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## *Living Lab approach to community training for recycling. A workshop experience*

### *Introduction*

Environmental problems have been on the world agenda for a long time. Population growth, rapid urbanization, and increasing energy demand caused environmental problems to become a global threat in the last decades. Environmental Resource Panel Report [1] states that material resource use expected in 2050 is going to be around 180 billion tonnes, more than double the amount from 2015. Additionally, in its 2016 report, the World Energy Council estimated that the global energy demand will increase until 2030 [2]. These values mean that the future does not promise a habitable environment for people and hence strategies for energy and resource use must change urgently. Consequently, the United Nations started the Sustainable Development Goals Programme, a set of 17 integrated and indivisible goals and targets to guide governments and people towards a more sustainable future [3]. Governments must revise their development strategies accordingly to decrease energy and resource demand in the future. However, governments are not the only actors that hold responsibility for a sustainable future. People gathered around non-government organizations may play a role in creating a better future for the upcoming generations. Environmental challenges involve multiple groups of people with different needs and interests [4]. After all, energy and resource issues are environmental problems that directly affect the everyday life of people, so that they must recognize the importance of the individual's

role in the sustainability of society. Being aware of the efficient use of energy and resources may have a significant impact on the life of future generations. Living labs as non-governmental organizations have a user-centric research methodology for searching solutions for certain problems of societies. Therefore, they might be beneficial for practicing methods on the efficient use of resources and energy and raising awareness of environmental problems among the members of society.

This article presents research conducted at the Başaşehir Living Lab on the role of society for effective use of resources through a case study based on a workshop series about the functional reuse of electronic waste. The workshop series were repeated 3 times with different participants and the outcomes of the workshops along with a survey on user opinions were assessed within the scope of this article. The experience provides an important insight into the effective use of the living lab approach in raising awareness of environmental problems among society.

### *Aim of the study*

Living labs have various aims and can be used with different strategies. Their user-centric structure makes them suitable tools for the examination of problems at macro, as well as micro levels. The main aim of the study is based on the micro level by examining the benefits of the living lab approach for the awareness among the society about environmental problems with the example of electronic waste. Additionally, it also aims to help people understand the ways of design thinking and practice them from the perspective of emerging global problems. In the case study, the workshop was structured in a such way so as to combine design thinking principles with recycling processes.

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### ***Methodology of the study***

The methodology of the paper consists of a case study following a literature review. The literature review provides a theoretical framework for the case study looking into the existing environmental problems and their historical background. Sustainability, its relationship with society, together with the living lab approach and its applications form other sections of the theoretical background of the paper. The case study conducted in this paper is a series of workshops where the attendees' work processes and products are assessed in the result section. In addition, a survey on the attendees' opinions has been conducted to evaluate the relationship between the living lab workshops and society's awareness of environmental problems and sustainability. The insight and projections in the conclusion and discussion section are derived from the results of the workshop experience and the survey.

### ***Sustainability with various aspects***

Sustainability is an important and urgent theme for humanity. Through growing environmental problems, its importance has started to be recognized by the global masses in the recent years. With its effects having started to be felt by the end users and governments, precautions to maintain sustainability in different areas of life are being taken by authorities. However, to achieve effective results, it is important to provide community awareness and engagement in this kind of operation. The community's role in sustainability and sustainable development is an undeniable truth. Until recently, sustainability issues have been a field of interest for a group of scientists, academics, and activists. Nowadays, with an increasing number and level of environmental problems, communities started to engage with environmental problems and sustainability issues. The engagement of the community is important in terms of creating mass awareness of sustainability and the education of coming generations.

The term sustainability entered the world agenda in the 2<sup>nd</sup> half of the 20<sup>th</sup> century, following the increasing problems with nature and environmental pollution. Humankind started to recognize that the energy and resources offered by the world are not infinite, and measures need to be taken to allow the world to regenerate itself for the good of the next generations. In 1987, the World Commission on Environment and Development published the report *Our Common Future*, which defines sustainable development as the *development that meets the needs of the present without compromising the ability of the future generations to meet their own needs* [5]. This definition was quoted many times in the following years in different organizations like the United Nations Conference on Environment and Development in 1992 in Rio de Janeiro, which proposed *Agenda 21*, a global action plan for sustainable development [6]. The Rio Summit was repeated after 10 years with the name Rio+10, and in 2012 with the name Rio+20 to follow up the workflow of the action plan introduced in 1992, and to bring forth new strategies and requirements of the contemporary world as to sustaina-

bility issues [7]. Many different organizations are trying to come up with novel strategies and methods to develop sustainability solutions; with precautions to decrease energy consumption levels and environmental pollution, by presenting alternative energy sources, or regarding water and resource management. In the light of the knowledge gained from this large amount of experience, it is generally accepted that all the actors must play their part to achieve an effective result for sustainable development. Therefore, the term sustainability needs to be approached in detail through its different aspects.

