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A Critical Inquiry into the Value of Systems Thinking in the Time of COVID-19 Crisis

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Abstract: The COVID-19 pandemic offers an historic precedent to review and challenge the values of social, economic, environmental, and cultural belief systems. The concept of the "New Normal" and the experience of the global pandemic provide points of transition in thinking about our relationship to our planet and to each other. These include the fragility of contemporary economics, dependency on industrialized urban infrastructures, and reliance on top-down governance, vulnerability to climate disasters, dislocation from the natural world, societal inequalities, and the loss of cultural memory. The paper considers the potential role of systems thinking in attempting to manage societies' responses to the pandemic. To provide the methodological context in which some systems thinking can be applied to alleviate the pandemic, we conduct a focused literature review of systemic frameworks, and using examples from Brazil and England, the paper questions the validity of existing disaster management systems and proposes an integrated critical systems approach. Reflecting on these experiences, questions of systems criticality are further developed and considered in relation to critical recovery from disasters and as integral critical systems (ICS) to interrogate the intention of systems. Finally, the paper reflects upon the value of systems and the values embedded in systems that may or may not promote equitable well-being in recovery from disasters such as COVID-19.

Keywords: systems thinking; COVID-19; critical recovery; ecology; integral critical systems

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1. Introduction

The COVID-19 pandemic is the world's most serious sanitary crisis in the last one hundred years. Since the first information at the end of 2019 about the rapid spread of a new coronavirus killing people in Wuhan, China, it took the World Health Organization (WHO) until 11 March 2020, to declare the COVID-19 outbreak a pandemic. According to the WHO's Weekly Epidemiological Update of 17 November 2020, almost four million new cases and 60,000 new deaths were recorded, making a cumulative total of over 53.7 million confirmed cases and 1.3 million deaths globally [1].

Around the world, the pandemic has highlighted many distressing aspects of the way our lives are lived normally. These include the fragility of contemporary economics [2], dependency on industrialized urban infrastructures [3], failing governance institutions [4], vulnerability to climate disasters [5], dislocation from the natural world [6], societal inequalities, and the loss of cultural memory [7]. These brings into question the systems we inherit and maintain to sustain the global society. It further questions the systems we need to design for transition to futures of a different kind.

The devised management strategies to control the pandemic have thrown the majority of countries into economic recession and exacerbated existing social problems such as health care access, [8], unemployment, and inequality [9], revealing the profound cracks

that run along all levels of society. A few countries responded rapidly to the pandemic and have had success in its early containment [10], yet many countries continue to scramble to implement interventions and measures when major implications of the disease started to appear. Of course, we all hope that immunization and a cure for COVID-19 will happen soon and the crisis will pass, but the phrase "new normal" suggests a long-term, chronic situation [11]. Therefore, is the idea of post-crisis just a shift to a different timescale—from a shock event to a durational period?

In this paper, we assess how "systems Thinking" may contribute to our understanding of this dynamic situation and how it may help us cope with it. We argue that the complexity of the current pandemic can only be explored using systemic perspectives. Our contention is that the current crisis is not an "accident", but it is heavily linked to a myriad of social, political, technological, and cultural variables whose interactions have been badly misunderstood and consequently mismanaged by governments. Although systems thinking provides a good set of tools to tackle complex situations, we do not claim that this could be used as the panacea, but simply as an effective way to explore possible causes, the current situation, and possible ways out of it. We review relevant literature from different schools of systems thinking and use systems thinking ideas to propose an integral critical systems (ICS) response framework in which the interaction of economic, political, technological, and cultural variables can be assessed as a way to understand the consequences of the pandemic. The proposed framework uses three initial questions concerning communication and power relations to start the design process:

How are people from diverse cultures communicating their COVID-19 experiences and what may decision makers learn from these narratives to communicate effectively?

How may cultural learning be applied practically to create trusted public health information for communities and government agencies?

How may the effective communication of official health guidance generate resilience across diverse cultures to help them survive COVID-19?

We illustrate the framework by using the cases of governmental response to the pandemic crisis in the UK and Brazil in relation to critical recovery from disasters and as ICS to interrogate the purpose and intent of response systems. The paper is not able to address every aspect or issue impacted by the pandemic, but reflects upon the value of systems and the values embedded in systems that may or may not promote equitable well-being in recovery from disasters such as COVID-19.

The paper is organized as follows: After this introduction, in Section 2, we review the systems thinking literature dealing with complexity and wicked problems advancing some critical ideas for designing principles for improving systemic response. In Section 3, we present the national responses launched by the governments of UK and Brazil to scrutinize why responses are failing. In Section 4, we offer some ideas as to how systems thinking can play a pivotal role in post-pandemic crisis. Finally, in Section 5, we advance some final remarks to the study and avenues for further areas of research.

