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A Review of an Urban Living Lab Initiative

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3 POST-PRINT VERSION

4 A Review of an Urban Living Lab Initiative

5 In 2016, with the goal of exploiting and focusing on the bottom-up innovation 6 efforts of citizen communities and business organizations, the city of Turin, Italy, 7 launched the Torino Living Lab initiative. Via the use of the urban Living Lab 8 research approach, where firms, public bodies, universities and communities of 9 users collaborate to co-create innovation catered to human and societal 10 challenges, the city of Turin aims to engage and include citizens in the innovation 11 processes and to encourage, attract and foster a growing innovation environment. 12 This article describes the efforts that the city has made to design the Torino 13 Living Lab initiative and presents a structured methodology designed to assess its 14 results and successes. The expectations and objectives of the initiative's utilizers 15 and the characteristics, impressions, habits and behaviours of the citizens were 16 collected before the initiative through a series of semi-structured interviews and a 17 survey. By comparing the obtained results with similar post-mortem 18 measurements, it is possible to assess the results and success of the initiative and 19 to evaluate its impacts. Finally, from the results of the initiative's assessment and 20 the collection of the stakeholders feedback and impressions, it is possible to draw 21 policy takeaways for cities that have the aim of implementing urban Living Labs 22 and to identify best practices for the design, implementation and management of 23 similar initiatives.

24 **1 – Introduction**

25 Cities throughout the world are seeking innovative solutions to reduce the risks and take

- 26 advantage of the opportunities created by growing populations in urban areas (UN,
- 27 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;
- 29 Anthopoulos, 2017), city administrators are developing and fostering socially
- 30 innovative solutions (Edwards-Schachter, Matti and Alcántara, 2012) through the

31 implementation of the "Smart City" (SC) concept, a multi-disciplinary and multi-

32 objective urban development paradigm (Dameri, 2013; Monfaredzadeh and Bernardi,
33 2015; Stratigea et *al.*, 2015).

34 As a broad definition, a city becomes smart when "investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure 35 36 fuel sustainable economic growth and a high quality of life, with a wise management of 37 natural resources, through participatory governance" (Caragliu et al., 2011, pp. 70). By 38 using new innovative technologies in combination with human capital, cities are 39 developing projects and initiatives (Michelucci, De Marco and Tanda, 2016) with the 40 goal of reducing their environmental footprint, improving their global competitiveness 41 and their citizens' quality of life, thereby becoming a central force of regional 42 development, and driving innovation and local cooperation (Battaglia and Tremblay, 43 2011) (Tanda and De Marco, 2018a). However, while city administrators are 44 developing and implementing top-down strategic SC plans (Walravens, 2015; Breuer et 45 al., 2014), the main driver of SC innovation comes from the city's interconnected 46 bottom-up ecosystem of people, communities, businesses and industry, collaborating 47 and working together to foster creativity and social innovation (Edwards-Schachter, 48 Matti and Alcántara, 2012; Cosgrave et al., 2013; Towsend, 2013; De la Peña, 2013). 49 Hence, fostering social innovation and creativity to improve the quality of life, 50 competitiveness and sustainability must be the main goal of a city's strategic SC plan 51 (Cosgrave et al., 2013; Battaglia and Tremblay, 2011; Tanda and De Marco, 2018b). 52 This is the case for the city of Turin in Italy. In 2009, the city created the Turin 53 Action Plan for Energy (TAPE), with the goal of reducing the city's CO2 emissions by 54 40% by 2020, as one of the major milestones included in the Covenant of Mayors, a 55 multi-city action platform promoted by the European Commission. TAPE's main

56 objective is to improve Turin's sustainability in different city domains by implementing 57 solutions aimed at fostering local energy production, improving public lighting 58 efficiency, reducing public transport emissions, and raising the sustainability of public 59 and private buildings (Città di Torino, 2009). In 2011, in order to reach its smart urban 60 development and strategic renovation program goals, the city of Turin expanded the 61 TAPE initiatives by taking on the challenge of the European Commission's "Smart City 62 & Communities." As a result, the Torino Smart City Foundation (TSCF) was created. 63 The vision driving the TSCF strategy is to create a more sustainable, environmentally 64 friendly and livable city, where citizens are welcomed and engaged in the city's 65 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 66 67 technology players to public offices.

