sciendo

Management framework for higher education institution-based community innovation labs

Carmen PĂUNESCU
Bucharest University of Economic Studies, Bucharest, Romania
carmen.paunescu@ase.ro

Anna RUOHONEN
Haaga-Helia University of Applied Sciences, Helsinki, Finland
anna.ruohonen@haaga-helia.fi

Nicholas SPENCER
Northumbria University, Newcastle, UK
nick.spencer@northumbria.ac.uk

Nicolae Marius VAVURĂ
Bucharest University of Economic Studies, Bucharest, Romania
nicolae.vavura@fabiz.ase.ro

Abstract. *The paper aims at defining the management framework for community innovation labs (CILs) linked to higher education institutions (HEIs) by applying the Delphi method. CILs are regarded as experimental settings established in HEIs aimed at addressing societal challenges. Specifically, the research study investigated the following questions: (1) What is the HEI-based CIL purpose and role, which is beneficial to society; (2) What kinds of governance, business method, capabilities and core activities are necessary for the establishment of viable CILs in HEIs; and (3) What forms of added value generated by CILs have the most potential for benefiting society? Results indicate that during 2020s it is expected that CILs will play a significant role in designing the local, regional or country innovation agenda. Also, they are expected to establish networks of people and multi-disciplinary teams that can address various societal challenges, while aiming at catalysing deeper, more sustainable and more creative approaches to systemic change. In addition to reinforcing the conceptualisation of a HEI-based CIL, the research results indicate understandings of the role and priorities of HEIs in CILs. This, then, leaves open how a CIL can manifest across and within communities when operationalized through this developing management framework. The ongoing process of shaping the effective CIL governance and HEI collaboration calls for dialogue, exploration and pilot solutions.*

Keywords: innovation lab, higher education, community innovation, social innovation, Delphi method, SHIINE

Please cite the article as follows: Păunescu, C., Ruohonen, A., Spencer, N. and Vavură, N.M. (2022), "Management framework for higher education institution-based community innovations labs", *Management & Marketing. Challenges for the Knowledge Society*, Vol. 17, No. SI, pp. 364-380, DOI: 10.2478/mmcks-2022-0021.

Introduction

Higher Education Institutions (HEIs) are engines of community innovation and growth. Engagement of higher education institutions in their local communities enhances people's quality of life and environmental well-being. A growing literature has explored in this regard the role of innovation labs or other 'creative spaces' as a driver of healthy communities and economies (for instance, Schmidt & Brinks, 2017; Arndt et al., 2021). We observe the emergence of new spatial settings for experimentation and innovation, such as coworking spaces, fab labs, or living labs, aiming at stimulating an interactive and creative environment for problem resolution (Huertas et al., 2021; Real et al., 2022). However, attempts to conceptualize the relation between innovation labs linked to higher education and communities are still rare (Schmidt and Brinks, 2017). An umbrella term adopted in the paper, which captures the variety of such creative settings described in the literature, is community innovation labs. Following previous research, this paper defines the concept of community innovation lab (CIL) as an experimental setting established within HEIs to address societal challenges. Little is known about how (community) innovation labs are managed in practice or the main factors influencing their evolution or driving their performance (Osorio et al., 2020). This paper foresees a literature analysis on practical areas and elements of the management framework for community innovation labs, identifying the challenges for higher education institutions. The current paper reports the results of a two-written round Delphi study on the management framework of community innovation labs. The research aimed to shed light on the purpose and role of HEI-based CILs and the ways they benefit and add value to society. Furthermore, the research produced insight into governance, business method, capabilities and core activities deemed as necessary for the establishment of viable CILs in HEIs.

This paper proceeds by presenting a brief overview of research on community innovation lab management practices and frameworks. It continues by outlining the methodological approach. This is followed by a presentation of empirical findings and a discussion section, emphasizing theoretical and practical implications of the research findings. Conclusion, further recommendations and future avenues for research are following at the end.

Literature review

The community innovation concept, and labs in particular, have received increasing focus from academia as a tool for societal development (Păunescu et al., 2022; Perikangas et al., 2022). This is especially true in the last couple of years, where academic publications have begun increasing their coverage related to the impact of social innovation lab and similar concepts in various settings, different types of communities and across multiple countries. The perceived success of this type of organization, especially when tackling local level social issues, has prompted academia to pay more attention in recent publications to the measurement of the social impact of such organizations, and the modelling of key aspects related to guiding principles, structure and management models (Cole, 2022). This has been a sign of increasing involvement of Higher Education Institutions (HEIs) in developing and refining the activity of innovation labs, particularly community innovation labs (CILs), an aspect distinctly encouraged by some authors as HEIs are perceived as an integral part of community eco-systems (Lake et al., 2022). In this regard, we can already see examples of

HEIs choosing to increase social innovation activity through creating social innovation structures within their own institutions with the specific purpose of then developing community partnerships (Panitch et al., 2021).

As a result, in the context of current paper CIL was defined as an experimental setting in higher education institutions aimed to generating solutions to sustainability problems and fostering community learning and social innovation.

It should be noted that the literature treats multiple different denominations of CIL type organizations including community labs, social labs or living labs with innovation being a key objective of all of them (Asenbaum & Hanusch, 2021). One of the recent favourites in terms of publications is the concept of fab lab, short for fabrication laboratory, the number of which has grown exponentially in recent years with the advent of more digital technologies and developing cultures of entrepreneurship. A key aspect of fab labs seems to be a focus on developing community skills, especially when it comes to children, while increasing community integration of various groups (Garcia-Ruiz & Lena-Acebo, 2022).

