

A Review of an Urban Living Lab Initiative

Original

A Review of an Urban Living Lab Initiative / Tanda, Adriano; DE MARCO, Alberto. - In: REVIEW OF POLICY RESEARCH. - ISSN 1541-132X. - STAMPA. - 38:3(2021), pp. 370-390. [10.1111/ropr.12419]

Availability:

This version is available at: 11583/2888093 since: 2021-07-12T15:58:56Z

Publisher:

Wiley

Published

DOI:10.1111/ropr.12419

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

Wiley postprint/Author's Accepted Manuscript

This is the peer reviewed version of the above quoted article, which has been published in final form at <http://dx.doi.org/10.1111/ropr.12419>. This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Use of Self-Archived Versions.

(Article begins on next page)

1 Adriano Tanda, Alberto De Marco

2 Review of Policy Research – Published online 09/04/2021

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,
28 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
35 social capital and traditional (transport) and modern (ICT) communication infrastructure
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; Townsend, 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
66 close collaboration with a multitude of stakeholders, from start-up ventures to major
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.

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

93 **2 – The Living Lab Approach**

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

100 On the other hand, the European approach to LL 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 • *Context research*: research on the context of use, users and their environment;
- 169 • *Discovery*: 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 • *Co-creation*: initiatives aimed at including users in the innovation and
173 development process;
- 174 • *Evaluation*: research aimed at evaluating and validating new technological
175 solutions in direct contact with the users;
- 176 • *Technical testing*: 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
193 exploiting the knowledge created for the benefit of all the stakeholders partnered around
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 • *Concretization*: 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 • *Feedback*: final measurement of the same metrics used in the Concretization
234 step. (To 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 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 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.

263 Each proposal was evaluated, and only those that satisfied all eight of the
264 requirements were included in the initiative. Out of 37 proposals received, five failed to
265 meet one or more of the requirements. The initiative entered into operation in July
266 2016. Most of the projects finished by January 2018, although two of them, due to
267 unforeseeable problems, had to withdraw.

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

273 From this brief description, it is possible to see how the city, and in particular
274 TSCF, placed itself in the role of the enabler of the LL, by taking on the role of main
275 organizer, facilitating the development of networks and collaboration around the
276 institutional boundaries of the TLL initiative, and steering the innovation process
277 toward social issues and societal improvements (Leminen, Westerlund and Nyström,
278 2012). According to the urban LL responsibility framework proposed by Juujärvi and

279 Pessa (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 Pessa (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.

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

296 **4 – Methodology**

297 When designing the initiative, TSCF decided not to exert any form of control or
298 supervision over the utilizer's choice of methodology to implement their projects during
299 the *Concretization, Implementation* and *Feedback* steps of the LL's development
300 framework (Schuurman et al. 2012; Shamsi 2008). However, because of the lack of a
301 standardized methodology for the implementation and evaluation of the projects, TSCF
302 needed to develop its own methodology to evaluate the results, successes and impacts of
303 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***

317 The authors designed the evaluation methodology to gather feedback and assess the
318 experience from the utilizers' point of view. In particular, the authors sought to
319 understand whether, by the end of the initiative, the utilizers were able to satisfy their
320 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.

327 To help gauge the impact and success of the initiative, the 30 utilizers that
328 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 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

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*

393 The two questions proposed during the preliminary ex-ante interviews with the TLL
394 utilizers allowed us to understand the differences and highlight the similarities between
395 the 30 proposed SC projects. The goal of the first question was to understand the
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 projects
399 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
404 importance for these utilizers. In order to analyze and categorize the different objectives
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
418 gathered from the users' engagement to *Discover* new use cases and opportunities.
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*

446 It is worth noting how the success of these projects appears to be related to the
447 type of research approach planned at the outset. Only five out of the 14 already
448 commercially available projects were able to achieve a major result. Therefore, the less
449 commercially mature projects are the ones that were better able to take advantage of
450 their participation in the initiative. Out of the 12 projects that had planned to extensively
451 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
469 participating in the TLL initiative had been beneficial in that it allowed them to obtain a
470 better understanding of the mechanisms behind the public administration’s bureaucracy.
471 Finally, for 18 utilizers, participating in the initiative improved their firms’ market
472 visibility.