68 The main challenges that emerge from these numerous collaborations are about 69 understanding how citizens can be engaged and included in innovation processes, and 70 how to encourage, attract and foster a growing SC innovation environment. In 2015, in 71 order to reach its goals, TSCF started working on an initiative to engage citizens and 72 interface them directly with the innovation processes of private companies and start-73 ups. Furthermore, TSCF seeks to find ways to attract private companies' and start-up 74 businesses' innovation efforts by lessening bureaucratic burdens and helping develop 75 their collaborations, partnerships and networks. The result has been the creation of an 76 urban Living Lab (LL) initiative named Torino Living Lab (TLL). The LL approach 77 was chosen because of its ability to foster and encourage innovation, facilitate 78 integration and the engagement of citizens in the innovation process, and test innovative 79 solutions in real-life contexts (Westerlund and Leminen, 2011).

80 This paper describes the design steps that TSCF has taken in structuring, 81 implementing and managing the TLL initiative, and presents a structured 82 methodological LL assessment approach which combines LL design theory with the SC 83 evaluation literature. The goal of this approach is to measure TLL's results, impact, and 84 critical lessons, from which it is possible to draw several key policy takeaways, while 85 also highlighting best practices for the design, implementation and management of 86 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.

93

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).

100 On the other hand, the European approach toLL research is more focused on 101 involving the users in the innovation process by studying them in their everyday 102 environment (Schuurman et *al.*, 2012; Niitamo et *al.*, 2006). LLs are defined as 103 environments where it is possible to gather a deeper understanding of new services and 104 technologies by "confronting (potential) users with (prototypes or demonstrators) of 105 early technology early on in the innovation process" (Ballon, Pierson and Delaere, 106 2005, p. 16), and where "technology is given shape in real-life contexts in which (end) 107 users are considered 'co-producers'" (Ballon, Pierson and Delaere, 2005, pp. 15). 108 Involving users in the development of new products and services by collecting their 109 ideas and feedback, and having them play the role of co-generators of the innovation 110 process (Edwards-Schachter, Matti and Alcántara, 2012) has become a strategic need 111 for firms that want to strengthen their competitive advantage (European commission, 112 2009). Customer and user integration provides more than just access to the right market 113 information (Levén and Holmström, 2008). Indeed, opening the internal innovation 114 process can be considered a direct form of value creation (Wikström 1996; Gassmann, 115 2006). This shift from more traditional vertically integrated innovation processes is 116 forcing firms to invest time and resources in altering their research and development 117 processes and move toward a co-creation and open-innovation approach (Schuurman 118 and Marez, 2013). Almirall and Wareham (2008) defined the LL approach as a type of 119 open-innovation network that acts as a mediator between users, public organizations 120 and private firms. This allows the users' knowledge to be identified and made explicit 121 by means of exploring, capturing benefits from external sources of knowledge, 122 exploiting and leveraging existing knowledge, as well as retaining, storing and reusing 123 knowledge over time (Almirall and Wareham, 2011; Schuurman and Marez, 2013; 124 Lichtentahler and Lichtentahler, 2009). The LL approach is also considered a 125 methodology that can involve users in the development process and to bring different 126 stakeholders together in a co-creative way (Følstad, 2008). This is the notion described 127 by the European Networks of Living Labs (ENoLL, 2011), which identifies five main 128 dimensions of an LL, namely: an open innovation environment; real-life settings; user-129 driven innovation and co-creation processes; user engagement; and expected outcomes.

130 However, co-creation may in some cases be more ambition than reality, as argued by 131 Mirijamdotter et al. (2006) and Niitamo et al. (2006), who pointed out that many 132 modern LLs are closer to "sources of (predefined) technology use," rather than "sources 133 of innovation" (Niitamo et al., 2006, pp. 3) 134 One of the elements that is instrumental to a successful LL initiative is the 135 creation and fostering of close relationships between the multitude of stakeholders 136 involved in an LL (Leminen and Westerlund, 2012; Shaffers and Santoro, 2010). 137 Collaborations between producers, users and other parties allow change to be simulated, 138 and facilitate the creation of improved processes, services and business models (Möller, 139 Rajala and Westerlund, 2008; Edwards-Schachter, Matti and Alcántara, 2012). Lander 140 (2014) highlighted how collaboration, especially between different sectors, is vital for 141 fostering innovation. Schuurman (2013) also argues that, in an LL approach, all the 142 stakeholders of a product or service must participate in its development, with the 143 stakeholders collaborating and creating partnerships in order to co-create new product 144 and business models. Furthermore, ENoLL (Følstad, 2008) described LLs as 145 "'functional regions' where stakeholders have formed a Public-Private-Partnership 146 (PPP) of firms, public agencies, universities, institutions and people, all collaborating 147 for creating, prototyping, validating and testing new services, products and systems in 148 real-life contexts" (Følstad, 2008, pp. 3). Eriksson, Niitamo and Kulkki (2005) argued 149 that an LL approach allows products and services to be created and validated through a 150 collaborative effort, and that by creating relationships between different stakeholders, 151 the LL approach is able to focus on value creation and retention instead of technology. 152 Shaffers et al. (2007) argued that networks are a key part of an LL. The multi-153 stakeholder nature of the LL approach has been highlighted by several other authors 154 (Almirall and Wareham, 2008; Følstad, 2008).

