A Review of an Urban Living Lab Initiative

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In 2016, with the goal of exploiting and focusing on the bottom-up innovation efforts of citizen communities and business organizations, the city of Turin, Italy, launched the Torino Living Lab initiative. Via the use of the urban Living Lab research approach, where firms, public bodies, universities and communities of users collaborate to co-create innovation catered to human and societal challenges, the city of Turin aims to engage and include citizens in the innovation processes and to encourage, attract and foster a growing innovation environment. This article describes the efforts that the city has made to design the Torino Living Lab initiative and presents a structured methodology designed to assess its results and successes. The expectations and objectives of the initiative's utilizers and the characteristics, impressions, habits and behaviours of the citizens were collected before the initiative through a series of semi-structured interviews and a survey. By comparing the obtained results with similar post-mortem measurements, it is possible to assess the results and success of the initiative and to evaluate its impacts. Finally, from the results of the initiative's assessment and the collection of the stakeholders feedback and impressions, it is possible to draw policy takeaways for cities that have the aim of implementing urban Living Labs and to identify best practices for the design, implementation and management of similar initiatives.

1 – Introduction

Cities throughout the world are seeking innovative solutions to reduce the risks and take advantage of the opportunities created by growing populations in urban areas (UN, 2014; UN, 2017). In order to mitigate issues such as pollution, traffic congestion, unemployment and social inequalities (Lee, 2014; Nam and Pardo, 2011; Dameri, 2013; Anthopoulos, 2017), city administrators are developing and fostering socially innovative solutions (Edwards-Schachter, Matti and Alcántara, 2012) through the

implementation of the "Smart City" (SC) concept, a multi-disciplinary and multi-objective urban development paradigm (Dameri, 2013; Monfaredzadeh and Bernardi, 2015; Stratigea et *al*., 2015).

As a broad definition, a city becomes smart when "investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance" (Caragliu et *al*., 2011, pp. 70). By using new innovative technologies in combination with human capital, cities are developing projects and initiatives (Michelucci, De Marco and Tanda, 2016) with the goal of reducing their environmental footprint, improving their global competitiveness and their citizens' quality of life, thereby becoming a central force of regional development, and driving innovation and local cooperation (Battaglia and Tremblay, 2011) (Tanda and De Marco, 2018a). However, while city administrators are developing and implementing top-down strategic SC plans (Walravens, 2015; Breuer et *al*., 2014), the main driver of SC innovation comes from the city's interconnected bottom-up ecosystem of people, communities, businesses and industry, collaborating and working together to foster creativity and social innovation (Edwards-Schachter, Matti and Alcántara, 2012; Cosgrave et *al*., 2013; Towsend, 2013; De la Peña, 2013). Hence, fostering social innovation and creativity to improve the quality of life, competitiveness and sustainability must be the main goal of a city's strategic SC plan (Cosgrave et *al*., 2013; Battaglia and Tremblay, 2011; Tanda and De Marco, 2018b).

This is the case for the city of Turin in Italy. In 2009, the city created the Turin Action Plan for Energy (TAPE), with the goal of reducing the city's CO2 emissions by 40% by 2020, as one of the major milestones included in the Covenant of Mayors, a multi-city action platform promoted by the European Commission. TAPE's main

objective is to improve Turin's sustainability in different city domains by implementing solutions aimed at fostering local energy production, improving public lighting efficiency, reducing public transport emissions, and raising the sustainability of public and private buildings (Città di Torino, 2009). In 2011, in order to reach its smart urban development and strategic renovation program goals, the city of Turin expanded the TAPE initiatives by taking on the challenge of the European Commission's "Smart City & Communities." As a result, the Torino Smart City Foundation (TSCF) was created. The vision driving the TSCF strategy is to create a more sustainable, environmentally friendly and livable city, where citizens are welcomed and engaged in the city's innovation processes (Torino Smart City, 2015). To this end, TSCF has been working in close collaboration with a multitude of stakeholders, from start-up ventures to major technology players to public offices.

The main challenges that emerge from these numerous collaborations are about understanding how citizens can be engaged and included in innovation processes, and how to encourage, attract and foster a growing SC innovation environment. In 2015, in order to reach its goals, TSCF started working on an initiative to engage citizens and interface them directly with the innovation processes of private companies and start-ups. Furthermore, TSCF seeks to find ways to attract private companies' and start-up businesses' innovation efforts by lessening bureaucratic burdens and helping develop their collaborations, partnerships and networks. The result has been the creation of an urban Living Lab (LL) initiative named Torino Living Lab (TLL). The LL approach was chosen because of its ability to foster and encourage innovation, facilitate integration and the engagement of citizens in the innovation process, and test innovative solutions in real-life contexts (Westerlund and Leminen, 2011).

This paper describes the design steps that TSCF has taken in structuring, implementing and managing the TLL initiative, and presents a structured methodological LL assessment approach which combines LL design theory with the SC evaluation literature. The goal of this approach is to measure TLL's results, impact, and critical lessons, from which it is possible to draw several key policy takeaways, while also highlighting best practices for the design, implementation and management of similar initiatives.

To this end, this paper is structured as follows: first, a brief overview of the literature on the LL research approach is presented, and TLL's design and development efforts are detailed and contextualized. The paper then presents the methodology for assessing the initiative and presents and discusses the results. Finally, the paper discusses implications and takeaways from the initiative, as well as considerations for future improvements, and presents several conclusions.

