both qualitative and quantitative research methods, could provide a more comprehensive understanding of the topic.

CRediT authorship contribution statement

Artur Strzelecki: Writing – review & editing, Writing – original draft, Supervision, Investigation. **Robert Wolny:** Writing – review & editing, Writing – original draft, Funding acquisition, Formal analysis, Conceptualization. **Magdalena Jaciow:** Writing – review & editing, Writing – original draft, Visualization, Investigation, Data curation. **Monika Klimontowicz:** Writing – review & editing, Writing – original draft, Investigation, Data curation. **Agata Austen:** Writing – review & editing, Writing – original draft, Investigation, Data curation.

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Data availability

Data will be made available on request.

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- Artur Strzelecki** He is associate professor at the Informatics Department, University of Economics in Katowice, Poland. In 2013 he has received his Ph.D. from the University of Economics in Katowice in management. In 2021 he has received his D.Sc. from the University of Economics in Katowice in management and quality sciences. His research is in the field of technology acceptance, information management, search engines, e-commerce and social media.
- Agata Austen** She is an Associate Professor in the Department of Human Resource Management, University of Economics in Katowice, Poland. During her twenty-years career as a researcher, she was involved in different scientific and practice-oriented research projects focusing on HRM (e.g. employability, Sustainable HRM), but also public management (e.g. Networks effectiveness, stakeholder management) and entrepreneurship (e.g. entrepreneurial learning by failure, real options reasoning).
- Monika Klimontowicz** She is an associate professor in the Department of Banking and Financial Markets at the University of Economics in Katowice, Poland. She holds a D.Sc. degree in Economics and Finance. Her scientific interests focus on innovations in business models and strategies, sustainability, innovability, creating value for customers, customers' behaviour, knowledge and intellectual capital, and competition in the banking market.
- Magdalena Jaciow** She is an associate professor at the Department of Digital Economy Research at the University of Economics in Katowice. She holds a post-doctoral degree in management and quality sciences. Her scientific interests focus on the behaviour of market entities and the methodology of marketing research. A special area of her research is changing the behaviour of enterprises and consumers under the influence of technological development, progressive digitization, virtualization and platformisation processes.
- Robert Wolny** Ph.D. (2005), D.Sc. (2014). He is an associate professor and a head of the Department of Digital Economy Research, University of Economics in Katowice. He is the author of more than 130 scientific publications. His research work is currently focused on e-services and behaviour of market entities in the digital economy.