While the direct implication of HEIs in the activity of fab labs has not been analysed in depth or seen as a driver for the activity of most labs, universities have been signalled as a significant stakeholder in such activity. This was especially pointed out with regard to producing an increased curiosity and propensity to pursue higher education in those attending lab related projects (Garcia-Ruiz & Lena-Acebo, 2022; Jeldes et al., 2022).

The increasing implication of HEIs, however, is becoming apparent with the growth of recent examples of HEIs or HEI-related actors becoming the main proponents of the development of fab labs by trying to define the key characteristics, structure, governance and principles by which labs should function given their envisioned purpose (Ben Rejeb & Roussel, 2022). This is very important, as these same initiatives pushed by HEIs have been almost immediately noted in subsequent studies to have been instrumental in the tackling of socio-economic crises, in particular the mitigation of the COVID-19 pandemic and its effects (Abbassi et al., 2022; Ghinea et al., 2017).

Overall, regardless of denomination with the increasing role of HEIs beyond a simple stakeholder in the activities of CIL type organizations, recent efforts of academics have begun to focus on defining in greater detail the specific frameworks through which CILs can be most effective in their mission and establish a standard for the way they should operate. Asenbaum and Hanusch (2021) consider that one of the key definitory characteristics of the way these labs operate is the equal engagement between the various groups of stakeholders that are participating in the lab's activity. This sort of democratic governance by the stakeholders is common among CILs, regardless of denomination. This is in line with the body of literature aiming to conceptualize the collaborative structures of innovation lab environments, such as the processes of co-creation and their value to 'academics, policymakers, and practitioners alike' (Rubalcaba et al., 2022).

Huertas et al. (2021) identify that the concept of CILs has already grown to include city level communities, where collaborative governance is not only more important given the level of diversity involved working with large communities, but also more complicated. Thus, they make the proposal that moving forward, data driven decision making and management should be the key approach. Not only is it necessary to have very clear frameworks for governance and management, but also a very well-developed feedback stream of data that can keep all stakeholders up to date on the progress of the solving of their issues and potential improvements. If there is one aspect that seems to be just as common as the

democratic nature of the governance of CILs is the co-design method of activity management, involving the community and relevant stakeholders directly into the research, with design-based research as a model for analysing, developing and implementing solutions (Geobey, 2022; Hernández-Pérez et al., 2022; Real et al., 2022; Sanchez et al., 2022).

The expansion of digital innovation and social spaces brings both opportunities for social co-creation and collaboration and challenges in terms of the organization, structure and evaluation of their activities (Romero-Frías & Robinson-García, 2017). The aspect of CIL governance and management is challenging not only at the macro level, but also at the micro level, for smaller communities revolving around a limited living space. The volunteering nature of CIL participation has been identified as potentially problematic, if there is no set minimum participation as communities tend to forego responsibilities in favour of leadership figures. At the same time-shared space and collective contact seems to also be a clear necessity in order to keep CIL members involved in its activity (Geobey, 2022).

It is readily apparent in the literature that labs should be user-centred, and research should be conducted and embedded into the community it serves. CIL activities and management should thus be aimed at solving practical local issues, involving local direct experimentation to be as relevant as possible to the issue that is being targeted by the community (Santonen et al., 2022). This is reflective of an active ongoing discussion in literature on the role of innovation labs as co-production platforms for public problem solving, pursuing more collaborative approaches to societal and public problems as well as policy design (see, e.g., McGann et al., 2021; Rubalcaba et al. 2022).

In addition to CIL governance and management, another key aspect that is starting to attract academic attention is the measurement of impact produced by CILs or other social organizations. Given the social nature of CIL activity, it is difficult to quantify certain parameters, but previous research has pointed towards indicators for the level of knowledge produced by open innovation approach of CILs (Yañez-Figueroa et al., 2022). The aspect of measuring social impact is increasingly relevant in the activity of CILs, especially as the data-driven feedback approach becomes an established standard for the operation of such forms of organizations.

Despite establishing that the role of higher education institutions is important in CIL activity and should be extended, the extent to which HEIs should be involved in the governance and management of a CIL has yet to be specifically established in order to be effective. The same can be said regarding the extent to which the CIL itself should be embedded into the community and through what mechanisms it should interact with the latter. In addition, while a democratic approach has been singled out as the proper system to apply in the governance of CILs, a particular format and effective practices involved remain unexplored. The exploration of co-design practices as well is lacking and does not provide a particular preferred methodology to be applied such as experiential or action-based learning.

In summary, the existing body of literature suggests an increased interest towards the development of CILs and similar structures. However, further conceptualization of CILs is needed, along with the better understanding of the effective governance and management practices of CILs as well as of the dynamics of HEI – CIL interaction and synergies. The present research aims to shed light on these knowledge gaps while supporting the important emerging phenomenon of innovation labs.

Method

Objectives, research questions and logic of inquiry

This paper aims at defining the management framework for community innovation labs linked to HEIs by applying the Delphi method. In the application of the Delphi method, the research relied on a structured qualitative method engaging a panel of experts to address a complex problem, where there was a high degree of ambiguity, lack of consensus, incomplete state of knowledge and uncertainty surrounding the area being investigated (for reference see, e.g., Okoli & Pawlowski, 2004; Skinner et al., 2015). The Delphi study employed a systematic process for structuring group communication and supported arriving at a group opinion or decision through consensus. As an interactive forecasting method, Delphi approach allowed for the understanding of the future of CILs. The application of the Delphi method included several steps: problem identification, specification of research questions, selection of experts and formation of the Delphi panel, development of the questionnaire, administration of the questionnaire to the Delphi panel members, data collection, data analysis for consensus in responses, and ranking of the relevant elements of analysis (see, e.g., Okoli & Pawlowski, 2004; Skinner et al., 2015).

