(Co-)learning and (Co-)evaluation in Scholarly Ecosystem: Challenges and Opportunities in the Covid-19 Era

Francesco Polese, Carlo Alessandro Sirianni, Mara Grimaldi, and Antonietta Megaro

Abstract The study aims at exploring the influence of global coronavirus pandemic on teaching, learning and evaluation processes involved in Higher Education (HE) by analysing the way in which knowledge exchange is reframed through ICTs and technology. Through the interpretative lens of Service Dominant logic, the chapter rereads HE as an ecosystem and investigates theoretically: (1) the transformations introduced in information management, technology adoption, resource integration, value co-creation and co-learning processes to challenge the sanitary emergency; (2) the way in which the adoption of this transformation can redefine the rules, practices and institutions in Higher education system. The results identify the different technological touchpoints that can be implemented in teaching, learning and evaluation to boost co-learning and the different mechanisms that can foster the emergence of social change and innovation.

Keywords Higher education · Service ecosystems view · Co-learning · Co-evaluation · Social change

1 Introduction

The diffusion of Covid-19 gives birth to technological, political, social, and managerial evolution, which is changing dramatically business management, people's interactions, daily lives, and work environment. The challenge to the global pandemic requires companies to reorient their strategies, redesign their business models and redefine their relationships with stakeholders. This process seems to have lasting effects on the use of technologies by introducing new waves of innovation (Azoulay & Jones, 2020) in different industries and business contexts and by advancing new tools,

F. Polese (✉) · C. A. Sirianni · M. Grimaldi · A. Megaro
University of Salerno, Fisciano, Italy
e-mail: fpolese@unisa.it

C. A. Sirianni
e-mail: carlo.sirianni@unisa.it

© Springer Nature Switzerland AG 2022

E. Gummesson et al. (eds.), *Improving the Evaluation of Scholarly Work*,
https://doi.org/10.1007/978-3-031-17662-3_8

platforms, applications and means to manage old problems (relational asymmetry, information sharing, knowledge management).

Even if the effects of the global crisis cannot yet be fully assessed and measured, the use of smart technologies can be considered as one of the key factors for emergency management (Ivanov & Dolgui, 2020; Palmieri et al., 2016). Technology plays a key role in the enhancement of information and knowledge management, especially in services based on the provision of culture such as education and higher education, by redesigning the processes of culture sharing, the interactions students-scholars-management, the evaluation process for students and scholars.

Higher education (HE) and scholarly community should adapt quickly to the changing scenario by applying distance learning tools. The redefinition of the traditional ways to provide learning services and the introduction new techniques imply the readjustment to a new reality where distance learning can become a new practice and can bring new rules for the entire learning community that will become commonly accepted institutions in the future.

The technological changes implied by Coronavirus emergency stress the key role of technology-enhanced learning in the management of continuity in the provision of education in a new era. The application of technologies can modify (and at the same time can obstruct or improve): (1) the process information and experience sharing; (2) the reciprocal interchange between community and scholarly; (3) the improvement of skills enhancement through students' involvement; (4) the way in which people learn, make research and propose innovation in different scientific areas.

In the last decades, the world of education has been enriched by new technological systems that can bring advantages to the formative process (learning management system, chatbot, intelligent tutoring system, etc.). Consequently, the academic world has been forced to exploit such technological resources to start successfully distance formative paths.

Higher Education (HE) is based on negotiation, agreement and mediation as key drivers for knowledge and cultural exchange. For this reason, this system can be intended as a service ecosystem in which the complex sharing of (implicit and codified) knowledge in the community aims at satisfying shared goals through the acquisitioning of skills, culture, meanings, shared language for all the actors involved.

The ecosystems view analyses organizations as complex configuration of actors that integrate resources to co-create value according to common institutions. Thus, this perspective can offer the right interpretative schemes to analyse how HE ecosystem can adapt and re-adapt its co-creating and co-learning activities and knowledge sharing practices through technology to transform the knowledge generated into innovative insights that produce benefits for scholarly system, students community and for the entire cultural system in a win–win logic.

In particular, new forms of evaluation of scholarly work, enhanced by the multiple touchpoints offered from new technologies and online teaching tools, can be introduced with the constant monitoring of users' opinion and data collection on community's evaluation.

Thus, the chapter rereads HE as an ecosystem and explores theoretically the impact of Covid-19 upon teaching & learning in education and scholarly service to explore the contribution of new technologies and distance learning tools.

To challenge the pandemic, education system should address a paradox by: (1) managing continuity, on the one hand; (2) transforming and innovating interactions, relational, co-creation, evaluation modalities and practices, on the other hand.

Therefore, the study aims at advancing the debate on two key issues: (1) how the new technological tools and instruments required to challenge the pandemic can lead education & scholarly system to improve teaching, learning and evaluation (RQ1); (2) how Higher Education ecosystem can manage innovation and become a catalyst for social change (RQ2) to shape and renew the rules, interactions and culture of the communities with which actors are engaged. The work seeks to address the following research questions:

RQ1: How can learning, teaching and scholarly evaluation be enhanced through technology in the Covid-19 Era?

RQ2: How can Higher Education ecosystem be reframed and create social changes to manage Pandemic?

Addressing these issues can be crucial in a context in which the rules of the game are changing unexpectedly. Industries, institutions, communities are trying to understand how to readapt their traditional practices and processes to comply with society's needs and evolution. The fast-technological readaptation imposed by pandemic can emphasize further the Digital Divide between countries and can disadvantage companies that even before the Covid-Era did not have the right ability and/or the possibility to employ technology successfully in their business.