155	The stakeholders in an LL research approach can take on one of the following				
156	main roles (Leminen and Westelund, 2012): Users, the actors that will use the product,				
157	service or technology tested in the LL and who help co-develop it; utilizers, non-				
158	producers that outsource their knowledge in order to improve the LL, while not being				
159	producers themselves; enablers, organizations that provide the necessary resources to				
160	the LL participants, such as physical space, facilities or utilities; and providers, private				
161	companies that join the LL to develop or co-develop new technologies, products and				
162	services.				
163	These stakeholders collaborate and create partnerships in order to contribute to				
164	the innovation, creation and development processes. These collaborations can have				
165	different purposes, depending on the scope of the LL. Følstad (2008) argued that there				
166	are mainly five contributions of the LL approach to the innovation and development				
167	process:				
168	• <i>Context research</i> : research on the context of use, users and their environment;				
169	• <i>Discovery</i> : research aimed at gathering knowledge and insights on unexpected				
170	uses and new services by "uncovering new issues and opportunities" (Abowd et				
171	al., 2000).				
172	• <i>Co-creation</i> : initiatives aimed at including users in the innovation and				
173	development process;				
174	• <i>Evaluation</i> : research aimed at evaluating and validating new technological				
175	solutions in direct contact with the users;				
176	• <i>Technical testing</i> : technical tests conducted in a realistic home environment,				
177	(closer to the previously discussed more "American" LL concept (Eriksson,				
178	Niitamo, and Kulkki, 2005)).				

179 Leminen, Westerlund and Nyström (2012) also discussed the purposes and 180 contribution to the innovation process provided by an LL, arguing that LLs have 181 different purposes and objectives, depending on which actor is the main driver of the 182 initiative. Using the classification of LL actors presented in Leminen and Westerlund 183 (2012), the authors of this paper classified LLs into four main categories: user-driven, 184 utilizer-driven, enabler-driven and provider-driven. Each of these categories presents 185 differences in terms of purpose, type of partnerships and collaborations. User-driven 186 LLs are focused on solving everyday problems through the co-creation of innovation 187 mostly within the community itself and without formal coordination mechanisms. 188 Utilizer-driven LLs, on the other hand, are more structured, with collaborations and 189 relationships centered around the utilizer actors and focused on developing or testing 190 new products and services. Enabler-driven LLs are organized around local-development 191 public bodies and focus their research efforts on societal needs and issues. Finally, 192 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 193 194 the knowledge creators.

195 All these considerations highlight the complexity of conceptualizing the LL 196 research approach and the difficulties involved in providing a consistent description, 197 due to its multiple relationships and collaboration networks. However, most of the 198 academic literature agrees that fostering innovation, co-creation, and user involvement 199 and engagement are the central goals of the LL approach (Chesbrough, 2003). 200 Schuurman et al. (2012) attempted to conceptualize the "ideal" LL as an approach that 201 "aims at medium- or long-term research co-creating innovations with the users in a 202 familiar and real-world context, taking into account the ecosystem surrounding the 203 innovation" (Schuurman et al., 2012, pp. 5). Westerlund and Leminen (2011) defined

204 LLs as public-private-people partnerships of firms, public bodies, universities and 205 communities collaborating to create new products and services in real life contexts. 206 Eriksson, Niitamo and Kulkki (2005) stated that LLs are human-centric systems of 207 innovation that create a research platform on different social and cultural issues. Kusiak 208 (2007) defined LLs as co-creation ecosystems for research and innovation centered on 209 human and societal issues and contexts, and Higgins and Klein (2011) defined them as 210 "platforms for user-driven innovation" (Higgins and Klein, 2011, pp. 31). According to 211 Følstad (2008), LLs are "environments for innovation and development where users are 212 exposed to new ICT solutions in (semi)realistic contexts, as part of medium- or long-213 term studies targeting evaluation of new ICT solutions and discovery of innovation 214 opportunities" (Følstad, 2008, pp. 116).

