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Convergent innovation for sustainable economic growth and affordable universal health care: innovating the way we innovate

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This paper introduces convergent innovation (CI) as a form of *meta-innovation*—an innovation in the way we innovate. CI integrates human and economic development outcomes, through behavioral and ecosystem transformation at scale, for sustainable prosperity and affordable universal health care within a whole-of-society paradigm. To this end, CI combines technological and social innovation (including organizational, social process, financial, and institutional), with a special focus on the most underserved populations. CI takes a modular approach that convenes around roadmaps for real world change—a portfolio of loosely coupled complementary partners from the business community, civil society, and the public sector. Roadmaps serve as collaborative platforms for focused, achievable, and time-bound projects to provide scalable, sustainable, and resilient solutions to complex challenges, with benefits both to participating partners and to society. In this paper, we first briefly review the literature on technological innovation that sets the foundations of CI and motivates its feasibility. We then describe CI, its building blocks, and enabling conditions for deployment and scaling up, illustrating its operational forms through examples of existing CI-sensitive innovation.

Keywords: innovation; convergent innovation; health; agriculture; business; vulnerability; industrialization; collaborative interdependence

Introduction

From the onset of the Industrial Revolution, technologies emerging from a rich diversity of research and development (R&D) pipelines have brought tremendous prosperity to the world. After millennia of little economic growth since the appearance of agriculture,[1,2] yearly per-capita income in the West grew by 20% in the 1700s, and then accelerated to 200% in the 1800s, and to 740% within the past century.[3] The contribution of technological innovation to this overall economic growth has been estimated at between 50% and 80%.[4,5] In addition to economic growth, technological innovation has also contributed to reducing hunger[6] and poverty[7] while increasing lifespan[8–10] and improving health.[1,11,12] For example, technological innovation in crop production during the Green Revolution belied dire predictions of a Malthusian famine with increased population.[7] Biotechnologies, pharmaceuticals, and medical and other healthcare technologies have alleviated suffering, saved lives, and cured many diseases in poor[1,13,14] and rich countries alike.[15,16] Transportation, communication, and other technologies have shaped modern societies and accelerated human and economic development globally.[17]

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However, reliance on technological innovation does not always lead to better outcomes.[8,11,12,15,18] In the specific context of health, in many countries, the growth of healthcare costs outpaces the growth of national income.[19–21] While many medical and health technologies create value relative to costs,[15,16] evidence based on cross-sectional comparisons—both across countries and within the United States—suggests that one-third or more of medical technologies do not provide improved health.[22–25] Healthcare costs are now an important constraint on the financial viability of individuals, businesses, and governments.[8,21] In most rich countries, from 10% to over 12% of the national GDP is spent on health care, and universal health care is provided.[26] However, in the United States, the health system has the most advanced technology but an important proportion of uncovered people,[27] at a cost of over 15% of the GDP and rising so rapidly as to be the most significant threat to future public finance.[20,28]

This rich-country model of healthcare innovation is unaffordable and cannot be replicated in low- and middle-income countries.[29–31] In India, for instance, less than 5% of the GDP is devoted to health care.[32] Currently, about 30% of the population only benefits from health financing coverage, with out-of-pocket health-related expenditures amounting to over 40% of a household's nonsubsistence expenditure.[33] As in many countries with large numbers of poor households,[34] ill health is a major determinant driving Indian households into poverty or keeping them poor.[35] Other nutrition and health indicators in India are equally worrying. The absolute number of undernourished people is greater than the population of sub-Saharan Africa,[36] and undernutrition rates are higher than the population of Bangladesh, despite India's superior economic growth.[37,38] Obesity and noncommunicable diseases (NCDs) are ever increasing, and India is described as the diabetes capital of the world.[39–41]

Clearly, alternative paths are urgently needed as governments and agencies consider how to manage economic growth and public finances while extending universal access to health care. Developed countries need to transform away from existing paths, and developing countries need to avoid them. What might the elements of these alternative paths be? One key element will be leveraging R&D pipelines in a portfolio across key economic and development sectors such as health, agriculture, and industrial development. For instance, Pingali has proposed that the outcomes of the Green Revolution agricultural investment could have provided much greater economic and human welfare benefits by linking to investment in nutrition and health R&D pipelines and systems.[7] The global economic burden of diet- and lifestyle-related chronic diseases such as diabetes and cardiovascular diseases is estimated at $47 trillion from 2010 to 2030 (75% of global GDP in 2010, U.S. $63 trillion) while causing 60% of deaths globally;[42] 80% of these deaths currently occur in low- and middle-income countries, and this percentage is expected to increase rapidly.[43] It has been suggested that this incredible economic and health burden of obesity and NCDs is the unexpected but natural outcome of ignoring nutrition and health in the many sectors of industrial innovation that shape lifestyle and environment, ranging from agriculture and food to transportation, housing, and communication technologies.[44–47] The impact of rising obesity, for instance, on health care has been clearly demonstrated, and it is still increasing.[48–50]

Alternatives in health care are also required. At present, most emerging and low-income economies follow a two-pronged strategy typically deployed in medical innovation and health system design, capacity building, and delivery. The first prong focuses on community and primary care for providing basic healthcare necessities, reducing infectious diseases and early mortality, with an emphasis on the most vulnerable segments of the population.[51] The second prong, deployed in tertiary and higher-level care, caters to cutting-edge diagnostic and treatment technologies.[52] Between these two extremes in the formal healthcare system is an unoccupied innovation space, which could overcome the nutrition and health disconnects and take a more preventive approach to the burden of obesity and NCDs through better multisectoral engagement and innovations in wellness, self-care, and the linking of nutrition and health innovations to basic primary care for vulnerable populations.[44,45]

Establishing a virtuous circle linking economic growth with health[53,54] and other human development outcomes[55] is clearly easier said than done. Technological developments in agriculture, food, sanitation, housing, and other industrial sectors at the core of poverty alleviation have not achieved impact and scale sufficient to reach the most vulnerable populations,[7] even though the economic

development they enabled has reduced poverty globally by 50% since 1990.[56] The joint optimization of wealth and health requires both convergence across industrial sectors and a more sophisticated combination of technical and social innovation.

A rich portfolio of such social innovation has developed over the last century to address problems of poverty, education, health, and other aspects of human development that cannot be solved by technologies alone. Social innovation provides new approaches, through both traditional and new social arrangements that address the underlying strategies, tactics, and theories of change to produce lasting impact through system-level transformation.[57–60] Social innovation to address human development problems may entail changes in basic routines and programs; in operational and business models; in the flows of physical and financial resources, communication, and authority in communities, value chains, and markets; and in beliefs and institutions.[60] For instance, recent work by Reardon[61,62] has documented the development of more robust rural–urban food systems, through social innovations in rural communities linked by commercial small and medium enterprises to urban areas. Beyond these basic changes, new social innovations such as social enterprises,[63] base-of-pyramid (BoP) ventures,[64] and corporate shared value creation[65] and BoP programs[64] support villages, communities, and emerging small and mid-sized towns to drive local and regional activities and provide access to health care.