2 – The Living Lab Approach

William J. Mitchell first introduced the term living laboratory, or LL, as the concept of research conducted in real home environments (Eriksson, Niitamo and Kulkki, 2005). This definition is related to the "American" vision of LLs, where users are presented with solutions and products to test, but earlier phases of the innovation process are not included (Zhong et *al.*, 2006). Within this conceptualization, LL is considered "an extension of laboratory experiments" (Schuurman et *al.*, 2012, pp. 1).

On the other hand, the European approach toLL research is more focused on involving the users in the innovation process by studying them in their everyday environment (Schuurman et *al.*, 2012; Niitamo et *al.*, 2006). LLs are defined as environments where it is possible to gather a deeper understanding of new services and technologies by "confronting (potential) users with (prototypes or demonstrators) of

early technology early on in the innovation process" (Ballon, Pierson and Delaere, 2005, p. 16), and where "technology is given shape in real-life contexts in which (end) users are considered 'co-producers'" (Ballon, Pierson and Delaere, 2005, pp. 15). Involving users in the development of new products and services by collecting their ideas and feedback, and having them play the role of co-generators of the innovation process (Edwards-Schachter, Matti and Alcántara, 2012) has become a strategic need for firms that want to strengthen their competitive advantage (European commission, 2009). Customer and user integration provides more than just access to the right market information (Levén and Holmström, 2008). Indeed, opening the internal innovation process can be considered a direct form of value creation (Wikström 1996; Gassmann, 2006). This shift from more traditional vertically integrated innovation processes is forcing firms to invest time and resources in altering their research and development processes and move toward a co-creation and open-innovation approach (Schuurman and Marez, 2013). Almirall and Wareham (2008) defined the LL approach as a type of open-innovation network that acts as a mediator between users, public organizations and private firms. This allows the users' knowledge to be identified and made explicit by means of exploring, capturing benefits from external sources of knowledge, exploiting and leveraging existing knowledge, as well as retaining, storing and reusing knowledge over time (Almirall and Wareham, 2011; Schuurman and Marez, 2013; Lichtentahler and Lichtentahler, 2009). The LL approach is also considered a methodology that can involve users in the development process and to bring different stakeholders together in a co-creative way (Følstad, 2008). This is the notion described by the European Networks of Living Labs (ENoLL, 2011), which identifies five main dimensions of an LL, namely: an open innovation environment; real-life settings; user-driven innovation and co-creation processes; user engagement; and expected outcomes.

However, co-creation may in some cases be more ambition than reality, as argued by Mirijamdotter et *al*. (2006) and Niitamo et *al*. (2006), who pointed out that many modern LLs are closer to "sources of (predefined) technology use," rather than "sources of innovation" (Niitamo et *al*., 2006, pp. 3)

One of the elements that is instrumental to a successful LL initiative is the creation and fostering of close relationships between the multitude of stakeholders involved in an LL (Leminen and Westerlund, 2012; Shaffers and Santoro, 2010). Collaborations between producers, users and other parties allow change to be simulated, and facilitate the creation of improved processes, services and business models (Möller, Rajala and Westerlund, 2008; Edwards-Schachter, Matti and Alcántara, 2012). Lander (2014) highlighted how collaboration, especially between different sectors, is vital for fostering innovation. Schuurman (2013) also argues that, in an LL approach, all the stakeholders of a product or service must participate in its development, with the stakeholders collaborating and creating partnerships in order to co-create new product and business models. Furthermore, ENoLL (Følstad, 2008) described LLs as "'functional regions' where stakeholders have formed a Public-Private-Partnership (PPP) of firms, public agencies, universities, institutions and people, all collaborating for creating, prototyping, validating and testing new services, products and systems in real-life contexts" (Følstad, 2008, pp. 3). Eriksson, Niitamo and Kulkki (2005) argued that an LL approach allows products and services to be created and validated through a collaborative effort, and that by creating relationships between different stakeholders, the LL approach is able to focus on value creation and retention instead of technology. Shaffers et al. (2007) argued that networks are a key part of an LL. The multi-stakeholder nature of the LL approach has been highlighted by several other authors (Almirall and Wareham, 2008; Følstad, 2008).

The stakeholders in an LL research approach can take on one of the following main roles (Leminen and Westelund, 2012): *Users*, the actors that will use the product, service or technology tested in the LL and who help co-develop it; *utilizers*, non-producers that outsource their knowledge in order to improve the LL, while not being producers themselves; *enablers*, organizations that provide the necessary resources to the LL participants, such as physical space, facilities or utilities; and *providers*, private companies that join the LL to develop or co-develop new technologies, products and services.

These stakeholders collaborate and create partnerships in order to contribute to the innovation, creation and development processes. These collaborations can have different purposes, depending on the scope of the LL. Følstad (2008) argued that there are mainly five contributions of the LL approach to the innovation and development process:

- *Context research*: research on the context of use, users and their environment;
- *Discovery*: research aimed at gathering knowledge and insights on unexpected uses and new services by "uncovering new issues and opportunities" (Abowd et al., 2000).
- *Co-creation*: initiatives aimed at including users in the innovation and development process;
- *Evaluation*: research aimed at evaluating and validating new technological solutions in direct contact with the users;
- *Technical testing*: technical tests conducted in a realistic home environment, (closer to the previously discussed more "American" LL concept (Eriksson, Niitamo, and Kulkki, 2005)).