473 The third question allowed the utilizers to express their criticism on how the
474 TLL initiative had been structured and managed by TSCF; these data are shown in
475 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***

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

496 ***5.2.1 – Ex-ante survey***

497 The demographic distribution of the ex-ante survey respondents, according to their
498 gender, 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 • *Economy*: citizens' purchasing choices are mostly driven by quality of product
506 (77%), then by cost (55%) and last by place of origin (44%).
- 507 • *People*: a minority of citizens are engaged in civic activities (15%).
- 508 • *Governance*: 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 • *Mobility*: 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 • *Environment*: 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

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

528 • *Living*: citizens in the neighborhood considered themselves relatively safe
529 (42%). Their use of public spaces was also relatively high (46%). However,
530 engagement in cultural and social activities was, once again, quite low (20% for
531 both).

532

533 It should be noted that, in general, the citizens reported a major lack of
534 engagement in civic activities and initiatives, regardless of purpose. They also reported
535 a considerably limited use of digital services and applications. Their awareness of
536 environmental topics was quite high; however, while they reported that they were
537 relatively well informed on actions and behaviours that needed to be taken to be more
538 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 findings, as per Table 8.

544

Please insert here Table 8

545 The quality of the digital services provided by the city appears to have
546 improved from 23% to 37%, respectively. The citizens' mobility habits appear more or
547 less the same, although environmental considerations became more influential in their
548 choice 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

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

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

- 556 1. Did any of the projects that were part of the TLL initiative have an impact on
557 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
564 and user engagement. The citizens also highlighted engagement as lacking, arguing that
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 criticism, complaining about lack of
568 citizens engagement.

569 Finally, two out of three citizen interviewees argued that, while the projects
570 were overall interesting and topical, it would have been better for the initiative to
571 involve the citizens directly from the outset in both the scope definition and project
572 selection processes. They argued that by doing so, citizens would have been more
573 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

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

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.

632 In sum, the TLL experience shows that urban LLs are a compelling and cost-
633 effective approach for cities whose policy priorities are to foster open and social
634 innovation, drive public engagement, and tackle local and community problems. Urban
635 LLs can be successful as long as they are designed and executed with such policy
636 objectives as the overall priority, while their value as a replacement for traditional
637 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

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

696 The main criticism of the initiative, from both the utilizers' and the citizens'
697 points of view, was that too little effort and too few resources were dedicated to
698 engaging the citizens in the innovation process, despite the fact that citizen engagement
699 was one of the major objectives of the initiative and one of the key elements for the
700 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.