Given the importance of technological innovations and the private sector as an engine for economic growth, the convergence of these two main types of innovation is critical. Like R&D pipelines for technological innovation, social innovation can, however, also be specialized and disconnected.[63] Moreover, because technological and social innovation originate in different societal sectors, there is a disconnect between them at present. This disconnect may be tied to their distinct leadership: private sector for the former and civil society for the latter. It may also be related to their different organizational cultures and structures, with civil society, until recently, lagging behind the private sector in its organization,[3] and with governments in many countries struggling to connect effectively to either or both groups, particularly when public resources are constrained and shrinking. However, there seems to be growing recognition and appreciation by the private sector, civil society, and governments that they need to work together to solve recurrent and persistent challenges. Have we reached a tipping point in which key actors are willing to consider both economic growth and nutrition/health/human needs and to seriously explore convergence possibilities for breaking the silos of technological R&D pipelines and social innovation?

Calls to this effect have been made by business[66,67] and civil society[3] leaders, as well as by academics.[44,65,68–70] In addition, as for environmental sustainability,[71] nutrition, health, and other aspects of human development are slowly moving toward becoming core drivers of business innovation and strategies, with active engagement by civil society and governments. Also, business has started to engage more meaningfully in social innovation and in multistakeholder partnerships for human development efforts to improve the impact, scalability, and resilience of universal healthcare coverage by bringing to bear their resources and capabilities for innovation, logistics, and investment.[3,72] Yet, so far no cohesive understanding exists of what innovation models sustain/underlie these critical transformations.

From this context, this paper introduces convergent innovation (CI) as a form of *meta-innovation*—an innovation in the way we innovate—that aligns and bridges individual and collective innovation throughout society to surpass what had been possible through siloed technological and social innovation to create human and economic development. CI proposes a comprehensive rethinking of complex societal problems and examination of needed innovations from a portfolio perspective to reach maximal societal outcomes given individual, local, and system-level contexts. Technologies are synergistically bundled with social (organizational, social process, financial, and institutional) innovations, creating convergent outcomes for precisely targeted, achievable, and time-bound challenges.[44] In this paper, we first briefly review the literature on technological innovation that sets the foundations of CI and motivates its feasibility. We then describe CI, its building blocks, and enabling conditions for deployment and scaling up, illustrating its operational forms through examples of existing CI-sensitive innovation. A fuller demonstration of

early-stage design, development, and implementation of a collaborative roadmap is presented in a companion paper.[73]

Review of academic literature on technological innovation

In this section, we examine the early patterns of technological innovation and how these evolved into the present disconnect between value creation for human and economic outcomes. We then review a rich portfolio of "convergence-sensitive" innovation approaches that have emerged over the last century. It is these, combined with social innovation, that are brought together in CI.

Early linear innovation model

Ever since Schumpeter[237] promulgated his theory of economic development, technologies emerging from R&D pipelines have been viewed as key drivers of growth in the Western world, being the means by which resources are transformed into commodities that have tradable value.[74] Through this early "linear" model of innovation, scientific development and disciplinary specialization arising with the Industrial Revolution have enabled technological breakthroughs that, with access to financial capital, creative entrepreneurship, and mass-production capacities, have helped address basic and less basic human needs and fueled economic growth in an unprecedented manner.[17] In other words, technological inventions from research institutions and corporate labs have been commercialized to address a number of human problems and needs. This innovative process, when providing value for clients who are able and willing to pay, in turn supports positioning strategies for businesses, with well-fed and fast-moving R&D pipelines competitively positioned within and across industrial sectors and markets.[17,75–77]

This early linear model lent itself to cutthroat hypercompetition in which lone innovators and entrepreneurs fought each other for the fastest and highest-margin road to market.[17,78] Schumpeter's key concept of creative destruction portrays the process of introducing new goods and services and entering new markets as a never-ending spiral that destroys old ways of commerce while increasing economic efficiency and creating more wealth.[79] This rising spiral of supply and demand has been further accelerated and intensified with the advent of globalization that translated into the exportation of Western technologies and business methods to other places around the world.[17] Centuries after the onset of the Industrial Revolution, the environmental, human, and financial limits to the successful deployment of this linear and siloed model of innovation are being recognized.[21,80,81] Although numerous adjustments are being made, they have yet to reach sufficient scale and scope for societal solutions.

Convergence-sensitive innovation models

The above early model of technological innovation, although still thriving, has progressively left room for other models, whereby different actors collectively and iteratively—through trial and error—bring about successful commercial exploitation of a new idea.[82–84] Also, as we review below, later approaches to innovation capitalized on capabilities and contexts of developing countries and emerging economies to bring about products and processes better attuned to a context of resource scarcity—or more appropriately to a context where resources of any type are not limitless as originally assumed during the Industrial Revolution.[17] These newer approaches have integrated resource-limits considerations into technological innovation (frugal innovation); fostered reciprocity between "the West-and-the-Rest"[85] in business innovation that addresses complex problems facing 21st-century society (reverse innovation); transformed technological or social processes (disruptive innovation); and enabled innovation to emerge throughout society (open innovation and collaborative innovation networks). More recently, a systems approach to innovation has arisen to help address and manage the complexity involved. At the policy level, the "innovation system" concept, while not denying the importance of research and technology commercialization, recognizes innovation as an interactive process involving individuals and organizations possessing different types of knowledge within a particular social, political, policy, economic, and institutional context.[83,86] In the field, the systems approach to innovation translates into a modular approach that bridges "loosely coupled"[87,88] innovators around collaborative platforms contributing to whole-system solutions to specific challenges, needs, and opportunities. Together these

approaches, briefly reviewed below, provide robust conceptual foundations for CI.

Disruptive innovation. Christensen[89] describes the process of how distinct products or ideas form in a niche market and eventually scale up and completely redefine an industry. In particular, the authors highlight that these innovations may seem unattractive or inconsequential to industry incumbents. Disruptive innovation consists of new products, processes, or services that transform an existing market or sector by introducing simplicity, convenience, accessibility, and affordability where complexity and high cost are the status quo. Although a classic example is the performance of hard disk drives in the technological sector,[90] disruptive innovation has also occurred in many other industrial sectors.[91] In health care, for instance, disruptive innovation drove major restructuring at large manufacturing corporations like GE,[67] while fostering the emergence of medical clinics in the retail sector (e.g., Walgreen's TakeCare and CVS's MinuteClinic). Although the lens of disruption allows important insights into the process of successful innovation, many potentially disruptive innovations are likely to fail either because they are too complex or because they are too high end. These problems are particularly vexing in contexts—such as large-scale healthy diet transformations—where most of the needs are in underserved populations or population segments.