2. Literature Review: Systems Thinking to Deal with Wicked Problems

The complex dynamics of COVID-19 make it a wicked problem, a term coined by [12] to refer to situations where there is contestation over what a problem might be and thus what might constitute an improvement. Such complex problems may also be further exacerbated by direct solution responses. It is, therefore, a framing choice for situations that warrant systemic responses [4]. It is our view that the COVID-19 pandemic is a typical wicked problem mainly because of its complexity. Health commentators have highlighted this feature very recently:

"Wicked problems are impossible to solve because of contradictory and changing requirements, the absence of equality, and ever-evolving social complexities. Poverty, crime, and climate change are wicked problems. COVID-19 is also a classic wicked problem, as evidenced by the unanticipated and disproportionate effect of the virus on minority racial and ethnic populations and individuals who have experienced health disparities" [13].

We argue that to tackle this wicked problem and the complexities of COVID-19, it is crucial to take a systemic view, that is, to approach complexity with systems thinking ideas. Systems thinking has been applied extensively to many fields of knowledge and organizational settings, and yields effective results when problematical situations are most recurrent. A systemic approach " ... involves using systems thinking to construct an epistemological device through which we can generate fresh and insightful explanations about the world—in contrast to descriptions of it—and which trigger new ways of taking purposeful action in the world" [14].

The approach is to tackle complexity, and it has been proposed by various authors to handle the detail and the complexity of sthe ituation by taking into account the different perspectives of the people involved. Well known UK commentators in the field of systems thinking state:

> "Systems approaches aim to simplify the process of our thinking about, and managing, complex realities that have been variously described by systems thinkers as messes [...], the swamp [...], wicked problems [...] Systems thinking provides ways of selectively handling the detail that may complicate our thinking in a transparent manner, in order to reveal the underlying features of a situation from a set of explicit perspectives" [15] p. 5.

Debates about handling COVID-19 have increased interest in systems thinking for health, healthcare, and medicine. A recent online publication suggests the necessity to use systems thinking: A systems approach to preventing and responding to COVID-19 [16]. The urgency for the use of systems thinking as the "most powerful tool" to cope with the COVID-19 aftermath has been echoed recently by The Organization for Economic Co-operation and Development:

> "[...] policy interventions and priorities to address COVID-19 must incorporate principles of system resilience to systemic disruption now, for not doing so will limit future socioeconomic recovery for the next decade at least. Systems thinking is the most powerful tool we have at our disposal to accomplish this task, if it is part of a trilogy completed by anticipation and resilience" [17].

Systems thinking can help policy makers understand and influence the spread of infection and its multifaceted consequences across the community [16]. It can provide a framework to look beyond the chain of infection and better understand the multiple implications of decisions and (in)actions in the face of such a complex situation involving many interconnected factors. Consulting the people most directly affected by an event –rather than assuming you know what they need—is always a good practice [18], and this study brings a systems thinking approach to the capture, analysis, and adoption of cultural narratives to gain a people's perspective of the pandemic.

Systems thinking has become an established field and can be defined as "an emergent discipline for understanding complexity and change" [19]. It is worth noticing that systems thinking in the US is regarded more as an approach, whereas in the UK, systems thinking is seen as a "way of thinking" and regarded as a meta-discipline embedded in the efforts of those involved in the systems movement; this was stated in the early 80s:

> "The systems movement comprises any and every effort to work out the implications of using the concept of an irreducible whole, 'a system', in any area of endeavour. [...] Because systems ideas provide a way of thinking about any kind of problem, systems thinking is not itself a discipline." [20].

A causal loop diagram (CLD) was developed to represent the complexity of the pandemic wicked problem, identifying cause-and-effect links and feedback loops among a huge set of variables [9]. The assumption is that visualizing the complexity of a system can help to identify leverage points to improve the system. Additionally, CLD is presented as an example of some important interacting components in a society that is responding to the threat of COVID-19 [16].

One of the most influential systems thinkers, West Churchman (1913–2004), described systems "both as a process of unfolding", by which he meant heroically "sweeping-in" as many factors as possible to our systems of concern, "and as a process of looking at things from different viewpoints" [15] p. 8]. Churchman is also credited with the description of a systems approach: "A systems approach begins when first you see the world through the eyes of another" [21].

This is a very difficult task to do, but good to try, mainly because no one can claim to totally understand the complexity of the world we inhabit. Therefore, systems thinking is a way of making sense of the complexity or better still an attempt to make sense of the world. Additionally, since the systems approaches start with the situation, like the current one, full of complexity and uncertainty, where there is no single "right" answer, it is sensible to use a different language and move away from deterministic types of language. Furthermore the language of systems thinking is about problem-situation rather than the problem, and of improving the situation rather than solving the problem [20].

