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Social Lab: Toward Value-Driven R&D&I in Collaboration with Citizens

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Abstract

Digitalization is an important driver of valuable service offerings in most industrial sectors. With the increasing use of digital technologies, the negative consequences of digitalization have also attracted attention. To address this issue, R&D organizations need to ensure that their R&D&I process and its results are in alignment with desirable services that create value and mitigate citizens' social concerns. This requires a close partnership with citizens. However, attempts to take the values of citizens as a driver of technology R&D&I remain limited and tend to be temporary. Therefore, we introduce the concept of the "social lab" as an R&D&I scheme emphasizing service and value as core elements to foster the R&D&I of digital technology in a socially acceptable manner. We introduce our development of a social lab and discuss the required processes and challenges, especially for developing citizen partnership.

Keywords: social lab, citizen participation, R&D&I, responsible research and innovation
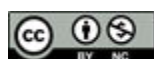
Introduction

Service and digital technology are essential parts in most industrial sectors. In the manufacturing industry, digital servitization has become a major management strategy to create more value for customers in a personalized manner (Gebauer et al., 2021; Paschou et al., 2020). In hospitality services, the adoption of technology has progressed both in the back office and at the customer-employee frontline in response to such advances in digital technology as service robots (De Keyser et al.,

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2019; Wirtz et al., 2018). Coronavirus disease 2019 (COVID-19) accelerated this trend, for example, by aiming for contact-less service encounters (Hazée & Van Vaerenbergh, 2020; Heinonen & Strandvik, 2020). This shift to digitalization is also significant in the public sectors to provide more resilient services (Field et al., 2021).

While digital technology has a strong potential to promote value creation, it may also destroy values among stakeholders (Čaić et al., 2018). There is growing concern about the negative impacts of digital technologies, such as losses of human autonomy and breaches of privacy (Dignum, 2018; Winfield & Jirotka, 2018). Recently, social and ethical considerations in the technology R&D process have been highly emphasized. R&D organizations that are developing and integrating digital technologies are required to adopt these ideas into their practices.

In the service research context, technology is an enabling part of the service system (Edvardsson & Olsson, 1996). Digital technologies should be developed and integrated to enhance value creation in the service system in the most effective manner. This "service first" thinking could change the process and results of R&D and the consequent innovations (hereafter, R&D&I) to become more adequate from the aspect of the values of stakeholders. When technology may have large social impacts, the values of citizens especially need to be considered. For example, human augmentation technology (HAT) has attracted attention in industries as a novel means to enhance value creation (Garry & Harwood, 2019; Raisamo et al., 2019). HAT like virtual reality (VR), avatar robots, and multimodal interaction technologies enhances humans' physical and cognitive capabilities (Ho et al., 2022; Raisamo et al., 2019). HAT has a strong potential to change our ways of living and working, both positively and negatively (Ho et al., 2022; Kishita et al., 2022). Hence, R&D organization should conduct R&D&I focusing on the values of citizens and value creation processes. However, attempts to take the values of citizens as a core driver of technology in R&D&I remain limited and have mostly been temporary (Compagnucci et al., 2021). To promote R&D&I with positive social impacts, current research schemes need to be reconsidered.

Against this backdrop, we introduce the concept of "social lab" as a new R&D&I scheme. Our social lab concept emphasizes service and value as core elements to foster the R&D&I of digital technology in a socially acceptable manner. This paper illustrates our journey toward developing a social lab specifically focusing on how to nurture a partnership with citizens for the R&D&I of HATs. We discuss the required processes and challenges for developing this citizen partnership for the social lab through an analysis of our collaborative activities since 2019.

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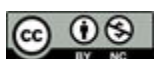Liveork

The remainder of this paper initially presents the research background, which covers digitalization, service design, and citizen involvement in the design process. We then introduce the concept of the social lab and its features, summarizing the journey of developing one in Japan. Finally, we discuss the lessons learned from our experience and the possibilities for future study.