215 **3 – The Torino Living Lab Initiative**

216 The TLL initiative was designed and implemented in an attempt to find ways to engage 217 and direct different stakeholders in the city in and toward the SC innovation process. 218 The City of Turin's objective in promoting this initiative was twofold: first, to harness 219 the innovation efforts of private companies by identifying the most promising SC 220 technologies, systems and applications, and to ensure the possibility of testing them in a 221 real-life environment (Tanda, De Marco and Rosso, 2017); second, to foster local 222 innovation and entrepreneurship and include and engage citizens in the innovation 223 process (Torino Living Lab, 2016). In order to achieve these goals, the development 224 process the TSCF undertook for the TLL initiative followed the five-step LL 225 development procedure presented by Schuurman et al. (2012) and Shamsi (2008): 226 *Contextualization*: exploration and investigation of the technology or service and • 227 its implications;

- 228
- Selection: identification of potential users or user communities;

229	• <i>Concretization</i> : preliminary measurement of the selected metrics in order to			
230	understand the characteristics, behaviours and perceptions of the targeted users.			
231	(To be performed before the start of the experimentation as a pre-measurement);			
232	• Implementation: kick-off of the LL operations;			
233	• <i>Feedback</i> : final measurement of the same metrics used in the Concretization			
234	step. (T o be performed as a post-measurement at the end of the			
235	experimentation.)			
236	The Contextualization phase started in January 2016 and involved the releasing			
237	of a public call in which the participation and selection rules and the main objectives of			
238	the TLL were defined (Città di Torino, 2016). A board of referees evaluated each			
239	9 proposal on the basis of its ability to fulfill eight main requirements. The proposed			
240	projects were required to: (i) have no direct cost for the municipality; (ii) have			
241	1 objectives consonant with the overall objectives of the TSC plan; and (iii) they needed			
242	to create synergies with other SC solutions implemented by the city; while (iv)			
243	providing an innovation element, whether in the technology, the processes, or the			
244	services provided. The projects also needed to: (v) have an impact on the citizens, (vi)			
245	be replicable and scalable to the whole urban environment, and (vii) be technically			
246	feasible, which means TSCF should be able to facilitate the start of the proposed			
247	project. Finally, the projects had to (viii) be accompanied by a preliminary business			
248	model in order to guarantee their economic feasibility and sustainability.			
249	In order to promote participation and support the proposals, TSCF guaranteed its			
250	help in facilitating the paperwork processes with other public offices, through actions			
251	such as expediting permits and authorizations and waiving all fees and taxes involved in			
252	the use of public assets, while facilitating networking and communication between the			
253	proposing firms and other private entities that may have been instrumental in setting up			

254 the projects, such as utility or transportation firms. In order to engage citizens and the 255 local community in the innovation process, TSCF also guaranteed each initiative 256 exposure through all the communication channels available to the city, such as city 257 websites, social media pages, local newsletters, flyers and posters. It further organized 258 several events in which the TLL initiative was presented. In addition to this exposure 259 and advertising campaign, the city also guaranteed it would make considerable efforts in 260 mediating and engaging citizens and communities directly in the innovation process, by 261 giving each utilizer the opportunity to meet with the local population to present and 262 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 279 Pesso (2013), TSCF, in its role of enabler, sought to provide the vision and strategic 280 leadership, as well as promote networking by creating a multi-stakeholder and multi-281 objective initiative to facilitate the establishment of a prolific environment for 282 innovation, citizen participation and co-creation. However, from its inception and 283 conceptualization, the TLL initiative suffered from a relative structural weakness. 284 According to Juujärvi and Pesso (2013), one of the main tasks of the utilizers within the 285 context of an urban LL is to produce place-based knowledge and suitable products and 286 services, which is why the TLL call for proposals required each participant to propose 287 projects that would create synergy with the city's SC plan, so as to focus and direct the 288 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.

296 **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 304 external third-party observers and to design a methodology that would be able to draw 305 up an exhaustive picture of the initiative. Given TSCF's role as the enabler and center 306 of the LL networks (Leminen Westelund and Nyström, 2012), the authors' efforts had 307 to focus on assessing the impacts of the initiatives on both the utilizers, i.e. the private 308 firms and start-ups participating in the TLL, and the users, in particular the citizens. 309 Before kicking off the initiative, an ex-ante set of indicators was established to 310 understand the expectations and objectives of the utilizers, and to evaluate the 311 characteristics, behaviours and perceptions of the users. After the TLL initiative, a 312 second set of ex-post measurements allowed TSCF to understand whether the utilizers 313 had managed to satisfy their initial expectations and objectives and if, by participating 314 and being engaged in the innovation process, the users had undergone a significant and 315 meaningful change in their characteristics, behaviours and perceptions.

316 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.