Systems thinking certainly helps us to perceive and even understand such "wicked problems", but how may it help us to deal with them? In the next paragraphs, we revise some systemic approaches, the aim being to draw some of the core ideas from these approaches to create a framework from which we can explore the current sanitary crisis. We start with critical systems heuristics (CSH), which is a practical framework for critical systems thinking and reflective practice based on practical philosophy and systems thinking [22].

In the rest of this section, we outline critical recovery (CR), a process of regeneration from trauma that promotes a culture of self-learning and self-determined community beyond mere survival from disasters, and integral critical systems (ICS), a whole systems approach that integrates dynamic, critical dialogue to maintain relevance and adaptability to a situation by facilitating flexible epistemic systems of co-learning.

2.1. Critical Systems Heuristics (CSH)

Critical systems heuristics was developed in 1983 to provide a reflective approach to problem solving based on both practical philosophy and systems thinking [22]. The framework is based in the emancipatory paradigm and focuses upon boundary settings and judgements [23]. The emancipatory systems approach is seen as suspicious towards society and current social order, and as trying to reform this in order for it not to benefit some groups at the expense of others, which then suffer from domination or discrimination. Furthermore, it states that emancipation of the oppressed can and often will benefit the oppressor too [24].

Without a firm set of boundaries for a given problem situation, it becomes nearly impossible to develop a common understanding of the situation, solutions, and plans for the involved stakeholders. Stakeholders are most likely to have very different perceptions of the situation. Boundaries cannot be defined as either right or wrong, but the participants need to agree upon the boundary setting in order for them to deal with the situation. For Jackson, boundaries should be set through dialog among the involved and affected.

Boundary critique deals with the concept of "setting the scene" or the boundary setting of the problem situation in question. Setting common boundaries enables a discussion about the given matter and establishes a frame for debate, solutions, and plans. The process of boundary critique contains several elements:

- Naming the preferences of any stakeholder regarding a problem situation or solution proposal
- Analyzing the practical and ethical implications of the boundary judgements
- Making alternative reference systems to obtain alternative answers to the boundary questions
- Searching for a common understanding of the reference systems among the involved stakeholders

- Challenging the given assumptions using boundary critique in the emancipatory way [22].

On this basis, CSH is certainly designed to deal with issues and inequalities addressing the imbalance of power relationships amongst stakeholders. Furthermore, some commentators have argued that:

> "CST, [. . .] claims the ability to cope with conflict and differences in perspective. A noted strength of the Critical approach is its ability to bring power relations and political and economic structures into the debate as the origin of Weltanschauungen" [25].

Figure 1 shows the relations between the three elements that, according to Ulrich [22], are the essence of boundary setting. These elements form the "eternal triangle" and should be assessed with regard to each other.

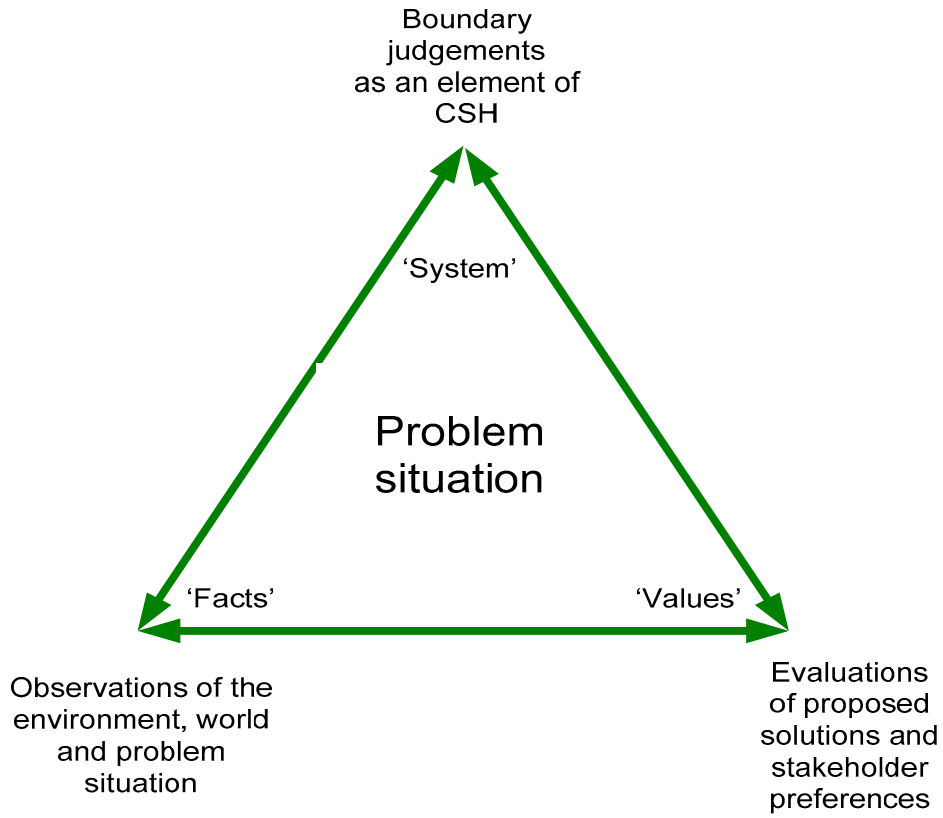

Figure 1. The "eternal triangle" of boundary judgements, facts, and values, adapted from Ulrich, W. (2005) [22].