Leminen, Westerlund and Nyström (2012) also discussed the purposes and contribution to the innovation process provided by an LL, arguing that LLs have different purposes and objectives, depending on which actor is the main driver of the initiative. Using the classification of LL actors presented in Leminen and Westerlund (2012), the authors of this paper classified LLs into four main categories: *user-driven, utilizer-driven, enabler-driven and provider-driven*. Each of these categories presents differences in terms of purpose, type of partnerships and collaborations. *User-driven* LLs are focused on solving everyday problems through the co-creation of innovation mostly within the community itself and without formal coordination mechanisms. *Utilizer-driven* LLs, on the other hand, are more structured, with collaborations and relationships centered around the utilizer actors and focused on developing or testing new products and services. *Enabler-driven* LLs are organized around local-development public bodies and focus their research efforts on societal needs and issues. Finally, *provider-driven* LLs focus on improving users' everyday lives, while at the same time exploiting the knowledge created for the benefit of all the stakeholders partnered around the knowledge creators.

All these considerations highlight the complexity of conceptualizing the LL research approach and the difficulties involved in providing a consistent description, due to its multiple relationships and collaboration networks. However, most of the academic literature agrees that fostering innovation, co-creation, and user involvement and engagement are the central goals of the LL approach (Chesbrough, 2003). Schuurman et al. (2012) attempted to conceptualize the "ideal" LL as an approach that "aims at medium- or long-term research co-creating innovations with the users in a familiar and real-world context, taking into account the ecosystem surrounding the innovation" (Schuurman et *al*., 2012, pp. 5). Westerlund and Leminen (2011) defined

LLs as public-private-people partnerships of firms, public bodies, universities and communities collaborating to create new products and services in real life contexts. Eriksson, Niitamo and Kulkki (2005) stated that LLs are human-centric systems of innovation that create a research platform on different social and cultural issues. Kusiak (2007) defined LLs as co-creation ecosystems for research and innovation centered on human and societal issues and contexts, and Higgins and Klein (2011) defined them as "platforms for user-driven innovation" (Higgins and Klein, 2011, pp. 31). According to Følstad (2008), LLs are "environments for innovation and development where users are exposed to new ICT solutions in (semi)realistic contexts, as part of medium- or long-term studies targeting evaluation of new ICT solutions and discovery of innovation opportunities" (Følstad, 2008, pp. 116).

3 – The Torino Living Lab Initiative

The TLL initiative was designed and implemented in an attempt to find ways to engage and direct different stakeholders in the city in and toward the SC innovation process. The City of Turin's objective in promoting this initiative was twofold: first, to harness the innovation efforts of private companies by identifying the most promising SC technologies, systems and applications, and to ensure the possibility of testing them in a real-life environment (Tanda, De Marco and Rosso, 2017); second, to foster local innovation and entrepreneurship and include and engage citizens in the innovation process (Torino Living Lab, 2016). In order to achieve these goals, the development process the TSCF undertook for the TLL initiative followed the five-step LL development procedure presented by Schuurman et *al.* (2012) and Shamsi (2008):

- *Contextualization*: exploration and investigation of the technology or service and its implications;
- *Selection*: identification of potential users or user communities;

- *Concretization*: preliminary measurement of the selected metrics in order to understand the characteristics, behaviours and perceptions of the targeted users. (To be performed before the start of the experimentation as a pre-measurement);
- *Implementation*: kick-off of the LL operations;
- *Feedback*: final measurement of the same metrics used in the Concretization step. (T o be performed as a post-measurement at the end of the experimentation.)

The *Contextualization* phase started in January 2016 and involved the releasing of a public call in which the participation and selection rules and the main objectives of the TLL were defined (Città di Torino, 2016). A board of referees evaluated each proposal on the basis of its ability to fulfill eight main requirements. The proposed projects were required to: (i) have no direct cost for the municipality; (ii) have objectives consonant with the overall objectives of the TSC plan; and (iii) they needed to create synergies with other SC solutions implemented by the city; while (iv) providing an innovation element, whether in the technology, the processes, or the services provided. The projects also needed to: (v) have an impact on the citizens, (vi) be replicable and scalable to the whole urban environment, and (vii) be technically feasible, which means TSCF should be able to facilitate the start of the proposed project. Finally, the projects had to (viii) be accompanied by a preliminary business model in order to guarantee their economic feasibility and sustainability.

In order to promote participation and support the proposals, TSCF guaranteed its help in facilitating the paperwork processes with other public offices, through actions such as expediting permits and authorizations and waiving all fees and taxes involved in the use of public assets, while facilitating networking and communication between the proposing firms and other private entities that may have been instrumental in setting up

the projects, such as utility or transportation firms. In order to engage citizens and the local community in the innovation process, TSCF also guaranteed each initiative exposure through all the communication channels available to the city, such as city websites, social media pages, local newsletters, flyers and posters. It further organized several events in which the TLL initiative was presented. In addition to this exposure and advertising campaign, the city also guaranteed it would make considerable efforts in mediating and engaging citizens and communities directly in the innovation process, by giving each utilizer the opportunity to meet with the local population to present and explain their solutions.

Each proposal was evaluated, and only those that satisfied all eight of the requirements were included in the initiative. Out of 37 proposals received, five failed to meet one or more of the requirements. The initiative entered into operation in July 2016.Most of the projects finished by January 2018, although two of them, due to unforeseeable problems, had to withdraw.

During the *Selection* phase, the city decided to narrow the test field to a limited neighborhood area called Campidoglio. This area, with 14.889 citizens living in just under one square kilometer (Torino Living Lab, 2016), was chosen because of its diverse population (as measured by age, job status, and social background) and because of its limited geographical dimensions.