321 An ex-ante round of semi-structured interviews was conducted, from April to 322 June 2016, before starting the initiative, to assess the initial expectations and goals of 323 the utilizers, by asking two main questions:

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

326 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

329	understanding whether they had managed to achieve their initial objectives and their		
330	participation had been in any way beneficial. Finally, they were asked to give feedback		
331	on how the TLL initiative had been structured and managed. To this end, from January		
332	2 to February 2018, they were asked the following questions:		
333	1. What results were you able to achieve through your participation in the TLL		
334	initiative?		
335	2. Was your company able take advantage of the TLL initiative?		
336	3. Do you have any feedback or comments on how the initiative was structured and		

337 managed by the TSCF?

338 4.2 – Impact on the Torino Living Lab users

339 The first step for assessing the impact of the TLL initiative on the population of users 340 was identifying a set of measurable indicators capable of representing the citizen's 341 characteristics, impressions, habits and behaviours. To this end, the authors started with 342 a review of the literature on evaluating and ranking SCs. This literature includes 343 comprehensive sets of metrics and indicators developed specifically to evaluate the 344 "smartness" level of a city. The following works were chosen as foundations for 345 evaluating the impact of the TLL initiative: Giffinger and Pichler-Milanović (2007), 346 Cohen (2014), Lazaroiu and Roscia (2012), and Lombardi et al. (2012). All the 347 indicators from the literature related to macro-economic dimensions were discarded, as 348 the chronologically and geographically limited nature of the TLL initiative meant there 349 would be negligible impacts on such indicators as the city's GDP, the employment level 350 and/or the immigration level, renderings these metrics useless to assess the TLL 351 initiative. After discarding the macro-economic indicators and purging any duplicates, 352 the four sets were joined together, resulting in 42 unique indicators. Finally, by looking 353 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 theTLL.

356	However, there were some problems with this list. While the indicators were
357	able to quantify certain things about the city, they did not provide a way of measuring
358	the characteristics, habits and behaviours of the people living in the city. With this issue
359	in mind, the 32 selected indicators were modified and reworded in order to capture the
360	impressions and opinions of the citizens and assign them a quantitative value. The final
361	shortlist of 16 indicators is presented in Table 1 with each indicator categorized
362	according to the SC taxonomy proposed in Giffinger and Pichler-Milanović (2007).
363	Please insert here Table 1
364	In order to assess the TLL initiative with these indicators, the authors sent out a
365	survey to the main users of the TLL initiative: the citizens of the Campidoglio
366	neighborhood. The survey was divided into two sections. The first section surveyed the
367	demographic profile of the respondents, namely their age, gender and profession. The
368	second section asked 15 questions to understand and measure the perception,
369	behaviours and habits of the users through the set of indicators given in Table 1. These
370	perceptions were quantified on a one-to-five point Likert scale, with one representing
371	strong disagreement or a minimum, and five representing strong agreement or a
372	maximum.
373	As with the assessment of the TLL initiative from the point of view of the
374	utilizers, in order to measure the impacts of the initiative on the users, the results of an
375	ex-ante measurement had to be compared with the ones taken at the end of the initiative.
376	The ex-ante survey was conducted from May to July 2016, right before the projects
377	began, and received 71 responses. To guarantee consistency between the ex-ante and

378 ex-post investigations, the 71 original respondents agreed to be contacted again to

379 participate in the ex-post assessment and received the same survey from January and 380 February 2018. However, out of the 71 original people that had been contacted, only 19 381 responded, while the remaining 52 decided either to ignore the request or refused to 382 participate in this second set of measurements. In order to understand the reasons 383 behind this fall in participation, the authors asked respondents to participate in a semi-384 structured interview that was aimed at investigating their experience in the TLL 385 initiative and at collecting their feedback and impressions on its perceived impacts and 386 management. Three of the 19 respondents agreed to do so.

387 5 – Results and Discussion

388 5.1 - Impacts on the Torino Living Lab's utilizers and results of the initiative

389 Interviewing the TLL utilizers at the start and end of the initiative allowed the authors

390 assess the users' experience and evaluate the initiative's results, benefits and

391 weaknesses.

392 5.1.1 – Ex-ante interviews

The two questions proposed during the preliminary ex-ante interviews with the TLLutilizers 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

sys and so proposed so projects. The gour of the first question was to understand in

396 utilizers' objectives and motivations for participating in the TLL initiative.