Hence, the contribution can shed light on how organizations can maintain and renew relationships with and between actors by exploiting the different technological touchpoints to engage users and discovering with new ways of experiencing interactions. In this way, companies and institutions can understand how to establish a continuous tension towards transformation, change and innovation in a fast-changing world.

2 Technology- Enhanced Learning and Evaluation

The application of ICTs to "traditional" education service does not automatically provide competitive advantage and value (Dellit, 2002). The incorporation of technology can accelerate and improve learning processes and can provide the means for gathering, integrating and analysing data to detect student needs, evaluate programs and learning processes more rapidly than in the past.

The concept of *technology-enhanced learning* (Wang & Hannafin, 2005) has been introduced to conceptualize the implementation of technology-based learning and instructional systems through which students can acquire skills or knowledge

through the support of teachers or facilitators such as learning support tools and other technological resources (Aleven et al., 2003).

Technology can allow teachers to hold discussion activities or to facilitate more immediate interaction during the lessons. Tools such as live streaming and virtual/personal learning environments enable the development of synchronous distance learning services in educational settings. One of the most useful technologies that permits teachers and students to exchange information is *interactive response system* (IRS). IRS can create a learning system that supports peer assessment activities by helping classmates to express their opinions and to generate and collect feedback regarding their performance (Wang, 2020). Moreover, it can immediately deliver learners' feedback to instructors, help teachers gain real-time perceptions of the students' understanding of the course, facilitate students' cooperative learning (Kietzig & Orjuela-Laverde, 2014), and increase students' engagement and motivation. Cooperative learning and peer assessment encourage students to release their opinion on the work and performance of other students and teachers by creating positive effects on learning effectiveness (Topping, 2003).

However, despite the relevant role of technology in the enhancement of education, there is still a skills gap in the digital skills owned by students (Bergdahl et al., 2020; Kaarakainen et al., 2017; Verhoeven et al., 2016). Digital skills are defined by Unesco (2017, p.4) as a "range of different abilities, many of which are not only 'skills' per se, but a combination of behaviours, expertise, know-how, work habits, character traits, dispositions and critical understandings".

On the other hand, the reciprocity in the relationship between teachers and students, one of the key foundations of educational service, is not always guaranteed in the provision of education service. As reported by Berghdal et al. (2020), if teachers do not support students' in using digital technologies for learning, the learners may use these instruments autonomously, which has been shown to be less beneficial and detrimental to learning (Bergdahl et al., 2018; Hietajärvi et al., 2019).

Thus, to apply successfully technology to learning, teaching and evaluation there is still the need to explore the role of human intervention in knowledge integration and of people's ability and capability to share resources, by overcoming the idea of education as the "simple" transmission of concepts and reframing this service as a process that involves the sharing of experience, attitude, soft skills and tacit knowledge (Baccarani, 2011). In addition, the interactive and relational dimensions, that consist in the capability of teachers to assist students and to share with them a digital culture, is another strategic driver for an effective use of technologies.

3 Higher Education as a Service Ecosystem

Service delivery in higher education can be defined as an experiential learning structured in terms of students' educational experiences in organised community, which are based on interaction activities characterized by the sharing of meanings,

languages and an internalized culture aimed at meeting system community goals (Erasmus & Albertyn, 2014; Lazarus, 2007).

For this reason, due to the systems and interactive features and to the cultural nature of the service offered, grounded on the exchange of knowledge, know-how, skills and capabilities, Higher Education can be reinterpreted as a *service ecosystem* (Akaka et al., 2013; Díaz-Méndez et al., 2017; Vargo & Lusch, 2010, 2016). Service ecosystems view is a systems perspective introduced in Service-Dominant logic (*S-D Logic*, Vargo & Lusch, 2008), which understands service as the glue of resource integration among engaged actors that, through a complex set of technology and ICTs-enabled interactions, can co-create value.

In the last decades, service theories redefined organizations as many-to-many networks (Gummesson, 2004) in which reticular interactions and multiple relationships are managed through human action and information technology (Gummesson, 2008). In line with the last development in service research, service ecosystems view (Chandler & Vargo, 2011) reframes organizations as embedded systems of actors that exchange resources more easily thanks to technology and based on the constant redefinition of the institutions and rules that coordinate exchanges (Spohrer et al., 2012; Vargo & Lusch, 2010) to co-create new value, new practices, innovation (Grieco & Cerruti, 2018). Value co-creation is intended as a process emerging from the combination of multi-levelled transformations at micro (individual), meso (relational) and macro (institutional) levels of exchange (Vargo et al., 2015).

In particular, the application of service ecosystems view to HE highlights that the concept of cooperative learning can be matched with knowledge and value co-creation, the cornerstones of the entire ecosystems' architecture. Moreover, the concept of reciprocity in teaching and learning fits well with the win–win logic of mutuality that encourages ecosystems actors to co-create value and multiple benefits for the different co-creators (students, teachers/scholars, top management) engaged.

The reinterpretation of HE as a service ecosystem can enable the understanding of how education can be managed as complex system in which many actors (students, teachers, researchers, managers, policymakers) interact to co-create value and engage students as co-creators (Díaz-Méndez et al., 2019).

In detail, as depicted in Fig. 1, it can be hypothesized that the key systems of actors engaged in Higher Education ecosystem are: (1) teachers/scholars; (2) students; (3) university management and organizations; (4) public institutions, research centres and private firms.

Teachers provide students with knowledge and know-how and mediate access to learning and culture by enhancing democracy, access, and transparency (through enabling technology) and exposing students to real-life situations. They are at the same time *scholars*, who perform research activities, advance new scientific developments, and realize publications to build their academic career.

