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Embracing complex social problems

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Abstract

Purpose – This paper aims to expose the inadequacy of social marketing to tackle complex social problems, while proposing an expansion in the discipline' conceptual repertoire. The goal is to incorporate complexity tools, in particular from the system dynamics field, and the promotion of mindware within a true transdisciplinary paradigm.

Design/methodology/approach – This paper uses literature review to support the proposed theoretical development. It also presents a short case study.

Findings – Most problems that plague our modern societies have a distinctive complex nature that is not amenable to traditional social marketing interventions. Social marketing has simplified the problem of bringing about societal change by thinking that upstream social actors can be influenced in the same way as downstream individuals. This paper shows that this is not the case while proposing a framework to close this gap.

Research limitations/implications – The proposed framework is a theoretical one. It depends on further refinements and actual application to wicked problems.

Practical implications – Complex social problems – or wicked problems – remain widespread in modern societies. Moreover, they are getting worse over time. The paper presents a proposal to redefine the limits of the social marketing discipline so it can be more useful to tackle such problems. Practical approaches such as measuring the success of mindware in the marketplace of ideas are implied in the proposed framework.

Social implications – The increase in complexity of social problems has not been accompanied by an evolution in the discipline of social marketing. The lack of proper conceptual tools has prevented the discipline from contributing to tackling these problems effectively. Some interventions may actually worsen the underlying problems, as illustrated in the paper.

Originality/value – This paper identifies two major gaps associated with the social marketing discipline, in particular the lack of complexity and systems thinking and the forsaking of ideas (mindware) as a legitimate goal of the discipline. This realization corroborates the claim that boundaries among disciplines are often artificial, hindering the proper understanding of complex social problems. In turn, only the use of adequate conceptual lenses makes it possible to devise interventions and programs that tackle actual causes (instead of symptoms) of complex social problems.

Keywords Marketing, Social marketing theory, Social marketing, Critical marketing, Public policy, Complexity science, System dynamics

Paper type Conceptual paper

> There is an even more fundamental reason why simulation is essential. There is no learning without feedback, without knowledge of the results of our actions. Traditionally, scientists generated that feedback through experimentation. But experiments are impossible in many of the most important systems. When experimentation is too slow, too costly, unethical or just plain impossible, when the consequences of our decisions take months, years, or centuries to manifest, that is, for most of the important issues we face, simulation becomes the main – perhaps the only – way we can discover for ourselves how complex systems work, where the high leverage points may lie. (John Sterman, 2002, "All models are wrong: Reflections on becoming a systems scientist")

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The gap between social marketing and complex social problems

Complex social problems remain widespread in modern societies. It is astonishing to find that, almost five decades after the release of the classic book *The Limits to Growth* (Meadows *et al.*, 1972), the same complex problems mentioned in the book are still here. These problems include poverty in the midst of plenty, degradation of the environment, economic disruption, insecurity of employment, low trust in institutions and uncontrolled urban spread.

Complex social problems result from interactions among a myriad of social actors, each responding to different structures of incentives and each striving to maximize the attainment of his or her particular goals. Often, individuals behaving in response to the goals of their subsystems prevent the overall societal system from reaching its desirable goals. Consider how politicians sometimes resort to populist policies to increase their electoral capital through short political cycles. The public, on the other hand, tends to reward illusory policies that relieve the symptoms of social problems while not recognizing the long-term importance of policies such as basic sanitation or early childhood development. The media needs to sell information, but complex information does not sell well, so it often relies on pundits who oversimplify important issues. Non-governmental organizations push their particular goals, competing in a crowded marketplace of ideas that overvalues "sexy" causes (Waddell, 2018), and so complex social problems continue to exist.

Another way to contemplate the issue is by considering that complex social problems arise at the intersection of the different spheres that encompass human life, as in the case of the tortilla riots described below. These spheres comprise natural, cultural, social, technological, economic, demographic, political and historical forces, and they have been interacting at an accelerating pace, generating constant waves of unexpected problems for modern societies.