397

Please insert here Table 2

398 From the data shown in Table 2, it is possible to note that, out of the 30 projects399 included in the TLL initiative, 14 are clearly different from the others, in that the

- 400 solutions implemented in these projects were already commercially available. Hence,
- 401 the participation goals for those 14 projects are different from those of the remaining 16

402 projects, in that they consisted of creating a demand for the product or service they 403 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 404 405 and research approaches undertaken by the remaining 16 utilizers, the authors employed 406 the LL research contribution framework presented by Følstad (2008). Out of these 16 407 projects, four aimed to conduct a *Technical Testing* of their solutions. These projects 408 aimed to test the technological solutions in a real-life home environment and gather 409 valuable insights from their final users at an extremely early stage of development. On 410 the other hand, the main priority of the remaining 12 projects of those 16 was to engage 411 the users in their innovation process. For all 12 projects, this engagement translated into 412 an effort to *Evaluate* and validate the solution and for nine of them, the aim was to use 413 TLL participation as a way to assess and evaluate the validity and sustainability of their 414 business models. Engaging the users in a direct and structured effort of Co-Creation 415 was a major objective of eight of these projects, while five utilizers also had aimed to 416 use their participation in Context Research to observe and study how the users 417 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. 418 419 From the answers to this first question, it is also possible to highlight another significant 420 difference: out of the 30 utilizers, 26 had market commercialization as their final 421 objective, while the remaining four had the creation and dissemination of knowledge as 422 their final goal, without any commercial implication. 423 The second question in the interview allowed us to understand the main targeted 424 user groups. Most of the projects had multiple final users, that is, citizens, other

425 businesses or the public administration.

426

Please insert here Table 3

427 As can be seen from Table 3, of the 30 projects, 18 targeted other business and 428 private organizations, while 14 were directly addressed to the city's public 429 administration. The presence of such a large number of projects that directly targeted 430 the public administration highlights the pre-existing need to create more direct and less 431 cumbersome communication channels between public administrations and private 432 companies and of streamlining the public procurement processes. Finally, 13 projects 433 had citizens as their primary user target, while one utilizer planned to use this 434 participation purely for academic purposes.

435 5.1.2 – Ex-post interviews

436 The 30 utilizers that participated in the entire TLL initiative were also interviewed at the 437 end to evaluate and assess their experience. From the responses to the first question, it is 438 possible to address the first criticism: out of the 30 utilizers, only 15 reported they had 439 achieved a major result. Eight took advantage of the possibilities created by the 440 initiative to improve their solution and provide a better product or service for their 441 users. Moreover, eight utilizers stated that, by participating in the TLL, they were able 442 to attract new clients. Finally, thanks to their participation in the initiative, six utilizers 443 have been able to release their product or service onto the market. These data are shown 444 in Table 4.

445

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.

452 Moreover, it also appears that successful participation is related to the type of user 453 targets. Out of the 18 projects that targeted private firms and organizations, 11 reported 454 a certain degree of success, while only six out of the 14 projects targeting public 455 administrations, and six out of the 13 projects directly targeting citizens found the 456 participation successful. Nevertheless, half of the utilizers did not achieve any 457 meaningful benefit from participating in the TLL initiative. 458 Please insert here Table 5 459 However, the responses to the second question, displayed in Table 5, show how 460 the majority of utilizers—that is, 27 out of 30—reported benefits from participating in 461 the initiative. One of the most appreciated benefits of participating is the possibility of 462 collaborating and interacting with a network of firms, organizations, public entities and 463 communities in a way that would have been difficult to achieve outside an LL 464 framework. Thirteen utilizers reported the creation of new collaborations and 465 relationships with other commercial partners as a major benefit, and ten utilizers 466 reported the creation of such collaborations and relationships with citizens as a major 467 benefit. Sixteen utilizers stated that participating in the TLL helped them set up 468 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 469 470 better understanding of the mechanisms behind the public administration's bureaucracy.

- 471 Finally, for 18 utilizers, participating in the initiative improved their firms' market472 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.
- 476

Please insert Table 6 here

477 Four utilizers highlighted the LL's lack of a narrow focus and coherent scope, 478 arguing that including projects in so many different SC domains reduced the 479 opportunity for creating synergies and the effectiveness of communication efforts. 480 Furthermore, five utilizers mentioned that because the initiative not allocate any 481 dedicated financial resources, the projects had to be scaled down and their effectiveness 482 was thus weakened. Helping create fruitful relationships with the public administration 483 and public entities, and helping firms navigate the public bureaucracy were two of the 484 objectives pursued by TSCF within the TLL initiative. However, seven of the utilizers 485 argued that these efforts could not achieve these goals in a significant way. Finally, the 486 utilizers' main complaint was about the inadequacy of TSCF efforts to promote the 487 initiative and engage users. Eight utilizers complained that the promotion efforts were 488 not adequate for the scope of the initiative, while 10 argued that efforts undertaken to 489 engage users, and particularly citizens, were insufficient--especially for projects that 490 required longer and continuous engagement and collaboration.

