

Exploring a framework for solidarity entrepreneurship in the context of the confluence of the fourth industrial revolution, covid-19, and climate change

Explorando un marco para el emprendimiento solidario en el contexto de la confluencia de la cuarta revolución industrial, el Covid-19 y el cambio climático

Explorando um enquadramento para o empreendedorismo solidário no contexto da confluência da quarta revolução industrial, Covid-19 e alterações climáticas

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Abstract

Introduction: Since the beginning of the last decade, the number and scope of studies on the impact of the Fourth Industrial Revolution have intensified, particularly in Artificial Intelligence, Automation, Robotics, and other related disciplines regarding the future of work. These studies discuss relevant changes in the employment and entrepreneurship ecosystem with significant socioeconomic and cultural implications. As a result of the global pandemic of COVID-19, it is essential to review the transformations that will further affect that ecosystem.

Objective: This article aims to identify the implications of the confluence of the Fourth Industrial Revolution, COVID-19, and Climate Change in terms of the challenges and opportunities faced by entrepreneurs during this remarkable global metamorphosis.

Methodology: In our exploration, we use a complexity science perspective to offer a framework for the management of *Solidarity Entrepreneurship*.

Results: We developed a framework to identify the elements that, under the *new global context*, must be considered to provide alternative perspectives of entrepreneurship oriented to preventing or mitigating the effects caused by the confluence described above.

Conclusions: Our proposal recommends an entrepreneur's skill set that considers the ethical, moral, regulatory, and other innovation and cognitive concerns to optimize entrepreneurial ventures focused on the requirements of the pressing global scenario in progress.

Originality and limitations of the research: We have implemented the proposed framework in projects related to health and education in rural environments where digital inclusion plays a fundamental role. We acknowledge that it is necessary to increase the scope and number of projects and contexts to create alternative models of Solidarity Entrepreneurship.

Keywords: Entrepreneurship, Fourth Industrial Revolution, COVID-19, Future of Work.

Resumen

Introducción: desde principios de la década pasada se ha intensificado el número y alcance de los estudios sobre el impacto de la Cuarta Revolución Industrial, particularmente en Inteligencia Artificial, Automatización, Robótica y otras disciplinas relacionadas con el futuro del trabajo. Estos estudios discuten cambios relevantes en el ecosistema de empleo y emprendimiento con importantes implicaciones socioeconómicas y culturales. Como resultado de la pandemia mundial de COVID-19, es fundamental revisar las transformaciones que afectarán aún más a ese ecosistema.

Objetivo: este artículo tiene como objetivo identificar las implicaciones de la confluencia de la Cuarta Revolución Industrial, el COVID-19 y el Cambio Climático en términos de los desafíos y oportunidades que enfrentan los emprendedores durante esta notable metamorfosis global.

Metodología: en nuestra exploración, utilizamos una perspectiva de ciencia de la complejidad para ofrecer un marco para la gestión del Emprendimiento Solidario.

Resultados: desarrollamos un marco para identificar los elementos que, bajo el nuevo contexto global, deben ser considerados para brindar perspectivas alternativas de emprendimiento orientadas a prevenir o mitigar los efectos causados por la confluencia descrita anteriormente.

Conclusiones: nuestra propuesta recomienda un conjunto de habilidades del emprendedor que considere las preocupaciones éticas, morales, regulatorias y otras de innovación y cognitivas para optimizar emprendimientos enfocados en los requerimientos del apremiante escenario global en curso.

Originalidad y limitaciones de la investigación: hemos implementado el marco propuesto en proyectos relacionados con la salud y la educación en entornos rurales donde la inclusión digital juega un papel fundamental. Reconocemos que es necesario aumentar el alcance, número de proyectos y contextos para generar modelos alternativos de Emprendimiento Solidario.

Palabras clave: emprendimiento, cuarta revolución industrial, COVID-19, futuro del trabajo.

Resumo

Introdução: desde o início da última década, intensificaram-se o número e a abrangência dos estudos sobre o impacto da Quarta Revolução Industrial, principalmente em Inteligência Artificial, Automação, Robótica e outras disciplinas relacionadas ao futuro do trabalho. Esses estudos discutem mudanças relevantes no ecossistema de emprego e empreendedorismo com importantes implicações socioeconômicas e culturais. Em decorrência da pandemia global da COVID-19, é fundamental rever as transformações que afetarão ainda mais aquele ecossistema.