On the other hand, while the complexity of social problems keeps increasing, the design of public policies still adheres to inadequate mental models, leading to sequences of failed interventions that often aggravate the very problems they are intended to address. Public policymakers, of course, rely on collective mental models, which are products of cultural, historical and scientific developments.

Nevertheless, the increase in complexity of social problems has not been accompanied by an evolution in the disciplines or frameworks intended to address them. In this paper, we focus on the discipline of social marketing, recognizing that the same criticisms could be applied to related disciplines that adopt linear paradigms, such as behavioral economics.

Our goal is twofold. First, we aim to expose the inadequacy of social marketing to tackle complex social problems. Second, we propose expanding the discipline's conceptual repertoire to incorporate complexity tools, in particular from the system dynamics field, and mindware (defined below) within a true transdisciplinary paradigm.

Criticism of the traditional focus of social marketing

Definitions of social marketing typically do not hint at mechanisms that influence upstream actors and bring about social change. Social marketing essentially is (or should be) about marketing social change (Gordon *et al.*, 2011). Even one of its founders recently acknowledged that a better name for the discipline would be "social cause marketing" (Kotler, 2017).

Nonetheless, with notable exceptions (French and Gordon, 2015; Hastings and Domegan, 2014; Domegan *et al.*, 2017), there is little attention in the literature to complex social systems and how they produce undesirable behaviors. Even in cases where attention is paid to broader influences on behavior, there is little comprehension of the structure and the dynamics of systems.

For instance, Kennedy *et al.* (2017), using the fast fashion industry as a case study, propose an approach based on the analysis of stakeholders, networks, social mechanisms of interaction and cooperation, structures of governance and identification of shared narratives. While this makes a valuable contribution to the literature, the approach fails to take into account elements essential to the dynamics of complex problems, such as multilevel feedback loops, delays and nonlinearities. Because it lacks a "grammar" to analyze and simulate these dynamics, such as system dynamics (Sterman, 2000a), the framework also fails to identify leverage points for change. Finally, although the approach emphasizes the importance of shared narratives, the authors do not discuss at length the role social marketing could have in reshaping the predominant mental models of upstream and downstream actors.

The criticism levied here is not new. The strong focus on downstream and individual-based approaches is notorious in the social marketing literature (Corner and Randall, 2011; Biroscak, 2014). There is an exaggerated focus on formulaic approaches to behavior change, which often prevents the use of interdisciplinary lenses (French and Gordon, 2015).

Additionally, there is little guidance on how to effect change in societal systemic structures through upstream approaches (Andreasen, 2006). Biroscak (2014) offers the community-based prevention marketing framework as an upstream approach for social marketing. However, that framework, although it accounts for important courses of action to promote policy change, such as coalition building and advocacy, still seems insufficient in light of the gaps that will be discussed below.

We make a strong statement here: social marketing has been flying blind for most of its history. By focusing on the visible parts of a system, especially the behavior of downstream individuals, by mostly ignoring complexity and systems thinking and by failing to adopt a true transdisciplinary stance, social marketing has produced results that are valuable but insufficient to address modern complex social problems.

We consider under two headings, what we see as the major gaps preventing the discipline from producing relevant social change: the complexity gap and the mindware gap. We now discuss these in turn.

The first gap: complexity matters

Most complex social problems have multilevel roots and a complex web of causation. Moreover, they exhibit a characteristic that politicians and public policymakers tend to ignore: the systems in which they are embedded are policy resistant (Sterman, 2000a). Interventions to improve the system often lead to worse conditions over time. Building roads to alleviate congestion is the classic example of this. The greater the number of roads, the more is the traffic over time. As Bandura (1997) remarks, some of the policies that cause harm were originally well intentioned – the harmful effects are typically unforeseen. Forrester (1971) insightfully acknowledges that evolution has not provided human beings with the necessary mental skills to interpret the dynamic properties of the systems we live in. Worse, social systems are far more complex than technological ones. As Forrester remarks, our prevailing mental models simply cannot anticipate the consequences of interactions between the parts of social systems.