Students translate the information received into knowledge and potential innovative service and products that bring benefit to the entire community. Their attitudinal changes can boost the development of awareness in their roles as future citizens in society. Learners can become practice-trained professionals who pursue the common good of society and the opportunity to contribute to community development. They

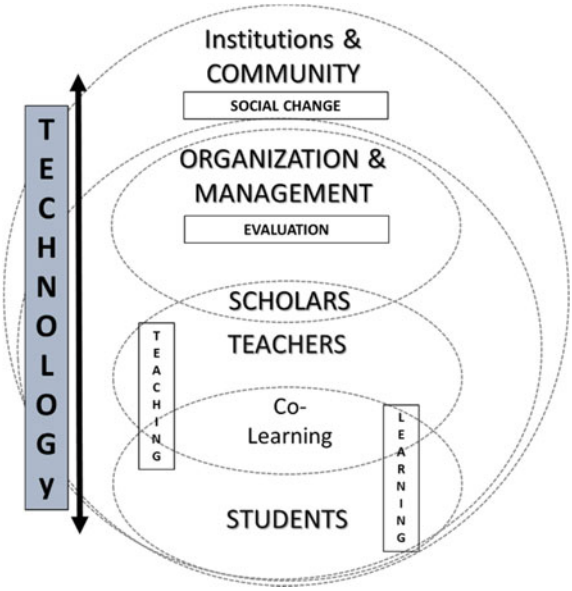

Fig. 1 The stakeholders and sub-systems embedded in Higher education ecosystem. *Source* our elaboration

are actively engaged in the building of educational service and can be considered as co-creators that not only learn from teachers but also provide teachers with their experiences and know-how. The reciprocity between *teaching* and *learning* and the successful mutual relationship teachers-students can produce *co-learning* (see the common co-creating section in the Figure).

University management and organization offer the practical management and organizational experience and design, select and organize the physical space and resources to be shared with students. The University as a complex organization and the effectiveness of the education service provided are evaluated by students and teachers to attain the continuous improvement of the offering.

Public institutions, research centres and private firms represent the surrounding community and institutions that provide information, share insights, interpret community needs and participate in HE decision-making to ensure that educational services can boost well-being and *social change*.

The multiple systems engaged in HE have different needs and goals and gain different benefits from service delivery and interactions. For this reason, it can be hypothesized that different kinds of technologies can be employed to empower the varied set of activities related to education service: learning, teaching and evaluation. Technology can have differentiated weights and impact on the different actors/sub-systems and processes involved in HE ecosystem:

– on teachers-scholars: through distance teaching, online conferences and through the general enrichment of the delivery of lessons and exams enhanced through technologies, which increase the transparency, the immediateness and the rapidity of the process;

– on students: through distant learning and the digitalization of interactions and of the different ways, modalities and practices for learning (social connections, relationships, experience, self-determination processes, etc.);
– on university as an organization: through cost and time reduction and increased rapidity in the delivery of services and through the strengthening of brand reputation and identity;
– on institutions, private and public companies: through the diffusion of a digital culture and the enrichment of economic, technological and development of community.

The adoption of ecosystems view can represent a first step to overcome the gaps identified above in the successful implementation of technology-enhanced learning (the lack of a digital mind-set that goes beyond the transmission of hard skills and the lack of teachers' relational and interactional capabilities). However, previous studies on ecosystems do not analyze sufficiently (Bartoli et al., 2015): (1) how technologies can redefine the interactions between and among actors during social, health and economic emergency; (2) the mechanisms that foster ecosystems re-adaptation and reconfiguration to overcome crisis and foster the emergence of innovation.

Therefore, the reinterpretation of HE as a complex ecosystem based on many- to-many relationships between and among teachers, students and scholarly world can allow the identification of the different kinds of technologies, people and resources (human component, entrepreneurial attitude, citizens' digital competencies and willingness to use technology) that can act as key enablers for the transformation of crisis into opportunities for innovation (Aquilani et al., 2015; Barile et al., 2016) and social changes (Visvizi et al., 2018a). The work hypothesizes that different combinations of value propositions, actors, interactions, and resource integration, mediated and boosted with technologies, can help HE ecosystem remodel the practices of education, teaching and learning.

4 University Ecosystem: A Framework

The reinterpretation of HE as a service ecosystem implies the definition of education service as a complex process based on learning, teaching and evaluation activities performed through an integrated set of technologies used by different co-creating actors with different goals and skills connected with multiple relationships based on the exchange of immaterial resources and knowledge across the three contextual levels of service ecosystems (Frow et al., 2015; Vargo et al., 2015): (1) micro, (2) meso, (3) macro.

As Fig. 2 shows, the three contexts of ecosystems (Akaka et al., 2019; Vargo & Lusch, 2010; Vargo et al., 2015) can be applied to the dynamics of HE.

The *Micro-level* is composed by individuals' intentions, attitudes, cognitive processes, value perception, skills and resources can be intended as a subjective sphere in which each actor has its own cultural background, opinions, beliefs and

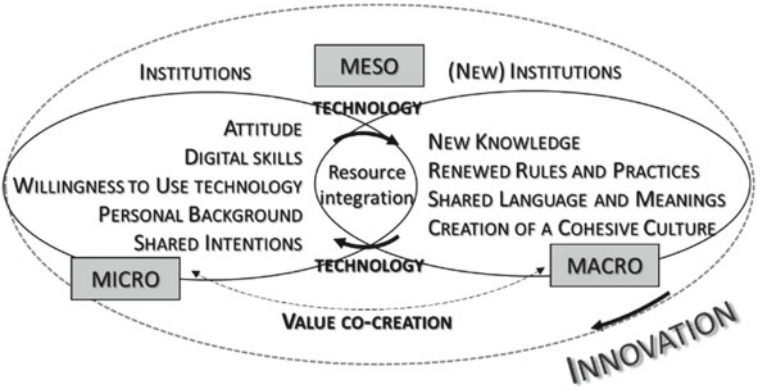

Fig. 2 The reinterpretation of education as a service ecosystem. *Source* our elaboration

personal meanings and develops a given attitude toward learning and co-creation and a willingness to engage and share resources and experiences. Moreover, each participant has a different degree of digital knowledge and a different predisposition for the use of technology.