From this brief description, it is possible to see how the city, and in particular TSCF, placed itself in the role of the enabler of the LL, by taking on the role of main organizer, facilitating the development of networks and collaboration around the institutional boundaries of the TLL initiative, and steering the innovation process toward social issues and societal improvements (Leminen, Westerlund and Nyström, 2012). According to the urban LL responsibility framework proposed by Juujärvi and

Pesso (2013), TSCF, in its role of enabler, sought to provide the vision and strategic leadership, as well as promote networking by creating a multi-stakeholder and multi-objective initiative to facilitate the establishment of a prolific environment for innovation, citizen participation and co-creation. However, from its inception and conceptualization, the TLL initiative suffered from a relative structural weakness. According to Juujärvi and Pesso (2013), one of the main tasks of the utilizers within the context of an urban LL is to produce place-based knowledge and suitable products and services, which is why the TLL call for proposals required each participant to propose projects that would create synergy with the city's SC plan, so as to focus and direct the innovation efforts toward the city's and community's social needs.

However, this criterion had not been taken into account during the evaluation process. This resulted in the inclusion of projects that were less focused on social and local issues. Furthermore, while engaging and including citizens and communities in the innovation process was of paramount importance for the success of the TLL initiative, and indeed are key for the success of any LL (Leminen Westelund and Nyström, 2012), none of the proposals was evaluated considering how to engage the users in the innovation process.

4 – Methodology

When designing the initiative, TSCF decided not to exert any form of control or supervision over the utilizer's choice of methodology to implement their projects during the *Concretization*, *Implementation* and *Feedback* steps of the LL's development framework (Schuurman et *al.* 2012; Shamsi 2008). However, because of the lack of a standardized methodology for the implementation and evaluation of the projects, TSCF needed to develop its own methodology to evaluate the results, successes and impacts of the initiative. To this end, the authors of this paper were tasked by TSCF to act as

external third-party observers and to design a methodology that would be able to draw up an exhaustive picture of the initiative. Given TSCF's role as the enabler and center of the LL networks (Leminen Westelund and Nyström, 2012), the authors' efforts had to focus on assessing the impacts of the initiatives on both the utilizers, i.e. the private firms and start-ups participating in the TLL, and the users, in particular the citizens. Before kicking off the initiative, an ex-ante set of indicators was established to understand the expectations and objectives of the utilizers, and to evaluate the characteristics, behaviours and perceptions of the users. After the TLL initiative, a second set of ex-post measurements allowed TSCF to understand whether the utilizers had managed to satisfy their initial expectations and objectives and if, by participating and being engaged in the innovation process, the users had undergone a significant and meaningful change in their characteristics, behaviours and perceptions.

4.1 – Impact measurements on the Torino Living Lab utilizers

The authors designed the evaluation methodology to gather feedback and assess the experience from the utilizers' point of view. In particular, the authors sought to understand whether, by the end of the initiative, the utilizers were able to satisfy their original expectations and objectives.

An ex-ante round of semi-structured interviews was conducted, from April to June 2016, before starting the initiative, to assess the initial expectations and goals of the utilizers, by asking two main questions:

1. What are your objectives for participating in the TLL initiative?
2. Who are your main users?

Thirty-two interviews, each lasting from 15 to 30 minutes, were recorded.

To help gauge the impact and success of the initiative, the 30 utilizers that concluded their projects were then re-interviewed after the initiative, with the goal of

understanding whether they had managed to achieve their initial objectives and their participation had been in any way beneficial. Finally, they were asked to give feedback on how the TLL initiative had been structured and managed. To this end, from January to February 2018, they were asked the following questions:

1. What results were you able to achieve through your participation in the TLL initiative?
2. Was your company able take advantage of the TLL initiative?
3. Do you have any feedback or comments on how the initiative was structured and managed by the TSCF?

4.2 – Impact on the Torino Living Lab users

The first step for assessing the impact of the TLL initiative on the population of users was identifying a set of measurable indicators capable of representing the citizen's characteristics, impressions, habits and behaviours. To this end, the authors started with a review of the literature on evaluating and ranking SCs. This literature includes comprehensive sets of metrics and indicators developed specifically to evaluate the "smartness" level of a city. The following works were chosen as foundations for evaluating the impact of the TLL initiative: Giffinger and Pichler-Milanović (2007), Cohen (2014), Lazaroiu and Roscia (2012), and Lombardi et al. (2012). All the indicators from the literature related to macro-economic dimensions were discarded, as the chronologically and geographically limited nature of the TLL initiative meant there would be negligible impacts on such indicators as the city's GDP, the employment level and/or the immigration level, renderings these metrics useless to assess the TLL initiative. After discarding the macro-economic indicators and purging any duplicates, the four sets were joined together, resulting in 42 unique indicators. Finally, by looking at how the 32 selected projects in the TLL initiative affected these 42 indicators, it was

possible to discard ten deemed not to have been influenced by any of the projects in the TLL.

However, there were some problems with this list. While the indicators were able to quantify certain things about the city, they did not provide a way of measuring the characteristics, habits and behaviours of the people living in the city. With this issue in mind, the 32 selected indicators were modified and reworded in order to capture the impressions and opinions of the citizens and assign them a quantitative value. The final shortlist of 16 indicators is presented in Table 1 with each indicator categorized according to the SC taxonomy proposed in Giffinger and Pichler-Milanović (2007).

Please insert here Table 1

In order to assessthe TLL initiative with these indicators, the authors sent out a survey to the main users of the TLL initiative: the citizens of the Campidoglio neighborhood. The survey was divided into two sections. The first section surveyed the demographic profile of the respondents, namely their age, gender and profession. The second section asked 15 questions to understand and measure the perception, behaviours and habits of the users through the set of indicators given in Table 1. These perceptions were quantified on a one-to-five point Likert scale, with one representing strong disagreement or a minimum, and five representing strong agreement or a maximum.