Objetivo: Este artigo tem como objetivo identificar as implicações da confluência da Quarta Revolução Industrial, COVID-19 e Mudanças Climáticas em termos de desafios e oportunidades enfrentados pelos empreendedores durante esta notável metamorfose global.

Metodologia: Em nossa exploração, usamos uma perspectiva da ciência da complexidade para oferecer uma estrutura para a gestão do Empreendedorismo Solidário.

Resultados: desenvolvemos uma estrutura para identificar os elementos que, no novo contexto global, devem ser considerados para fornecer perspectivas alternativas de empreendedorismo destinadas a prevenir ou mitigar os efeitos causados pela confluência descrita acima.

Conclusões: nossa proposta recomenda um conjunto de habilidades empreendedoras que considera as preocupações éticas, morais, regulatórias e outras de inovação e cognitivas para otimizar empreendimentos focados nas exigências do atual cenário global premente.

Originalidade e limitações da pesquisa: implementamos o referencial proposto em projetos relacionados à saúde e educação em contextos rurais onde a inclusão digital desempenha um papel fundamental. Reconhecemos que é necessário aumentar a abrangência, número de projetos e contextos para gerar modelos alternativos de Empreendedorismo Solidário.

Palavras-chave: empreendedorismo, quarta revolução industrial, COVID-19, futuro do trabalho.

1. Introduction

Governments, civil society organizations, industry, and academia are considering strategies to adapt to the new conditions of a world in transition due to the impact of a pandemic that has come to disrupt our *modus-operandi*. One of the economic activities that have been seriously affected is employment and, as a result, entrepreneurial processes. Over the last decade, the accelerated development of Artificial Intelligence, Automation, and Robotics, regarding the work of the future generated myriads of studies and reports on this crucial topic [1]-[10]. In other words, even before the pandemic, major societal transformations were already underway due to

processes of globalization. The accelerated technological change has significant implications for individuals, communities, and institutions. The magnitude of such metamorphosis leads to the emergence of new models: educational, regulatory, economic, business, technological, and, most importantly, human behavior. We argue that society faces a scenario of convergence of the Fourth Industrial Revolution [11], COVID-19, and Climate Change (4RI-COVID-19-CC) [12]-[14], among other forces in place. In this scenario, entrepreneurship requires special attention that demands rethinking and reassessing its essential traits. The purpose of this article focuses on exploring a framework that identifies elements concerning new approaches to entrepreneurship that include solidarity, cooperation, and compassion. In the same way, the model recommends a comprehensive skill set for entrepreneurs linked to the 17 sustainable development goals [15]-[19].

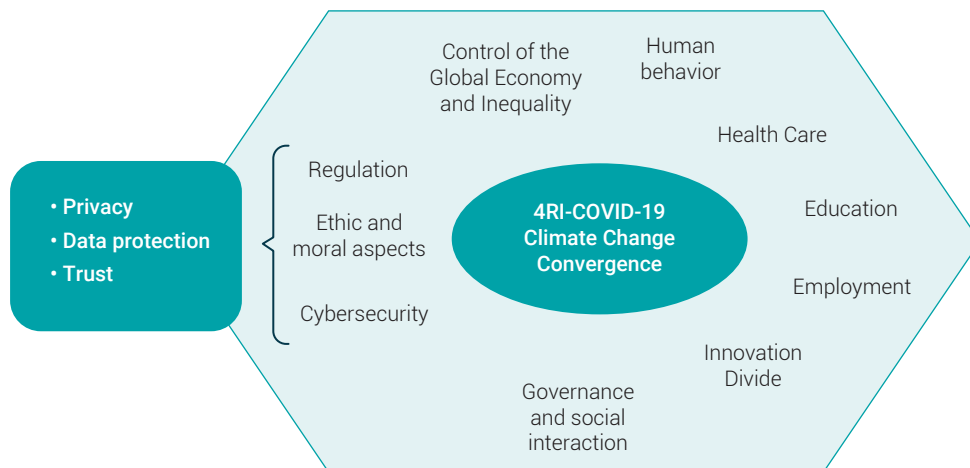


Figure 1. Implications of the 4RI-COVID-19-Climate Change Confluence.

Source: own work

Figure 1 shows a preliminary approach to identifying salient socio-technical implications in the context of the 4RI-COVID-19-CC confluence. Privacy, Personal Data Protection, and Trust show relevance regarding Artificial Intelligence and Data Science applications. Regulatory, ethical, and moral development issues also require special attention [20]. Figure 1 shows results from our analysis of the interactions of all the matters described in this figure and from interviews with government, business, and academic stakeholders. Our inferences coincided with the results of international consulting firms and governmental and non-governmental agencies [21]-[27].