Sustainability is a broad theme with various aspects. Different disciplines may handle sustainability from their perspectives based on certain criteria. Sustainability was called by many, with the term meaning something different to everyone, the quest for sustainable development was off to a cacophonous start [8]. Despite the endless possibilities for approaching the issue, according to various researchers [9]–[11], sustainability is divided into three main dimensions to provide wide descriptions and relevant action plans for a sustainable world: environmental, economic and social ones. All the three aspects are interrelated. The economic growth of the society makes it stronger and a stronger society is more sustainable where it also contributes to environmental sustainability. However, the social aspect of sustainability has not been given enough importance until recently. There are some possible reasons for that, one of them being the unclear definition of social sustainability, and the other one being that it does not offer tangible results as the other two aspects do. The results of environmental sustainability can be seen in the growth of biodiversity or the energy efficiency of a building, or economic sustainability reflects on the consistent growth of the economies, thus the results of the social aspect of sustainability are only to be observed in the structure of the societies. Especially in the short term, the consequences of actions to provide social sustainability are not visible. According to Sachs [12], it is unclear whether social sustainability refers to a need to sustain structures in societies and communities or is considered a precondition for sustainable development. Nevertheless, especially considering its long-term results, the social aspect of sustainability is a significant and important one.

### ***Community and sustainability***

Individual's role in sustainability is not upfront but important. It takes its strength from collectivity. The action of one single individual may not be significant, but when the majority in the community repeats the same action, its results and effects become visible. However, strategic action is a collective property, not something undertaken by persons in the collective [13]. Therefore, it is important to create and execute strategic actions of the community towards directions that have a positive impact on their environment and sustainability. Socially sustainable environments are the results of close relationship of communities with the public and private sectors [14]. The relationship between the community and sustainability is bipartite as

its sustainability supports the community to be a stronger and healthy one, and the community plays an important role to maintain and develop sustainability. The community's role in the maintenance of sustainability occurs in various ways.

### *Community's role in sustainability*

The community's most important and predominant role is generally creating awareness among people and influence authorities to take actions for public wellbeing through participatory approaches. Participatory approaches provide opportunities for community members to interact, develop leadership skills, improve a sense of efficacy and build social capital [15]. In the scope of sustainability, this role extends towards innovation and novel applications to familiarize the members of the community with the new definitions and methods to provide a more sustainable structure of society. The engagement of the community in design is seen as an opportunity to develop a "local ownership" of the facilities, therefore ensuring their long-term sustainability [16]. Additionally, the community's response to sustainability is also important for the education of the new generations. Therefore, the activities regarding sustainability in a community need to be ground-breaking and raise awareness among people. Although sustainability is a subject that has been under consideration for a long time, the actions of the community on sustainability is a recent field of interest. Israeli et al. [17] state that community-based participatory interventions promote social sustainability by engaging communities in improving their living environments. Sometimes, sustainability can also be a secondary concern regarding community actions, as one type of action can be useful for several purposes at the same time. The community has several strategies to deal with the issues of sustainability:

- Use of energy-efficient products in the household,
- Change in the daily habits towards energy efficiency,
- Broader use of public transportation,
- Alternative energy production,
- Social inclusion in decision-making processes,
- Recycling and upcycling of waste.

There are important principles like cogency, stability, and consistency that need to be maintained in this kind of social activities. The strategies can be employed in the community either during daily life activities or various occasions to engage people in these kinds of activities. Living labs in this regard create some of the opportunities.

### *The Living Lab Approach*

Living Lab (LL) is defined as an innovation platform where researchers, academics, innovators, citizens, and users meet to perform an open, user-centred innovation based on co-creation, participation, and user engagement. Higgins and Klein state that *LLs are both practice-driven organizations that facilitate and foster open, collaborative innovation, as well as real-life environments or arenas*

*where both open innovation and user innovation processes can be studied and subject to experiments and where new solutions are developed* [18, p. 32]. Although each living lab's focus areas may vary, Living Labs share certain common elements as follows.

1. Multi-Method Approaches: There is not a single method that all living labs use. Instead, each living lab uses different methods and techniques according to the focus areas and projects they are involved in.

2. User Engagement: Living Labs collaborate with real users right from the beginning of the innovation process.

3. Multi-stakeholder Participation: More than one stakeholder is always involved in the LL project.

4. Real-Life Setting: Living Labs do not simulate or model the test environment. Instead, they use real-life settings for testing the developed products and services.

5. Co-Creation: Living Labs rely on a participatory approach. This is systematic and productive participation. Users in the co-creation process are not only factors but they are important actors.