Complex social problems are incongruous with mental models that rely on linear or single-cause explanations. However, in practice there are few frameworks to circumvent the prevalence of linear models. In discussing what they call the dawn of systems leadership, Senge *et al.* (2015) stress that self-sustaining changes in social systems are not the product of the volition of leaders. Instead, change depends on the creation of appropriate conditions, which, in turn, requires a proper visualization of the entire system. Most people in any

complex system, they argue, tend to focus on limited parts of the system, depending on their perspective. One viable way out of this predictable trap is to engage stakeholders in the creation of a systems map that captures all the necessarily different perceptions of a given problem, but this is often not possible within our outdated policy venues.

Complex problems do not respect academic boundaries. Acemoglu and Robinson (2013, pp. 68-69) provide, perhaps one of the best examples regarding the consequences of adopting limited viewpoints. Speaking of the income inequalities that characterize the modern world, they claim that:

> Poor countries are poor because those who have power make choices that create poverty. They get it wrong not by mistake or ignorance but on purpose. To understand this, you have to go beyond economics and expert advice on the best thing to do and, instead, study how decisions actually get made, who gets to make them, and why those people decide to do what they do. This is the study of politics and political processes. Traditionally economics has ignored politics, but understanding politics is crucial for explaining world inequality. As the economist Abba Lerner noted in the 1970s, "Economics has gained the title Queen of the Social Sciences by choosing solved political problems as its domain." We will argue that achieving prosperity depends on solving some basic political problems. It is precisely because economics has assumed that political problems are solved that it has not been able to come up with a convincing explanation for world inequality. Explaining world inequality still needs economics to understand how different types of policies and social arrangements affect economic incentives and behavior. But it also needs politics.

There has been little cross-fertilization

Complexity matters, but there has been little cross-fertilization between social marketing and complexity sciences (including systems thinking). Most instances of use of complexity concepts in social marketing are qualitative and cursory. In addition, examples of rigorous systemic methods applied to social marketing are rare.

It is not the case; however, that marketing has been immune to concepts from other disciplines. For instance, the paths of system thinking and the marketing discipline crossed when a particular instance of the former (general systems theory) was used as a reference for the influential work of Fisk (1967) or when the marketing pioneer Wroe Alderson developed a general theory of marketing (Beckman, 2007). Their paths would cross again on other occasions (French and Gordon, 2015, in the field of social marketing), but the cross-fertilization did not bear much fruit besides a superficial understanding of how systems work. Fisk (1967), for instance, discusses (very briefly) hierarchies of goals, the role of interacting variables, negative feedback, delays and the classic elements of systems represented by inputs, constraints and outputs. He was mostly interested in the interrelationships among production, marketing and consumption. His work attests to the nature of "universal acid" that few theoretical bodies occasionally acquire. The general systems framework was very popular at the time, especially because of novel theoretical developments in biology and information sciences (Bertalanffy, 1968; Richardson, 1999).

A few social marketers have, however, identified the need for systems thinking in the discipline. We now briefly discuss these exceptions, sampling the most relevant contributions from the literature.

Hastings and Domegan (2014) claim that social marketing should aim to realign market structure with wider societal values instead of just applying downstream formulaic solution to social problems. This upstream approach entails the alignment of public policy decisions, corporate marketing decisions and civil society. They argue that social marketing's repertoire should encompass the identification of collective sources of problems, the use of coordinated approaches and long-term, strategic critical thinking. They also recognize

(Hastings and Domegan,2014, p. 269) that behavior change is inextricably linked to societal change, which requires a move from playing simple tunes (i.e. using standard commercial tools to influence individual behaviors) to running a complete symphony (i.e. addressing the problems in all their complexity):