The aim of the current Delphi study was to gather expert opinions on various elements of the management framework of HEI-based community innovation labs, as defined in the literature, and understand the priorities in managing successfully CILs. In the paper CILs were regarded as experimental settings established in higher education institutions aimed at addressing societal challenges and proposing viable solutions. Specifically, the research study investigated the following questions: (RQ1) What is the HEI-based CIL purpose and role, which is beneficial to society; (RQ2) What kinds of governance, business method, capabilities and core activities are necessary for the establishment of viable CILs in HEIs; and (RQ3) What forms of added value generated by CILs have the most potential for benefiting society? The expert opinions and arguments collected through a Delphi questionnaire survey were used as foundation for ranking the relevant elements of the management framework of HEI-based CILs on which consensus was reached, to further answer the research questions.

Research participants and expert panel selection

Following the Delphi methodology (see, e.g., Okoli & Pawlowski, 2004), the study did not require a statistical sample that attempts to be representative of any population, but qualified experts who have deep understanding of the problem investigated and the research questions. Therefore, one of the most critical requirements for the success of the present research and in the application of Delphi method was the selection of qualified experts.

The panel of experts selected for the current Delphi study included the Management Committee members of the Cost Action SHIINE "Multidisciplinary innovation for social change". This COST network included 1 or 2 country experts from 37 countries from Europe. Each expert from the network was selected at the country level based on his or her relevant expertise to the specific objectives of the Cost Action. Therefore, the experts included in the Delphi panel were highly qualified to address the problem investigated. Also, Delphi was desirable in this case as it did not require the international experts to meet physically.

Following recommendations from Delphi literature (e.g., Grisham, 2009; Garcia-Ruiz & Lena-Acebo, 2018), the suggested panel size was from 10 to 50 experts. For the current study data was collected online in a series of two rounds, the target panel size being 71

experts. The respondents remained anonymous to each other throughout the process (though not to the principal investigator).

Procedure of data collection

The present study reports the results of the two written Delphi rounds. The administration of the questionnaire to the experts and collection of data were done online via Survey Monkey, between April 13th and May 5th 2022 for the first round and between June 3rd and June 24th 2022 for the second round. Invitations to the experts were sent individually via email, each expert being contacted two or three times in total.

The questionnaire for the first round of the Delphi study was designed starting from the problem areas and management framework elements of HEI-based CILs identified in the literature. A 9-point Likert agreement scale was used to measure the strength of a subject's agreement with a clear statement (1 to 3 – completely disagree, 4 to 6 – do not disagree/ nor agree and 7 to 9 – completely agree). The questionnaire was structured around five dimensions of a CIL management framework as follows: (1) CIL purpose and goal (six questions), (2) CIL governance (four questions), (3) CIL business model and method (six questions), (4) CIL capabilities and core activities (seven questions), and (5) value added by CIL (five questions). The questionnaire consisted of a total of 28 questions or agreement statements, and 5 open boxes for comments, one after each dimension of the CIL management framework. The questions were provided with a tick box for the respondents to fill out their replies for each statement.

Following the first round, the questions on which no consensus was reached were fed back to the research participants as a new questionnaire in the second round. Statements that reached consensus in the first round were not included in the second round of the Delphi. Furthermore, some of the initial questions were reviewed to formulate precising and new questions in order to reconfirm some of the statements or to obtain additional insight. The qualitative comments along with the statistical results obtained in the first round were used to formulate the second questionnaire, which was fed back to the respondents as summaries.

The questionnaire for the second round was structured around five areas: (1) CIL significance and role (three questions), (2) CIL governance (seven questions), (3) CIL business model and method (four questions), (4) CIL capabilities and core activities (seven questions), and (5) value added by CIL (two questions). After each dimension of the CIL management framework an open box for comments followed. The collected data was analysed anonymously.

Methods of analysis

Hasson and Keeney (2011) suggested that the major statistical techniques that can be used in Delphi studies are measures of central tendency and level of dispersion, such as median and standard deviation. Schmidt (1997) described different nonparametric statistical techniques to be used in detail while applying the Delphi method, out of which Kendall's W coefficient of concordance is widely recognized as the best.

For the current research, the statistical measures analysed included median, standard deviation and mean. Following Lindl et al. (2020), median, along with mean and mode, was used as a measure of central tendency that determined the middle value of a dataset (centre of data distribution. The standard deviation (SD) was a measure of the amount of variation of a set of values. A high value for standard deviation indicated that the values are spread out

over a wide range. A low standard deviation indicated that the values tend to be close to the mean of the dataset. Values no greater than ±2 SD represented measurements that are closer to the true value (Lindl et al., 2020). Mean was used as a measure against which the relevant elements of the HEI-based CILs management framework (on which consensus was achieved) were ranked.

The analysis of the responses to each of the two rounds was done by employing the statistical measures (median, standard deviation and mean) using SPSS and textual responses and comments (qualitative data) provided by the panellists. The answers were grouped into three brackets (1 to 3 – completely disagree, 4 to 6 – nor agree/nor disagree and 7 to 9 – completely agree). Consensus was defined if 67% (minimum of 67% consistency in the answers) or more of the answers fell in one of the three brackets.

Results

Panellist representation

In the first round of the Delphi study, 71 experts (the target panel size) from 37 countries were invited, via email, individually, to take part in the Delphi survey, out of which 49 accepted the invitation. 48 responses were collected from 33 countries (67,61% response rate) (Table 1). In the second round all of the 48 panellists (the target panel size) who responded to Round 1 were invited again, individually, to fill in the second-round Delphi questionnaire survey. In addition, four more experts from the same 33 responding countries received the invitation to participate in Round 2 at their own request. 43 accepted the invitation and 38 valid responses were collected from 27 countries (73,07% response rate) (Table 1).