Boundary critique is referred to as either a reflective or an emancipatory practice. As [24] states:

> "(. . .) boundary critique is not a self-contained approach but is more useful in combination with other approaches to problem structuring and problem-solving" [22], p. 6.

Another UK operational research and systems thinking practitioner commenting on the ethical strengths of CSH states:

> "In essence, CSH identifies the key ethical issue in a professional inquiry (or intervention or engagement) as the choice of who is to be involved in the discussion and in what role (expert, citizen, decision maker, etc.). These choices should be debated in the particular instance. The method does not offer fixed

ethical principles to guide the choices but it does draw attention to the affected but uninvolved" [26].

2.2. Critical Recovery (CR)

Critical recovery [27] is defined here as a process of regeneration from trauma. It considers emergence from disaster or systems collapse [28] as an opportunity for "ecological resilience" [29], to become a new state of being—not merely to survive a disastrous impact, but to thrive beyond it. It further questions what the preferred state of becoming may be, how it may be achieved, and even how it may be prepared for. In other words, the boundary time frame includes how the situation occurred, how it was responded to, how the situation continues to change, and how recovery may improve the situation, as a dynamic evolving continuum.

With regard to COVID-19, CR could focus on a system of personal, societal, and global recovery through learning the ethical value and practical value of "fundamental culture" [30]. Beyond the nebulous concept of a "New Normal", CR learns from, questions, and provides society with systems of common beliefs and aims (culture). CR thereby transforms disaster to opportunity, giving meaning to societal resilience, and such resilience may manifest in the development of self-determined communities, with the capacity to learn for themselves how to generate their diverse "capable futures" [31]. This takes community resilience beyond mere disaster risk reduction (DRR) and top-down techno-fix approaches to catastrophes that turn survivors into vulnerable victims. A CR approach provides an expanded function of emancipation that starts with the survivors understanding and owning their vulnerability. Authorities and disaster aid agencies may then become better informed of the development needs of survivors and better able to provide appropriate strategic support. This further reduces the cynical approaches of the disaster industries that profit from the misery of others and often exacerbate the situation. Indeed, insurance loss assessors and foresight planners are fully aware that GDP in some sectors (e.g., construction industry in response to floods) increases in times of disaster [32], but it rarely benefits those who have suffered the consequences of the event itself.

2.3. Integral Critical Systems (ICS)

So far, this paper has considered the potential failure of governance systems in managing different aspects of the COVID-19 pandemic, but what if the current systems are designed to do what they are doing? Endemic institutional poverty, racism, ecocide, and retention of power by the few have been well maintained, if not enhanced. Methods of population control through the rule of what some consider to be draconian laws have been expanded to manage social interaction. While many have lost their livelihoods and entire industries have collapsed through the economic constraints, other individuals and industries continue to flourish and even expand. The next section considers the introduction of criticality into systems perception, design, and practice beyond abstract problem solving and the belief in the concern of states for the common good.

As a development from CSH and CR, integral critical systems provides a whole systems approach that integrates dynamic, critical dialogue to maintain relevance and adaptability by facilitating flexible epistemic systems of co-learning [33]. The integration of criticality throughout such a process may be understood as a dynamic method of checks and balances between stakeholders and stacked and networked systems affecting a situation. Such an approach does not necessarily challenge hierarchical systems so much as disperse them through transparency and constant inquiry. Normality as a desired state of being, to be sustained through "engineered resilience", is then dissolved as a societal propaganda myth. Indeed, normality as adaptation to the diktats of oppression is revealed as an undesirable development [34]. ICS, therefore, transcends ST as a management tool that may be appropriated and developed for purposes of control and predetermined future scenarios. ICS specifically questions the intentions, the relevance, and the values embedded in the systems of foresight planning that have been adopted by global industrial

corporate interests. Acknowledging the earlier work of Richard Slaughter on "integral critical futures" [35], ICS could be applied to the idea of a post-COVID-19 world by questioning the integrity of the jingoistic politics of "build back better" [36].