The *Meso-level* is the intersubjective sphere of relational and social connections between actors in which students, teachers, organizations, institutions integrate resources through interactions that form and reform their mind-set, knowledge personal beliefs and values according to a constant modelling and co-creation of meanings.

The *Macro-level* refers to the collective sphere of the ecosystem's general community (public administration, institutions, legal system, etc.), in which the new co-created meanings, the new practices for teaching, learning and evaluation are disseminated, accepted and incorporated into the wider educational and social context to become institutionalized practices.

The transition from micro to macro context, that can be defined as an "evolution" from subjective, to intersubjective and collective value creation processes can enable the transformation of value to develop innovation incrementally.

Starting from the identification of the basic elements of the three contexts of HE ecosystem, the different kinds of technologies employed for teaching, learning and evaluation at the micro, meso and macro-levels (RQ1) and the different practices that can lead to innovation and social change (RQ2) can be identified. Therefore, the framework depicted in Fig. 2 can be applied to the context of education service to identify the circular process that depicts how learning/teaching and evaluation processes can be enhanced through technology. It can be noticed that evaluation is not an activity to be accomplished only after the delivery of service, but it can be achieved even before and during the delivery in line with the aim to pursue continuous improvement. The technology-enhanced evaluation at each level can improve the service progressively, by "adding" incremental value and enriching the value co-created in each step.

Thanks to the key notion of institutionalization, ecosystem's transformation can be defined as the complex result of: (1) *maintenance* (readaptation); (2) *disruption* (recombination of extant skills in use to foster the emergence of new value; (3) *change*, as a complex result of value co-creation and of the discovery of new solutions for new or existing problems.

The three concepts introduced by Vargo et al. (2015) can be associated with different "changes" of status in the ecosystem and can be connected with the three ecosystem's context (micro, meso, macro) to detect the different ecosystem "level" on which organizations should act to make the change:

- through *maintenance*, at micro-level organizations can readjust their pre-existing skills and institutions to adapt the value proposition, the business idea, the activities to users needs and attitude;
- in the *disruption* phase, at meso-level, the existing knowledge, rules and practices are recombined and re-designed to give shape to the relationships-connections between actors with new interactive-communicative methods in a smart perspective;
- transformation at systems macro-level can *change* the organizational structure, culture, the connections between actors and their roles by co-creating new shared meanings and innovation.

The value co-created gives birth to meanings and symbols that create a unique and cohesive culture by renewing organizational structure, processes, and culture, at micro, meso and macro-levels. It follows that innovation can be reframed as a process emerging from the combination of multi-levelled transformations across different ecosystem's context.

Therefore, as Fig. 3 shows, the association of micro, meso and macro-levels with maintenance, disruption and change can allow the investigation of: (1) the different enabling technologies that can be used in each level to foster ecosystems' restructuring for technology-enhanced learning (RQ1); (2) the emergence of innovation and social changes to overcome the sanitary emergency in HE (RQ2).

4.1 Micro-level: Establishing Common Ground

At micro-level, University as an organization, with the support of teachers, establishes a common ground with students by co-creating with team guidelines, rules and the program of education offering.

Two key activities are realized: (1) alignment of teachers' skills and attitude with students' background and willingness to engage; (2) change in the entrepreneurial mind-set of university. In the first activity, management tries to assess the ability-propensity of students and teachers in the use of technologies based on their background and level of digitization and their possible resistance in the use of telematic tools in work, study and of daily life. The provision of online teaching implies a

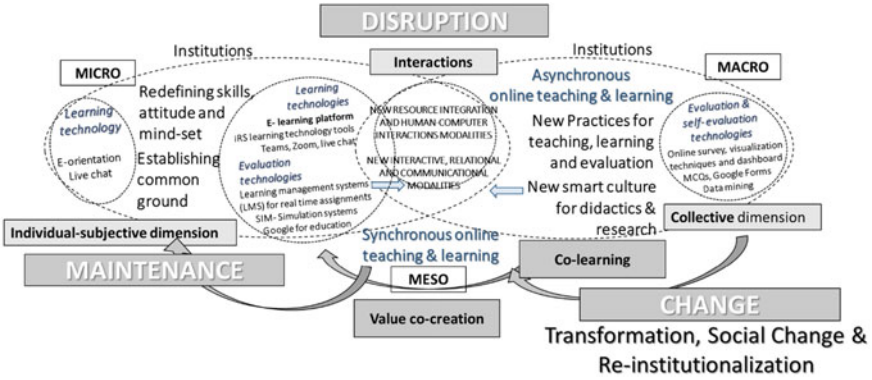

Fig. 3 A framework for the ecosystem's redefinition of technology-enhanced learning processes. *Source* our elaboration

change not only in the methods of digital service provision but also in the identification of objectives and the division of tasks (through the enhancement of autonomy and power distribution). University managers should rethink the service/business digitally, as a new way of doing education and culture.

The technology employed at this stage are engaging tools, aimed at providing teachers' and students' with training activities to use e-tools and psychological support, through live chat for assistance and for student orientation.