Table 1. Country representation in Round 1 and Round 2 of the CIL Delphi study

No.	Country	Representation Round 1 (N=48)	Representation Round 2 (N=38)
1	Albania	2	1
2	Austria	1	1
3	Belgium	1	1
4	Bulgaria	2	2
5	Croatia	2	2
6	Cyprus	1	1
7	Czechia	2	2
8	Estonia	2	2
8	Finland	2	2
10	France	2	2
11	Hungary	1	1
12	Iceland	2	2
13	Ireland	2	1
14	Israel	2	0
15	Italy	1	0
16	Latvia	1	1
17	Lithuania	2	1
18	Malta	1	0
19	Moldova	2	2
20	Montenegro	1	1
21	Netherlands	2	2
22	North Macedonia	1	1
23	Norway	1	1
24	Poland	1	0
25	Portugal	1	0
26	Romania	1	1

No.	Country	Representation Round 1 (N=48)	Representation Round 2 (N=38)
27	Serbia	2	1
28	Slovakia	1	1
29	Slovenia	1	0
30	Spain	1	2
31	Switzerland	2	1
32	Turkey	1	2
33	United Kingdom	1	1

Source: Authors' own research.

The results of the research are introduced via five key dimensions, including the significance and role of CIL, the governance of CIL, business model and method, CIL capabilities and core activities, and value added by CIL. The presentation of the results is followed by the discussion of the findings, their meaning and interpretation.

Results regarding CIL significance and role

After the two-round Delphi study consensus was achieved for seven out of nine items from the questionnaires concerning CIL significance and role (Table 2). Ranking of the items (on which consensus was reached) by mean led to the following priorities regarding HEI-based CIL significance and role (items selected by over 50% of the panellists or mean ≥ 8): (1) During 2020s, CILs are expected to play a significant role in designing the local, regional or country innovation agenda, as part of the challenge-driven university (mean=8.36); (2) CILs are necessary to establish networks of people and multi-disciplinary teams that can address wider perspectives and seeing larger connections than HEI's own narrow specialties (mean=8.23); and (3) The aim of CILs should be to catalyse deeper, more sustainable, more creative approaches to systemic change (mean=8.03). Table 2 summarizes the level of consistency in the answers and statistical measures of central tendency for CIL significance and role, as first relevant element of the CIL management framework. The table summarizes only the data for the items on which consensus was reached (min. 67% consistency in the answers).

Table 2. CIL significance and role: consistency level and statistics

CIL significance and role	Consistency in the answers, % Round 1 (N=48)	Consistency in the answers, % Round 2 (N=38)	Median	Standard deviation	Mean
Design innovation agenda (at local, regional, country level)	69		9	0.73	**8.36**
Establish networks of people and multi-disciplinary teams	83		8.5	0.85	**8.23**
Govern increasing complexities in the operating environment	67		7	0.85	7.69
Contribute significantly to local or regional economy	75		7	0.75	7.64
Catalyse approaches to systemic change		87	8	0.87	**8.03**
Identify social inequalities & address them		79	8	0.73	7.83
Become a part of community's infrastructure		76	8	0.82	7.86

Source: Authors' own research.

Results regarding CIL governance

After the two-round Delphi study consensus was reached for four out of nine items from the questionnaires concerning CIL governance (Table 3). No consensus was achieved for the following items: embracing a culture of volunteering; distributing membership equally, each member having an equal sense of ownership; establishing societal impact as KPI of HEIs; and having an independent governance of CILs from the governance of HEIs. For the items on which consensus was reached, there is only one priority regarding HEI-based CIL governance that emerged from the research (items selected by at least 50% of the panellists or mean ≥ 8), namely: HEI-based CIL's governance should cultivate and rely on collaborative work, collective intelligence and open innovation (mean=8.11). Table 3 summarizes the level of consistency in the answers and statistical measures of central tendency for CIL governance, as second relevant element of the CIL management framework. The table summarizes only the data for the items on which consensus was reached (min. 67% consistency in the answers).

Table 3. CIL governance: consistency level and statistics

CIL governance	Consistency in the answers, % Round 1 (N=48)	Consistency in the answers, % Round 2 (N=38)	Median	Standard deviation	Mean
Cultivate collaborative work, collective intelligence and open innovation	73		8	0.75	**8.11**
Self-directed governance, consensus-based decisions		71	8	0.74	7.89
Create platforms for equitable participation		68	8	0.73	7.92
Ensure an effective two-way communication		87	8	0.89	7.76

Source: Authors' own research.

Results regarding CIL business model and method

After the two-round Delphi study consensus was achieved for seven out of eight items from the questionnaires concerning CIL business model and method (Table 4). No consensus was reached for the item 'supporting learning by developing as opposed to learning by doing'. For the items on which consensus was reached, the ranking of the items by mean led to the following priorities regarding HEI-based CIL business model and method (items selected by over 50% of the panellists or mean ≥ 8): (1) The learning model employed by HEI-based CILs can be either problem-based or project-based learning. It should be action-oriented (develop, test, evaluate, iterate, apply) and allow real world experimentation (mean=8.14); (2) CILs should adopt an experiential learning model, a process of learning through experience exchange and experimentation, where insights gained are transformed into knowledge and innovation (mean=8.09); (3) HEI-based CILs can work as clusters of innovation; by engaging a wide range of societal actors, across sectors and professions, which are of relevance to or have an interest in a social challenge, CILs will facilitate an interactive learning process in joint development of solutions, through mutual exposure of views and experiences, expectations, and concerns (mean=8.08); (4) HEI-based CILs should apply an agile and iterative approach, which allows the evolution of multiple creative solutions over time

(mean=8.06); (5) CILs are expected to demonstrate how community engagement and responsible action can be embedded into the HEI curricula (mean=8.03); and (6) Understanding community and business challenges will create an understanding of what problems are interesting in the research undertaken by HEI-based CILs (mean=8.03). Table 4 summarizes the level of consistency in the answers and statistical measures of central tendency for CIL business model and method, as third relevant element of the CIL management framework. The table summarizes only the data for the items on which consensus was reached (min. 67% consistency in the answers).