As with the assessment of the TLL initiative from the point of view of the utilizers, in order to measure the impacts of the initiative on the users, the results of an ex-ante measurement had to be compared with the ones taken at the end of the initiative. The ex-ante survey was conducted from May to July 2016, right before the projects began, and received 71 responses. To guarantee consistency between the ex-ante and ex-post investigations, the 71 original respondents agreed to be contacted again to

participate in the ex-post assessment and received the same survey from January and February 2018. However, out of the 71 original people that had been contacted, only 19 responded, while the remaining 52 decided either to ignore the request or refused to participate in this second set of measurements. In order to understand the reasons behind this fall in participation, the authors asked respondents to participate in a semi-structured interview that was aimed at investigating their experience in the TLL initiative and at collecting their feedback and impressions on its perceived impacts and management. Three of the 19 respondents agreed to do so.

5 – Results and Discussion

5.1 - Impacts on the Torino Living Lab's utilizers and results of the initiative

Interviewing the TLL utilizers at the start and end of the initiative allowed the authors assess the users' experience and evaluate the initiative's results, benefits and weaknesses.

5.1.1 – Ex-ante interviews

The two questions proposed during the preliminary ex-ante interviews with the TLL utilizers allowed us to understand the differences and highlight the similarities between the 30 proposed SC projects. The goal of the first question was to understand the utilizers' objectives and motivations for participating in the TLL initiative.

Please insert here Table 2

From the data shown in Table 2, it is possible to note that, out of the 30 projects included in the TLL initiative, 14 are clearly different from the others, in that the solutions implemented in these projects were already commercially available. Hence, the participation goals for those 14 projects are different from those of the remaining 16

projects, in that they consisted of creating a demand for the product or service they present. Users' engagement and inclusion in the innovation process is of secondary importance for these utilizers. In order to analyze and categorize the different objectives and research approaches undertaken by the remaining 16 utilizers, the authors employed the LL research contribution framework presented by Følstad (2008). Out of these 16 projects, four aimed to conduct a *Technical Testing* of their solutions. These projects aimed to test the technological solutions in a real-life home environment and gather valuable insights from their final users at an extremely early stage of development. On the other hand, the main priority of the remaining 12 projects of those 16 was to engage the users in their innovation process. For all 12 projects, this engagement translated into an effort to *Evaluate* and validate the solution and for nine of them, the aim was to use TLL participation as a way to assess and evaluate the validity and sustainability of their business models. Engaging the users in a direct and structured effort of *Co-Creation* was a major objective of eight of these projects, while five utilizers also had aimed to use their participation in *Context Research* to observe and study how the users interacted with their solutions. Finally, two projects were aimed at using the insights gathered from the users' engagement to *Discover* new use cases and opportunities. From the answers to this first question, it is also possible to highlight another significant difference: out of the 30 utilizers, 26 had market commercialization as their final objective, while the remaining four had the creation and dissemination of knowledge as their final goal, without any commercial implication.

The second question in the interview allowed us to understand the main targeted user groups. Most of the projects had multiple final users, that is, citizens, other businesses or the public administration.

Please insert here Table 3

As can be seen from Table 3, of the 30 projects, 18 targeted other business and private organizations, while 14 were directly addressed to the city's public administration. The presence of such a large number of projects that directly targeted the public administration highlights the pre-existing need to create more direct and less cumbersome communication channels between public administrations and private companies and of streamlining the public procurement processes. Finally, 13 projects had citizens as their primary user target, while one utilizer planned to use this participation purely for academic purposes.

5.1.2 – Ex-post interviews

The 30 utilizers that participated in the entire TLL initiative were also interviewed at the end to evaluate and assess their experience. From the responses to the first question, it is possible to address the first criticism: out of the 30 utilizers, only 15 reported they had achieved a major result. Eight took advantage of the possibilities created by the initiative to improve their solution and provide a better product or service for their users. Moreover, eight utilizers stated that, by participating in the TLL, they were able to attract new clients. Finally, thanks to their participation in the initiative, six utilizers have been able to release their product or service onto the market. These data are shown in Table 4.

Please insert here Table 4

It is worth noting how the success of these projects appears to be related to the type of research approach planned at the outset. Only five out of the 14 already commercially available projects were able to achieve a major result. Therefore, the less commercially mature projects are the ones that were better able to take advantage of their participation in the initiative. Out of the 12 projects that had planned to extensively include the users in the research process, eight managed to achieve significant results.

Moreover, it also appears that successful participation is related to the type of user targets. Out of the 18 projects that targeted private firms and organizations, 11 reported a certain degree of success, while only six out of the 14 projects targeting public administrations, and six out of the 13 projects directly targeting citizens found the participation successful. Nevertheless, half of the utilizers did not achieve any meaningful benefit from participating in the TLL initiative.

Please insert here Table 5

However, the responses to the second question, displayed in Table 5, show how the majority of utilizers—that is, 27 out of 30—*reported* benefits from participating in the initiative. One of the most appreciated benefits of participating is the possibility of collaborating and interacting with a network of firms, organizations, public entities and communities in a way that would have been difficult to achieve outside an LL framework. Thirteen utilizers reported the creation of new collaborations and relationships with other commercial partners as a major benefit, and ten utilizers reported the creation of such collaborations and relationships with citizens as a major benefit. Sixteen utilizers stated that participating in the TLL helped them set up synergetic relationships with other firms. Furthermore, 18 participants reported that participating in the TLL initiative had been beneficial in that it allowed them to obtain a better understanding of the mechanisms behind the public administration's bureaucracy. Finally, for 18 utilizers, participating in the initiative improved their firms' market visibility.

The third question allowed the utilizers to express their criticism on how the TLL initiative had been structured and managed by TSCF; these data are shown in Table 6.