Reverse innovation. In contrast to disruptive innovation, which tends to occur in high-end niches, reverse innovation[92–94] is about creating fundamentally different products to meet the needs of people in emerging markets that combine right functionality and a price they can afford, and bringing these back to core markets in industrialized countries. This creates solutions that are affordable and of good quality for the increasingly cash-strapped and price-sensitive Western clients, be they individuals, organizations, or governments. Reverse innovation can be disruptive, but disruptive technologies are not necessary to enable reverse innovation.[92] Examples of reverse innovations include the Tata Nano car, the Grameen Bank (microfinance), and GE's ultrasound.[93]

Both disruptive- and reverse-innovation approaches further underlie a rich portfolio of innovation approaches in emerging markets that provide "good-enough" products, processes, or broader solutions that meet basic needs at a low cost and thus provide high value, often made of simpler, cheaper materials and offering limited functionalities.[95] Providing extreme cost advantages relative to existing solutions in contexts with severe resource constraints, these innovations have focused primarily on small-holder agriculture, food, health care, education, financial access, and community development. These include BOP innovation,[64,70,96,97] catalytic innovation,[89,91] frugal innovation,[95,98] "resource-constrained innovations,"[99] "cost innovations,"[100,101] and jugaad innovation.[102,103] For instance, India has established itself as a leading producer of low-cost drugs, vaccines, and diagnostics and has played a crucial role in bringing a range of affordable medicines to developing countries.[104,105] These types of innovation are increasingly seen as the source of wealth creation for emerging economies and solutions to high healthcare costs in the West.[106] For instance, Narayana Health, which delivers state-of-the-art cardiac care in India at a fraction of the cost of equal quality in the United States, is now opening a 2000-bed clinic in the Cayman Islands, not far from U.S. borders.[107]

Open innovation and innovation networks. Open innovation[108] describes an emergent model of innovation in which firms draw on research and development that may lie outside their own boundaries. The paradigm of open innovation recognizes that a firm, by itself, may no longer be able to deal with the complexity and pace of technology and needs to harness external sources to generate new ideas, develop them, and bring them to market.[108,109] While open innovation is most applicable in "high technology" industries, there are instances of other industries embracing it as well.[109]

Building on open innovation is the notion of disaggregated "clusters," "networks," or "ecosystems" of innovation in a number of industries, including computers, telecommunications, pharmaceuticals, and consumer goods.[82,110–121] In these networks, the innovation activities (R&D, product design, production, distribution, system integration) are dispersed across the network constituents. Some networks are orchestrated by a lead firm[122] while others are self-organizing.[123] Complementing the organizational innovation networks are grassroots

innovation by users,[82,124–132] in consumer and nonconsumer domains like farming.[132–134] Innovation by users is a participatory approach to technology development that entails actively leveraging user experience and knowledge to drive the innovation process.[132] Such an approach to innovation development is likely to result in higher acceptability and better diffusion of innovations. The formation and reformation of such innovation networks across a diverse set of actors has been found to be stimulated by an environment that provides social and geographical propinquity.[135]

However, innovation networks have now crossed geographical boundaries, thanks to a revolution in communication and collaboration technologies. This is evident from the emergence of "Collaborative Innovation Networks" (COINs), which are a cyber-team of self-motivated people with a collective vision and enabled by the web to achieve a common goal by sharing ideas, information and work.[136] These networks work in a predominantly virtual manner (e.g., Wikipedia) leveraging a diverse, dispersed knowledge base to address global problems.[137]

In sum, the emergence of innovation networks epitomizes a shift from a centralized, closed model of innovation to a decentralized, open model of innovation.

Innovation systems. Evidence that has accumulated since the 1970s from direct observations of countries and sectors with strong records of innovation has shown that strengthened research capacity for science and industrial technologies does not correlate highly with the capacity to innovate and adopt innovations throughout society in order to support human development and economic growth within and across sectors.[138] Instead, the top ranks were occupied by countries that had taken a systems approach to innovation. An *innovation system* can be defined as a network of institutions, organizations, and individuals from university, industry, and government—what has been called the "triple helix"[139,140]—that focuses on bringing new products, new processes, and new forms of organization into social and economic use, together with the institutions, policies, and other factors that affect their behavior and performance. From a systems perspective, it is not so much the component parts, or nodes, but rather how it performs as a dynamic whole, with strong single components potentially forming a weak system.[87,88,141] To date, the concept has been used predominantly to explain past patterns of economic performance at national levels[86] and within sectors,[142] with interesting extension to regional systems of innovation.[143] The innovation systems approach has thus far not been leveraged to inform the practice of innovation per se, as it translates into products, processes, or services being brought to market or to the village.

Platform architecture and modularity. While the above streams suggest an unmistakeable trend toward a collaborative, open innovation model, the problems addressed by these models remain grounded in the traditional paradigm (i.e., they address a narrow and specific business or social problem). However, CI, with a goal to simultaneously drive economic growth and human development, requires adopting a systems approach. In other words, individual initiatives and organic collaborations,[144] each addressing a subset of the overall problem domain, need to be woven together for behavioral change at scale and transformation of the entire ecosystem. Insights into how to make a systems approach to innovation operational come from the engineering system design and computer science innovation literature,[110,145–147] central to which is the concept of modularity (e.g., Refs. 110, 112, 148, and 149). The notion of interdependence within modules and independence between modules lies at the core of modularity.[110,145] The costs and benefits of modularity have been examined in the context of management of complexity,[150] product-line architecture,[151] manufacturing,[145] process design,[152,153] process improvement,[154] and industry evolution.[110] Recently, the concept of a platform has been used to specify a system architecture that encompasses its overall structure and function, as well as the interfaces that govern the relationships among components and allow them to interoperate. Interfaces establish the boundaries of modules—components of a system whose "elements are powerfully connected among themselves and relatively weakly connected to elements in other components."[110] Because they define points of weak linkage in a network of relationships, modular interfaces reduce both coordination costs and transaction costs across the module boundary,[111] making innovation in one part of

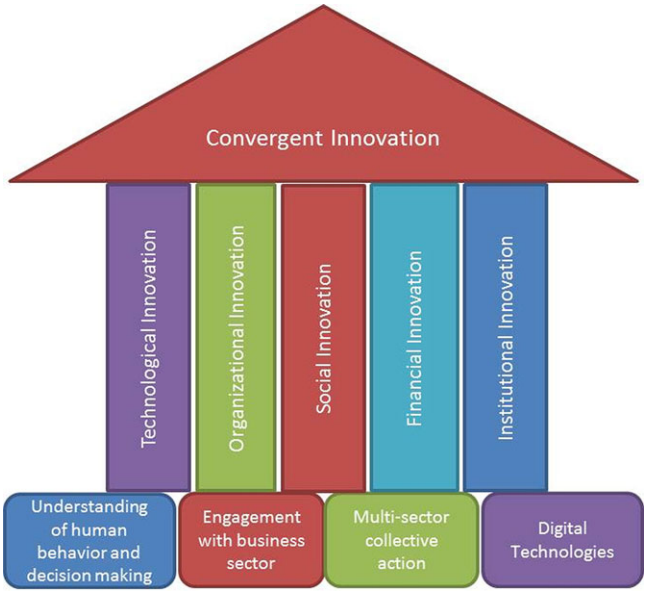

Figure 1. Convergent innovation.

the system possible without requiring changes in all other parts. Thus, the loosely coupled nature of modular designs is such that changes made to one module have little impact on the others, making transactions feasible where they were previously impossible or very costly in terms of time and investment. The concepts and methods of modular platform architecture are core to the CI approach. This lens allows actors to work semi-independently toward a convergent goal while pursuing their respective undertakings, mediated by a common innovation platform.