Table 4. CIL business model and method: consistency level and statistics

CIL business model and method	Consistency in the answers, % Round 1 (N=48)	Consistency in the answers, % Round 2 (N=38)	Median	Standard deviation	Mean
Work as clusters of innovation	79		8	0.66	**8.08**
Research community and business challenges	77		8	0.75	**8.03**
Experiential learning model (experience exchange, experimentation)	67		8	0.80	**8.09**
Action-oriented learning, problem-based or project-based	77		8	0.74	**8.14**
Foster community learning		82	8	0.78	7.97
Demonstrate how community engagement and responsible action can be embedded into the HEI curricula		79	8	0.80	**8.03**
Apply an agile and iterative approach, allow multiple creative solutions over time		89	8	0.80	**8.06**

Source: Authors' own research.

Results regarding CIL capabilities and core activities

After the two-round Delphi study consensus was reached for all 13 items from the questionnaires concerning CIL capabilities and core activities (Table 5). Ranking of the items by mean led to the following priorities regarding HEI-based CIL capabilities and core activities (items selected by over 50% of the panellists or mean ≥ 8): (1) HEI-based CILs should glean needed expertise and skills from the community to make real social change (mean=8.33); (2) CILs should integrate individuals with disciplinary, professional and lived experience (mean=8.23); (3) HEI-based CILs should develop and test practical solutions in a real-life contexts and apply them on an experimental basis to the social realities that make up the context (mean=8.17); (4) CILs should engage with beneficiaries in a safe environment to generate ideas, test prototypes and re-design concepts/ solutions that solve the problem (mean=8.11); (5) It is desirable that community actors learn to use research as a way of identifying and creating future business opportunities, rather than simply trying to solve today's business problems (mean=8.09); (6) HEI-based CILs should combine academic and business knowledge, but also knowledge from grassroots organizations and community work approaches (mean=8.08); (7) HEI-based CILs should provide multi-disciplinary skills and expertise, a creative space or an area of experimentation for implementation of innovation projects and events (mean=8.08); and (8) Applying the principles of sustainable

development in business and community requires academic research expertise potentially offered by HEI-based CILs (mean=8.03). Table 5 summarizes the level of consistency in the answers and statistical measures of central tendency for CIL capabilities and core activities, as forth relevant element of the CIL management framework. The table summarizes only the data for the items on which consensus was reached (min. 67% consistency in the answers).

Table 5. CIL capabilities and core activities: consistency level and statistics

CIL capabilities and core activities	Consistency in the answers, % Round 1 (N=48)	Consistency in the answers, % Round 2 (N=38)	Median	Standard deviation	Mean
Academic research expertise	71		8	0.79	**8.03**
Meaningful work, impacting social and environmental goals	71		8	0.80	7.88
Multi-disciplinary skills, a creative space for experimentation	81		8	0.80	**8.08**
Mixed academic, community, and business expertise	83		8.5	0.75	**8.33**
Core activities: ideation, experimentation, evaluation, iteration, and implementation	73		8	0.75	**8.11**
Develop and test practical solutions in a real-life context	75		8	0.73	**8.17**
Use research as a way of creating future opportunities	73		8	0.84	**8.09**
Create grounds for systemic thinking		79	8	0.85	7.87
Produce visions of what 'better' is and might be like		71	8	0.79	7.96
Explore systems change and its responses to various interventions		79	8	0.76	7.87
Mixed knowledge: academic, business, grassroot organization, community work		95	8	0.79	**8.08**
Integrate individuals with disciplinary, professional and lived experience		82	8	0.66	**8.23**
Explore emerging technologies to investigate positive social change		84	8	0.81	7.97

Source: Authors' own research.

Results regarding CIL value-added

After the two-round Delphi study consensus was achieved for six out of seven items from the questionnaires concerning CIL value-added (Table 6). No consensus was reached in what regards the results expected from CILs linked to HEIs that should be complementary to NGOs. For the items on which consensus was reached, the ranking of the items by mean led to the following priorities regarding HEI-based CIL value-added (items selected by at least 50% of the panellists or mean ≥ 8): (1) HEI-based CILs should promote the design of evidence-based public policies, which foster inclusive models of innovation and the economy development at the local/ regional/ country level (mean=8.0); and (2) HEI-based CILs should provide an experimental setting for the prototyping of social innovations to assist individuals and organizations in the formulation of models, prototypes and evaluations that facilitate

community development (mean=8.0). Table 6 summarizes the level of consistency in the answers and statistical measures of central tendency for CIL value-added, as fifth relevant element of the CIL management framework. The table summarizes only the data for the items on which consensus was reached (min. 67% consistency in the answers).

Table 6. CIL value-added: consistency level and statistics

CIL value added	Consistency in the answers, % Round 1 (N=48)	Consistency in the answers, % Round 2 (N=38)	Median	Standard deviation	Mean
Develop experimental education models	75		8	0.76	7.92
Enhance the employability of students, foster entrepreneurial development	83		8	0.82	7.93
Prototype social innovations that lead to community development	67		8	0.77	**8.00**
Design evidence-based public policies	75		8	0.80	**8.00**
Early-stage policy design across sectors and professions	69		8	0.69	7.94
Help democratise social innovation and who can be a change maker		76	7	0.97	7.55

Source: Authors' own research.