Please insert Table 6 here

Four utilizers highlighted the LL's lack of a narrow focus and coherent scope, arguing that including projects in so many different SC domains reduced the opportunity for creating synergies and the effectiveness of communication efforts. Furthermore, five utilizers mentioned that because the initiative not allocate any dedicated financial resources, the projects had to be scaled down and their effectiveness was thus weakened. Helping create fruitful relationships with the public administration and public entities, and helping firms navigate the public bureaucracy were two of the objectives pursued by TSCF within the TLL initiative. However, seven of the utilizers argued that these efforts could not achieve these goals in a significant way. Finally, the utilizers' main complaint was about the inadequacy of TSCF efforts to promote the initiative and engage users. Eight utilizers complained that the promotion efforts were not adequate for the scope of the initiative, while 10 argued that efforts undertaken to engage users, and particularly citizens, were insufficient--especially for projects that required longer and continuous engagement and collaboration.

5.2 – Impacts on the users

In order to assess and evaluate the TLL initiative's potential impacts on the population of the Campidoglio neighborhood, two surveys were conducted, one at the outset of the initiative and one at the end, investigating the characteristics, impressions, habits and behaviours of the population.

5.2.1 – Ex-ante survey

The demographic distribution of the ex-ante survey respondents, according to their gender, age and profession, is presented in Table 7.

Please insert here Table 7

The results of the first survey present a preliminary picture of the characteristics, impressions, habits and behaviours of the citizens living in the Campidoglio neighborhood. The degree of agreement was measured for each question as the percentage of positive votes (4 or 5) over the total. These results are reported here with reference to the measurement indicators presented in Table 1:

- *Economy*: citizens' purchasing choices are mostly driven by quality of product (77%), then by cost (55%) and last by place of origin (44%).
- *People*: a minority of citizens are engaged in civic activities (15%).
- *Governance*: most digital services and applications used by citizens are related to transportation and mobility (42%) and civic activities (48%), although their use is quite limited (14%). Furthermore, their use is predominantly passive, and presents a very low level of user engagement as a content co-generator. Opinions about the usefulness and ease of use of these services were also low (24% and 28%, respectively).
- *Mobility*: the citizens' preferred means of transportation is public transport (49%), followed by automobile (24%), bicycle (23%) and alternative means such as bike- or car-sharing (20%). The main factor in transportation choice was necessity (68%), followed by speed and travel distance (63%), and finally cost (49%). The environmental impact of the chosen method was less important (45%).
- *Environment*: relatively few of the respondents reported knowledge about the amount of air pollution in the area (14%) and their energy consumption (34%). On the other hand, they considered themselves to be relatively well informed about best practices for reducing their energy and environmental footprint (42% and 45%, respectively). They also practiced and encouraged environmentally

friendly and sustainable behaviours (66% and 58%, respectively), and put efforts into preserving green public spaces (54%). However, the degree of participation in civic activities aimed at environmental protection was quite low (15%).

- *Living*: citizens in the neighborhood considered themselves relatively safe (42%). Their use of public spaces was also relatively high (46%). However, engagement in cultural and social activities was, once again, quite low (20% for both).

It should be noted that, in general, the citizens reported a major lack of engagement in civic activities and initiatives, regardless of purpose. They also reported a considerably limited use of digital services and applications. Their awareness of environmental topics was quite high; however, while they reported that they were relatively well informed on actions and behaviours that needed to be taken to be more environmentally friendly, they did not feel informed about the actual level of pollution.

5.2.2 – Ex-post survey and interviews

Out of the 71 people that participated in the ex-ante survey, only 19 decided to respond to the survey conducted after the TLL initiative finished. Hence, it is not possible to compare the results of both surveys in a statistically significant analysis. However, it is possible to highlight some findigns, as per Table 8.

Please insert here Table 8

The quality of the digital servaices provided by the city appears to have improved from 23% to 37%, respectively. The citizens' mobility habits appear more or less the same, although environmental considerations becme more influential in theit choice of transportation (from 45% to 68%). The new survey reports an increase in awareness about actions and best practices to reduce the environmental impact of their

activities (from 45% to 63%), but does not show any significant improvements in the awareness of pollution levels or energy consumptions. Finally, in the ex-post survey, fewer citizens reported using public spaces (from 46% to 26%).

As stated earlier, three out of the 19 people who responded to the ex-post survey agreed to be interviewed. During the semi-structured interviews, the citizens were asked:

1. Did any of the projects that were part of the TLL initiative have an impact on your impressions, habits and/or behaviours?
2. Why or why not?

The three interviewees basically responded negatively to the first question, providing several reasons why. While the proposed projects were reportedly quite interesting, the respondents lamented a lack of focus and criticised the lack of a coherent scope for the initiative. Several utilizers made a similar criticism,noting that the lack of a coherent scope decreased the effectiveness of the promotion campaigns and user engagement. The citizens also highlighted engagement as lacking, arguing that the efforts of both TSCF and the utilizers were not adequate. They felt, in particular, that both promotion and engagement efforts, after a quite active initial phase, decreased dramatically. Again, utilizers made a similar criticish, complaining about lack of citizens engagement.

Finally, two out of three citizen interviewees argued that, while the projects were overall interesting and topical, it would have been better for the initiative to involve the citizens directly from the outset in both the scope definition and project selection processes. They argued that by doing so, citizens would have been more involved in the initiative results.

6 – Implications

The methodological approach used to evaluate the city of Turin's experience with the TLL initiative combines LL design theory with a review of the literature on SC evaluation and assessment techniques. It provides a theoretical contribution to improve critical success factor metrics that can be used when evaluating other urban LL initiatives.