Convergent innovation

The review above suggests that the path to sustainable prosperity and affordable universal health coverage will depend more on the capacity to *innovate in the way we innovate* than on accelerating technology development. The above streams together form the key lenses highlighting, respectively, processes of scaling up; coordination and collective knowledge building across distinct actors; the presence of coordinating institutions; and coordination through an innovation platform.

Building on this, CI (Fig. 1) is a solution-oriented approach that combines technological and social innovation in a form of "meta-innovation" that integrates human and economic development outcomes through behavioral and ecosystem transformation. The long-term goal is to create new paths of convergence for agriculture, health, and wealth production and distribution. Convergence will allow the managing of trade-offs and the catalyzing of synergies within and between health and economic activities. This translates into rebalancing the emphasis on curative technologies with more prevention and better integrating economic and other social domains in healthcare innovation, systems design, and policy. CI also brings together diverse actors and approaches, incorporating modern and traditional, natural and industrial, and technical and social approaches as appropriate. In this section, we briefly describe CI, its building blocks, and enabling conditions for deployment and scaling up, illustrating its operational forms through examples of existing CI-sensitive innovation. A fuller demonstration of early-stage design, development, and implementation of a CI roadmap is presented in a companion paper.[73]

What is convergent innovation?

CI is anchored in the whole-of-society (WoS) paradigm for the convergence of human and economic development,[44,144] which views the individual and society as part of the same complex, dynamic, and adaptive system, shaping and being shaped by each other. CI pragmatically capitalizes

on individual and collective actions deployed at different scales, each targeting behavioral change and progressive ecosystem transformation, one project at a time, making convergence the default *modus operandi* within and across sectors and scales. CI links siloed technological and social innovation (including organizational, social processes, financial, and institutional innovation) to maximize availability, access, and use of their single and combined convergent outcomes in both developing and developed countries, with a special focus on the most underserved populations.

Moving away from universally applicable blueprints for change, CI takes a modular approach that convenes a complementary set of participants from the public sector, the business community, and civil society, loosely coupled around roadmaps that serve as virtual collaborative platforms on concrete, precisely targeted, and time-bound projects targeting scalable, sustainable, and resilient solutions where convergence adds value to the participants and to society. Modularity is key to innovation in complex systems.[155] Much like the modular platforms above, interfaces are defined for each of the participants in terms of the facets of their core strategic activities that feed and are fed by the roadmap projects. Challenges where CI bears the most promise relate to (1) addressing diet- and lifestyle-related health problems linked to agri-food and healthcare systems innovation and growth under both scarcity and affluence; (2) preventing and controlling communicable and noncommunicable diseases through sectoral and cross-sectoral innovation and partnerships; (3) scaling up home, school, and workplace wellness and self-care through the life course; and (4) expanding digital technologies and traditions for affordable universal health coverage.

Key enablers

Four key enablers of CI determine its relevance and feasibility. First is the depth of knowledge now available on human behavior both in terms of the diversity of rational and less rational motives driving individual choice,[156–158] whether personal, professional, or political, and in terms of the sets of social norms, rules, reciprocity, and other social capital processes that guide collective action.[81,159] For instance, the integration of such knowledge into both technological and social innovation through behavioral change intervention or product/program design[160–162] may help alleviate the poor performance of many nutrition- or health-sensitive technological innovations[163] and contribute to a higher acceptance rate of many organizational and institutional transformations.[164] This knowledge is also increasingly used to complement the present portfolio of policy tools with a rich diversity of nudge policies and choice architecture designs,[164–167] with the aim of making the normative (equitable, ethical, and leading to convergent outcomes) choice the simplest and most appealing, guiding individuals to act in their own and in society's best interest while preserving freedom of choice.

The second key enabler of CI is strategic engagement by private enterprises. Private enterprises, the primary drivers of technological innovation, play a crucial role in the systemic transformation that CI aspires to achieve. Moving beyond viewing human development as a peripheral, corporate social-responsibility (CSR) activity, private enterprises need to make it a core principle guiding their innovation and business strategy. We have seen this happen in pockets, as documented by the scholars studying innovation for the BoP markets.[65,168,169] For instance, ITC, through its e-Choupal initiative, has effectively sourced directly from the rural community. This not only has strengthened ITC's supply chain but has also uplifted the rural communities by integrating them into mainstream industrial activity.[170] While a handful of such cases have been documented, they are still the exception, and the majority of private enterprises view human development as an obligation rather than a strategy. CI proposes that the new-age enterprises, be they large multinational corporations or small and medium enterprises, need to shift the dominant logic within their organizations[171] toward proactive and organic sensitivity for human development as a driver of their core innovation and business strategy.

The third key enabler of CI relates to community mobilization and cross-sector collective action, facilitated by the rapid global increase in connectivity through Internet and mobile technologies, allowing communities, both rural and urban, to organize themselves better and faster than ever. Now community members can interact with each other and also with communities around the world in real time to achieve common goals.[172–175] There is also a growing appreciation of how collective

action occurs and can be enhanced. Decades of work in environmental sustainability of socioecological systems by Ostrom[81,176,177] and other leaders in the field[178,179] demonstrated that communities have an accurate understanding of how complex, multilevel socioecological systems operate and how community actions can lead to more sustainable and equitable outcomes. The BoP literature has advanced our understanding of markets, moving from viewing the BoP community as mere customers to cocreators[168,180]—incorporating concepts of social embeddedness, mutual value addition, and co-ownership as critical drivers of equity and sustainability.[65,168,180] Cross-sectoral collaboration around common goals that target convergent outcomes between private sector actors and communities are at the core of many efforts in business engagement, including second-generation BoP protocols.[181]

Beyond connectivity, the fourth CI enabler is the rich functionality of information and communication technologies (ICTs) now available. At the core of ICTs' enablers of CI is the ever-increasing digitization of operational and administrative data and digital literacy within and across organizations, value chains, and systems in industrialized societies.[182–185] Operations, administration, and monitoring functions in government, NGOs, or commercial businesses are now often supported by comprehensive enterprise information systems (ES), fostering the standardization and real-time integration of flows of material, information, and finances. These ICT systems can either be highly integrated or be linking organizations that are plural and loosely coupled, separate from each other and yet responsive to each other in some fashion.[87,88] This enabling is essential to supporting the modular architecture approach of CI roadmap projects. As suggested by Zammuto *et al.*,[186] the use of information (e.g., collection, storage, and distribution) can drive convergence without imposing "command and control" hierarchies. The authors proposed that innovation in ICT and the novel organizational arrangements and practices they support give rise to five key functional "affordances:" (1) the visualizing of entire processes; (2) real-time and flexible product delivery; (3) service and program innovation; (4) virtual and mass collaboration; and (5) simulation to capture complex nonlinear dynamics and anticipate outcomes. ICT provides a disruptive innovation that can and does enable convergence of health and economics in new and exciting ways.