This article is structured as follows: Section 2 presents a summary of the methodology employed, Section 3 discusses entrepreneurship in the framework of the

4RI-COVID-19-CC confluence, and Section 4 offers the proposed framework for Solidarity Entrepreneurship; which in our view, is a step further from Social Entrepreneurship toward sustainable development schemes where capacity building, service to society and systematic learning constitute the foundation for the emergence of patterns of thought and behavior for the betterment of society. Finally, we offer conclusions on the relevance of Solidarity Entrepreneurship in response to the current global conditions.

2. METHODOLOGY

Our methodology draws on applying the principles of complex systems to entrepreneurship; likewise, the development of the proposed framework included interviews with key agents of the region's innovation ecosystem called CaliBaja (California-Baja California): Faculty members, entrepreneurs, government officials, and students [31].

The central theme of this article is to explore entrepreneurship mechanisms focused on the urgent attention to innovation strategies and actions that the 4RI-COVID-19-CC confluence demands. We reviewed emerging digital technologies' state of the art by examining recent literature associated with the pandemic to understand its implications. [32]-[35].

3. ENTREPRENEURSHIP and THE 4RI-COVID-19-CC CONFLUENCE

Entrepreneurship plays a salient role in innovation ecosystems. In the trajectory of the 4RI-COVID-19-CC confluence, we argue that entrepreneurs should consider complementary elements that might provide a clearer vision, relevance, and new learning elements about the most critical conditions of society at this current juncture. In this new scenario, competitiveness depends not only on optimizing local resources but also on the innovation value chain between organizations and the partners' technologies, products, services, and systems (all the agents of the Entrepreneurship ecosystem). By interconnecting with agents, entrepreneurs, and organizations, this co-creates innovative supply and value chains between entities operating in a collaborative ecosystem at local, regional, and global levels. In our current pandemic condition, competitiveness is still a key factor for entrepreneurship; however, cooperation comes into play. The possibilities of new models of entrepreneurship, with human empathy and focused on service to society, emerge. Processes of creation and extraction of value with social well-being and solidarity mindset concur. We adopt

the term Solidary Entrepreneurship [36], [37], also denoted by other authors as Human Entrepreneurship [38], to stress the importance of ethical and moral development, empathy, and compassion with a marked attitude of learning (humility) and emphasis on the common good and community participation.

We posit that entrepreneurship in the “new normal” must be an organized and strategic tool, where the acquisition and development of skills demanded by society is vital. Figure 2 shows our proposal regarding the interrelation of three skills domains, which, in the authors' opinion, constitute a coherent set of skills and abilities as constituents of a model of Solidarity Entrepreneurship in response to the 4RI-COVID-19-CC Convergence. Such skill domains are:

- Socio-cognitive and linguistic skills associated with an ethical and moral framework.
- Technical and professional development skills.
- Social Action skills.

The grouping of skills into relevant themes has also been the subject of educational experiences in universities, study centers, and global consulting firms in various regions [39]. It is essential to understand that the process of entrepreneurship requires an interdisciplinary, collaborative, and profound human mindset from its inception and during its life cycle [40]-[47]. As a matter of comparison of our skill domains analysis, Figure 3 shows McKinsey's perspective defining the skills citizens will need in the future world of work [48].

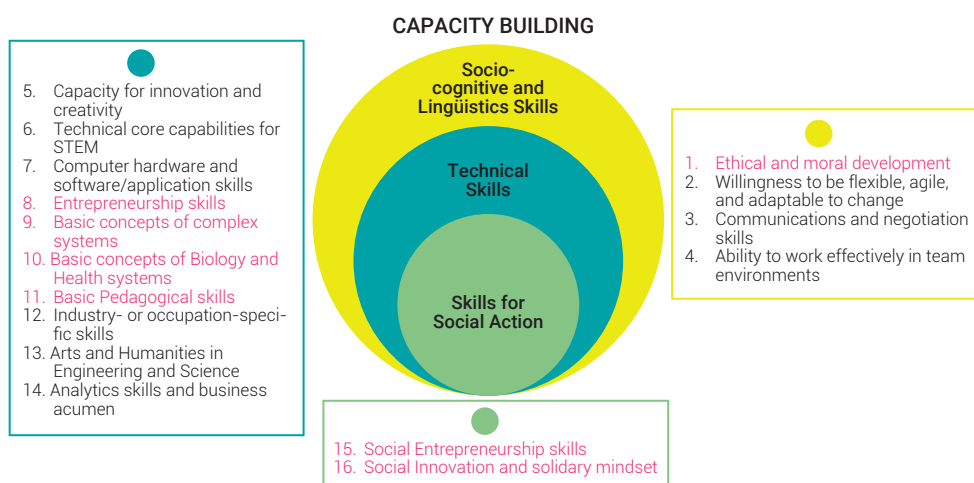


Figure 2. Triad of Abilities: Entrepreneurship Skills in the 4RI-COVID-19-CC confluence