> The need for systems thinking becomes even more apparent when we move from small decisions about shopping to large-scale problems with multiple stakeholders such as global warming. *These sorts of problems are not only complex, but also typically conflicted because differing interests have to be accommodated*. The oil industry will have one perspective, Friends of Earth another and car-owners a third – with politicians caught in the middle trying to please multiple constituencies while also hoping to get re-elected. These problems become so intractable they are sometimes termed "wicked" and the temptation is to ignore them. It is much easier and more pleasant to focus on simpler actions – a bit of recycling here and litter-picking there. But, when, as with planetary degradation, *the problems are systemic, the solutions have to be equally wide ranging*. (Emphasis added)

In turn, Kennedy and Parsons (2012) call positive social engineering the combination of macro-social marketing with other social technologies that facilitate social change. In explaining the government-sponsored anti-smoking campaign in Canada, they identified the critical factors of success as a coordinated combination of social marketing, legislation, regulation, education, funding, community mobilization and research.

Biroscak (2014) provides a substantial contribution to the social marketing literature by using system dynamics to model policy implementation in community-based marketing programs. Domegan *et al.* (2017) discuss how the discipline can benefit from non-linear causal thinking, offering examples of methods designed to engage stakeholders in mapping and modeling complex problems. Brychkov and Domegan (2017), in turn, offer a comprehensive review of the historical integration between the discipline of social marketing and systems science. Finally, Truong *et al.* (2019) offer a critical appraisal of the systems social marketing literature, emphasizing aspects such as the use of multiple methodologies and the possibility of interventions at multiple levels of systems.

Outside the social marketing field, but still under the marketing theoretical umbrella, macromarketing is the sole example of a marketing sub-discipline specifically concerned with systems. Its birth in 1965 was even influenced by the work of Jay Forrester, the founder of system dynamics (Layton and Grossbart, 2006). Throughout its history, macromarketing has addressed a wide range of issues: the societal effects of marketing, the coordination of production, distribution and consumption activities, the effects of institutional factors and society on marketing and the quality and quantity of life goals served by marketing. Notwithstanding the importance of these issues, and although understanding complex systems was one of the goals advocated by macromarketing scholars, the discipline so far has not been able to provide an integrated conceptual framework for dealing with complex social problems. It has dealt with the attribute of adaptive systems, the adaptiveness of marketing systems and with business ecologies for instance, but little theoretical ground has been covered beyond those issues.

Nevertheless, the perceived gap between marketing and complex social problems has been recognized, albeit at a slow pace. No one epitomizes this realization better than Philip Kotler, the co-founder of the social marketing discipline. In his 2015 book *Confronting Capitalism*, Kotler discusses and presents a proposed solution to a wide range of social problems, from income inequality and poverty to environment exploitation, debt burden and societal well-being (Kotler, 2015). In the domain of poverty and inequality, for instance, he advocates the consideration by governments of minimum income programs. On the issue of how politics subverts the interests of the broader society, he recommends a set of measures,

including higher taxes on luxury goods. This kind of recommendation represents a healthy departure from the narrow downstream focus present in the social marketing discipline. Other examples of complex problems addressed by social marketers (even if they do not adopt complexity approaches) are corruption and crime (Homel and Carroll, 2009; Kindra and Stapenhurst, 1998).

While the literature on systems thinking and complexity often diverge, we have chosen to select common elements and propose a unified framework, which, we posit, should be incorporated into a discipline tackling complex social problems. However, before discussing that framework, and with the goal of illustrating how downstream social marketing interventions may entirely miss the point, we first present an example of a social problem that defies any discipline confined to its artificial, narrow academic boundaries.

An example: ethanol, tortilla riots and the Arab Spring

A practical example of the complexity gap comes from the unsuspected connections between the expansion of ethanol use in the USA, the tortilla riots in Mexico and the Arab Spring.