Discussion

The results point towards the evolution of CIL as a concept and offer insight into the future of CILs, their value and HEI integration. Supporting the existing literature, the research demonstrates CIL as complex and multidimensional (see, e.g., Schmidt and Brinks, 2017). CIL may shape differently and manifest in numerous forms depending on context and environment. However, the results of this study offer a developing management framework that will enhance theoretical critiques and support practical managerial considerations.

The results showed that CILs are anticipated to play a significant role in designing the local, regional or country innovation agenda. This is to be achieved as part of the challenge-driven university and HEI environment. The HEIs' contribution within the process is expected to advance from narrow specialties towards establishing networks of people and multi-disciplinary teams that can address wider perspectives and seeing larger societal connections – the aspect to be reinforced by CILs.

While the significance of CILs appeared undisputed, the results demonstrate the lack of clear understanding of the governance methods of CILs as organizations. This indicates the great need and opportunity for proactive dialogue, exploration and pilot solutions of effective forms of CIL governance independently and in relation to HEIs. However, one critical aspect of governance was consensually highlighted: the notable role of CILs in cultivating collaborative work, collective intelligence and open innovation. This was reinforced in the discoveries made in respect to CIL business model alternatives. In the business model vision for CIL operating as clusters of innovation was noted.

Analysis of the results indicates the great need for CILs to be practice-oriented and effective in addressing concrete issues, such as business challenges. Action-oriented learning, problem-based or project-based business models along with experiential learning models (experience exchange, experimentation) were highly desired and viewed as critical elements of CILs operation mode.

In order to achieve the above vision, the research results show that CILs will need to become diversified talent pools. CILs are expected to attract mixed academic research, community and business expertise. This offers yet another important integration between CILs and HEIs in terms of recruiting, attracting, growing and nurturing the talents required for development and testing of practical solutions in a real-life context and achieving meaningful community impact. The results show that some of the core CILs functions include ideation, experimentation, evaluation, iteration and implementation of future opportunities. This is to be achieved by means of integrating individuals with disciplinary, professional and lived experience.

Prototyping social innovations were perceived to go hand-in-hand with and to support the design of evidence-based public policies. This study's results suggest that CILs, through the development of policy-relevant evidence, could contribute to policy deliberation and decision making. The findings identify that CILs should inform policymaking related to inclusive models of innovation and influence innovation agenda setting at local, regional, and national scales. The results indicate, in this context, that a role for HEI-based CILs is to develop action-based experimentation that explores the interfaces between local populations and community development initiatives and the contextual policy environment related to innovation-led sustainable development. It is imperative that structural formation of a HEI-based CIL and the capabilities it can utilise supports the development of these evidence bases and that it develops and nurtures the relationships and forums that allow these community anchored public policy dialogues to take place (Cole, 2022).

This study's results suggest that a role for HEI-based CILs is to catalyse more sustainable and more creative approaches to systems change and indicate that this might be achieved by both a CIL's form and content. Over time, by targeting challenges arising from across communities, a CIL should generate understanding of how inequalities manifest and are experienced differently in local contexts and be able to explore interventions for reducing different forms of structural barrier. Further, the results indicate that CILs, in their governance and operation, would seek to model more inclusive approaches to democratizing social innovation; the processes, practices and structures that determine who can be a change maker. Appropriate documentation and analysis of this dual approach suggests areas of leadership and knowledge exchange relating to systems change research. Osorio et al. (2020) also found that a shared strategic intent, a community-based approach and effective governance mechanisms are some critical factors that may enable or limit innovation labs to evolve in a sustainable manner.

This study's results suggest that a core activity for HEI-based CILs is to develop understandings of and leverage community competencies while further enhancing the capacity of communities to actively participate in processes of change and practices of community design and entrepreneurship. Sanchez et al. (2022) also acknowledged the importance of building, growing, and nurturing a learning community as a key challenge in the successful implementation of an innovation lab. The study's results produced consensus upon a significant range of CIL capabilities and core activities. Relationships between these activities and capabilities will need to be understood with greater clarity in specific CIL contexts. This can be an ongoing concern for a CIL as it gradually embeds within, and overtime becomes part of a community's infrastructure. Enhancing the capabilities and their coordination within a region so they are better equipped to respond to community challenges and catalyse systems change is a key practical consideration highlighted by these results.

This study utilised 'HEI-based CIL' as a key conceptualisation. However, is the HEI-based aspect of this a useful framing? The results of this study highlight the importance of mutual exchange and co-development across different aspects of civic society. Rather than reinforcing the conceptualisation of a HEI-based CIL, we suggest that these results indicate understandings of the role and priorities of HEIs in CILs. This, then, leaves open how a CIL can manifest across and within communities when operationalized through this developing management framework.

Conclusion

The paper presented a developing management framework for community innovation labs linked to higher education institutions, as resulted through application of the Delphi method with a panel of qualified experts from Cost Action SHIINE "Multidisciplinary skills for social innovation". The results showed that areas of significance and role, governance mechanisms, business model and method, core capabilities and activities and value added are the key elements of an effective management framework for HEI-based CILs. Based on the mean rank of the items for each element of the proposed CIL management framework, several priorities were identified.