The term *Living Lab* refers to a living laboratory. As each laboratory is a test environment, living labs implement research and innovation activities into real-life settings. The Living Lab concept originates from MIT, Boston, Prof. William Mitchell, MediaLab and School of Architecture and city planning. Living Labs represent a user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real-life contexts [19]. First Living Labs were established in MIT for a research project about the home of the future. For observing the technologies in real-life settings, a test environment reflecting the future challenges is created. A new live-in, apartment-scale research facility called the PlaceLab was formed in MIT, which opened in July of 2004 in an urban neighbourhood in Cambridge, Massachusetts. Volunteer research participants individually live in the PlaceLab for days or weeks, treating it as a temporary home. Meanwhile, a detailed description of their activities is recorded by sensing devices integrated into the fabric of the architecture [20]. PlaceLab's primary vision is to provide a neutral atmosphere for users to get sensory feedback from real users for developing the services or technologies used in the house. It is most likely a 1/1 scale prototype of an architectural element equipped with high technology. The European version of living labs is larger in the scale of the test environments, as they are not focusing on only a specific research project, instead they are most likely a platform for innovators. Depending on the type of the research project, testing capacities are adopted. Each living lab constitutes a test area within the frame of the established geography.

The European version of living labs carried the Living Lab concept into a holistic approach affecting the communities, cities and geographies on a larger scale. For European Living Labs, test environments are cities, neighbourhoods, campuses, or buildings depending on the focused research area. From this point of view, Living Labs in Europe is affecting the local development of its region by all means.

### *Living Lab methodology*

Living Labs may vary depending on its organization level. Schuurmann [21] identified the different levels of these organizations as follows:

1. The Macro or organizational level, where the Living Lab is a set of actors and stakeholders organized to enable and foster innovation, typically in a certain domain or area, often also with a territorial link or focus. These organizations tend to be Public-Private, People partnerships (after: [21]).

2. The mezzo or project level, where Living Lab activities take place following a mostly organization-specific methodology to foster innovation.

3. The micro or user activity level, where the various assets and capabilities of the Living Lab organization manifest themselves as separate activities where users and/or stakeholders are involved.

Even though there are such scales at the organization level, the LL methodology shares some common properties. LL methodology starts with exploration in order to get to know the “current state” and to design the possible “future states”, continues with experimentation in real-life settings and it is followed by an evaluation process to assess the impact of the experiment with regard to the “current state” to iterate the “future state” [21]. From the point of its phases, LL methodology resonates with design thinking. Design thinking is a human-centred approach to innovation that draws from the designer’s toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success [22]. The process of design thinking is as follows: Empathy – Define – Ideation – Prototyping – Testing – Evaluation – Implementation. Both LL methodology and Design Thinking process share an experimental, continuous, and perpetual learning process and a human-centred approach for fostering innovation.

### *European Network of Living Lab (ENOLL)*

The emergence of Living Labs in Europe started after the foundation of the European Network of Living Lab (ENOLL) in 2006. Living Labs are connected by a network called European Network of Living Labs (ENOLL). ENOLL is a roof platform for all living labs, serves as a facilitator, communicator, research and idea exchange platform. After its foundation in November 2006, 20 living labs in 15 EU countries were formed in the same year. ENOLL expanded during the years and labelled 440+ Living Labs until 2020. Living Labs are classified by ENOLL under different categories like the established country, type of membership and sectors. There are currently active 19 full members, 149 adherent members labelled by ENOLL. Living Labs operates in 9+ different sectors, health & wellbeing, smart cities and regions, culture & creativity, energy, mobility, social inclusion, social innovation, government, education and others. A living lab may be classified under more than one sector meaning that they operate in multiple sectors.

### *Başakşehir Living Lab*

The Living Lab has aimed to increase the living standards of the local society, the quality of Başakşehir city and consciousness of urbanization through consideration of the desires of the local citizen and society by a set of high and standardized innovative services for the local public as well as private organizations. Başakşehir Municipality, in accordance with these purposes regarding applying the quality, provides unconditioned customer satisfaction, education and control to all of its citizen and employees, by continuously improving and applying development facilities. One of the near future objectives is also to replicate similar Living Labs to other cities around Turkey [23].

Başakşehir Living Lab (BLL) was established in 2012 by the Municipality of Basaksehir to foster the innovation based on ICT (Information and Communication Technologies) (Fig. 1). BLL became a member of ENOLL in its 6<sup>th</sup> wave enlargement. The vision of the partners involved in the establishment of BLL includes the following:

- 1) providing the environment for promoting the development of innovative ICT products and services,
- 2) establishing a modern, livable, efficient, and environmentally friendly living place that is in line with its vision,
- 3) being a good example for replication of similar Living Labs in other cities around Turkey [23].

Başakşehir region is situated on the northern side of Istanbul surrounded by different municipal regions and natural forests. The Municipality was established in 2008. The area is situated close to the Istanbul Airport and beside the central ring road which provides a suitable infrastructure for growth (economic, urban, population-wise, etc.).