Research Background

Digitalization of services and digital servitization

The utilization of digital technology in services is a recent trend in service research. In response to the advancement and diffusion of digital technologies, such as machine learning, the internet of things, and social robotics, many scholars have investigated how digitalization contributes to value creation in service systems (Huang & Rust, 2018; Ostrom et al., 2015; Ostrom et al., 2021; Wirtz et al., 2018). More recently, HAT has attracted attention as a new means to enhance service capabilities and experiences (Garry & Harwood, 2019; Ho et al., 2022). Digitalization and services are key topics in not only the service sectors but also manufacturing (Martín-Peña et al., 2019). Servitization of manufacturing, aiming to innovate business models beyond the "moving the box" business, is further accelerated by the effective use of data from digital technologies. This is actively discussed under the name of digital servitization (Gebauer et al., 2021; Kohtamäki et al., 2022; Paschou et al., 2020; Pirola et al., 2020). It is anticipated that data-driven service solutions or smart product-service systems (smart PSS) will realize more customized and well-suited value propositions for customers (Kohtamäki et al., 2022; Watanabe et al., 2020; Zheng et al., 2019).

The development and integration of digital technologies are crucial processes in both trends. In the service research context, the holistic design of service systems including digital technologies is essential for successful digitalization (Watanabe & Mochimaru, 2017; Zheng et al., 2018). While the design and development of smart service systems or smart PSS have been studied (Beverungen et al., 2017; Watanabe et al., 2020; Zheng et al., 2019), this concept has not necessarily been adopted in general R&D. As the development of new digital technologies is rapid, R&D&I activity should be properly aligned with the consequent implementation and innovation (Kosztyán et al., 2022). Service design is applied to specify and create stakeholder values by embodying the required activities and resources, including appropriate technologies (Yu & Sangiorgi, 2018). The integration of R&D&I and

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service design as a process of R&D organizations could increase the effectiveness and efficiency of ordinary R&D for promoting value creation.
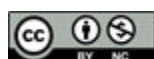
Social impact of digital technology and the role of service design

The social impact of digital technology has attracted both academic and public concerns in relation to R&D&I. This concern includes privacy breaches and the loss of human autonomy (Winfield & Jirotka, 2018). In response to this concern, a trans-disciplinary approach including citizen involvement is highlighted (Maynard & Scragg, 2019). The participation of stakeholders is also encouraged in the R&D&I process from the perspective of responsible research and innovation (Owen et al., 2021; Reber, 2017). National governments and non-government organizations are actively engaged in this issue, proposing ethical guidelines and principles for the development and implementation of digital technologies, especially artificial intelligence (Morley et al., 2020). Value-sensitive design, a design approach for information technologies taking ethical consideration, has also attracted attention to responses to technology concerns (Friedman et al., 2013).

Interest in the social impacts of digital technologies has been rather weak in service design research (Watanabe, Kishita, et al., 2021). However, some studies have addressed the consideration of social and ethical issues in service design. For example, Tsunetomo et al. (2022) proposed a design process for smart PSS considering social and ethical values. With the growing social impact of digital technologies, R&D organizations' need to arrange the R&D&I process to mitigate negative risks. Service design that focuses on value creation among stakeholders has a strong potential to contribute to this issue.

Living lab

Citizen participation is essential when addressing the social needs of technologies (Owen et al., 2021). The living lab is a common approach for this aim. According to the European Network of Living Labs (ENoLL), "living lab" refers to the "open innovation ecosystems in real-life environments using iterative feedback processes throughout a lifecycle approach of an innovation to create sustainable impact" (ENoLL, n.d.). Living labs have been commonly adopted in R&D projects such as welfare technologies (Edwards-Schachter et al., 2012), aiming to foster user-centered development through citizen involvement. Technology acceptance and its effectiveness in meeting social challenges are important topics handled in the living lab project (Compagnucci et al., 2021). This approach will be a central part of the future R&D&I for digital technologies.

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One challenge for living lab is its continuity. Most living lab activities are sustained by public funds with limited project periods. This means that the activity tends to cease when the project ends (Hossain et al., 2019). Another challenge in technology R&D is that citizen participants can be exploited for the R&D aims of technology developers and organizations. This has been criticized in living lab research, and a well-balanced cooperative scheme contributing to both the organizers and participants needs to be established (Ley et al., 2015; Ogonowski et al., 2013).