Building blocks

To understand which actors need to be involved and which elements need to be brought together in the process toward self-sustaining innovation or universal healthcare coverage, we introduce four key CI building blocks (technological, organizational, social process, financial and institutional). Table 1 briefly describes each building block and displays the form that an operational deployment may take. These building blocks are concretely illustrated in the companion roadmap papers on a CI targeting affordable dietary diversity and balance through the promotion of pulse production and consumption around the world.[73] This roadmap brings to bear agricultural, food, and nutrition technologies, first, to enable pulses to compete with other, more immediately lucrative, crops in the farming schedule, and second, to increase pulses' share of the diet as affordable and environment-friendly sources of protein, while also eventually competing with metformin, statins, and other such drugs for the prevention and management of diabetes and cardiovascular diseases. The health benefits of pulses tied to the prevention and management of obesity,[187] hypertension,[188] diabetes,[189] and cardiovascular diseases[190] are well documented.

Technological innovation. Technological innovation has been extensively discussed above. In terms of CI, a critical challenge is managing the diverse trade-offs associated with the costs and benefits of technologies at different levels from individual to society. For instance, as innovation strategies are being developed by states and countries worldwide, an appropriate strategic choice to ensure healthcare financial sustainability might be to reduce investments in medical technologies that do not contribute to population health in favor of investment in other technologies or social innovations that prevent diseases. However, this trade-off may be unacceptable to health professionals who are committed to individual patient health[191] or to ethicists who view the provision of health interventions as a human right,[192] although one perhaps beyond the original vision enshrined in the WHO essential medicines. A second point with respect to technologies is the creation of demand for better nutrition and health products, especially

Table 1. Convergent innovation building blocks

Innovation	Definition	Example
Technological innovation	Technological innovation is an iterative process initiated by the perception of a new market opportunity for a technology-based invention that leads to development, production, and marketing tasks striving for the commercial success of the invention	New seed varieties Food process technologies Pharmaceutical drugs Medical devices Electronic devices such as DVD players, mobile and other ICTs
Social process innovation	Changes in the way individuals interact with each other that opens up new opportunities to individuals as well as the entities they interact with	Micro-entrepreneurship Virtual and real-world communities formed on the basis of shared practice, shared problems (e.g., communities of patients) Electronic word of mouth and social media
Organizational innovation	Intra- and/or interorganizational structures and processes that facilitate new types of activities	Traditional–modern value chain integration Accountable healthcare model InnoCentive Pulse Innovation Partnership[73]
Financial innovation	Advances over time in financial instruments and payment systems used in the lending and borrowing of funds	Distributed system risk financing Crowd funding Microcredit Impact investment Angel venture capital Health/nutrition/human index for signals to investment markets (e.g., ATNI) Innovation prizes
Institutional innovation	Institutional innovation is a generative process of collective action though which institutions are created or modified	Reforms toward a market economy in countries like India and China Establishment of new credibility-enhancing bodies, adjudicators

when benefits are not immediate. Without social demand creation, businesses providing innovative nutrition- or health-sensitive products face huge innovation costs relative to weak demand compared to providers of regular products. An enabling ecosystem is required to spur more nutrition- and health-sensitive technological innovation. Reframing education efforts that focus on knowledge to make them more effective for actual behavioral change and demand building could make a significant difference in this regard. Third, the enabling innovation-investment and policy-making environment needs to change innovation incentives and the valuing of externalities to favor synergies for more sustainable and equitable outcomes, particularly for the most vulnerable populations.

Organizational innovation. Organizational innovation refers to intra- and/or interorganizational structures and processes that facilitate new types of activities.[51] Business process innovations, among others, have reshaped entire industries, changing the distribution of value creation and value appropriation. Low-cost airlines, delivery, and retailers, capitalizing on this organizational innovation, have been successful, driving 11 companies from this

sector to be part of the 27 companies born in the last three decades to be on the Fortune 500 list.[193] Two key facets of this type of innovation are relevant here. First is innovation to foster more effective linkages between informal and formal value chains and markets, covering the full chain of value-creation activities, professional practices, production, and delivery systems. This type of innovation is relevant in agriculture, food, health, and many other sectors of activities and also equally relevant across industrialized, emerging, and resource-poor economies. The second facet, motivated by the fact that both health and economic sectors have evolved with a strong focus on building supply, bears on business and operational models that foster a better balance between drivers of supply and demand as well as affordability, access, and equity. For instance, in spite of many political barriers,[27] accountable care[194] is emerging as an integrated model for health care in the United States that takes a whole-person perspective in order to bridge traditional healthcare silos to boost quality and reduce costs by reallocating resources and changing processes on the basis of measurable improvements in care. In India, iKure,[195] employing a unique combination of medical and communication technologies, skills training, and capacity building, has developed a sustainable hub-and-spoke model that provides affordable and accessible health care up to the last-mile rural population, alleviating some of the chronic problems of doctor nonattendance, inexistent or decrepit infrastructure, and shortage of supplies faced by these villages.[196–198] This also helps reduce the reliance of many poor people in India, like in many emerging and less-developed countries, on informal providers for a large proportion of their health care and drugs, these working outside of regulatory frameworks, with significant adverse consequences in terms of safety, efficacy, and cost of treatment.[199,200]

Social process innovation. This type of innovation entails changes in the way individuals interact with each other that open up new opportunities to individuals as well as to the entities they interact with. For instance, micro-entrepreneurship creates local agency and self-reliance, enabling communities in underserved populations to more sustainably provide good or services locally, through financial or nonfinancial exchange. The use of social media and other ICT functions can empower individuals and communities as they interact with professional organizations and institutions, allowing them to obtain better service and value. For instances, eKutir,[201] using the most modern platform technologies, is transforming social processes within rural communities and between these and slum and other poor urban communities in the state of Odisha, India. The platform is becoming an engine for the creation of micro-entrepreneurs in a diversity of sectors, planting the seed for CI as villages are still struggling for subsistence. In the United States, Wholesome Wave,[202] also ICT-enabled, cleverly taps into agriculture funds for food stamps to improve access to and affordability of fresh fruits and vegetables in order to address obesity and NCDs in underserved communities. They do so by building capacity and fostering linkages between vulnerable populations and local food systems, while weaving in behavioral economics principles in order to design incentives for both buyers and producers. These social entrepreneurs and their partner networks work persistently to institutionalize such support in state and national legislation, including the Farm Bill. Beyond governmental food-stamp money, complementary funding comes from individuals as well as from local, state, national, and global private sectors and philanthropy. The most recent innovation by social entrepreneur Wholesome Wave tries to transform the social processes between agriculture, food, and healthcare communities by introducing into the formal healthcare system prescriptions for fruits and vegetables for obese adolescents and diabetic mothers from underserved communities, while building further capacity for local food systems in rural, peri-urban and urban contexts.