Zolli and Healy (2012) describe the mechanisms behind the tortilla riots that took place in Mexico, starting in January 2007, when the price of corn hit an all-time high of US$35 a pound, hundreds of times more expensive than just a few months previously. Tortilla is a staple food for poor Mexicans, which means half of the population. A hypothetical social marketer working for the Mexican Government would probably try to change the behavior of the poor with the goal of promoting the consumption of cheaper alternatives to tortillas. The social marketer could even work on upstream channels along with organizations involved in food production and distribution, in an attempt to broaden the offer of food alternatives. This approach could mitigate the problem, but it would never address its root causes.

The ultimate cause of the social unrest that followed the sharp increase in the price of tortillas was not, as the protesters assumed, the political party in power or Mexican businesses. In fact, the cause could be traced back to the passage of Hurricane Katrina in 2005. The hurricane closed 95 per cent of oil production in the Gulf Coast for several months, leading to a spike in oil prices in the USA, followed by pressure to increase the production of biofuels. Ethanol in the USA is made from corn, and the five-fold increase in its production mandated by Congress resulted in a rush for new plants and the substitution in cultivation fields of inedible varieties of corn for edible ones. At the same time, because of the North American Free Trade Agreement (NAFTA), US-produced corn was being sold in Mexico for 20 per cent less than its production cost, as its production was (and still is) heavily subsidized. This had led many small-scale rural farmers in Mexico to abandon the cultivation of corn, making the country dependent on imports from its northern neighbor and pushing farmers toward the cities, where they swelled the ranks of the urban poor. The concentration in the distribution sector had also increased, with a few powerful economic actors, all headquartered in the US, making all the relevant decisions. Katrina was thus the catalyzer of a perfect storm whose elements were already aligned.

Moreover, all the forces at work in these different systems had different time scales: fast in the case of Katrina, moderate for the coupling of oil and corn prices and slow for NAFTA and the concentration of market players. Hence, the interplay among the diverse systems amplified the effect of disruption (Katrina) to unprecedented levels. As Zolli and Healy (2012, p. 4) stress, this case made visible:

> The linkages between the energy system (the oil rigs), the ecological system (Katrina), the agricultural system (the corn harvest), the global trade system (NAFTA), social factors (urbanization and poverty) and the political systems of both Mexico and the United States.

Figure 1 is a graphical representation of those linkages, adding what we call the catalyzing factor of change, in this case, Hurricane Katrina.

The Mexican Government quickly struck a deal with tortilla producers while acting on NAFTA rules to increase imports. Luckily, international corn prices started to fall at the same time (Thomson, 2010). The crisis was mitigated. However, the same dynamics produced effects elsewhere, in a different context. Lagi *et al.* (2011) modeled the causal influence of the rise in international food prices, including corn, on pushing the social systems in some Arab countries past the tipping point of social unrest (leading to the Arab Spring).

Thus, the occurrence of food riots foretells a future of increasing interconnection in systems, with unanticipated consequences of policies in many sensitive social contexts.

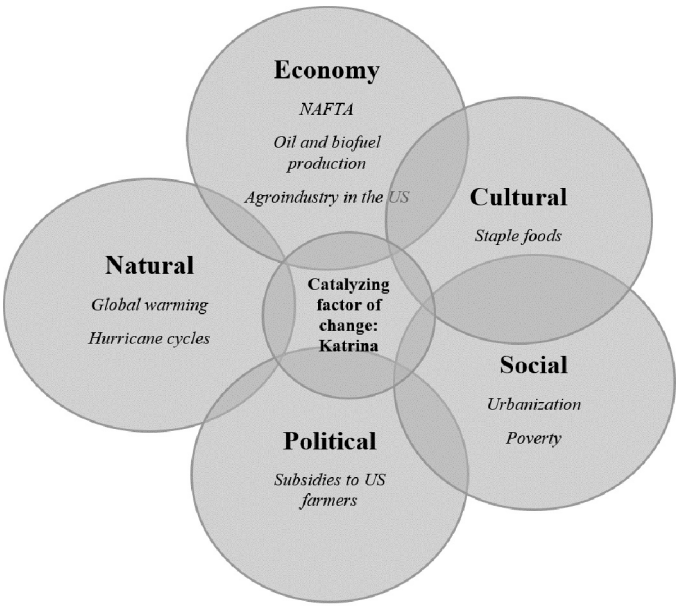
The plague of event-oriented worldviews

As we have suggested, most public policymakers and influential social actors, including social marketers, tend to possess an event-oriented worldview (Sterman, 2000a).