Industrial centres and real estate are the driving force of Başakşehir’s economic structure. One of the two biggest industrial zones of Turkey called the İkitelli Industrial Zone is in Başakşehir. Small and medium-sized enterprises are the main actors in İkitelli Industrial Zone. SME’s had been active participants in Living Lab activities.

Başakşehir is a developing region with its population increasing year by year, from 226,387 in 2009 to 460,259 in 2019. According to the Turkish Statistic Institute, working age population includes the population between the ages of 15 and 65. The working-age population is 270,350 which means 68% of the total population according to 2017 calculations.

Given all of these, structuring a Living Lab focusing on ICT applications, empowering smart city policies to make the life of its citizens more comfortable while fostering innovation and promoting entrepreneurship for its young population may be considered as a beneficial policy.

The organization scheme for the Başakşehir Living Lab reflects a collaboration of different organizations in various fields. It consists of an experience centre, incubation centre, education centre, modelling studios and design factory that are connected.

### *Experience centre*

BLL constitutes an experience centre aiming to present the outcome of the LL projects to be used by the visitors

and get feedback from them. As BLL is an ICT-based LL, the majority of the works presented include computer technologies. These products are developed by entrepreneurs or researchers supported by BLL. As education and design is part of the BLL, the outcome of the design workshops and education is presented in the experience centre as well.

#### *Incubation centre*

Incubation centre aims to find talented entrepreneurs and to support them in being successful in their projects. Entrepreneurs may get support from BLL by applying with a project to be evaluated by a committee. These supports include mentorship, office facilities in incubation office of the BLL, test environment, design services and education. BLL organizes start-up days twice a year for gathering the angel investors and entrepreneurs together.

#### *Education centre*

BLL develops education content for multiple participant profiles. The content of the education varies according to the participants. Entrepreneurs, children, designers are among the participants.

#### *Modelling studio and design factory*

As design is part of everything, BLL includes a design office for supplying design services for its entrepreneurs and presenting design workshops for various groups. Mo-

delling studio is part of the design factory providing fast prototyping equipment like 3d printers, workshop desks and modelling tools (Fig. 2).

Living Lab Methodologies and participatory design processes have similarities. Both of them consider the user at the centre of the co-creation process. For that reason, the design methodologies may be considered as a useful tool for innovation processes. From this point of view the existence of a design factory in Başakşehir Living Lab plays an important role in Living Lab activities.

The activity of the design factory in BLL relies on three responsibilities. To provide design services to the entrepreneurs and start-ups in the BLL incubation office, to do design workshops to develop awareness in the near environment of BLL and the city of Istanbul and to support BLL activities from the point of design. Within the scope of this paper, the workshops organized by the design factory are going to be highlighted in the upcoming chapters. The content of the workshops for non-designers is going to be investigated in detail.

### ***The case study: Living Lab Approach to Sustainability***

In 2018 and 2019, BLL organized several workshops to raise awareness of the efficient use of resources and sustainability throughout the community. The workshop in the scope of this paper is a part of this workshop series, with an emphasis on environmental problems like waste management. As the effects of environmental problems



Fig. 1. Başakşehir Living Lab Building (photo by M.E. Arslan)

Il. 1. Budynek Başakşehir Living Lab (fot. M.E. Arslan)



Fig. 2. Interior of Başakşehir Living Lab Building (photo by M.E. Arslan)

Il. 2. Wnętrze Başakşehir Living Lab Building (fot. M.E. Arslan)

have become visible in the daily lives of people through global climate change, air pollution, or deforestation, it becomes an important responsibility of non-government organizations like Living Labs to develop novel insights and future projections on the issues of sustainability and energy efficiency. Therefore, the main objectives of the organized workshops were to engage regular people in design processes with various thematic foci, to support them to become more conscious of the environmental problems, and to make them understand that everyday objects and even waste could be utilized to create functional products. Emphasizing these objectives, various workshops with the following titles were organized: “Recycled playground design”, “Functional furniture design”, “Digital design”, and “Automotive design”. Among the others, the workshop with the title “From electronic waste to design” was the most relevant event that contributed to raising awareness among the society of sustainability, recycling and efficient use of resources.

### ***“From electronic waste to design” workshop***

In contemporary society, the bond between people and technological devices is indisputable. Using electronic devices like personal computers, mobile phones, TV-sets, cameras, or media players is currently a routine activity for people. However, relatively short life cycles of the electronic devices cause problems in the management of electronic waste. Electronic waste is described as the electrical or electronic devices that have reached the end of their life and are discarded [24]. Even though the amount of electronic waste produced globally is increasing day by day and there is a big potential for reusing or recycling the products, their management is not given enough importance by the governments and the society. Therefore, BLL organized a series of workshops, aiming to raise awareness of electronic waste among society, by creating an opportunity to use its resources for product or furniture design (Fig. 3). The main

keywords for the definition of the workshop were reuse, recycle, and upcycle. Through the workshops, members of the society had the opportunity to face the problems of electronic waste and have a deeper insight into using them as valuable resources for recycling and upcycling, rather than waste products. Consequently, society would become more conscious of using electronic devices cautiously, and aware of the recycling options of electronic waste. Additionally, the essence of the workshop also included the idea of combining recycling processes with design thinking principles. Participants in the workshop were given a perspective of design thinking throughout the process and tended to create uniquely designed products from electronic waste.