Social Lab

The term "social lab" was first coined by Hassan (2014) to refer to a platform for multiple actors to address complex social problems. Timmermans et al. (2020) have further conceptualized its methodology under six features: a space for experimentation, social experiments in real-life settings, the involvement of various stakeholder groups, interdisciplinarity, multi-level experimentation, and iterative, agile learning cycles. We share the common interest with the existing definition and methodology of social lab, focusing on social challenges; however, in our understanding, their concept aiming to "truly move away from technology and natural sciences focus" (Timmermans et al., 2020, p. 414) makes it difficult for R&D organizations to adopt it. Hence, we reconceptualize social lab as a strategic shift of R&D organizations to tackle social challenges.

"Social lab" in this paper refers to an R&D&I scheme to foster a socially acceptable implementation of digital technologies in the service form through cooperation with citizens. A conceptual sketch of the social lab is shown in Figure 1. In this scheme, an R&D organization has design researchers in addition to ordinary technology researchers. Design researchers conduct value explorations and study design services for extended values with citizens and other stakeholders such as companies and municipalities. These design practices are conducted in parallel with technology R&D. The design researcher communicates with or even involves R&D researchers in sharing ideas about the values that need to be fulfilled and the services expected. The technology is then developed and integrated into the designed service.

To implement digital technologies to meet stakeholder values, it is essential to address what these values are and how to satisfy them. These are the critical questions of service design, and the value exploration and service design practices lead the required R&D. While the motivation and research span of technological R&D do not always match the value exploration and service design processes, specified values can help clarify the potential direction of R&D and service design so that they
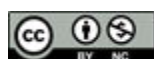
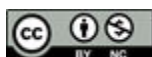integrate well-aligned technologies that will be effective in creating values and mitigating social risks.

To make this value-driven R&D&I a standard practice of R&D organizations, the social lab is meant to foster closer researcher–citizen collaboration. More accurately, a social lab needs the following features:

- Long-term partnership
  The existing approaches to involve citizens in research (i.e., living labs) tend to be project-based and discontinued in the long term (Hossain et al., 2019). As citizen involvement requires time and effort to develop mutual trust, it is inefficient to stop cooperation with citizens based on the timing of collaborations. Moreover, this could even lead to distrust of researchers. The social lab aims to maintain a long-term citizen partnership regardless of project periods. With a continuous citizen community, researchers can start cooperating with citizens having specific interests immediately when a new initiative is begun.

- Mutual learning
  To identify the social issues that R&D&I activities need to address, both design and R&D researchers should learn what kinds of difficulties and challenges citizens confront in the social context. In addition, citizens also need to learn what digital technologies can do for them. Digital technology tends to be considered silver bullets or magic wands by non-technologists (Watanabe et al., 2023). The mismatch between their expectations and the technology's actual function tends to cause disillusionment with technologies and collaboration with researchers (Watanabe & Mochimaru, 2017). Hence, mutual learning between researchers and citizens about each other's realms is essential for effective collaboration (Timmermans et al., 2020).
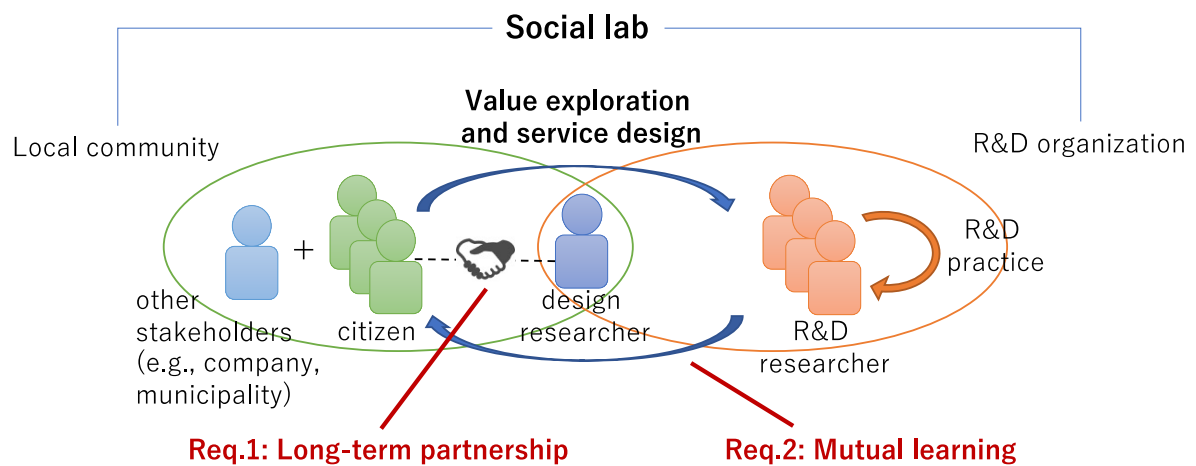
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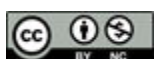Figure 1. Social lab concept and its requisites