Financial innovation. While the finance literature and practice emphasizes innovation in derivatives and other stock market investment tools, we explore financial innovation more broadly in CI. Financial tools are key to any successful innovation.[203] Financial innovations such as novel funding mechanisms like crowdfunding,[204,205] or micro-insurance schemes[206] to ensure affordability, sustainability, and resiliency, can provide both humanitarian and economic returns on investments. A number of access-to-finance models are being tried, moving beyond the well-known case of microfinance[207] to influence investment,[208,209] supporting companies with strong social benefits through investments

from "catalytic" philanthropy,[210] which increasingly targets investments and efforts to address gaps left by market and government failures.[211] For example, Liechtenstein Global Trust (LG), a venture philanthropy, provides loans, grants, and investment capital to businesses that meet a broad range of nutrition needs. Other financial innovations provide environmental or health indices for social investors. For instance, the ATNI,[212] much like the Dow Jones sustainability index, provides information on the nutrition policies, practices, and performance of the largest food and beverage manufacturers. Pull mechanisms such as innovation prizes are also being used to foster results-based financial incentives, rewarding successful commercial and social innovations that address health and other humanitarian problems in a way that is financially sustainable and that supports economic development.

More investment and financial innovation is needed in social businesses[213,214] and other forms of social entrepreneurships[3,72] that are often formed as for-profit enterprises, while targeting human development outcomes. This status limits their access to investment to the limited-impact investment pool and excludes them from charities, while their targeting of human development outcomes renders them unable to compete in commercial capital markets. Currently, there are a number of insurance innovations. One very cost-effective approach is index-based drought insurance, in which the payout depends on a verifiable and objective index of drought (usually satellite imagery) rather than costly verification of all individuals. Insurance can be bought by individuals or even by governments or philanthropies providing disaster support to vulnerable communities. In health care, the Discovery Group in South Africa has developed a highly innovative private sector lead model of finance pooling that targets wellness promotion and prevention and control of NCDs.

Institutional innovation. Institutions embody the deeper norms, rules, and regularized patterns underpinning societies.[44] The lens applied in addressing institutional innovation in CI roadmaps is that of institutional voids,[215] a concept originally developed to understand challenges faced by Western multinational corporations as they were entering into or attempting to build value chains and markets in developing countries. Institutional voids relate in this context to underdeveloped capital markets, infrastructure, intermediary markets, regulatory systems, contract-enforcing mechanisms, or other institutions.[215] We posit that the limited convergence we see in practice today is due to a similar lack of institutions (or institutional voids) to bridge private and public sector organizations for collective action. With that as the point of departure, institutional innovation aims to fill these gaps and promote new types of institutions that are necessary for enabling CI. A core domain in which institutional innovation is urgently needed for CI is in rules for intellectual assets that better balance the trade-offs between rewarding innovators, preserving public investments in technology, and providing affordable products.

Roadmap development and deployment process

In terms of the development and deployment process (Fig. 2), CI roadmaps convene participants to generate convergent outcomes both through their respective contribution to the collective convergence target and through the pragmatic integration of convergence in their own mindsets and core strategies and activities. Participants include individuals in their diverse and sometimes conflicting roles as consumers, parents, producers, investors, and citizens; single organizations and institutions targeting convergent outcomes; and clusters of organizations and institutions forming a loosely coupled partnership around concrete, time-bound, and achievable goals within a roadmap domain. We focus here on the latter. Clusters of partners engage in roadmap innovations that are sufficiently close to their strategic activities to motivate significant and lasting commitment and return on investment (in terms of both human and economic development, for individual partners and for society). Their contribution to the collective goals can take many shapes,[179] from simple interdependent aggregation of individual partner actions into more coordinated or integrated collective actions to collaborations with diverse, sometimes conflicting, mindsets, methods, and motives.

While it is impossible to outline a process that can be standardized across various problem domains, it is critical to develop a process that facilitates collective understanding and trust building among distinct players. Beyond social capital, achieving

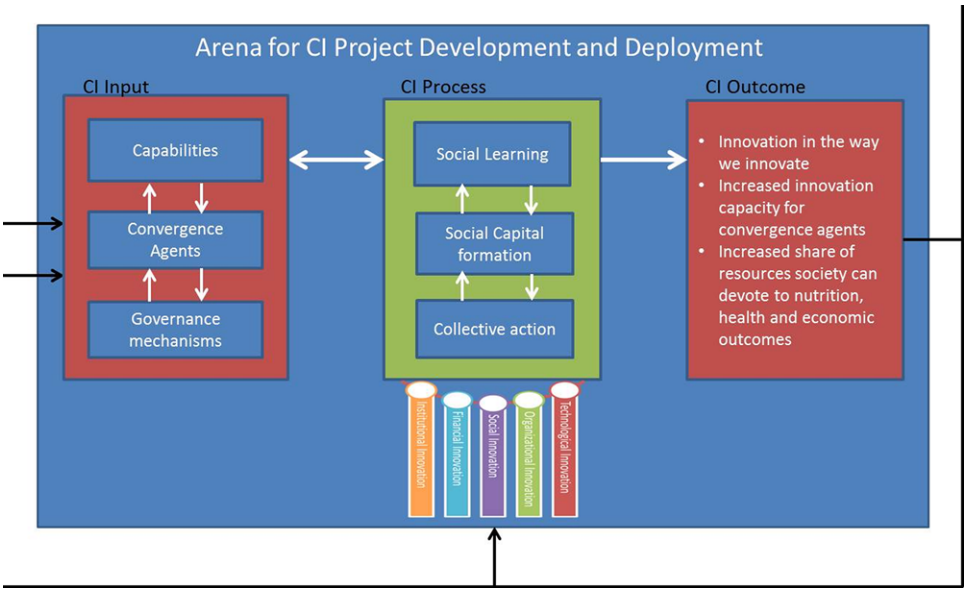

Figure 2. Development and deployment process of convergent innovation roadmaps.

transformative change in complex systems requires a collective capacity for learning and change.[216] That is, CI projects aimed at developing creative and robust cross-sectoral solutions not only facilitate coordination of focused and sustained commitment but also build collective understanding of the dynamically complex problems among actors.