### *Workshop schedule*

From electronic waste to design workshop was organized through 3 repeated sessions with different attendees between October, 26<sup>th</sup> and November 10<sup>th</sup>, 2019. Each group worked for 2 days. A total of 48 people attended the workshops. Therefore, each session had 15–16 attendees split into 4 or 5 small collaborative groups. The first day consisted of informative sessions like the introduction and various lectures by experts, which were followed by initial design ideas and their evaluations, as the second day included the design and production steps respectively.

First day sessions started with an introductory presentation about BLL and its mission. The introduction was followed by a lecture about Başakşehir Municipality’s policies on waste management and recycling, including alternative perspectives on recycled products. The next lectures of the day were focused on electronic waste, its recycling processes, and its current global and local status. After those lectures, attendees of the workshop visited an exhibition that was organized in coordination with the schedule of the workshop, as the topic of the exhibition focused on art pieces that were created using electronic waste. The exhibition was aimed to be inspirational for

the attendees by stimulating design ideas in their minds. After the exhibition visit, attendees had some free time to think and discuss their initial design proposals. At that stage they were given some insight into design thinking and its principles, including how it might affect a production process that proceeds from wasted material to useful products. The final session of the day was a discussion on the design ideas, considering their positive and negative sides, and how the design proposals could be developed and finalized the following day.

On the second day, the first session was a presentation on safety precautions about the treatment of electronic waste and the introduction of tools and equipment for the design and production phases. After the presentation, participants of the workshop started to work on their design proposals in groups which they formed the previous day. Every group had 3 or 4 members to work collaboratively. They had the chance to consult the organizers of the workshop about the design ideas to develop their products. Eventually, every group produced a unique product from the given electronic waste (Fig. 4). At the end of each workshop session, the products or proposals were monitored and discussed, and finally, after the end of all repeated sessions, a common exhibition day was organized to give the attendees the chance to share their designed products with each other and with visitors to BLL.

### The questionnaire

BLL conducts questionnaires after every organization it holds to understand the satisfaction of the attendees and their opinions on how to develop those organizations in the upcoming times. After “From electronic waste to design” workshop, a similar questionnaire was carried out to find out if the workshop was appreciated by the attendees and how it served the purpose of raising awareness of recycling and sustainability among the society.

The questionnaire was conducted right after the final discussions were over and printed questionnaire sheets were distributed to the attendees for them to answer and return in about 10 minutes. It had 10 questions in 4 sections; the first one consisting of questions that required short answers about the general information of the attendees such as age, gender and education level. The second section was about their general satisfaction level from the workshop, and the third section was about the contents and planning of the workshop and it consisted of agreement to statements on a 5 point Likert scale. The fourth section consisted of open-ended questions about their opinions on the workshop and how it served its purpose (Fig. 5). Results and outcomes of the questionnaire are presented in the following chapters.

### Results

The workshop series, as well as the questionnaire was attended by a total of 48 people. According to the answers of the first section, 22 of the attendees were male, and 26 were female. 39 attendees were at undergraduate level, as 9 were high school graduates. Regarding the age of the



Fig. 3. The poster for the workshop announcement (source: the authors' archive)

Il. 3. Plakat informujący o warsztatach (źródło: archiwum autorów)



Fig. 4. Some workshop participants and their products (photo by M.E. Arslan)

Il. 4. Uczestnicy warsztatów i ich produkty (photo by M.E. Arslan)

attendees, the questionnaire revealed that 9 were between 15 and 19, 27 were between 20 and 29, and 2 were between 30 and 40 years old.