4.2 Meso-Level: Co-learning and New Knowledge Creation

At meso-level of interactions, teachers and university staff seek to support students in the fulfillment of activities and processes (courses, exams, thesis elaboration and dissertation, etc.) towards the accomplishment of shared goals.

The technologies employed are experiencing tools, such as the smart technologies, the platforms and the mobile application that enable human–computer interactions for synchronous online teaching and learning. Synchronous teaching in real-time overcomes any restrictions of time and distance.

The learning technology tools for course interaction (such as Teams, Zoom) can support teacher and students in creating an interactive atmosphere in class. During the lesson, smarter classroom tools are employed through IRS systems. The teachers can use various functions to enable the teacher-student interaction function and to let all students "raise their hands" or answer questions through different devices. After having uploaded student's answers, the teacher can select the works to observe, share and discuss in the same room class.

In this way, new communication and relational methods for technology-enhanced learning are created, based on timely information and on the possibility of being

in contact 24 h a day, through tools such as live chat, one-to-one and personalized assistance to students, etc.

After the lesson, e-learning platform can help teachers and students handle homework assignments and share course materials. These tools permit to provide students with assignments that can be completed in real time. Students can share their feedback during the lessons through learning management systems such as "Moodle" and can use advanced assessment settings for different question types, such as shuffling the items and their options, using sequential or free navigation.

To aid learning process, SIM Share (simulation share) is a basic WordPress framework that provides an open-access platform for learner development. Students and teachers can share resources as embedded videos, links to videos on sharing sites, online learning courses, documents, webinars, websites, podcasts and links to other online resources. The aim is to gather and place materials to facilitate the transition from face-to-face learning to online learning.

Regarding evaluation technology, real time assessment of students is based on the estimation of learners' knowledge through multiple choice questions that can be given online to the students on a predetermined date and for fixed duration. Teachers can receive immediate feedback from students in different places and make real-time statistics based on the results of students' performance, by adjusting future teaching with data.

IRS platforms permit students to answer questions by raising their hands and to respond to teacher's questions. Moreover, statistical data can be generated in real-time so that the students can judge the learning status of teachers, thereby improving the teaching efficiency, and students can evaluate teachers through post-class reviews, pre-class previews. After students answer questions through the IRS system, the teacher can present the results in a visual chart, such as a bar chart and pie chart to display each students; in this way, not only the single students can improve learning but also other students can clarify the concepts.

Kahoot!AS and Menti are two IRS tools used to collect students' qualitative and quantitative ideas in the classes. By providing their insights and by visualizing other students' suggestions, a process of co-innovation can start in which each member can improve the service. This is an automatized version of the "rasing hand" activity which permits to collect simultaneously ideas from every student, to store them and to re-elaborate them for the proposal of new service, extension of the programme.

Moreover, Google for education is an e-platform developed by Google that performs educational and assessment activity. This for-free platform permits to create learning activities to engage students whenever and wherever they want and on any device. Google forms and Google sheet not only facilitate the fulfillment of assignments and project works but help teachers administer answers and tracks rapidly students' responses from any mobile devices. Learners can immediately and synchronously create, co-author, and peer-edit textual comments through web applications.

The integrated use of technology-enhanced learning tools and evaluation tools can facilitate the sharing of experience, tacit and codified knowledge to obtain new knowledge and co-create learning (*co- learning*). The use of IRS in this phase can

deliver learners' feedback to instructors, help teachers gain real-time perceptions of the students' understanding of the course, and facilitate enhance students' motivation.

Cooperative learning, a common concept in education, can be translated into co-learning (co-created learning) according to the principles of S-D logic. In this way, new ways of exchanging knowledge and creating new knowledge are generated. Students and digital natives can provide teachers with their experience, especially in the field of technology, due to their familiarity with the Internet and with ICTs.

Thus, these tools can permit the full realization of the essence of co-learning: education does not imply the unidirectional sharing of knowledge (from teachers to students) but empowers the enrichment of both students and teachers experience, know-how, tacit knowledge, culture and beliefs.

4.3 Macro-level: Continuous Improvement and Social Change

The introduction of new teaching, learning and evaluation practices for scholars and students can develop constantly opportunities to change and pursue continuous improvement. The novelties emerged at macro-level are: (1) new methods for educational service provision, which can become stable practices over time and can be maintained even after the restarting of activities in the presence; (2) a new smart culture for training, learning, didactics and research that redefines languages and shared meanings between students, teachers and staff.

The learning technology tools (such as Google sheets and forms) for teaching and course evaluation permit students and teaching to self-evaluate performance and enhance continuous improvement.

The tools employed to assess students and teachers performances and students opinion on the education service are online surveys on the satisfaction of courses and exams and on University reputation, monitoring of students access in user areas, tracking of users behaviour on internet, visualization techniques and dashboard to collect data on students and on teachers' performance. Thanks to user areas in e-learning platforms, student's portfolios can be created to realize personalized environments in which assignments can be uploaded and detailed qualitative feedback is given to the students to improve their learning. These learning systems can be used to assess student's skills through online submission of recorded videos of the tasks performed and the provision of teacher's feedback. There are several online platforms for evaluation, such as MCQs, which can be implemented through Google Forms.

In asynchronous methods of assessment, which are not in real time, assignments and portfolios can be used to assess knowledge and skills. Assignments can measure higher order thinking which includes critical thinking and problem-solving ability of the students.

The IRS tools can be used to evaluate the degree of attention and learning of students during the course lectures. Google for education can allow various kinds of assessment activities such as immediate or anonymous peer assessment and teachers'/course assessment after the exam.