721 Bibliography

- 722 Abowd, G.D., G.D. Atkeson, A.F. Bobock, I.A. Essa. B. MacIntyre, E. Mynatt, T.E. Starner. (2000).
723 Living Laboratories: The Future Computing Environments Group at the Georgia Institute of Technology.
724 Paper presented at the CHI '00 on Human Factors in Computing Systems. The Hague, The Netherlands.
725 April 01-06.
- 726 Almirall, E. J. Wareham. (2008). Living Labs and Open Innovation: Roles and Applicability. *eJOV: The*
727 *Electronic Journal for Virtual Organization & Networks*, 10, 21-46.
- 728 Almirall, E., J. Wareham. (2011). Living Labs: Arbiters of Mid-and Ground-level Innovation. *Technology*
729 *Analysis & Strategic Management*, 23(1), 87-102.
- 730 Anthopoulos L.G. (2017). The Rise of the Smart City. In *Understanding Smart Cities: A Tool for Smart*
731 *Government or an Industrial Trick?* edited by Anthopoulos L.G., 5-45. Switzerland: Springer, Cham.
- 732 Ballon, P., J. Pierson, S. Delaere. (2005). Test and Experimentation Platforms for Broadband Innovation:
733 Examining European Practice. Paper presented at the 16th European Regional Conference by the
734 International Telecommunications Society. Porto, Portugal, September 4-6.
- 735 Battaglia, A. and Tremblay, D.G. (2011). 22@ and the Innovation District in Barcelona and Montreal: a
736 Process of Clustering Development Between Urban Regeneration and Economic Competitiveness. *Urban*
737 *Studies Research*, 2011.
- 738 Breuer, J., Walravens, N. and Ballon, P. (2014). Beyond Defining the Smart City. Meeting Top-down and
739 Bottom-up Approaches in the Middle. *Tema. Journal of Land Use, Mobility and Environment*.
- 740 Caragliu, A., Del Bo, C. and Nijkamp, P. (2011). Smart Cities in Europe. *Journal of Urban Technology*.
741 18(2), 65-82.
- 742 Chesbrough, H.W. (2003). The Era of Open Innovation.” MIT Sloan Management Review, April 15.
743 Accessed 15 November 2017. <https://sloanreview.mit.edu/article/the-era-of-open-innovation/>
- 744 Città di Torino. (2009). Piano d'azione per l'Energia Sostenibile. Retrieved from:
745 <http://www.comune.torino.it/ambiente/bm~doc/tape-2.pdf>
- 746 Città di Torino. (2016). Avviso pubblico per la ricerca di soggetti interessati alla promozione, lo sviluppo,
747 il testing e la sperimentazione di iniziative e soluzioni tecnologiche innovative in ambito "Smart City"
748 sull'area del quartiere campidoglio. Retrieved from: [http://torinolivinglab.it/wp-](http://torinolivinglab.it/wp-content/uploads/2016/01/Campidoglio_Avviso_torino-25-01-2016_Def.pdf)
749 [content/uploads/2016/01/Campidoglio_Avviso_torino-25-01-2016_Def.pdf](http://torinolivinglab.it/wp-content/uploads/2016/01/Campidoglio_Avviso_torino-25-01-2016_Def.pdf)
- 750 Città di Torino. (2018). Avviso Pubblico “Torino Living Lab Axto – Contributi Per Sperimentazioni
751 Innovative Applicate All'economia Collaborativa E Circolare Per Le Periferie Torinesi”. Retrieved from:
752 http://torinolivinglab.it/wp-content/uploads/2018/06/Avviso_TLL_SCE_prorogato.pdf
- 753 Cohen B. (2014). Smart City Index Master Indicators Survey. Smart Cities Council, October 2014.
754 Accessed 19 November 2017. Retrieved from: [http://smartcitiescouncil.com/resources/smart-city-index-](http://smartcitiescouncil.com/resources/smart-city-index-master-indicators-survey)
755 [master-indicators-survey](http://smartcitiescouncil.com/resources/smart-city-index-master-indicators-survey)
- 756 Cosgrave E., Tryfonas T., Crick T. (2014). The Smart City from a Public Value Perspective. Paper
757 presented in the 2nd International Conference on ICT for Sustainability. Stockholm, Sweden, August 24-
758 27.
- 759 Dameri, R.P. (2013). Searching for Smart City Definition: a Comprehensive Proposal. *International*
760 *Journal of Computers & Technology*. 11(5), 2544-2551.
- 761 De la Peña B. (2013). The Autocatalytic City. In *T.E.D. Books City 2.0: The Habitat of the Future and*
762 *How to Get There (Ebook)*. T.E.D. Conferences.
- 763 Edwards-Schachter, M.E., C.E. Matti. E. Alcántara. (2012). Fostering Quality of Life Through Social
764 Innovation: A Living Lab Methodology Study Case. *Review of Policy Research*. 29(6), 672-692.
- 765 Eriksson, M., V.P. Niitamo, S. Kulkki. (2005). State-of-the-art in Utilizing Living Labs Approach to
766 User-centric ICT Innovation-a European Approach. *Lulea: Center for Distance-spanning Technology*.
767 *Lulea University of Technology Sweden: Lulea*.
- 768 European Commission. (2009). *Design as a Driver of User-centred Innovation. Commission Staff*
769 *Working Document SEC(2009)501*. Belgium, Brussels: European Commission. Retrieved from:
770 <http://ec.europa.eu/DocsRoom/documents/2583/attachments/1/translations/en/renditions/native>
- 771 Følstad, A. (2008). Living Labs for Innovation and Development of Information and Communication
772 Technology: a Literature Review. *Electronic Journal of Organizational Virtualness*. 10, 99-131.
- 773 Gassmann, O. (2006). Opening Up the Innovation Process: Towards an Agenda. *R&D Management*.
774 36(3), 223–228.
- 775 Giffinger, R. and N. Pichler-Milanović. (2007). Smart Cities: Ranking of European Medium-sized Cities.
776 Centre of Regional Science, Vienna University of Technology.
- 777 Higgins, A. S. Klein. (2011). Introduction to the Living Lab Approach. In *Accelerating global supply*
778 *chains with IT-innovation*, edited by Y. Tan, N. Björn-Andersen, S. Klein, B. Rukanova, 31-36. Berlin,
779 Heidelberg: Springer.