General satisfaction of the attendees was tested in the second section of the questionnaire, and all the 48 attendees stated that they would be interested in attending another workshop if some activity with a similar focus was to be

BAŞAKŞEHİR LİVİNG LAB "FROM ELECTRONIC WASTE TO DESIGN" WORKSHOP			
<b>A. PERSONAL INFO</b>	<b>GENDER</b>	<b>EDUCATION</b>	<b>AGE</b>
<b>B. GENERAL EVALUATION</b>	<b>Would you recommend this workshop to others?</b>	<b>Would you like to attend another workshop offered by Başakşehir Living Lab?</b>	
	YES	YES	
	NO	NO	
<b>STRUCTURE OF THE WORKSHOP</b>	<b>Duration of the workshop</b>		<b>Suitability of the workshop contents to its aim</b>
	5 (PERFECT)		5 (PERFECT)
	4 (SUFFICIENT)		4 (SUFFICIENT)
	3 (NEUTRAL)		3 (NEUTRAL)
	2 (INSUFFICIENT)		2 (INSUFFICIENT)
	1 (VERY INSUFFICIENT)		1 (VERY INSUFFICIENT)
	<b>Suitability of the workshop methodology for a better understanding</b>		<b>The effective use of materials, methods, and documents for a more effective workshop experience</b>
	5 (PERFECT)		5 (PERFECT)
	4 (SUFFICIENT)		4 (SUFFICIENT)
	3 (NEUTRAL)		3 (NEUTRAL)
	2 (INSUFFICIENT)		2 (INSUFFICIENT)
	1 (VERY INSUFFICIENT)		1 (VERY INSUFFICIENT)
<b>Qualifications of the instructors and lecturers</b>		<b>Did the workshop meet your expectations?</b>	
5 (PERFECT)		5 (PERFECT)	
4 (SUFFICIENT)		4 (SUFFICIENT)	
3 (NEUTRAL)		3 (NEUTRAL)	
2 (INSUFFICIENT)		2 (INSUFFICIENT)	
1 (VERY INSUFFICIENT)		1 (VERY INSUFFICIENT)	
<b>D. COMMENTS ON THE WORKSHOP</b>	<b>Did this workshop change your vision towards electronic waste and recycling?</b>	<b>What are your opinions about sustainability and energy efficiency under the influence of this workshop?</b>	

Fig. 5. A sample questionnaire sheet (source: the authors' archive)

Il. 5. Przykładowy formularz ankiety (źródło: archiwum autorów)

organized. Another question in that section was asked in order to understand if the attendees would recommend this workshop to other people, and only 6 out of 48 people were negative about it.

The third section of the questionnaire revealed some detailed opinions of the attendees through questions regarding the contents and planning of the workshop. 39 out of 48 attendees stated that the workshop contents perfectly met their expectations, and only 2 attendees were neutral about it. Only 2 attendees thought that the wisdom and interest level of the instructors was insufficient while 30 people mentioned that they were wise. 32 people had the opinion that the tools, instruments, and documentation of the workshop were totally sufficient, while 9 were neu-

tral and 2 people were negative about it. Regarding the methodology and communication techniques, only 1 person was negative and 3 people were neutral, whereas the rest (44 people) had positive opinions. 43 attendees had a positive impression about the workshop contents and the suitability to the given problem, while only 4 people were neutral and 1 person was negative about them. The lowest average result found in this section of the questionnaire was the question about the duration of the workshop: 8 people stated that it was insufficient, and 6 people were neutral. 18 people thought the duration was enough and 16 people mentioned that it was perfectly well. The diagram showing the answers to section 3 of the questionnaire can be seen in Figure 6.