3. Government Responses to COVID-19 Pandemic: The Cases of UK and Brazil

Governance systems are failing on several issues and situations, and the pandemic just highlighted already existing flaws in (state) governance around the world. Accordingly, States were hit by the pandemic in different intensities.

The failure (or success) to control the pandemic is an emergent outcome of a governance system, and of how certain practices to control the outspread of COVID-19 have been institutionalized (or not), leading to systemic policy failure.

Governance systems are failing due to many reasons, and in relation to COVID-19, some possible causes of failure are lack of transparency, lack of trust in civil society, institutional failure, lack of leadership, contradictory information from different levels of government, reducing the confidence of the population, ideological health policies, etc.

Urgency is required to address this dynamic, complex situation, as the prospects of the "new normal" may provide opportunities, but positivist political spin rings hollow for the vast majority of people, as their outlook is extremely grim [37]. People cannot help themselves, if they are not being listened to and included in the process.

This seems to be the case in the majority of countries in the west that largely have been at the top of the list in terms of infected cases and deaths. There is evidence that western economies, with all their "liberal values" based on respecting "individual" and "democratic" values, have succumbed to the deadly virus, whereas autocracies and communitarian societies in Asia have managed to control the virus and managed to protect their economies that are starting to grow again [38]. There is no place in this paper to discuss the differences embedded in political and economic models, but suffice it to say that some countries, societies, and cultures are more attuned to systems management. Compared with South Korea, which has experience of virulent epidemics, the UK, USA, and many European countries seem laden by a positivistic epistemology that is less able to cope with indeterminacy [39].

Figure 2 illustrates the number of deaths (rounded to the nearest 1000) in the top 10 countries. These figures based on John Hopkins University show that the USA and Brazil are the two top in terms of deaths, 240,000 and 163,000, respectively. In fifth place, the UK was the first country to reach 50,000 deaths on 11 November 2020 [40].

In the next section, we concentrate on the cases of two of the countries from this list. In Europe, the UK was hit badly, and one can argue that the government was slow in its preparation to face the crisis and did not learn from the other European countries, in particular from Italy and Spain. When the response came, it was disorganized and lacked the basics of reasonable communication and trust. In South America, Brazil's response was equally disorganized, chaotic, and lead by a president who, right from the start, completely disregarded the seriousness of the crisis [41].

3.1. United Kingdom

While the UK Government has come under severe criticism from many quarters for its handling of the COVID-19 pandemic, with each nation pursuing different approaches, the on-going distain for mismanaging the acquisition of personal protective equipment (PPE) [42], the Government's Chief Advisor, Dominic Cummings, flagrantly breaking the rules of lockdown [43], the apps that did not work, and the Test and Trace system that never fulfilled its many promises all add up to systemic failure [44]. Indeed, the key to the coronavirus problems facing the UK may be found in the systemic insistence of Government to "handle" or "manage" the virus. Few have considered the potential role of a bottom-up, multi-perspective, critical systems approach, whereby the people are supported by Government to handle and manage such situations themselves.