Journey of Developing a Social Lab

To embody the concept of social lab in the actual research activities of our own organization, we as design researchers initiated collaborative actions with citizens in 2019. In this study, we analyze our activity processes and results in public reports and internal records to clarify effective practices and approaches for strengthening our collaborative relationship with citizens (Dalsgaard & Eriksson, 2013) for value-driven R&D&I. In this section, we introduce our journey toward establishing a social lab.

2019–2020: Engaging with citizens

Our first action was to create a solid ground of citizen partnership in the Kashiwa-no-ha region where our research organization, Human Augmentation Research Center, AIST is situated. For this, we created a "citizen advisor" program in November 2019 (Watanabe, 2020). This program was designed to organize a citizen community of those who are interested in technologies and regional issues and wish to work with researchers. The number of citizen advisors is 46 as of April 2023.

After the launch of this citizen community, COVID-19 spread across Japan and the globe, making face-to-face communication with citizens impossible. To maintain the network and nurture a longer relationship with citizens, the organizing members had regular virtual cafe-talk meetings once or twice a month in 2020 whose topics included general findings and changes in life under the influence of COVID-19 and technology-related experiences such as COVID-19 contact apps, the role of care

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technologies, virtual entertainment, and virtual tourism (Watanabe, 2020). R&D researchers also participated in several meetings with technology topics. These talks revealed the changing ideas of life during the COVID-19 experience.
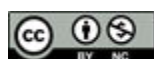
In addition, a collaborative event with citizens called "Yachallenge" was launched in 2020 to promote the innovative minds of local citizens and create an innovative culture in the region (Yachallenge, 2023). The first year's event theme was a "100-day challenge." Under this theme, the participants tried certain challenging topics such as learning a new language or developing a two-legged robot for 100 days. The results were broadcast in a webinar. Some citizen advisors joined the organizing team of the event. The event has been organized annually since then.

2021: Mutual learning

The first two years were devoted to developing a collaborative relationship with citizens. To broaden the range of citizen participation and proceed with mutual understanding between researchers and citizens, we arranged mini-school programs for citizens (Watanabe & Akasaka, 2021).

The mini-school programs were of two types: tech mini-school and design mini-school. Three sessions were organized for each type of the programs (six sessions in total) and approximately 50 participants in total joined the sessions. The tech mini school aimed to provide an opportunity for citizens to learn about HAT. In this program, we demonstrated various HATs including VR, avatar robots, and multimodal sensing technologies. The citizen participants explored the potential benefits and threats to their future lives when these technologies become available. This was a learning opportunity not only for the citizens but also the researchers as they became familiar with the potential impact of technologies from the citizens' perspective. The design mini-school provided citizens with collaborative skills such as deep listening and inspiring discussions. This aimed to nurture collaborative minds and skillsets in citizens, which could foster researcher–citizen collaboration and also citizen-led innovation. These occasions allowed the development of mutual learning opportunities between researchers and citizens.

Moreover, we started to develop actual services in collaboration with citizens. In the initial case, a virtual lab tour program was co-developed with citizens (Watanabe & Akasaka, 2021), enabling remote participants to walk through our research lab using an avatar robot. The first prototype program was experienced by citizen advisors. Based on their feedback, an education program for local high school students was organized (Watanabe & Akasaka, 2021). Two courses were held for first-year students and second-year students. After the lab tour experience for the second-year students, the students discussed their vision for future schools where HATs would be

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used. The participants mentioned not only the positive impacts but also potential threats. These ideas were insightful for the researchers. Through the experiences of different actors in the region, a new type of service has been gradually developed.