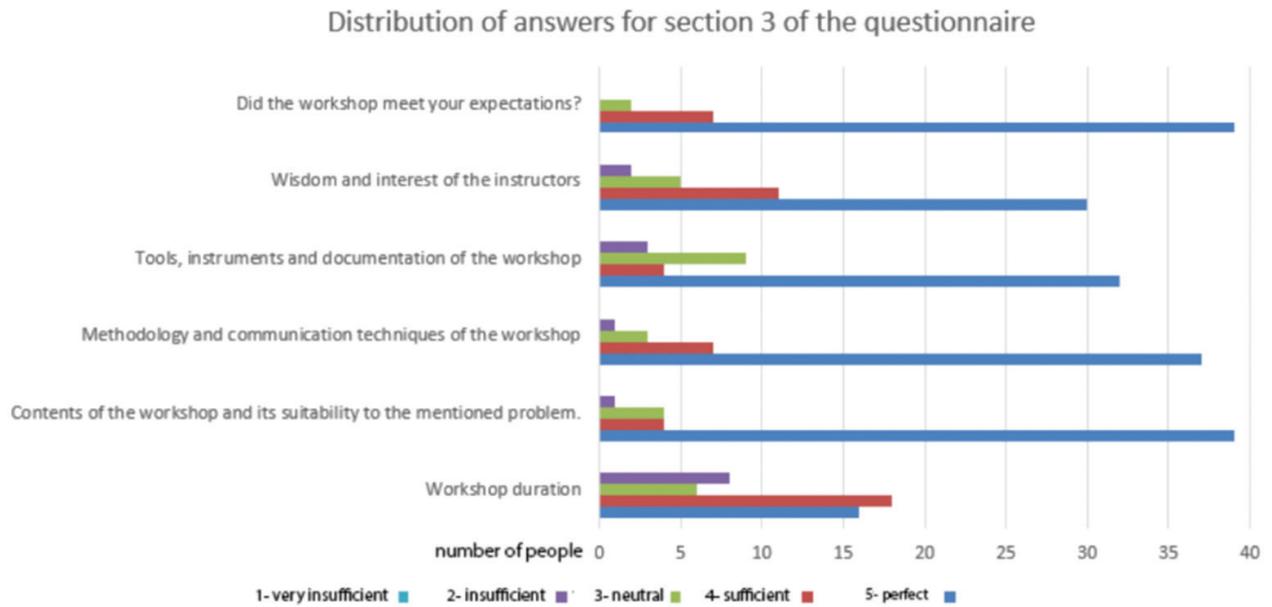


Fig. 6. Distribution of answers for section 3 of the questionnaire (elaborated by S. Ceylan)

Il. 6. Rozkład odpowiedzi dla sekcji 3 kwestionariusza ankiety (oprac. S. Ceylan)

In the fourth and last section of the questionnaire, attendees were asked to shortly write about their opinions on the experience they had with 2 open-ended questions. One question focused on the concepts of sustainability and energy efficiency, and the other one was about electronic waste. Attendees' answers hold useful information regarding these subjects. Most common comment on electronic waste has been that the attendees had become more aware of the potentials and problems with the subject, and they mentioned that they would be more careful when using their electronic devices. 8 attendees answered that they would try to reuse and recycle electronic waste from that day on.

Regarding the question about sustainability and energy efficiency, the attendees responded that especially some lectures in the scope of the workshop helped them recognize the importance of the issue. Additionally, some attendees stated that they understood the relationship between recycling and sustainability much better thanks to the workshop. The analysis of the answers to these two questions as well as further interpretation of the questionnaire results are presented in the next chapter of the article.

### Outcomes

The questionnaire about the workshop *From Electronic Waste to Design* revealed important outcomes. First of all, it showed that the workshop was appreciated by the attendees. All attendees stated that they would like to attend a similar program, and most of them said that they would recommend other people to join that workshop. Additionally, contents and the methodology used in the workshop were also approved. However, there are still some points that need further attention.

Firstly, the duration of the workshop appears to be not enough for the program. Some attendees complained about the lectures that they were too many and too dense within a day. Having fewer lectures, or shorter presentations would be a way to solve the problem. On the other hand, all the given information was important and beneficial for the attendees. Another idea would be having a longer total duration for the workshop, either having a three day duration, or two longer days would be possible. It is also possible to spread the lectures over time instead of concentrating all of them on the first day one after the other.

Even though there were complaints about the lectures that they were too many during one day, their contents were appreciated. Attendees said they helped them a lot to understand the severity of the situation through the lectures. Therefore, it is important to have the right type of lectures with right informative content in the workshop program. At the same time they must be interesting and attractive to catch the interest of the attendees which will result in the rise of awareness among the society.

The results for the question about the tools, instruments and documentation in the workshop were satisfactory. Most of the attendees did not have any problem reaching documents or tools for design. However, there is still room for improvement such as the implementation of digital tools for design and documentation into the workshop program. For instance, if each group of attendees had one person with digital design skills and knowledge about digital design software, better design proposals would be created.

One important outcome of the questionnaire is the distribution of the attendees and working groups. The workshop was organized three repeated times, each one with 15–16 attendees and 1 main instructor. In every session, 4 groups were formed to work collaboratively. Conse-

quently, the instructors had to split their time among the working groups. That raised some complaints among the attendees. Having one or two more instructors would help them to spend longer times for each group so that they could be more productive. Hence it would be beneficial for the workshop to have more impressive results. Additionally, the questionnaire revealed that the majority of the attendees were between 20 and 30 years old. To reach all the different layers of the society, a more balanced distribution regarding age groups can be considered. That is an issue that needs attention during the announcement and preliminary organization periods of the workshop.

### Conclusion and discussion

*From Electronic Waste to Design* workshop has been an indicator showing that Living Labs are important educational institutions for society. There is always room for improvement in the workshops and other organizations, but the main idea is to keep going with these occasions for the development of society. Given the fact that consistency and continuity are important factors for a sustainable society, this type of organization needs to be repeated consistently, touching upon important and emerging problems of the society.

Living labs are great places to create knowledge, and to spread it throughout society. They are places that can directly reach out to people to find out their problems, and to make them more aware of the existing problems of the world. Therefore, they are very beneficial for forming sustainable societies. Living Labs need to be used more effectively to encourage social participation among the members of society. Regardless of their age, gender, education level, religious or ethnic background, income level, etc., every member of the society must be invited to participate in the organizations of the Living Labs. That is one of the keys to social sustainability.