Starting from the collection of students' opinions and behaviours, teachers can make decisions based on statistical data and adjust teaching according to the information extracted. Data on teachers and student's performance are also stored in diagnostic reports by means of cloud systems to enhance self-systematic remedial learning. Moreover, data mining techniques are employed to discover and obtain knowledge from databases to support the analysis of student learning processes and the evaluation of the effectiveness and usability of online courses.

5 Discussion

The framework introduced in Fig. 3 shows how the use of technologies and a proper management of the different tools of smart learning can help organizations overcome global emergency, through a constant re-adaptation of interactions, relational modalities, value, which should harmonize the trade-off between the preservation of systems continuity and a proactive tension to innovation (Baccarani & Golinelli, 2014; Polese et al., 2017).

Extant research on technology and information management and Big data management (Chen et al., 2015; Gupta & George, 2016) shows how an "uncritical" and not strategically conceived use of smart technologies cannot guarantee the attainment of innovation but can be counter-productive. Smart ecosystems in which new technologies are implemented without an alignment with the real needs of population and with the digital literacy and competencies of users are destined to fail. Therefore, the use of technologies (especially when this use is "imposed" by historical, political and economic contingencies) can be considered a necessary but not sufficient condition for the development of community's well-being, value and innovation (Visvizi et al., 2018b).

The main result of the conceptual analysis proposed in the previous paragraph is that the adoption of service ecosystems view in HE and scholarly system can contribute to perform a strategic design of technologies based on the implementation of different tools for different actors with different needs at an individual, intersubjective and collective level (at micro, meso and macro level). The personalization of the technologies offered to overcome the challenges of online teaching and learning can foster the emergence of novelty, unexpected elements, which can act as a source for innovation and social change. Thus, challenging the emergency by learning to manage the use of new technologies and the appearance of new modalities of interactions, rules and practices can make possible to transform the "unknown", the crisis into an opportunity. Managing emergency by managing innovation emergence can be supported by ecosystems view that underlines how combining technologies and the human factor (Ugolini, 2004), as well as an optimal management

of knowledge exchange processes, through the key elements of ecosystems (technology, actors, integration resources, value propositions) can help to co-create value and re-institutionalize the new practices introduced over time.

New ways for designing, planning and delivering the educational offering, for interacting with students and for improving teacher's performance are introduced to challenge the emergency and respond to the crisis. These novel practices, that are advanced as contingent "tactics", can be considered unexpectedly as "better" than the old ones. For instance, online teaching can be more immediate and can guarantee more simple interactions with students and colleagues, can help the reduction of costs for travels, increase students attention during the lessons and their capability to boost their ability to learn concepts and stimulate memory (with the opportunity to listen to the recordings of the lesson).

Then, after a new modality of provision/knowledge sharing/interaction (at meso-level) is accepted, it becomes institutionalized (at a macro-level) it and can be turned into a more or less permanent practice, by adding the new online methods within the offering and program (at micro-level) and can become a commonly shared practice within all the universities.

The circularity in the framework is stressed through the bidirectional arrows that connect the three ecosystems contexts, which can represent the so-called downward effect (Peters, 2016). At the beginning, the emergence of online delivery method for lessons and exams is tactical, forced by contingencies (at meso-level); then, it is institutionalized at the macro-level and becomes an established and accepted practice again that can "come back" to the micro-level, in which it can become an integral part (a rule, a section of the programme, a new condition to make online exams and thesis dissertation, or to evaluate scientific publications) of the educational offering.

The key findings of the conceptual analysis can be translated into two propositions, which address the three research questions of the study:

P1: Online learning and teaching and scholarly evaluation can be enhanced through a series of touchpoints that range from engaging, to experiencing, co-learning and improvement tools across the value co-creation and co-learning process.

P2: Ecosystems readaptation (maintenance, disruption and change) can lead to the re-institutionalization of the new rules and coordination mechanisms for interactions, relationships and service provision, that can lead to the emergence of social change which helps turn the crisis into an opportunity through the emergence of three interconnected processes:

(1) *The redefinition of actors' attitude, beliefs, willingness to use technology at an individual level (micro)*;
(2) *The co-learning and co-creation of new knowledge at the intersubjective level of interactions and resource integration, in which new modalities of teaching and learning emerge (meso)*;
(3) *The re-institutionalization of the new emerging modalities, practices and rules and their acceptance as established ecosystem's elements at a collective level (macro).*

6 Concluding Remarks

The economic, relational and social transformations determined by the active resolution of COVID-19 can change, probably definitively, the nature of interactions and collaborations between users and providers (Velotti & Murphy, 2020), citizens and public organizations by emphasizing that the application of technology (Ugolini, 1999), properly combined with human intervention (Azoulay & Jones, 2020), is the only way to manage unexpected phenomena. However, the "simple" use of technology could be necessary but not a sufficient condition for the fast readaptation of organisational processes. During a state of emergency, the digital divide can be emphasized further by increasing the economic, technological and knowledge gaps between institutions that own the right skills to integrate properly technologies with their strategies to comply with users' needs and institutions that do not (or cannot) adopt technologies strategically.

To clarify the opportunity and challenges deriving from Covid-19 management through technology, the findings of the study show how ecosystems (multi-levelled and network) organizations can overcome the sanitary emergency by investing in relationships and value creation strategies that can give birth to the creation of new knowledge, rules and institutions (Gervilla et al., 2019; Gummesson, 2017a).

The framework advanced as a result of the conceptual analysis can help management, practitioners and scholars understand: (1) how technology (which kind of tools) is employed to challenge pandemic and perform online teaching, learning and scholarly evaluation in HE as an ecosystem; (2) how ecosystems adaptation can lead to the introduction of new practices and institutions for teaching and learning that can change durably (in the long- term) the relational modalities of teachers, students, university management and community to determine societal changes.