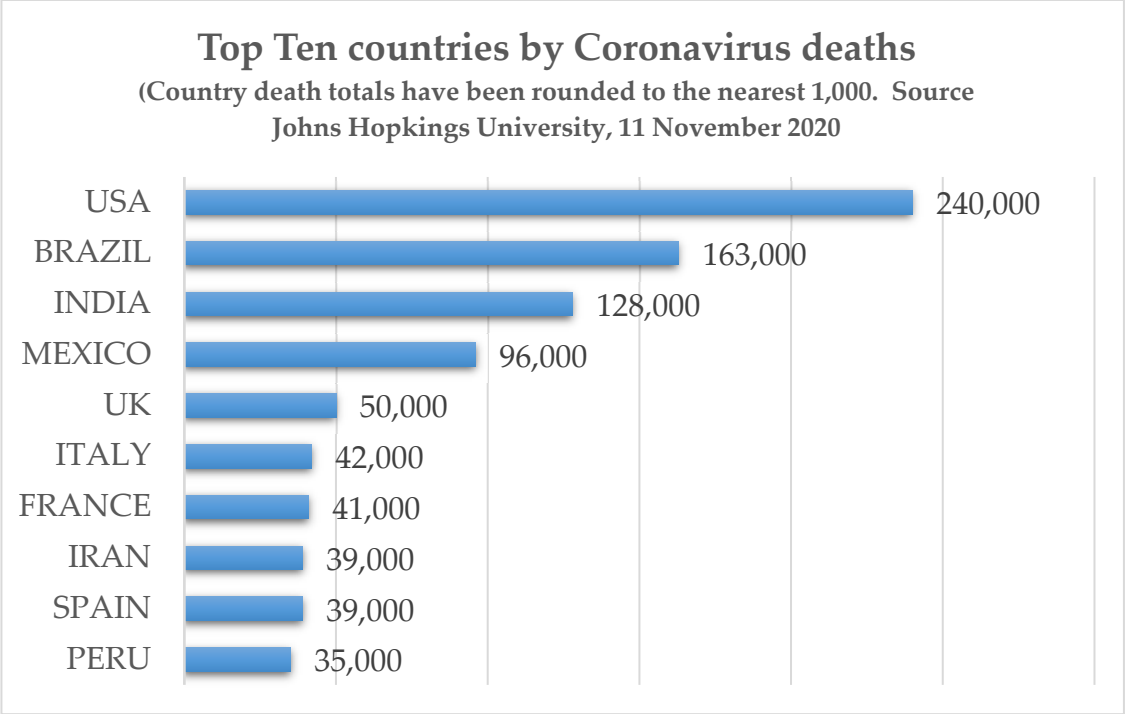

Figure 2. Top ten countries by coronavirus deaths. Adapted from [41].

At the time of writing this paper (19 November 2020) Britain had among the highest levels of COVID-19 deaths in the world: 1,192,013 infected and 49,044 deaths [45]. Different parts of the UK had moved out of lockdown, but were responding to the predicted second wave at different rates, with different approaches and strategies that confused people [46]. While many people returned to pre-COVID-19 life, others were living a "new normal", and some were developing neuroses from continuing fears and bewilderment [47]. A second lockdown was undermined by remarks from a top Cabinet Minister and scientists that the month-long measure was unlikely to be long enough [48], and the persistent changing of rules fueled protests for rule-breaking [49]. What was not provided was the support people need to learn for themselves how to become confident in their futures, beyond fiscal aid. The population was, therefore, rendered vulnerable through their dependence on demonstrably unreliable and confused systems.

At the heart of society, culture defines how we learn, what we believe, and how we live and form our future expectations. Indeed, our perception of reality is based on cognitive beliefs learned through intergenerational culture interacting with environment and society [50]. Together, these factors provide each of us with our ontogenetic capacity to survive the world as we encounter it. While COVID-19 incapacitated our fragile economy [51], impacted social and personal wellbeing, and revealed our over-reliance on industrialized urban infrastructures, it may also offer opportunities for nascent cultural reinvention at every level of society. Systematically understanding this emergent culture would provide the vital knowledge exchange, survival skills and foresight for the populous and Government agencies, together, to regenerate communities following systemic collapse. Alas, such systems are not even being considered by the UK Government.

One of the things that COVID-19 is teaching us is that the consent of populations and their willingness to participate in collective action is just as crucial to fighting the virus as is expertise [18]. To act decisively, decision makers need to be properly informed of the on-going impacts and future prospects of COVID-19 on people at a community scale, across the UK's diverse cultures. Despite claims to be working with local authorities, however, the UK Government (England in particular) continued to deploy an entirely top-down approach to managing the situation [52]. This has resulted in political stand-offs that

further distance the populous from the realities of the pandemic and result in frustration and dangerous defiance of precautionary measures and social distancing. Despite being one of the most economically, scientifically, politically sophisticated and advanced countries in the world, the UK Central Government simply did not have the systems to listen to the people it governs.

3.2. Brazil

Although it is difficult to state precisely when the virus came to Brazil, the first case of COVID-19 was confirmed on February 25 in the city of São Paulo in a 61-year-old patient who had travelled to Italy. From that date, the virus spread rapidly in the city of São Paulo as well as in the whole metropolitan region, and from there it spread to other Brazilian states, rapidly collapsing the health system of several municipalities [53], not to mention the large heterogeneity across the country in the ability to meet the sanitary needs arising from the pandemic, or to conduct widespread testing that might have contained the disease. According to the Brazilian Ministry of Health [54], the first death caused by COVID-19 occurred also in the city of São Paulo on March 12. After 6 months, by the end of September, the total number of COVID-19 cases in Brazil had exceeded the mark of 4.7 million, with more than 142 thousand deaths [55], a number being surpassed only by the number of deaths in the USA.

The chronicle of the response to the COVID-19 pandemic in Brazil is not very different, generally speaking, from that of other countries in the world. It consisted basically of measures to contain the spread of the virus, like lockdown (mostly at the beginning of the pandemic), social distancing and mask wearing, besides different sorts of financial measures to support vulnerable people, like unemployed (more than 65 million people received the so called "Emergency Aid" [56]), and businesses. Despite those measures, however, at the highest levels of government as in the Ministry of Health and in the Presidency itself, the sanitary crisis and its effects have been downplayed and handled with indifference, and the seriousness of the pandemic has been systematically denied. Also, scientific evidence about the ineffectiveness of certain medications was not only doubted, but as in some situations their use was fostered through their free distribution to the population.