Although there is no universal blueprint for the process of developing and deploying CI projects because of the diversity, complexity, and dynamic nature of conditions and contexts, guidance can be derived from models of collective action in socioecological[176,177,217–219] and market-chain[220] systems, as well as from a growing literature on multi-stakeholder partnerships.[221–224] The roadmap process entails three iterative phases that will progressively transform multiple stakeholders into CI partners.

In a first, social-learning phase, all CI projects involve the use and combination of new ideas, technologies, or ways of doing things differently. Hence, CI project development starts by bringing together individuals and organizations that are strongly and meaningfully engaged in reaching the targeted solution and that can articulate a common vision and goals with pragmatism, determination, ethics, and a good dose of hope and enthusiasm. Since everyone involved has traditionally worked in silos and is likely to have a worldview strongly colored by their respective disciplines, sectors, or jurisdictions, an adequate participative social-learning phase is critical to strengthen early patterns of interaction and to build solution-focused scaffolds or bridges when boundaries are difficult to cross. Recent work on practices used by cross-functional teams to integrate their knowledge in order to cocreate a solution may be relevant here to avoid inertia caused by the overwhelming nature of the task.[225] Others suggest that when confronted with seemingly irreconcilable differences, strategies that jump over examining and discussing differences to develop a collective team problem-solving orientation are effective.[226,227]

Through a social-learning process, CI groups of individuals or stakeholder organizations learn to operate: together they define problems and set priority areas where CI could add value; and they search for possible solutions and assess the value and feasibility of alternative solutions for a specific practice. In the social-learning phase, problems and solutions are defined and explored from multiple perspectives, and participants get to know each other, their activities, interests, ideas, and problems. Progressively, participants experience a shift away from what authors have called "multiple cognitions" toward convergence on a "collective cognition"—a shared vision of what solutions are brought to what

problems—and an emerging sense of how single and collective efforts can make targeted innovations happen. In such a learning process, each party benefits from and contributes to collective insights and solutions that none could have reached alone. Social capital starts to form, becoming the catalytic element that bridges and adds value to the many other forms of capital brought to the nascent venture by CI consortia partners.

As CI roadmaps and projects are specified further, consortia partners build social capital, which encompasses four central aspects: (1) relations of trust; (2) principles of reciprocity and exchanges; (3) general common rules, norms, incentives, and sanctions; and (4) connectedness, networks, and groups. There are no prescribed strategies to form social capital. Successful efforts vary with the domains where solutions are targeted, the diversity of partners, the values and attitudes of key individuals and organizations engaged, their patterns of interaction, and the external environment and institutional context in which CI projects are to be developed. The mere involvement of all partners in specifying further what CI is and how they will work together forms a basis for the trust and connectedness that is needed for long-term planning. Beyond effectiveness in joint planning, CI requires efforts to develop actors' substantive collective capabilities for change. Achieving change in complex systems necessitates developing robust shared understanding of the problem at hand.[216] Humans, however, are poorly equipped to understand the behavior of complex systems, as a result of feedback, time delays, accumulation, and nonlinear interactions across many actors.[228] Individually, we tend to see only fragmented parts of the system and to impose artificial boundaries.[62] As a consequence, actors cannot rely on their intuition to assess the likely impact of their policies and strategies in complex systems. Therefore, CI projects require interactive learning processes with explicit activities and tools for developing shared knowledge and collective understanding about the transformation dynamics. Underlying activities to facilitate this can be grounded in participative modeling and systems-thinking processes.[216] Interactive learning tools such as management flight simulators allow participants to discover individually and collectively how complex systems behave and to improve their mental models.[229] These computational tools allow actors to experiment themselves with the impact of uncertainty in scenarios, of changes in the defined problem scope, and of varying policies on the outcomes. In this way, policymakers and other key stakeholders, as well as the media and the public,[229] may gain a robust understanding of the likely consequences of interventions. The collective learning that ensues can lead to new policy practices and business models for health systems innovation.

As social-capital formation progresses, a sense of shared risks and rewards further facilitates long-term commitment to developing and deploying the CI project proper. As they build social capital among themselves, consortia partners specify in more detail what the project is to be, articulating variations it may take for different targets by starting with the most relevant CI building blocks. In this process, they proceed to the typical phases of innovation, business-plan development, financing, deployment, and monitoring, being fully prepared to learn and adapt as needed. Possible intermediary outcomes of CI projects include access to target populations or markets, access to resources, increased bargaining powers, risk reduction, economies of scale, and so forth. There are as many steps for aligning supply and demand factors to reach the targeted balance of nutrition, health, and economic performance as there are final outcomes for each CI project. In this dynamic process, consortia partners work for and with the CI targets.

Discussion

Many factors are likely to affect CI success and sustainability. Some bear on the composition of the CI consortia, the partners' approach to innovation, their experience with collective action, and their willingness to demonstrate their interconnectedness, motivation, and capacity to act together. Others are tied to the careful design of the CI and its ability to actually deliver the intended solution adapted to the needs, motives, preferences, and conditions of often highly differentiated target populations or markets, whether on the basis of gender, age, level of education, financial resources, size, assets, or geography. The presence of visionary and powerful "champions" in both CI partners and target populations and markets can be a key catalyst, but grassroots efforts through the WoS are equally critical, because only social movement can ensure development and affordable health care in an economically sustainable manner. In this discussion, we elaborate

on two key capabilities needed for CI scalability, namely collaborative interdependency and convergent leadership.

CI needs collaborative interdependency

Successful CI will require partners to eschew familiar collaboration models on the basis of dependence or independence. Instead, they will need to embrace a collaboration approach grounded in interdependence.[230] In initiatives targeting social issues, including those seeking to engage the BoP, a collaboration model focused on dependence is driven by the assumption, often implicit, that the experts should be teaching the proposed recipients. A dependent partner is subservient in the hierarchy of decision making, and the relationship model is based on "how I am going to help you." Emphasizing independence in collaborative activities often results in each organization maintaining separate metrics and strategies and generally interacting only for a specific scope- and time-bounded project. In this case, the partners are equal, but separate, and view relationships through a lens that emphasizes "how you can help me."

Neither approach will work in CI. The modular approach to roadmap development calls for complementary capabilities. Each partner engaging in CI has a core competence[171] but relies on other partners to complement that capability for a bigger or broader impact. For instance, NGOs' core competence is their intimate understanding of the challenges faced by marginalized communities. Private enterprises, apart from their domain-specific technological capabilities, generally have a core competence in business modeling and sustainable practices, which is crucial for sustainability. These two actors, with their complementary capabilities, can together achieve what neither can achieve on their own. In essence, the existence of complementary capabilities among partners underpins the emergence of collaborative interdependence.