491 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.

496 *5.2.1 – Ex-ante survey*

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

499

Please insert here Table 7

500	The results of the first survey present a preliminary picture of the characteristics,				
501	impressions, habits and behaviours of the citizens living in the Campidoglio				
502	neighborhood. The degree of agreement was measured for each question as the				
503	percentage of positive votes (4 or 5) over the total. These results are reported here with				
504	reference to the measurement indicators presented in Table 1:				
505	• <i>Economy</i> : citizens' purchasing choices are mostly driven by quality of product				
506	(77%), then by cost (55%) and last by place of origin (44%).				
507	• <i>People</i> : a minority of citizens are engaged in civic activities (15%).				
508	• <i>Governance</i> : most digital services and applications used by citizens are related				
509	to transportation and mobility (42%) and civic activities (48%), although their				
510	use is quite limited (14%). Furthermore, their use is predominantly passive, and				
511	presents a very low level of user engagement as a content co-generator.				
512	Opinions about the usefulness and ease of use of these services were also low				
513	(24% and 28%, respectively).				
514	• <i>Mobility</i> : the citizens' preferred means of transportation is public transport				
515	(49%), followed by automobile (24%), bicycle (23%) and alternative means				
516	such as bike- or car-sharing (20%). The main factor in transportation choice was				
517	necessity (68%), followed by speed and travel distance (63%), and finally cost				
518	(49%). The environmental impact of the chosen method was less important				
519	(45%).				
520	• <i>Environment</i> : relatively few of the respondents reported knowledge about the				
521	amount of air pollution in the area (14%) and their energy consumption (34%).				
522	On the other hand, they considered themselves to be relatively well informed				
523	about best practices for reducing their energy and environmental footprint (42%				
524	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).

532

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.

539 5.2.2 – *Ex-post survey and interviews*

540 Out of the 71 people that participated in the ex-ante survey, only 19 decided to respond 541 to the survey conducted after the TLL initiative finished. Hence, it is not possible to 542 compare the results of both surveys in a statistically significant analysis. However, it is 543 possible to highlight some findigns, as per Table 8.

544

Please insert here Table 8

545The quality of the digital servaices provided by the city appears to have546improved from 23% to 37%, respectively. The citizens' mobility habits appear more or547less the same, although environmental considerations becme more influential in theit548choice of transportation (from 45% to 68%). The new survey reports an increase in

549 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:

556 1. Did any of the projects that were part of the TLL initiative have an impact on557 your impressions, habits and/or behaviours?

558 2. Why or why not?

559 The three interviewees basically responded negatively to the first question, 560 providing several reasons why. While the proposed projects were reportedly quite 561 interesting, the respondents lamented a lack of focus and criticised the lack of a 562 coherent scope for the initiative. Several utilizers made a similar criticism, noting that 563 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 564 565 the efforts of both TSCF and the utilizers were not adequate. They felt, in particular, 566 that both promotion and engagement efforts, after a quite active initial phase, decreased 567 dramatically. Again, utilizers made a similar criticish, complaining about lack of 568 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.

574 **6 – Implications**

575 The methodological approach used to evaluate the city of Turin's experience with the 576 TLL initiative combines LL design theory with a review of the literature on SC 577 evaluation and assessment techniques. It provides a theoretical contribution to improve 578 critical success factor metrics that can be used when evaluating other urban LL 579 initiatives.

580 Furthermore, the results of the TLL case study evaluation have several policy 581 and practical implications that could be useful for both scholars and practitioners in the 582 design, implementation and management of similar initiatives.

583 6.1 – Policy implications

584 The TLL initiative's success and shortcomings suggest several policy takeaways. The 585 literature suggests that complex problems, such as pollution and environmental 586 protection, can best be tackled when cities and municipalities are able to engage citizens 587 and communities in their innovation and policy making processes. Indeed, in their study 588 on the success of implementation [of what?], the Covenant of Mayors of Spanish cities, 589 Pablo-Romero, Sanchez-Braza, and Gonzalez-Limon (2015), highlighted that the 590 engagement of local communities is a key requirement for the successful 591 implementation of environmentally related initiatives. Edwards-Schachter, Matti and 592 Alcántara (2012) argued that citizen engagement and participation is a key priority for a 593 city that wants to innovate its quality of life, social justice and ethics, and in general 594 develop "innovations that are social both in their ends and in their means" (Edwards-595 Schachter, Matti and Alcántara, 2012, pp. 677). In general, the active participation of 596 citizens and communities, while often expensive, can be beneficial for policy and 597 decision makers as they can provide "more comprehensive information on all aspects of

the policy process" (Kweit and Kweit, 1984, pp. 273). The initial success of the TLL 598 599 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