The work analyses the case of Higher Education by producing theoretical advancements on the classification of the different technological tools that can support the provision of educational services in the different moments of service provision and across the different resource integration and knowledge exchange involved in value co-creation and co-learning processes. The classification is.

Education managers can understand: (1) how the use of different kind of technologies can help redefine the interaction modalities between and among students, teachers and community to challenge the global epidemic; (2) the key ecosystem's enablers for social changes and the development of different innovation opportunities through crisis resolution.

Thus, the study detects, firstly, the main ecosystem's elements involved in Higher Education ecosystem to address the global emergency of Covid-19 and, secondly, how these elements can be harmonized to attain systems continuous re-adaptation that fosters social changes and transformation.

The identification of the enablers of societal changes and of the potential new interaction modalities and main strategies to challenge the pandemic can help scholars and practitioners identify the key drivers to overcome social and economic crisis.

Moreover, the elaboration of a framework that analyzes how technology can redefine humans interactions and can foster social changes can address a gap in literature related to the absence of studies exploring the role of technologies in reframing community management and social innovation (Lytras & Visvizi, 2018; Polese et al., 2018).

Further studies can employ grounded theory according to a constructivist approach (Charmaz, 2002; Gummesson, 2017b), a technique usually employed in HE since it provides researchers with the possibility to explore how the enrichment of knowledge can be enhanced gradually through multiple research steps and different phases of observation, in which the new knowledge acquired and the changes in the relationships between actors can be assessed in each step according to an incremental methodological procedure.

References

Akaka, M. A., Vargo, S. L., & Lusch, R. F. (2013). The complexity of context: A service ecosystems approach for international marketing. *Journal of International Marketing, 21*(4), 1–20.

Akaka, M. A., Koskela-Huotari, K., & Vargo, S. L. (2019). Further advancing service science with service-dominant logic: Service ecosystems, institutions, and their implications for innovation. *Handbook of Service Science* (Vol. II, pp. 641–659). Springer.

Aleven, V., Stahl, E., Schworm, S., Fischer, F., & Wallace, R. (2003). Help seeking and help design in interactive learning environments. *Review of Educational Research, 73*(3), 277–320.

Aquilani, B., Abbate, T., D'Amico, A., & Gatti, C. (2015). Co-creare prodotti e processi con i clienti: i servizi degli Open Innovation Intermediaries (OII), *Sinergie Italian Journal of Management*, *33*(Sep-Dec), 311–329.

Azoulay, P., & Jones, B. (2020). Beat COVID-19 through innovation. *Science, 368*(6491), 553.

Baccarani, C. (2011). Sui sentieri della creatività. *Sinergie Italian Journal of Management, 64–65*(4), 347–360.

Baccarani, C., & Golinelli, G. M. (2014). Le parole dell'innovazione. *Sinergie Italian Journal of Management*, *94*, 9–14.

Barile, S., Lusch, R. F., Reynoso, J., Saviano, M., & Spohrer, J. C. (2016). Systems, networks, and ecosystems in service research. *Journal of Service Management, 27*(4), 652–674.

Bartoli, G., Fantacci, R., Gei, F., Marabissi, D., & Micciullo, L. (2015). A novel emergency management platform for smart public safety. *International Journal of Communication Systems, 28*(5), 928–943.

Bergdahl, N., Nouri, J., & Fors, U. (2020). Disengagement, engagement and digital skills in technology-enhanced learning. *Education and Information Technologies, 25*(2), 957–983.

Bergdahl, N., Fors, U., Hernwall, P., & Knutsson, O. (2018). The use of learning technologies and student engagement in learning activities. *Nordic Journal of Digital Literacy*, *13*(2), 113–130. https://doi.org/10.18261/ISSN.18919-943x-2018-02-04

Charmaz, K. (2002). Qualitative interviewing and grounded theory analysis. In J. F. Gubrium & J. A. Holstein (Eds.), *Handbook of interview research: Context and method* (pp. 675–694). Sage.

Chen, D. Q., Preston, D. S., & Swink, M. (2015). How the use of big data analytics affects value creation in supply chain management. *Journal of Management Information Systems, 32*(4), 4–39.

Chandler, J.D., & Vargo, S.L. (2011). Contextualization and value-in-context: How context frames exchange. *Marketing Theory, 11*(1) 35–49.

Dellit, J. (2002). Using ICT for quality in teaching-learning evaluation processes. *Using ICT for quality teaching, learning and effective management*, 56–66.

Díaz-Méndez, M., Saren, M., & Gummesson, E. (2017). Considering pollution in the Higher education (HE) service ecosystem: The role of students' evaluation surveys. *The TQM Journal, 29*(6), 767–782.

Díaz-Méndez, M., Paredes, M. R., & Saren, M. (2019). Improving society by improving education through service-dominant logic: Reframing the role of students in higher education. *Sustainability, 11*(19), 5292.

Erasmus, M., & Albertyn, R. (2014). *Knowledge as enablement. Engagement between higher education and the third sector in South Africa.* Sun Media.

Frow, P., Nenonen, S., Payne, A., & Storbacka, K. (2015). Managing co-creation design: A strategic approach to innovation. *British Journal of Management*, *26*(3), 463–483.

Gervilla, M. J. Q., Díaz-Méndez, M., & Gummesson, E. (2019). Balanced centricity and triads: Strategies to reach ecosystem equilibrium in the arts sector. *Journal of Business & Industrial Marketing, 35*(3), 447–456.

Grieco, C., & Cerruti, C. (2018). Managing co-creation in innovative business models: The case of sharing economy. *Sinergie Italian Journal of Management*, *36*(May-Aug).