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Two of the biggest global threads the world will face in the upcoming decades are environmental problems and global climate change as a result. The problems have become very obvious in the contemporary world, so that they can be felt even by the end-users. Therefore, in addition to governmental, commercial, and industrial organizations, households and societies are the places to fight the approaching problems. However, participation from every member of the society is needed. Based on this fact, raising awareness of environmental problems among the society is a crucial necessity for the sustainability of the societies. Living labs and their organizations are in this regard very suitable for this purpose. They can help to raise awareness among the society, and at the same time they can also be informative about the problems the world is facing.

Regarding the local aspects of living labs, the authors of this article must discuss the context of BLL. Istanbul, the city where BLL is located, is a huge metropolis with a population of more than 18 million people. Therefore, the city has big and various problems such as waste management, air pollution, traffic density, deforestation, water management, etc. Solutions to these problems need comprehensive approaches and design thinking. Living labs are a great opportunity to develop design ideas and solutions to various problems. BLL keeps doing and improving its workshop organizations with the same purpose, but it is also important to create more Living Labs in the city to come up with more and alternating solution proposals to local, as well as global issues.

For future work at the BLL, design thinking will continue being an initial point of interest as it is one of the important aspects of a living lab organization. Additionally, current global issues like recycling and energy efficiency need to be approached frequently and thoroughly, in order to contribute to the development of the society regarding sustainability and connected themes.

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## Abstract

### *Living Lab approach to community training for recycling. A workshop experience*

The subject of the article is Living Labs – innovative platforms for meetings and exchange of ideas between specialists and users in order to develop and implement improvements oriented towards the needs of the latter. These modifications may concern not only products and services, but also, for example, the urban living environment. Living Labs are among those enterprises that approach sustainable development in a social context. Living Labs’ practical activities relate directly to the everyday problems of local communities, and in the search for solutions, the opinions and ideas of their members are taken into account, therefore these platforms are potentially an important place helping to shape sustainable societies.

The aim of this study was to present the benefits of living laboratories. This was done on the basis of the case study of Başakşehir Living Lab, an organization that conducts research on the efficient use of natural resources and the improvement of the quality of life in one of the districts of Istanbul, the city with the highest population in Turkey. The publication focused on the presentation of a series of workshops entitled “From electronic waste to design”, the purpose of which was to show the possibility of reusing electronic waste. From the methodological point of view, the article was prepared on the basis of the authors’ own experience related to the organization and conducting of workshops and a review of the literature, on the basis of which the theoretical foundation for the undertaken practical activities was outlined.

The article also discusses the results of surveys which were carried out at the end of the series of workshops, which showed that such projects have a significant impact on building and raising the pro-ecological awareness of participants.

**Key words:** Living Lab, sustainable societies, waste management, electronic waste

## Streszczenie

### *Living Lab jako sposób kształcenia w zakresie recyklingu. Doświadczenia warsztatowe*

Tematem artykułu są żyjące laboratoria (*Living Labs*) – innowacyjne platformy służące spotkaniom i wymianie myśli między specjalistami i użytkownikami w celu wypracowania i wdrożenia ulepszeń zorientowanych na potrzeby tych ostatnich. Wspomniane modyfikacje mogą dotyczyć nie tylko produktów i usług, ale też na przykład miejskiego środowiska życia. Living Labs należą do tych przedsięwzięć, które traktują zrównoważony rozwój w kontekście społecznym. Działania praktyczne Living Labs dotyczą bezpośrednio codziennych problemów lokalnych społeczności, a w poszukiwaniu rozwiązań bierze się pod uwagę opinie i pomysły ich członków, dlatego platformy te są potencjalnie ważnym miejscem wspomagającym kształtowanie zrównoważonych społeczności.

Celem niniejszej pracy było przybliżenie korzyści płynących z istnienia żyjących laboratoriów. Uczyniono to na podstawie studium przypadku Başakşehir Living Lab – organizacji prowadzącej badania nad efektywnym wykorzystaniem zasobów naturalnych i poprawą jakości życia w jednej z dzielnic Stambułu, miasta z największą liczbą mieszkańców w Turcji. W publikacji skupiono się na przedstawieniu serii warsztatów zatytułowanych: „Od odpadów elektronicznych do projektu”, których celem było pokazanie możliwości ponownego użycia odpadów elektronicznych. Od strony

metodologicznej artykuł przygotowano w oparciu o własne doświadczenia związane z organizacją i prowadzeniem warsztatów oraz przegląd literatury, na podstawie której nakreślono teoretyczną podbudowę do podjętych działań praktycznych.

W artykule omówiono też wyniki ankiet przeprowadzonych na zakończenie cyklu wspomnianych warsztatów, które wskazały, że takie przedsięwzięcia mają znaczący wpływ na budowanie i podnoszenie proekologicznej świadomości uczestników.

**Słowa kluczowe:** Living Lab, społeczeństwo, zrównoważenie, gospodarka odpadami, odpady elektroniczne