As such, during 2020s it is expected that CILs will play a significant role in designing the local, regional or country innovation agenda. Also, they are expected to establish networks of people and multi-disciplinary teams that can address various societal challenges, while aiming at catalysing deeper, more sustainable and more creative approaches to systemic change. Concerning CIL governance, it is expected that CILs will cultivate a collaborative work, collective intelligence and open innovation. The governance of CILs should continuously keep open lines of dialogue and feedback with its networks' members and communities.

In what regards CIL business model and method, the operating model adopted by HEI-based CILs should be action-oriented (problem-based or project-based learning), allowing for real world experimentation. The experiential learning model adopted will rely on experience exchange and experimentation, where insights gained are transformed into knowledge and innovation. HEI-based CILs can work as clusters of innovation. By engaging a wide range of societal actors, across sectors and professions, CILs will facilitate an interactive learning process in joint development of solutions, through mutual exposure of views and experiences, expectations, and concerns. The iterative approach applied by CILs should allow the evolution of multiple creative solutions over time. Moreover, CILs are expected to demonstrate how community engagement and responsible action can be embedded into the HEI curricula and what problems in this area are interesting in the research.

In what concerns CIL capabilities and core activities, CILs are expected to glean needed expertise and skills from the community to make real social change, by integrating individuals with disciplinary, professional and lived experience. CILs should develop and test practical solutions in a real-life context and apply them on an experimental basis to the social realities that make up the context. This will be done through engagement with beneficiaries and community actors who will use research as a way of identifying and creating future business opportunities. HEI-based CILs are expected to combine academic and business knowledge, but also knowledge from grassroots organizations and community work approaches and provide a creative area of experimentation for implementation of innovation projects and events. Finally, concerning CIL value added, CILs are expected to support with

priority the design of evidence-based public policies, which foster inclusive models of innovation and the economy development. Also, CILs should encourage prototyping of social innovations that assist individuals and organizations in the formulation of models, prototypes and evaluations that facilitate community learning and development.

The purpose of this research was not to produce generalizable results on the management framework of community innovation labs. On the contrary, this paper aimed to provide insights into how the application of the proposed management framework and the list of priorities identified could help to understand the strategic orientation and the effective management of HEI-based CILs. The research findings are also worthwhile in terms of inspiring practitioners to prioritize future actions. However, this research is not without limitations. The results presented are limited to the opinions and arguments of the experts selected in the panel. Further research should also include perspectives of other stakeholders and communities around the innovation labs. Also, data was collected only virtually, during two written Delphi rounds. Further research should ask each expert to individually submit a rank ordering of the items for each element in the CIL's developing management framework. This can be done online or physically. The questionnaire should also ask experts to submit comments explaining or justifying their rankings. The research should also determine quantitatively the ranks of the items in the lists. One metrics recommended for measuring nonparametric rankings is Kendall's W coefficient of concordance (Schmidt, 1997). This process should be iterated until strong coefficients of concordance will be achieved.

Acknowledgement

This paper is based upon collaborative work from COST Action SHIINE "Multi-disciplinary Innovation for Social Change", supported by COST (European Cooperation in Science and Technology).

References

Abbassi, W., Harmel, A., Belkahla, W., & Ben Rejeb, H. (2022). Maker movement contribution to fighting COVID-19 pandemic: insights from Tunisian FabLabs. *R and D Management, 52*(2), 343-355. https://doi.org/10.1111/radm.12503.

Arndt, F., Ng, W., & Huang, T. (2021). Do-It-Yourself laboratories, communities of practice, and open innovation in a digitalised environment. *Technology Analysis & Strategic Management*, *33*(10), 1186-1197.

Asenbaum, H., & Hanusch, F. (2021). (De)futuring democracy: Labs, playgrounds, and ateliers as democratic innovations. *Futures, 134*, Article 102836. https://doi.org/10.1016/j.futures.2021.102836.

Ben Rejeb, H., & Roussel, B. (2022). Perspectives on the evolution of a fabrication laboratory in an emerging country: a comparative lexicometric study of European FabLabs. *Journal of Manufacturing Technology Management, 33*(2), 399-422. https://doi.org/10.1108/JMTM-01-2021-0007.

Cole, L. (2022). A framework to conceptualize innovation purpose in public sector innovation labs. *Policy Design and Practice, 5*(2), 164-182. https://doi.org/10.1080/25741292.2021.2007619.

Garcia-Ruiz, M.-E., & Lena-Acebo, F.-J. (2022). FabLabs: The Road to Distributed and Sustainable Technological Training through Digital Manufacturing. *Sustainability, 14*(7), Article 3938. https://doi.org/10.3390/su14073938.

Garcia-Ruiz, M.-E., & Lena-Acebo, F.-J. (2018). Application of the Delphi methods in the design of a quantitative investigation on the FabLabs. *Empiria*, *40*, 129-166.

Geobey, S. (2022). Reckoning with Reality: Reflections on a Place-Based Social Innovation Lab. *Sustainability, 14*(7), Article 3958. https://doi.org/10.3390/su14073958.

Ghinea, V.M, Dima, A.M., & Hadad, S. (2017). Excellence model for sustainable convergence in the EU higher education, *Amfiteatru Economic Journal*, 19(11), SI, 1107-1122.

Grisham, T. (2009). The Delphi technique: a method for testing complex and multifaceted topics*. International Journal of Managing Projects in Business, 2*(1), 112-130. DOI: 10.1108/17538370910930545.

Hasson, F., & Keeney, S. (2011). Enhancing rigour in the Delphi technique research. *Technological Forecasting and Social Change*, *78*, 1695-1704.

Hernández-Pérez, O., Vilariño, F., & Domènech, M. (2022). Public Libraries Engaging Communities through Technology and Innovation: Insights from the Library Living Lab. *Public Library Quarterly, 41*(1), 17-42. https://doi.org/10.1080/01616846.2020.1845047.