2022: Co-creation in projects

In 2022, project-based co-creation activities were organized based on the researcher–citizen relationship and the surrounding networks. This enables in-depth collaboration between researchers and citizens and idea generation leading to R&D&I well-suited to meeting social needs (Baumann et al., 2017). In addition, such co-creating experiences deepen mutual understanding on a specific topic (Simonsen & Robertson, 2012), which contributes to meaningful R&D&I.

One of the projects is a four-month-long co-creation program with citizens to create a future vision of living environments for seniors (Akasaka, Mitake, Watanabe & Kawasaki, 2023). In collaboration with the town management organization, this program led 17 citizen participants of different ages (20s–70s) in designing imaginary living environments and services for themselves based on their experience and the knowledge obtained regarding senior lives and future technologies. To this end, the program started with lectures on aging and assistive technologies and introductory design workshops to explore the participants' desirable future after reaching old age; thereafter, the participants designed their visions. Several R&D researchers also participated in the program in different roles, such as a technology informant, an advisor, and a design participant. This will contribute to the R&D&I of health and welfare technologies by shedding light on the requirements of future generations.

Moreover, several research projects have been organized in a way that adopts citizen ideas in research activities. For example, Akasaka, Mitake, Watanabe, Nishikawa et al. (2023) seek to involve citizens in the vision design for developing digital service systems to realize a human-cantered smart city. The connection with R&D&I activities is being developed further in our organization.

Discussion

Development process of the social lab

The journey described in the previous section was not necessarily fully planned in advance. The process was affected by various unexpected factors. For example, the COVID-19 pandemic caused a fundamental change in the method of communicating with citizen advisors. Nevertheless, we were able to learn a meaningful approach and several insights through this journey.
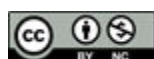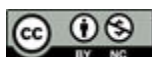
In 2019–2020, we aimed to develop a relationship with citizens without project-oriented purposes, which is unusual compared to the usual citizen collaboration and living lab approaches (Hossain et al., 2019). The period for the relationship development was almost one year. Although the contact was limited to virtual meetings, citizens and researchers were able to communicate with each other through continuous cafe-talk sessions, which might have helped develop friendly relationships among them. Moreover, researchers were also able to obtain a basic understanding of the concerns and challenges the citizen participants felt and their impression of technologies through the themed sessions. This communication period would nurture the engagement and trust that are the basis of the long-term citizen partnership.

In 2021, we shifted our activities to provide an opportunity to learn technologies and collaboration skills based on the experience in the cafe talks. The original expectation was to attract more participants to the citizen advisor activities for deeper collaboration. Eventually, some participants in the mini-schools joined the advisor program. Moreover, we were able to learn the participants' interests and concerns about HATs, while enabling the participants to learn more about them. The knowledge gap between technology providers and their users about technology features and user problems tends to cause a mismatch in expectations, leading to a failure (Watanabe et al., 2023). Hence, mutual understanding through learning experiences would help researchers and citizens collaborate on specific topics. Contrariwise, it is difficult to assess the effect of communication skills learned in the design mini school, though they should contribute generally to the mutual learning of parties with different perspectives (i.e., researchers and citizens).

The project-based cooperation that mainly started in 2022 was supported by the prior understanding of the interests and concerns of citizen advisors and other participants. The aforementioned co-creation program started with mutual learning opportunities (i.e., lectures and introductory design workshops) before vision development. The results of this mutual learning process could serve as important assets for co-creating practices. The service design experiences clarify value propositions, which can be directly connected to R&D activities. Although the R&D&I collaboration is still ongoing, this process contributes to the development of the social lab.