Furthermore, the results of the TLL case study evaluation have several policy and practical implications that could be useful for both scholars and practitioners in the design, implementation and management of similar initiatives.

6.1 – Policy implications

The TLL initiative's success and shortcomings suggest several policy takeaways. The literature suggests that complex problems, such as pollution and environmental protection, can best be tackled when cities and municipalities are able to engage citizens and communities in their innovation and policy making processes. Indeed, in their study on the success of implementation [of what?], the Covenant of Mayors of Spanish cities, Pablo-Romero, Sanchez-Braza, and Gonzalez-Limon (2015), highlighted that the engagement of local communities is a key requirement for the successful implementation of environmentally related initiatives. Edwards-Schachter, Matti and Alcántara (2012) argued that citizen engagement and participation is a key priority for a city that wants to innovate its quality of life, social justice and ethics, and in general develop "innovations that are social both in their ends and in their means" (Edwards-Schachter, Matti and Alcántara, 2012, pp. 677). In general, the active participation of citizens and communities, while often expensive, can be beneficial for policy and decision makers as they can provide "more comprehensive information on all aspects of

598 the policy process" (Kweit and Kweit, 1984, pp. 273). The initial success of the TLL
599 initiative, both in terms of participation and the engagement of citizens and
600 communities, and in terms of open and social innovation proposals, highlights the
601 potential of urban LLs as cost-effective initiatives that are able to drive public
602 engagement toward local and community issues and innovations, and to engage citizens
603 and communities in innovation processes. The focus on social problems, the alignment
604 with the city's strategic objectives, the relationship with the local community, and the
605 focus on citizens' engagement have been the key factors behind the initial success of the
606 TLL. Hence, cities whose objective is to foster open and social innovation and citizen
607 and community engagement can replicate the here presented TLL by designing an urban
608 LL initiative focused on local problems, needs and innovations, as well as on citizen
609 and community engagement. On the other hand, as pointed out in the previous sections,
610 such initiatives also need to avoid the TLL's shortcomings and explicitly introduce and
611 enforce citizen participation and community engagement, while focusing on local and
612 social innovation from the start of the initiative contextualization phase and throughout
613 its execution.

614 Not only is the urban LL approach a cost-effective way of engaging citizens and
615 communities and of fostering social innovation, but it also offers cities a relatively
616 cheap source of innovative solutions. Indeed, municipalities can drive efforts of
617 citizens, communities and private organizations toward the development of innovative
618 solutions focused on the city's needs, and create a workaround for the often more rigid
619 and expensive classic public procurement process. That said, Johnson, and Robinson
620 (2014), in relation to civic hackathons, argued that this kind of crowdsourced public
621 procurement may result in issues related to the adoption and maintenance of the
622 solutions developed through these channels, and in general cast doubt on the actual

value delivered by these kinds of initiatives. The TLL experience suggests that the inclusion of projects participating in order to be purchased by the city can be problematic. Indeed, although the presence of several commercially available projects has highlighted the need to streamline public procurement processes, their contribution to the overall success of the TLL initiative was quite limited. Hence, in the contextualization phase of an urban LL, a city needs to select projects and initiatives carefully and focus predominantly on open and social innovation and citizen engagement, while carefully considering whether to include projects with a clear commercial side.

In sum, the TLL experience shows that urban LLs are a compelling and cost-effective approach for cities whose policy priorities are to foster open and social innovation, drive public engagement, and tackle local and community problems. Urban LLs can be successful as long as they are designed and executed with such policy objectives as the overall priority, while their value as a replacement for traditional procurement processes is, at best, limited.

6.2 – Design implications

Gathering feedback from both utilizers and citizens makes it possible to highlight some design takeaways and best practices. Future organizers of urban LLs may in particular wish to consider three main improvements. First, the initiative's enabler, such as the city council or other equivalent public entity, will need to ensure citizens' engagement directly from the design step onward to improve the citizens' commitment and engagement in the initiative from the offset. This may be achieved by including citizens in the design phase, for example by having them collaborate in the choice of themes and in the project selection process. Furthermore, these engagement efforts must be

sustained throughout the entire initiative in order to maintain a high level of engagement and inclusion.

Second, and closely linked to the first suggested improvement, is the need for the project selection process to evaluate project proposals on the basis of their strategies to include and engage their users, and to penalize projects that do not have a structured research approach and whose goal is primarily to increase their demand and user base. This is necessary to avoid including projects that just intend to use the initiative as a way of improving their market position, without contributing to the creation of synergies and links between the various stakeholders, or the engagement of users in the co-creation process—the main objectives of any LL (Schuurman et *al.* 2012; Westerlund and Leminen 2011). Finally, in order to improve the communication, promotion and engagement efforts of both the utilizers and the enabler, the initiative should be narrowly focused, and all projects should adhere more closely to the chosen scope of the LL.

The city of Turin itself was able to learn from some of these lessons before designing its next LL initiative: "TLL AxTO Economia Collaborativa e Circolare," for which the call for proposals was published in May 2018. The city defined the scope of the initiative, and limited participation to innovative projects on the collaborative and circular economy. To participate in the new initiative, project were to be 3-9 months in duration, be innovative, beneficial, and grounded in Turin's social and economic territorial reality. To this end, proposals were to be evaluated not only on the basis of their innovation and feasibility, but also on their coherence with territorial needs and on how the projects plan to engage and include users in the innovation and co-creation project. Furthermore, in addition to communication and promotion efforts, and assistance navigating bureaucracy, each accepted project was to receive financial

672 support equal to 50% of the total investment, up to a total of €15.000, thereby
673 addressing one the criticisms expressed by the TLL utilizers (Città di Torino, 2018).