Gummesson, E. (2004). From one-to-one to many-to-many marketing. In B. Edvardsson, A. Gustafsson, S. Brown, & R. Johnston (Eds.), *Service excellence in management: Interdisciplinary contributions, proceedings from the QUIS 9 symposium* (pp. 16–25). Karlstad University.

Gummesson, E. (2008). *Total relationship marketing* (3rd ed.). Butterworth-Heinemann.

Gummesson, E. (2017a). From relationship marketing to total relationship marketing and beyond. *Journal of Services Marketing, 31*(1), 16–19.

Gummesson, E. (2017b). *Case theory in business and management: Reinventing case study research.* Sage.

Gupta, M., & George, J. F. (2016). Toward the development of a big data analytics capability. *Information & Management, 53*(8), 1049–1064.

Hietajärvi, L., Salmela-Aro, K., Tuominen, H., Hakkarainen, K., & Lonka, K. (2019). Beyond screen time: Multidimensionality of socio-digital participation and relations to academic wellbeing in three educational phases. *Computers in Human Behavior*, *93*, 13–24. https://doi.org/10.1016/J.CHB.2018.11.049

Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks: Extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak. *International Journal of Production Research*, *58*(10), 2904–2915.

Kaarakainen, M.-T., Kivinen, O., & Vainio, T., (2017). Performance-based testing for ICT skills assessing: A case study of students and teachers' ICT skills in Finnish schools. *Universal Access in the Information Society*, *17*. https://doi.org/10.1007/s10209-017-0553-9

Kietzig, A. M., & Orjuela-Laverde, M. C. (2014). Increasing student engagement in class using an open-ended student response system. In: *Proceedings of the Canadian Engineering Education Association (CEEA).*

Lazarus, J. (2007). Embedding service learning in higher education in South Africa: The catalytic role of the CHESP initiative. *Education as Change*, *11*, 91–108. (Special Issue: Community service-learning)

Lytras, M. D., & Visvizi, A. (2018). Who uses smart city services and what to make of it: Toward interdisciplinary smart cities research. *Sustainability, 10*(6), 1998.

Palmieri, F., Ficco, M., Pardi, S., & Castiglione, A. (2016). A cloud-based architecture for emergency management and first responder's localization in smart city environments. *Computers & Electrical Engineering, 56*, 810–830.

Peters, L. D. (2016). Heteropathic versus homopathic resource integration and value co-creation in service ecosystems. *Journal of Business Research, 69*(8), 2999–3007.

Polese, F., Mele, C., & Gummesson, E. (2017). Value co-creation as a complex adaptive process. *Journal of Service Theory and Practice, 27*(5), 926–929.

Polese, F., Botti, A., Grimaldi, M., Monda, A., & Vesci, M. (2018). Social innovation in smart tourism ecosystems: How technology and institutions shape sustainable value co-creation. *Sustainability, 10*(1), 140.

Spohrer, J., Piciocchi, P., & Bassano, C. (2012). Three frameworks for service research: Exploring multilevel governance in nested, networked systems. *Service Science*, *4*(2), 147–160.
Topping, K. (2003). Self and peer assessment in school and university: Reliability, validity and utility. In: *Optimising New Modes of Assessment: In search of qualities and standards* (pp. 55–87). Springer, Dordrecht.
Ugolini, M. (1999). Tecnologie dell'informazione e fiducia: La nuova sfida per l'impresa. *Sinergie, Italian Journal of Management, 50*, 63–89.
Ugolini, M. (2004). *Un approccio di service management per la gestione del reparto ospedaliero.* Giuffrè Milan, Italy.
UNESCO. (2017). Working group on education: Digital skills for life and work. Accessed March 13, 2019, from https://unesdoc.unesco.org/ark:/48223/pf0000259013/PDF/259013eng.pdf.multi
Vargo, S. L., & Lusch, R. F. (2008). Service-dominant logic: Continuing the evolution. *Journal of the Academy of Marketing Science, 36*(1), 1–10.
Vargo, S. L., & Lusch, R. F. (2010). From repeat patronage to value co-creation in service ecosystems: A transcending conceptualization of relationship. *Journal of Business Market Management, 4*(4), 169–179.
Vargo, S. L., & Lusch, R. F. (2016). Institutions and axioms: An extension and update of service-dominant logic. *Journal of the Academy of Marketing Science, 44*(1), 5–23.
Vargo, S. L., Wieland, H., & Akaka, M. A. (2015). Innovation through institutionalization: A service ecosystems perspective. *Industrial Marketing Management, 44*, 63–72.
Velotti, L., & Murphy, P. (2020). Service and value co-production and co-creation in emergency services and emergency management. *International Journal of Emergency Services, 9*(1), 1–7.
Verhoeven, J. C., Heerwegh, D., & De Wit, K. (2016). ICT learning experience and research orientation as predictors of ICT skills and the ICT use of university students. *Education and Information Technologies, 21*(1), 71–103. https://doi.org/10.1007/s10639-014-9310-3
Visvizi, A., Lytras, M., Damiani, E., & Hassan, M. (2018b). Policy making for smart cities: Innovation and social inclusive economic growth for sustainability. *Journal of Science and Technology Policy Management., 9*(2), 126–133.
Visvizi, A., Lytras, M., & Daniela, L. (2018a). (Re)defining smart education: Towards dynamic education and information systems for innovation networks. In: *Enhancing knowledge discovery and innovation in the digital era* (pp. 1–12). IGI Global.
Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development, 53*(4), 5–23.
Wang, Y. H. (2020). Design-based research on integrating learning technology tools into higher education classes to achieve active learning. *Computers & Education*, 103935.