Figure 2 illustrates the development process for the social lab in this study. While it is a preliminary model, it would be meaningful for determining the steps to take in establishing a long-term partnership and mutual learning relationship with citizens for the establishment of the social lab. R&D&I activities could work properly based on these assets. Further research is needed, however, to generalize this process.
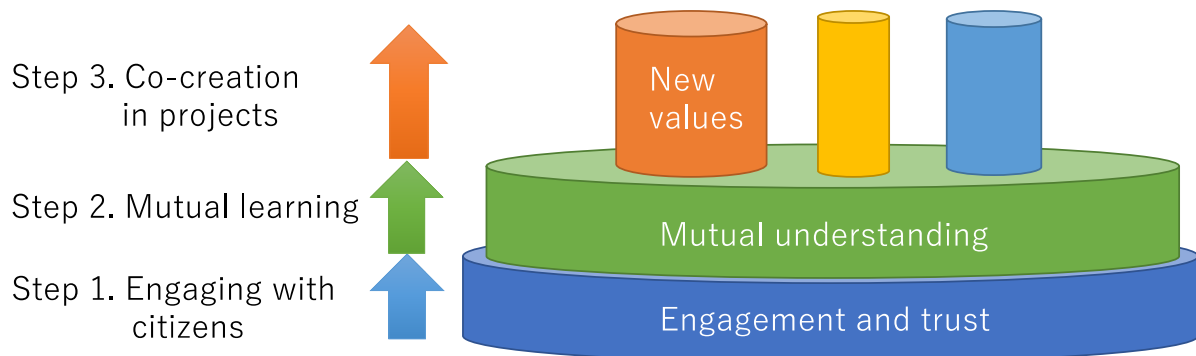
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Step 3. Co-creation
in projects

Step 2. Mutual learning

Step 1. Engaging with
citizens

New
values

Mutual understanding

Engagement and trust

Figure 2. Development process of the social lab
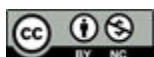
Challenges in developing the social lab

Several challenges were observed in the development of our social lab.

First, the challenge of developing a long-term relationship entailed a lack of resources for continuous engagement. The arrangement of meetings with citizens required human resources. This has been a major challenge throughout the whole development process until the present. Stable resources such as organizational support are essential for the continuous operation of the social lab.

Second, further effort is required to involve diverse participants in social lab activities. The variety of participants that appear in this paper was not necessarily narrow, ranging from young students to senior adults through collaborations with high schools and senior communities. However, to elicit different views in the R&D&I practices, it is meaningful to include more diverse members with different needs and contexts.

Third, we need to be cautious about courtesy bias, which could hinder effective feedback from the participants, especially as the relation with researchers becomes longer (Watanabe et al., 2023).

Fourth, it is also important to consider how to maintain the motivation of participants to participate in this initiative (Marschalek et al., 2022). In the short term, it is effective to provide opportunities to learn something interesting. However, to ensure the sustainable operation of this process, it is essential that all participants be self-motivated to participate. The event "Yachallenge" was intended to cultivate innovation cultures, which would help citizens find their own motivations.

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Concluding Remarks

This paper introduced our journey toward developing a social lab, an R&D&I scheme that includes the concept of service system design. The social lab highlights cooperation with citizens for socially acceptable technology development and integration based on a long-term researcher–citizen partnership and mutual learning. This paper specifically illustrates the process to develop cooperation with these two features, which can promote R&D&I with positive social impacts.
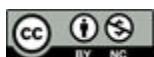
The journey toward establishing a sustainable social lab is still ongoing. Currently, several projects include these collaborative practices in R&D&I activities whose results could form the basis of an updated social lab model. In future research activities, we would like to collaborate with citizens in other areas and connect the results with R&D&I. By connecting the co-creative initiatives in different places with the R&D organization, the results would be more generalized and impactful. A comparative study with other countries will also be beneficial for generalizing this R&D&I model. We thus expect further collaboration with international partners.

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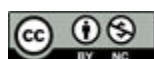https://doi.org/10.1080/02642069600000019

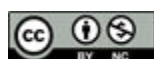Edwards-Schachter, M. E., Matti, C. E., & Alcántara, E. (2012). Fostering quality of
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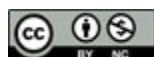DAD | PUC-Rio Pontifícia Universidade Católica Do Rio De Janeiro
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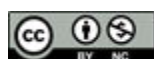
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