Source: own work

As seen in Figures 2 and 3, entrepreneurship demands skills that include humility, empathy, compassion, and other spiritual human virtues. In our proposal, we also consider business skills and the acquisition of basic concepts from Complex Systems, Biology and Health Systems, and Sustainable Development with a focus on Solidarity and Basic Pedagogical Skills as critical elements in transmitting knowledge and learning. Likewise, Innovation and Social Action skills are essential in this paper's framework of Solidarity Entrepreneurship.

Cognitive		Interpersonal	
Critical thinking <ul style="list-style-type: none"> • Structured problem solving • Logical reasoning • Understanding biases • Seeking relevant information 	Planning and ways of working <ul style="list-style-type: none"> • Work-plan development • Time management and prioritization • Agile thinking 	Mobilizing systems <ul style="list-style-type: none"> • Role modeling • Win-win negotiations • Crafting an inspiring vision • Organizational awareness 	Developing relationships <ul style="list-style-type: none"> • Empathy • Inspiring trust • Humility • Sociability
Communication <ul style="list-style-type: none"> • Storytelling and public speaking • Asking the right questions • Synthesizing messages • Active listening 	Mental flexibility <ul style="list-style-type: none"> • Creativity and imagination • Translating knowledge to different contexts • Adopting a different perspective • Adaptability • Ability to learn 	Teamwork effectiveness <ul style="list-style-type: none"> • Fostering inclusiveness • Motivating different personalities • Resolving conflicts • Collaboration • Coaching • Empowering 	
Self-leadership		Digital	
Self-awareness and self-management <ul style="list-style-type: none"> • Understanding own emotions and triggers • Self-control and regulation • Understanding own strengths • Integrity • Self-motivation and wellness • Self-confidence 		Digital fluency and citizenship <ul style="list-style-type: none"> • Digital literacy • Digital learning • Digital collaboration • Digital ethics 	
Entrepreneurship <ul style="list-style-type: none"> • Courage and risk-taking • Driving change and innovation • Energy, passion, and optimism • Breaking orthodoxies 		Software use and development <ul style="list-style-type: none"> • Programming literacy • Data analysis and statistics • Computational and algorithmic thinking 	
Goals achievement <ul style="list-style-type: none"> • Ownership and decisiveness • Achievement orientation • Grit and persistence • Coping with uncertainty • Self-development 		Understanding digital systems <ul style="list-style-type: none"> • Data literacy • Smart systems • Cybersecurity literacy • Tech translation and enablement 	

Figure 3. Skills citizens will need in the future world of work
 Source: Mckinsey, 2021

4. EXPLORATION OF AN ENTREPRENEURSHIP MODEL IN THE 4RI-COVID-19-CLIMATE CHANGE CONFLUENCE

In our complexity science perspective, we conceptualize entrepreneurship as a socio-technical system, with human interactions giving rise to processes of emergence, self-organization, and non-linearity. The aspects of inter-discipline, resilience, risks, ambiguities, and adaptability, among others, are characteristic attributes of the entrepreneurship processes. Interconnectivity is the essence of complex systems, which comprise a network of interconnected nodes whose interactions define their nature and behavior.

Applying Rolando Garcia's proposal [33],[34] to the case of entrepreneurship, the proposed model described in Figure 4 emerges. The research question to exemplify our model is: What is the role of Solidarity Entrepreneurship in the 4RI-COVID-19-CC Convergence? The *Observed Condition* of the context, which includes reading its social reality, provides the starting elements which constitute the initial conditions that would lead to the *Desired Condition* through the answer to the research question(s). Thus, Solidarity Entrepreneurship emerges from the interaction of the context agents, considering the Triad of skills suggested in Figure 2.