623 value delivered by these kinds of initiatives. The TLL experience suggests that the 624 inclusion of projects participating in order to be purchased by the city can be 625 problematic. Indeed, although the presence of several commercially available projects 626 has highlighted the need to streamline public procurement processes, their contribution 627 to the overall success of the TLL initiative was quite limited. Hence, in the 628 contextualization phase of an urban LL, a city needs to select projects and initiatives 629 carefully and focus predominantly on open and social innovation and citizen 630 engagement, while carefully considering whether to include projects with a clear 631 commercial side.

In sum, the TLL experience shows that urban LLs are a compelling and costeffective 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.

638 6.2 – Design implications

639 Gathering feedback from both utilizers and citizens makes it possible to highlight some 640 design takeaways and best practices. Future organizers of urban LLs may in particular 641 wish to consider three main improvements. First, the initiative's enabler, such as the 642 city council or other equivalent public entity, will need to ensure citizens' engagement 643 directly from the design step onward to improve the citizens' commitment and 644 engagement in the initiative from the offset. This may be achieved by including citizens 645 in the design phase, for example by having them collaborate in the choice of themes and 646 in the project selection process. Furthermore, these engagement efforts must be

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

649 Second, and closely linked to the first suggested improvement, is the need for 650 the project selection process to evaluate project proposals on the basis of their strategies 651 to include and engage their users, and to penalize projects that do not have a structured 652 research approach and whose goal is primarily to increase their demand and user base. 653 This is necessary to avoid including projects that just intend to use the initiative as a 654 way of improving their market position, without contributing to the creation of 655 synergies and links between the various stakeholders, or the engagement of users in the 656 co-creation process-the main objectives of any LL (Schuurman et al. 2012; 657 Westerlund and Leminen 2011). Finally, in order to improve the communication, 658 promotion and engagement efforts of both the utilizers and the enabler, the initiative 659 should be narrowly focused, and all projects should adhere more closely to the chosen 660 scope of the LL.

661 The city of Turin itself was able to learn from some of these lessons before 662 designing its next LL initiative: "TLL AxTO Economia Collaborativa e Circolare," for 663 which the call for proposals was published in May 2018. The city defined the scope of 664 the initiative, and limited participation to innovative projects on the collaborative and 665 circular economy. To participate in the new initiative, project were to be 3-9 months in 666 duration, be innovative, beneficial, and grounded in Turin's social and economic 667 territorial reality. To this end, proposals were to be evaluated not only on the basis of 668 their innovation and feasibility, but also on their coherence with territorial needs and on 669 how the projects plan to engage and include users in the innovation and co-creation 670 project. Furthermore, in addition to communication and promotion efforts, and 671 assistance navigating bureaucracy, each accepted project was to receive financial

672	support equal	to 50%	of the total	investment,	up to a total	of $\in 15.000$, thereby
				,		· · ·

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.

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

Half of the utilizers reported that they were able to achieve one or more major
result, while the vast majority of the utilizers reported beneficial participation.
However, these successes have not translated into a meaningful impact on the citizens.
The majority of users who participated in the ex-ante survey decided not to take part in
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).

701 This study has several implications. First, the methodology developed in this 702 work provides scholars with a structured approach grounded in both the LL design 703 theory and SC evaluation literature to assess the impact and success of urban LLs. 704 Furthermore, the citizen engagement that drives municipal policy and the use of 705 innovative techniques to address municipal challenges is a timely and ongoing 706 conversation currently taking place in many cities around the world. The results of the 707 case study presented in this paper suggest several policy takeaways that both scholars 708 and practitioners can use to study and implement urban LLs. In particular, these 709 initiatives emerge as a compelling and cost-effective approach for any city whose 710 strategic goals are to foster open and social innovation and drive citizen and community 711 participation and engagement in both innovation and policy making processes. 712 Nevertheless, cities need to be wary of using such initiatives as a replacement for 713 traditional procurement processes. Finally, it is possible to draw some more practical 714 implications on the best practices of designing an urban LL. The citizens' and utilizers' 715 feedback in fact suggest three possible actions that could be adopted to address the 716 criticisms of the TLL initiative and design a more effective urban LL: (1) citizens must 717 be included from the design phase onward and be sustained and supported throughout 718 the initiative's duration; (2) the proposal selection should evaluate the user engagement 719 strategy of each project and, (3) the initiative should have a narrower and more focused 720 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	
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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

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

880 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

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