674 **7 – Conclusions**

675 With the TLL initiative, the city of Turin aims to engage and include citizens in the
676 urban and social innovation process by encouraging, attracting and fostering a growing
677 SC innovation environment in the city. These main objectives are pursued through the
678 implementation of the LL research approach, whereby public-private-people
679 partnerships of firms, public bodies, universities and communities collaborate to co-
680 create innovation centered around human and societal issues and contexts (Westerlund
681 and Leminen, 2011; Kusiak, 2007). This paper describes the city's efforts to design the
682 TLL initiative and the work of the authors in designing a structured methodology to
683 evaluate its impacts, assess its results and successes, and gather feedback and
684 impressions.

685 Two separate sets of measurements were taken. Ex-ante measurements of the
686 utilizers' expectations and objectives taken through a series of semi-structured
687 interviews, and an initial user survey, which gathered the characteristics, impressions,
688 habits and behaviours of citizen users. Ex-post measurements were also taken,
689 evaluating the results and success of the utilizers' participation and assessing the
690 initiative's impact on the users' habits and behaviours.

691 Half of the utilizers reported that they were able to achieve one or more major
692 result, while the vast majority of the utilizers reported beneficial participation.
693 However, these successes have not translated into a meaningful impact on the citizens.
694 The majority of users who participated in the ex-ante survey decided not to take part in
695 the ex-post one, and those who did just reported some very marginal behaviour changes.

The main criticism of the initiative, from both the utilizers' and the citizens' points of view, was that too little effort and too few resources were dedicated to engaging the citizens in the innovation process, despite the fact that citizen engagement was one of the major objectives of the initiative and one of the key elements for the success of any LL (Leminen, Westerlund and Nyström, 2012).

This study has several implications. First, the methodology developed in this work provides scholars with a structured approach grounded in both the LL design theory and SC evaluation literature to assess the impact and success of urban LLs. Furthermore, the citizen engagement that drives municipal policy and the use of innovative techniques to address municipal challenges is a timely and ongoing conversation currently taking place in many cities around the world. The results of the case study presented in this paper suggest several policy takeaways that both scholars and practitioners can use to study and implement urban LLs. In particular, these initiatives emerge as a compelling and cost-effective approach for any city whose strategic goals are to foster open and social innovation and drive citizen and community participation and engagement in both innovation and policy making processes. Nevertheless, cities need to be wary of using such initiatives as a replacement for traditional procurement processes. Finally, it is possible to draw some more practical implications on the best practices of designing an urban LL. The citizens' and utilizers' feedback in fact suggest three possible actions that could be adopted to address the criticisms of the TLL initiative and design a more effective urban LL: (1) citizens must be included from the design phase onward and be sustained and supported throughout the initiative's duration; (2) the proposal selection should evaluate the user engagement strategy of each project and, (3) the initiative should have a narrower and more focused scope.

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Domain (Giffinger and Pichler-Milanović, 2007)	Indicator
Economy	Components of domestic material consumption
People	Civic engagement activities
Governance	Usage and perception of applications based on open data
Governance	Usage and perception of institutional digital services
Mobility	Frequency of use and perception of bicycles and/or bike-sharing
Mobility	Frequency of use and perception of car-sharing and/or car-pooling
Mobility	Frequency of use and perception of public transportation
Mobility	Assessment of the extensiveness of efforts introduced to increase the use of cleaner transport
Environment	Perception of the total residential energy consumption
Environment	Perception of particulate matter emissions and air quality
Environment	Individual efforts to protect nature and the environment
Environment	Assessment of the extent to which citizens are willing to participate in environmental decision making
Environment	Assessment of the citizens' engagement in environmental and sustainability-oriented activities
Living	Perception of public safety
Living	Participation in cultural initiatives and events

Living	Use of public and green spaces

875 Table 1: list of indicators used to assess the impacts of the TLL initiative.

Research approach	Number of projects
Create demand	14
Technical testing	4
Evaluation	12
Co-Creation	8
Context research	5
Discovery	2

876 Table 2: Distribution of the projects per research approach.

Target group	Number of projects
Private companies	18
Public administration	14
Citizens	13
Academia	1

877 Table 3: Distribution of the projects per target group.

Results achieved	Number of projects
No major result	15
Project improvements	8
New clients	8
Market commercialization	6

878 Table 4: Distribution of the projects per achieved results.

Benefits achieved	Number of projects
No major benefit	3
New relationships with commercial partners	12
New relationships with citizens	10
New commercial synergies	16
Knowledge on the public administration structure	18
Market visibility	18

879 Table 5: Distribution of the projects per type of benefit.

Complaints	Number of projects
Lack of focus	4
Lack of financial resources	5
Ineffective efforts to include utilizers in the public administration processes	7
Ineffective promotion efforts	8
Ineffective citizens' engagement efforts	10

Table 6: Distribution of the projects per type of benefit.

Gender		
Female	32	45%
Male	39	55%
Age		
18 - 25	7	10%
26 - 35	12	17%
36 - 45	19	27%
46 - 55	11	15%
56 - 65	11	15%
More than 65	11	15%
Profession		
Employee	24	34%
Self-employed/entrepreneur	8	11%
Student	7	10%
Retired	11	34%
Other/unemployed	21	30%

881 Table 7: demographic mark-up of the ex-ante survey respondents

Indicator	Ex-ante survey (%)	Ex-post survey (%)
Usage and perception of institutional digital services	23	37
Assessment of the extensiveness of efforts to increase the use of cleaner transport	45	68
Individual efforts to protect nature and the environment	45	63
Use of public and green spaces	46	26

882 Table 8: Comparison between the ex-ante and ex-post survey.