In Brazil, the COVID-19 pandemic also opened up the existent social inequality, exposing historical needs, and revealing the real situation of public policies to assist the population. Although the public health system SUS (Sistema Único de Saúde—Unified Health System) saved the Brazilian population from a greater tragedy, it was the poorest people who died the most from the disease. Also, corruption cases have increased during the pandemic, most of them linked to bidding for the acquisition of hospital supplies, so that currently (October 2020) two state governors are facing impeachment trials due to corruption allegations.

The lack of coordination from the federal and state governments to control the spread of the virus, led local (municipal) level governance systems to show severe failure. Mayors, yielding to pressure from some business sectors, relaxed the measures of social distancing, which prevented a faster decrease in the number of cases of the disease and of deaths. Ultimately, this is what happens when economy and health systems are seen as a dualism rather than a duality. Further, the lack of an effective federal policy to support actions against the pandemic, the failure of the health policy led by the Ministry of Health and the absence of the fundamental articulating role of the Ministry of Education hindered a quicker resumption of school activities.

As the number of disease cases and of deaths in Brazil show very clearly, the way the State responded to the sanitary crisis of the new Coronavirus tragically reveal the magnitude of the failures of governance systems at all levels, and what it means to fail to think and act systemically.

4. The Value of Systems Thinking in Post-Pandemic Crisis

Systems are human conceptualizations of the world, our relationship to the world, and our management of world resources and inhabitants. Such thinking has been embodied in human minds as a definition of Homo sapiens. However, we must not mistake the map for the terrain, and systems are only as good as their effectiveness and affectiveness. Furthermore, every system reflects the beliefs, values, and the culture of those who perceive, design, and implement it.

The inability of the most affluent of the world's nations to effectively manage COVID-19 suggests that present systems are at the very least inappropriate, if not part of the cause of the COVID-19 epidemic becoming a pandemic as it persists to at least a second wave. We must, therefore, consider global systemic infrastructures, such as transport, urbanization, and economics to be systems developed with inbuilt faults and unintended consequences. The notion of "future proofing" is appealing, but is it realistic? In themselves, systems need to be adaptable and prepared for collapse—destruction and creation are integral to the adaptive cycle of evolution. COVID-19 represents the uncertain, the unexpected, the indeterminate, and "the unknown unknowns" [57].

Dogmatic belief systems and systemic rigidity persist for reasons of power or intransigence, and some systems are retained beyond their usefulness to become counterproductive. Traditional systems of education, capitalism, and industrial growth are such examples [58]. There is a great need for learning to be systems savvy—intuition, improvisation, and creativity have never been taken seriously when considering adaptation and resilience, and yet they are at the heart of such strategies. Evolution is not merely a matter of survival of the fittest, but is based upon mutation, symbiosis, and chance, none of which fit neatly into most systemic patterns [59].

Guided by systems thinking principles, we propose a framework that should reflect on the current crisis, and it should be informed by systemic methodologies revised here: critical systems heuristics, critical recovery, and integral critical systems. The framework will allow the systematic gathering of people's pandemic experiences—listening to the people's stories. The reflection should focus on co-evolutionary learning with those affected by the situation: decision makers, government officials, and systems experts. Working across sectors and disciplines, with local communities, we believe that the framework could address the following questions:

How are people from diverse cultures communicating their COVID-19 experiences and what may decision makers learn from these narratives to communicate effectively?

How may cultural learning be applied practically to create trusted public health information for communities and government agencies?

How may the effective communication of official health guidance generate resilience across diverse cultures to help them survive COVID-19?

From this dynamic situation, the framework (shown in Figure 3) will allow the further engagement of local and regional agencies in critical dialogue to reveal how different cultural characteristics hinder and help their recovery. Co-creation and co-designing as principles for systematic intervention are paramount. Testing the framework will be predominantly conducted in a dialogical fashion to value the diverse nuances and qualities of cultures [60]. Throughout the process, an analytical systems approach will transform the cultural narratives into dynamic co-learning Knowledge Exchange applications to create trusted public health information sources. Such approaches will provide "ecopedagogical" curricula for all levels of education and inform decision makers across all sectors of society for critical recovery [60,61]. Strategically, the creation of local, regional and national Centers for Critical Recovery would systematically place cultural co-learning at the heart of decision making.