780 Johnson, P. and Robinson, P., 2014. Civic Hackathons: Innovation, Procurement, or Civic Engagement?
781 *Review of Policy Research*, 31(4), 349-357.

782 Juujärvi, S., K. Pessa. (2013). Actor Roles in an Urban Living Lab: What Can We Learn from Suurpelto,
783 Finland? *Technology Innovation Management Review*. 3(11), 22-27.

784 Kusiak, A. (2007). Innovation: the Living Laboratory Perspective. *Computer-Aided Design and*
785 *Applications*. 4(6), 863–876.

786 Kweit, M.G. and Kweit, R.W., 1984. The Politics of Policy Analysis: The Role of Citizen Participation in
787 Analytic Decisionmaking. *Review of Policy Research*, 3(2), 234-245.

788 Lander, B. (2014). The Role of Institutions and Capital in Intersectoral Collaboration: Infection and
789 Immunity Research and Development Collaboration in Vancouver. *Review of Policy Research*, 31(5),
790 390-407.

791 Lazaroiu, G.C. and M. Roscia. (2012). Definition Methodology for the Smart Cities Model. *Energy*.
792 47(1), 326-332.

793 Lee, J.H., Hancock, M.G. and Hu, M.C. (2014). Towards an Effective Framework for Building Smart
794 Cities: Lessons from Seoul and San Francisco. *Technological Forecasting and Social Change*. 89, 80-99.

795 Leminen, S. M. Westerlund. (2012). Towards innovation in Living Labs networks. *International Journal*
796 *of Product Development*. 17(1-2), 43-59.

797 Leminen, S., M. Westerlund, A.G. Nyström. (2012). Living Labs as Open-innovation Networks.
798 *Technology Innovation Management Review*. 2(9), 6-11.

799 Levén, P., J. Holmström. (2008). Consumer co-creation and the ecology of innovation: A living lab
800 approach. Paper presented at the 31st Information Systems Research Seminar in Scandinavia. Are,
801 Sweden, August 08-13.

802 Lichtenthaler, U., E. Lichtenthaler. (2009). A capability-based framework for open innovation:
803 Complementing absorptive capacity. *Journal of management studies*. 46(8), 1315-1338.

804 Lombardi, P., S. Giordano, H. Farouh, W. Yousef. (2012). Modelling the smart city performance.
805 *Innovation: The European Journal of Social Science Research*. 25(2), 137-149.

806 Michelucci, F.V., De Marco, A. and Tanda, A. (2016). Defining the Role of the Smart-City Manager: An
807 Analysis of Responsibilities and Skills. *Journal of Urban Technology*, 23(3), 23-42.

808 Mirijamdotter, A., A. Ståhlbröst, A. Sällström, V. Niitamo, S. Kulkki. (2006). The European Network of
809 Living Labs for CWE-user-centric Co-creation and Innovation. *Exploiting the Knowledge Economy:*
810 *Issues, Applications and Case Studies*. 3, 840–47.

811 Möller, K., R. Rajala, M. Westerlund. (2008). Service Innovation Myopia? A New Recipe for Client-
812 Provider Value Creation. *California Management Review*. 50(3), 31–48.

813 Monfaredzadeh, T. and Berardi, U. (2015). Beneath the Smart City: Dichotomy Between Sustainability
814 and Competitiveness. *International Journal of Sustainable Building Technology and Urban Development*.
815 6(3), 140-156.

816 Nam, T. T.A. Pardo. (2011). Conceptualizing Smart City with Dimensions of Technology, People, and
817 Institutions. Paper presented at the 12th Annual International Digital Government Research Conference:
818 Digital Government Innovation in Challenging Times, College Park, Maryland, USA, June 12-15.

819 Niitamo, V.P., S. Kulkki, M. Eriksson, K.A. Hribernik. (2006). State-of-the-art and Good Practice in the
820 Field of Living Labs. Paper presented at the 2006 International Technology Management Conference
821 (ICE). Milan, Italy, June 26-28.

822 Pablo-Romero, M.D.P., Sánchez-Braza, A. and Manuel González-Limón, J., 2015. Covenant of Mayors:
823 Reasons for Being an Environmentally and Energy Friendly Municipality. *Review of Policy Research*,
824 32(5), 576-599.

825 Schaffers, H. R. Santoro. (2010). The Living Labs Concept Enhancing Regional Innovation Policies and
826 Instruments. Paper presented at the 2010 International Technology Management Conference (ICE).
827 Lugano, Switzerland, June 21-23.