Huertas, J., Mahlknecht, J., Lozoya-Santos, J., Uribe, S., López-Guajardo, E., & Ramirez-Mendoza, R. (2021). Campus city project: Challenge living lab for smart cities. *Applied Sciences, 11*(23), Article 11085. https://doi.org/10.3390/app112311085.

Jeldes, J., Cortés-Morales, S., Rodo Lunissi, R., & Moreira-Muñoz, A. (2022). Aconcagua Fablab: Learning to Become with the World through Design and Digital Fabrication Technologies. *International Journal of Art and Design Education, 41*(1), 23-38. https://doi.org/10.1111/jade.12394.

Lake, D., Motley, P., & Moner, W. (2022). Completing the CiCLE: long-term assessment of community-involved collaborative learning ecosystems for social innovation in higher education. *Social Enterprise Journal, 18*(1), 28-50. https://doi.org/10.1108/SEJ-10-2020-0089.

Lindl, A., Krauss, S., Schilcher, A., & Hilbert, S. (2020). Statistical methods in transdisciplinary educational research. *Front. Educ.*, 5(97). doi: 10.3389/feduc.2020.00097.

McGann, M., Wells, T., & Blomkamp, E. (2021). Innovation labs and co-production in public problem solving. *Public Management Review*, *23*(2), 297-316.

Okoli, C., & Pawlowski, S.D. (2004). The Delphi method as a research tool: an example, design considerations and applications. *Information & Management*, *42*(1), 15-29. http://dx.doi.org/10.1016/j.im.2003.11.002.

Osorio, F., Dupont, L., Camargo, M., Sandoval, C., & Pena, J.I. (2020). Shaping a public innovation laboratory in Bogota: Learning through time, space and stakeholders. *Journal of Innovation Economics & Management*, 31, 69-100. DOI: 10.3917/jie.031.0069.

Panitch, M., Machado, J., Courneya, J., Idrees, A., & Wehbi, S. (2021). HEI as a pressure cooker: crafting the secret sauce to social justice in social innovation. *Social Enterprise Journal, 18*(1), 218-233. https://doi.org/10.1108/SEJ-10-2020-0080.

Păunescu, C., Lepik, K.L., & Spencer, N. (2022). Introduction: An Overview of the Research. In: Păunescu, C., Lepik, KL., Spencer, N. (eds) Social Innovation in Higher Education. Innovation, Technology, and Knowledge Management. Springer, Cham. https:// doi.org/10.1007/978-3-030-84044-0_1.

Perikangas, S., Kostilainen, H., Paananen, R., Määttä, A., & Kainulainen, S. (2022). A Human-Centric Co-creation Platform for Solving Wicked Social Challenges. In: Păunescu, C., Lepik, KL., Spencer, N. (eds) *Social Innovation in Higher Education*. Innovation, Technology, and Knowledge Management. Springer, Cham. https://doi.org/10.1007/ 978-3-030-84044-0_11.

Real, M., Pistofidou, A., & Juarez Calvos, M. (2022). FabLab Barcelona—Co-design With Food Surplus: Better Redistributing, Upcycling and Composting. In *Springer Series in Design and Innovation* (Vol. 15, pp. 17-42). Springer, Cham. https://doi.org/10.1007/978-3-030-78733-2_4.

Romero-Frías, E., & Robinson-García, N. (2017). Social Labs in Universities: Innovation and impact in Medialab UGR. *Comunicar*, 25(51), 29-38.

Rubalcaba, L., Strokosch, K., Hansen, A. V., Røhnebæk, M., & Liefooghe, C. (2022). Insights on Value Co-Creation, Living Labs and Innovation in the Public Sector. *Administrative Sciences (2076-3387)*, 12(1), 42. https://doi-org.ezproxy.haaga-helia.fi/10.3390/ admsci12010042.

Sanchez, E., Paukovics, E., Cheniti-Belcadhi, L., El Khayat, G., Said, B., & Korbaa, O. (2022). What do you mean by learning lab? *Education and Information Technologies, 27*(4), 4501-4520. https://doi.org/10.1007/s10639-021-10783-x.

Santonen, T., Petsani, D., Julin, M., Garschall, M., Kropf, J., Van der Auwera, V., Bernaerts, S., Losada, R., Almeida, R., Garatea, J., Muñoz, I., Nagy, E., Kehayia, E., de Guise, E., Nadeau, S., Azevedo, N., Segkouli, S., Lazarou, I., Petronikolou, V., … Konstantinidis E. (2022). Cocreating a Harmonized Living Lab for Big Data Driven Hybrid Persona Development: Protocol for Cocreating, Testing, and Seeking Consensus. *JMIR Research Protocols, 11*(1), e34567. https://doi.org/10.2196/34567.

Schmidt, R.C. (1997). Managing Delphi surveys using nonparametric statistical techniques. *Decision Sciences, 28*(3), 763-774.

Schmidt, S., & Brinks, V. (2017). Open creative labs: Spatial settings at the intersection of communities and organizations. *Creat Innov Manag.,* 26, 291–299. https:// doi.org/ 10.1111/caim.12220.

Skinner, R., Nelson, R.R., Chin, W.W., & Land, L. (2015). The Delphi method research strategy in studies of information systems. *Communications of the Association for Information Systems*, *37*, Article 2. DOI: 10.17705/1CAIS.03702.

Yañez-Figueroa, J., Ramírez-Montoya, M., & García-Peñalvo, F. (2022). Measurement of the social construction of knowledge: validation and reliability of the K-Social-C instrument. *Social Network Analysis and Mining, 12*(1), 50. https://doi.org/10.1007/ s13278-022-00868-x.