Adopting collaborative interdependence provides the foundation needed to facilitate interaction in building a CI-based roadmap. The framing for collaborative interdependence stresses "how we can help each other" and "how we can collectively improve our understanding." Collaborative interdependence is a partnership model whereby each party recognizes that, on a fundamental level, their goals and strategies intersect and overlap. Their success is inextricably tied to the success of their partners. Consider CI-oriented efforts among for-profit and development partners to create businesses that serve the BoP. For the development sector, it does not matter how much money or other resources they invest in the business. Nor does PR count as a metric of success. The development sector succeeds only if efforts to build viable enterprises succeed. For the for-profit partners, they must not forget that business success is based on understanding how to create value for their stakeholders—BoP customers, suppliers, and entrepreneurs, and other partners. And creating value for the BoP means alleviating their poverty, which is a key metric for the development sector.

The challenge of building partnerships based on collaborative interdependence such as CI, however, should not be underestimated. Each party has to reconsider existing mindsets about roles, capabilities, metrics, and investments. For example, the development community needs to move away from execution-oriented projects with predetermined deliverables and fixed schedules and become comfortable with innovation-oriented approaches that allow for flexibility in enterprises' time frames and deliverables. The for-profit community has to accept development-sector measures of success—including demonstrating that the enterprise does achieve social goals, such as alleviating poverty. Furthermore, long-term success is not about leveling the playing field, as development partners generally desire, or about capturing the playing field, a typical for-profit orientation. Rather, the partners must collaborate to raise the playing field. In other words, they should focus on producing new sources of value. Indeed, interdependence-based collaborations must be grounded on the idea of mutual value creation. Development organizations, for-profit enterprises, local communities, foundations, academia, and governments seek different types of value and measure success in different ways. Initiating partnership based on collaborative interdependence, therefore, requires that each partner recognize and embrace the value proposition of their potential collaborators. Sustaining these collaborations entails developing a deep understanding of what type of value is created, how much of each type is created, and how that value is allocated. Scaling interdependence-based collaborations involves ensuring that the type, amount,

and allocation of value remain balanced as the enterprise expands across communities, geographies, technologies, and industries. While achieving this state of cross-organizational collaboration is easier said than done, truly leveraging the power behind the CI approach requires adopting this partnership model. In building CI-based roadmaps, different partners in the process have unique strengths and particular limitations. The challenge—and the opportunity—is to be aware of these differences, leverage them as much as possible, accommodate them when necessary, and keep the shared long-term vision, and long-term value creation, in sight.

Scaling up CI requires convergent leadership

CI requires, as for any transformation context, the involvement of forward-looking leaders who can "manage the present, selectively forget the past, and create the future."[94] Equally important are pragmatic cooperative leadership with an ability to use appropriate incentives and disincentives to get results from one's own and other partner's organizations[89] and the ability to learn by doing.[89] In addition, the convergent leadership to be deployed in every roadmap project to enroll and maintain frictionless participation by all actors involved is one where private, public, and nonprofit/civil society sector leaders can appreciate one another's needs, aspirations, and incentives and find meaningful interfaces to work together toward lasting CI success. In a similar concept used to describe qualities deployed over the course of a person's career moving across the three sectors, namely triple-strength leadership, Lovegrove and Thomas[231] distilled six skills that characterize these leaders. First, they find ways to pursue overlapping and potentially conflicting professional goals, combining self-interest with concern for others. Second, they acquire transferable skills across business (to allocate scarce resources and to capture attractive market opportunities), government (to create legal and policy framework), and nonprofit (to assemble more limited resources, longer time horizons, and greater operating freedom on devising creative ways to further social good). Third comes the ability to develop contextual intelligence, to see parallels between sectors and to accurately assess differences in contexts that call for translation and adaptation. Fourth, the triple-strength leaders have forged an intellectual thread, building subject-matter expertise (similar to roadmaps domain). Fifth is the ability to build integrated networks, which they use to build leadership teams and to convene diverse groups to address tri-sector issues. Finally, leaders must keep an open mind and be willing to embrace opportunities that will extend their experience and skills across sectors—and to run the accompanying risks. Convergent leadership should deploy all five strategies at the same point in in time and space within any single roadmap project undertaking.

The trap of diffusion of responsibility or CI governance

When a collaborative project has a lead organization, the responsibility for orchestration such as mobilizing resources and coordinating activities rests with that organization.[232] However, many CI projects take a consortium approach, where all partners are equal partners, having complementary and agreed-upon roles, responsibilities, and resources. In such a scenario where there is no clear leader, there is a risk that each organization will expect the others to assume the responsibility of coordination, thus resulting in a diffusion of responsibility.[233] This issue must be addressed up front and can be resolved through one of two methods. The partners could convene a governance council comprising representatives from each of the partnering organizations as well as others, as appropriate. This council is analogous to the board of directors of a company, ensuring continued alignment in strategy and action. Such a high-level council could be augmented by an operational council with representation from each partnering organization that would coordinate action. As an alternative, the partners might elect a lead partner depending on the project type. This might be an organization that has the field connect and would be responsible for a bulk of operational activities. Even in this scenario, the formation of a governance council would be recommended to ensure continued alignment.

Needs and possibilities for convergence metrics and decision support throughout society

In complex systems, information is key to transformation.[234] There is, therefore, an urgent need to establish bridges between metrics and analytics that support sectoral decision making in order to inform CI roadmap design, evaluation, and monitoring and to foster rapid and adaptive

learning. Business intelligence currently uses artificial intelligence to organize and bridge georeferenced big data from different sources and in real time, to identify patterns, and to bring in systems-science methods to extrapolate from those patterns in order to predict and/or simulate consumer, competitor, industry, and market behavior under different policy and ecosystem conditions. Similar approaches are now being used to monitor population health and to guide various facets of interventions, public policy, and systems design in a diversity of sectors involved in human development as well. Real-time, sectoral, and cross-sectoral knowledge and learning platforms can be made available to actors from the local, state/provincial, national, and global arenas in sectors that have an impact on either human or economic development or both, harnessing the combined power of big data, knowledge modeling, and complexity sciences.[235,236]

Conclusion

CI is not expected to be a panacea, and it is not without costs; it requires investment of all types, both individual and collective. CI is also not without risk, and all risks, rewards, and outcomes should be visible to CI partners, targets, and all other actors involved. However, we believe CI has real potential to improve the share and impact of the resources that society devotes to fixing complex challenges, such as cross-sectoral efforts to improve nutrition and health in an economically sustainable manner. This early sketch of the CI approach is presented as an opening field for science, policy, and innovation that we hope will spark behavioral change and ecosystem transformation throughout society to move sustainable prosperity and universal affordable health care in the 21st-century society away from wishful thinking and depressive realism and toward realistic optimism.

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Conflicts of interest

The authors declare no conflicts of interest.

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