828 Schaffers, H., M.C. Cordoba, P. Hongisto. T. Kallai. C. Merz, J. van Rensburg. (2007). Exploring
829 Business Models for Open Innovation in Rural Living Labs. Paper presented at the 13th International
830 Conference on Concurrent Enterprising (ICE). Sophia-Antipolis, France, June 4-6.

831 Schuurman, D., B. Lievens, L. De Marez, P. Ballon. (2012). Towards Optimal User Involvement in
832 Innovation Processes: A Panel-centered Living Lab-approach. Paper presented at the PICMET '12:
833 Technology Management for Emerging Technologies. Vancouver, Canada, July 29-31, August 1-2.

834 Schuurman, D., L. De Marez, P. Ballon. (2013). Open Innovation Processes in Living Lab Innovation
835 Systems: Insights from the LeYLab. *Technology Innovation Management Review*, 3(11), 28-36.

836 Shamsi, T. A. (2008). Living Labs: Good Practices in Europe. In *European Living Labs - A new approach*
837 *for human centric regional innovation*, edited by J. Schumacher, V. Niitamo, 15-30. Berlin, WVB.

838 Stratigea, A., Papadopoulou, C.A. and Panagiotopoulou, M. (2015). Tools and Technologies for Planning
839 the Development of Smart Cities. *Journal of Urban Technology*. 22(2), 43-62.

840 *Studies*. 3: 840–47.
841 (ENoLL) The European Network of Living Labs. (2011). Living Labs Definition. Accessed March 03,
842 2018. Retrieved from: <https://enoll.org/about-us/>
843 Tanda, A., De Marco, A. and Rosso, M., 2017. Evaluating the impact of smart city initiatives. Paper
844 presented at the 6th International Conference on Smart Cities and Green ICT Systems. Porto, Portugal,
845 April 22-24.
846 Tanda, A. and De Marco, A., 2018a. Drivers of Public Demand of IoT-Enabled Smart City Services: A
847 Regional Analysis. *Journal of Urban Technology*, 25(4), 77-94.
848 Tanda, A. and De Marco, A., 2018b. Business Model Framework for Smart City Mobility Projects. Paper
849 presented at the 3rd World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium.
850 Prague, June 18-22.
851 Torino Living Lab. (2016). Torino Living Lab. Accessed November 17, 2017. Retrieved from
852 <http://torinolivinglab.it>
853 Torino Smart City. (2015). La Vision. Accessed November 14, 2017. Retrieved from:
854 <http://www.torinosmartcity.it/torino-smart-city/>
855 Townsend, A.M. (2013). *Smart cities: Big Data, Civic Hackers, and the Quest for a New Utopia*. New
856 York, NY: WW Norton & Company.
857 United Nations, Department of Economic and Social Affairs, Population Division. (2014). *World*
858 *Urbanization Prospects: The 2014 Revision, Highlights*. New York, NY: United Nations Department of
859 Economic and Social Affairs. Retrieved from: [https://esa.un.org/unpd/wup/Publications/Files/WUP2014-](https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Highlights.pdf)
860 [Highlights.pdf](https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Highlights.pdf)
861 United Nations, Department of Economic and Social Affairs, Population Division. (2017). *World*
862 *Population Prospects: The 2017 Revision, Volume I: Comprehensive Tables*. New York, NY: United
863 Nations Department of Economic and Social Affairs.
864 Walravens, N. (2015). Qualitative Indicators for Smart City Business Models: The Case of Mobile
865 Services and Applications. *Telecommunications Policy*, 39(3-4), 218-240.
866 Westerlund, M. and Leminen, S. (2011). Managing the Challenges of Becoming an Open Innovation
867 Company: Experiences from Living Labs. *Technology Innovation Management Review*, 1(1), 19-25.
868 Wikström, S. (1996). Value Creation by Company–consumer Interaction. *Journal of Marketing*
869 *Management*. 12(5), 359–374.
870 Zhong, X., H.H. Chan, T.J. Rogers, C.P. Rosenberg, E.J. Coyle. (2006). The development and eStadium
871 testbeds for research and development of wireless services for large-scale sports venues. Paper presented
872 at the 2nd International Conference on Testbeds and Research Infrastructures for the Development of
873 Networks and Communities. Barcelona, Spain, March 1-3.

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

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

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