Upskilling and reskilling have received considerable attention to cope with the challenges of the work of the future. Our Triad of Skills goes beyond upskilling and reskilling; entrepreneurs should see themselves as protagonists of a constant effort to apply knowledge to effect individual and collective transformation [49]. This Triad of Skills denoted as *deepskilling*, emphasizes human existence's intellectual and spiritual dimensions to contribute to society's betterment and moral and sustainable development - fundamental traits of the framework discussed in this article [50].

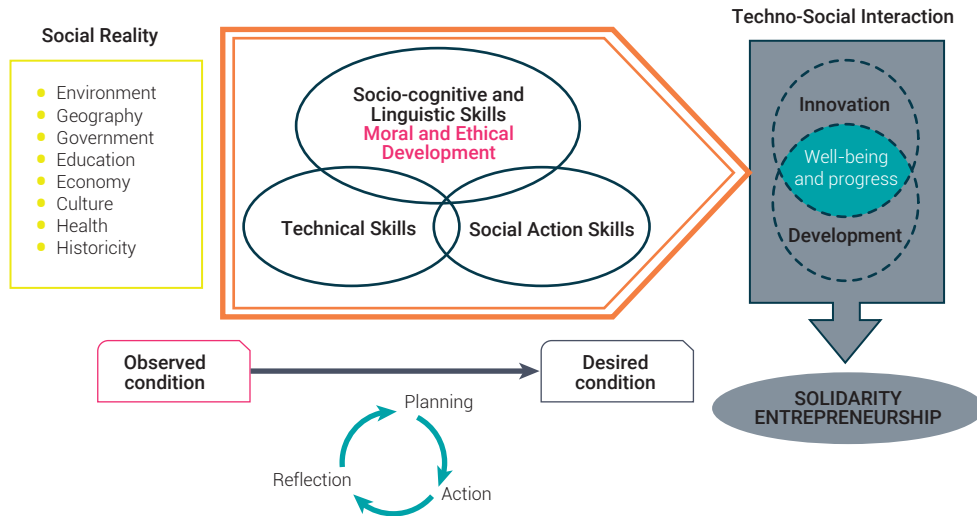


Figure 4. Solidarity Entrepreneurship Model
Source: own work

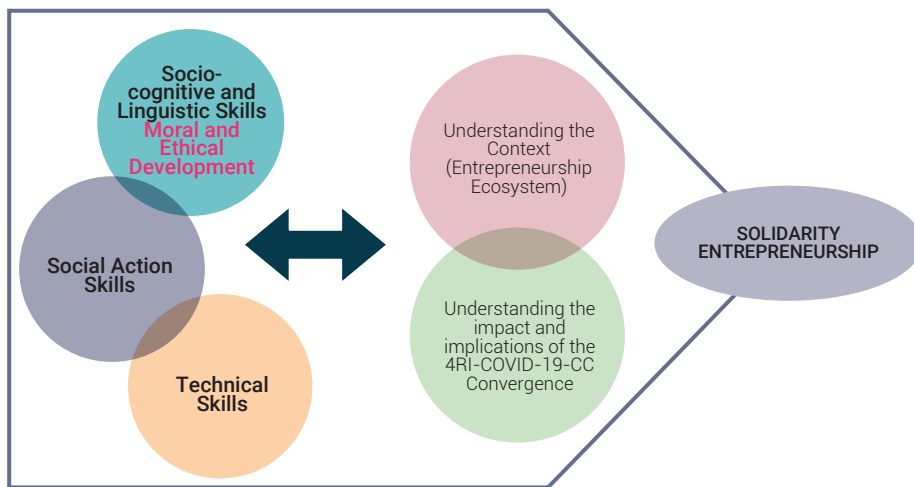


Figure 5. Entrepreneurship Ecosystem
Source: own work

5. DISCUSSION AND CONCLUSIONS

The accelerated growth of digital technology represents a challenge for forming human capital that can respond to the emerging needs in the 4RI-COVID-19-CC confluence, where Web3.0, Artificial Intelligence and related branches will significantly impact

society. For this reason, developing a new conception of human capital management is relevant to facing societal and environmental changes that demand new technological and business skills. Comprehensive skill sets are fundamental, as indicated in the proposed Triad described in Figure 2. Figure 5 summarizes the conclusions of this article, where the interactions between the proposed Triad of Skills, the knowledge of the context (Entrepreneurship Ecosystem), and the understanding of the impact and implications of the 4RI-COVID-19-CC confluence are crucial factors in the development of Solidarity Ventures. Collaborative Academy-Industry-Government-Society spaces are also vital to promoting a shared vision and ethical and moral responsibility in search of solutions with social relevance, sustainability, and, most importantly, a learning attitude.

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