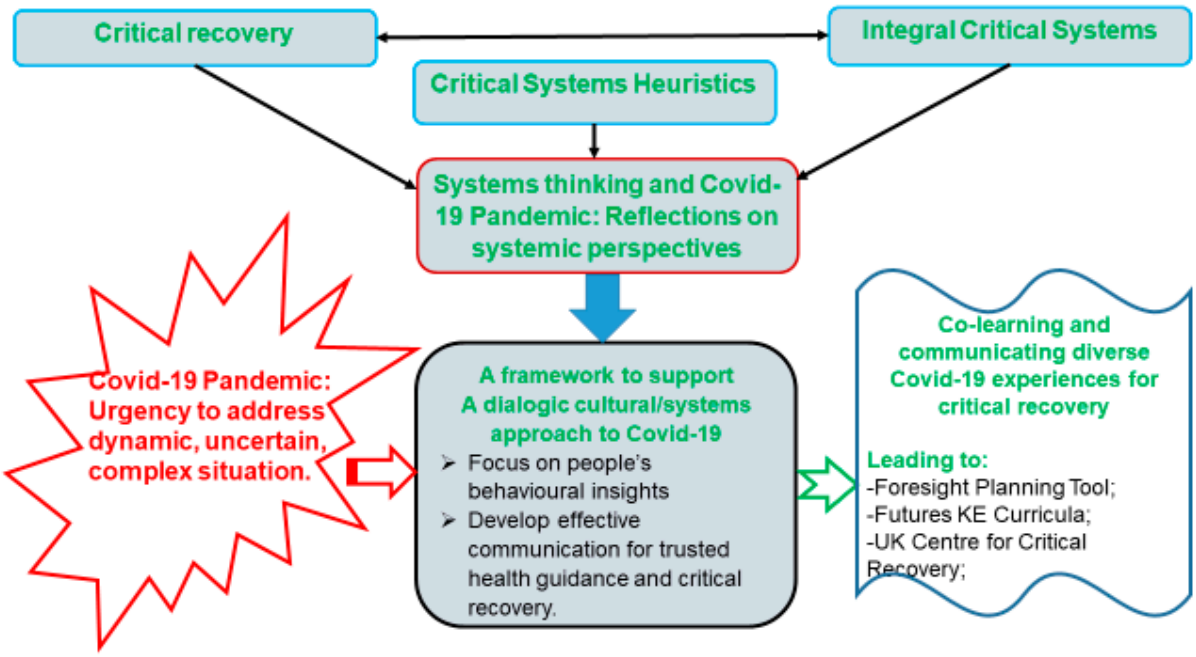

Figure 3. Conceptual Framework to support a Dialogical cultural/systemic Approach to Covid-19.

5. Final Remarks: A Systemic Question of Values

In this third millennium, it seems crises like the current one will be more frequent. The challenge will be for all of us. As Ervin Laszlo put it:

> "To live in the third millennium, . . . we shall need new thinking joined with new ways of perceiving and visioning ourselves, others, nature and the world around us". [62]

In this paper, we would like to propose that systems thinking can help us to rise to that challenge, but we must first be aware of the full context in which we live. We live in the time of six simultaneous waves of global crises, each greater than the previous, each within its own timescale, each interrelated to the others, each needing critical systems heuristics, critical recovery, and collectively requiring integrated critical systems means of living with them and beyond them to the future.

6th Wave: Species extinction
5th Wave: Climate chaos
4th Wave: Human mass migrations
3rd Wave: Economic collapse
2nd Wave: Covid-20
1st Wave: Covid-19

We need to seek systems that operate beyond conservation and restoration towards regeneration. We need to invent systems for critical recovery. Similarly to Gunderson and Hollings' concept of Panarchy, where "ecological resilience" considers the potential for life after collapse [63], critical recovery questions how collapse occurred, how survival was possible, and how "capable futures" may be achieved, and this becomes a question of values [64].

An integral critical systems approach values the nature of diverse cultures and their interconnectivity, providing the context for genuine transdisciplinarity [65], communicating with people, rather than adopting top-down instruction and abstract data information. While the impacts differ for each sector, considering systemic values would provide people

and authorities with a dynamic, fluid framework to reduce the economic and societal impacts and contribute to their equitable sustainability.

Through co-participatory training, communities would value co-learning and increase their resilience to environmental, economic, and cultural threats, making their livelihoods viable, while increasing their well-being. This could empower communities to learn for themselves how to become self-determined and adapt to and manage the impacts of disasters, beyond COVID-19.

To address this situation and contribute directly to critical recovery and transformation, we must value people's lived experiences and insights. This could be systemically developed and adopted by applying integrated critical systems for the re-enchantment of cultures to regenerate societal resilience to survive this and future disasters. In other words, enabling people to learn for themselves how to be self-determined and adapt critically to their diverse futures, thereby enabling each level of government to understand, work with, and value the populace.

Systems thinking and critical systems heuristics have been with us for many years. This paper introduced the recently conceived critical recovery and integrated critical systems. It is worth reiterating that all systems are human conceptions; they are formed within the realms of the social sciences and applied to the myriad of human experience. To help us engage fully with the transformative challenges we all face, they need to be paid much greater attention and require much further research, as they apply in a transdisciplinary sense to all other human endeavor.

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