Figure 2 depicts the event-oriented worldview, and Table I provides examples of common policies that inevitably backfire.

Events are visible manifestations of problems or the proverbial tip of the iceberg. They inevitably distract decision makers from inquiring into the real underlying causes of phenomena. One characteristic of the prevalence of event-oriented worldviews among policymakers is the common ascription of undesirable effects following inadequate decisions to the category of "side effects".

Event-oriented mindsets are the rule in public policymaking and also in business settings. A recent example comes from a *Harvard Business Review* article written by Roger Martin, the famous strategy researcher. Discussing why mergers and acquisitions remain a



Source: Adapted from Zolli and Healy (2012)

Figure 1.
Dimensions involved in the tortilla riots

dominant strategy in the business world, even when history and data show that most such transactions destroy value for the shareholders of the acquiring companies, Martin identifies two major structural factors explaining their prevalence (Martin, 2016). The first is stock-based compensation for CEOs and executives. The second is a remarkable example of an event-oriented worldview: a change in the depreciation rule of assets in the USA that had the unintended consequence of increasing the value of acquisitions, making them more attractive for CEOs.

Another example is the controversy over giving financial aid to poor countries. There is growing evidence that, rather than ameliorating poverty, aid increases corruption and limits economic growth (Swanson, 2015).

In sum, event-oriented thinking typically leads to decisions that make sense superficially but bring about negative consequences in the long term.

Hence, by accepting commonsensical approaches to tackle complex social problems, social marketers risk pulling the wrong levers, acting on symptoms instead of causes or, in a more benign scenario, acting on points of low leverage for change. Thus, any discipline concerned with social change must incorporate complexity and systems sciences into its toolbox. In the specific case of social marketing, this incorporation could also help in overcoming the discipline's "curse" of being associated with the negative aspects of commercial marketing.

The universal acid of complexity sciences

We draw on the metaphor proposed by the philosopher Daniel Dennett, who compared evolutionary thinking to a universal acid that, since Darwin, has slowly corroded old ways of thinking, reaching all scientific fields (Dennett, 2013). We argue that the same metaphor applies to the expansion of the complexity sciences.

The initial academic discussion of complexity is usually traced back to Adam Smith's *Wealth of Nations*. However, the origin of the complexity sciences as formalized fields of inquiry can be attributed to information and computation theorists working in the first half of past century, such as the mathematician Stanislaw Ulam and the computational scientist John von Neumann (Miller, 2015). Ideas from biology and evolution (e.g. the role of simple rules in generating complex structures) were also progressively incorporated into the tenets of complexity thinking (Furtado and Sakowski, 2014). Currently, the field of complexity has

Problem as event	Solution as fix
Unruly binge drinkers	Deploy more police
Drug-related crime	Deploy more police
Congestion	Build new roads
Loss of market share	Launch new product
Decline of fishing community	Build new fish factory

Source: Morecroft (2015)

Table I.
Examples of event-oriented thinking

Source: Adapted from Sterman (2000a)

Figure 2.
Event-oriented worldview

developed into several subfields and methods, such as agent-based modeling, network science, neural networks and genetic algorithms.

There are several definitions of complexity and complex systems. We cite two definitions from influential thinkers in this field. Complexity, according to Arthur (2013, p. 3):

> [. . .] is not a theory, but a movement in the sciences that studies how the interacting elements in a system create overall patterns, and how these overall patterns in turn cause the interacting elements to change or adapt.

Mitchell (2011, p. 13), in turn, defines a complex system as:

> [. . .] a system in which large networks of components with no central control and simple rules of operation give rise to complex collective behavior, sophisticated information processing and adaptation via learning or evolution.

We note, however, that complex social problems often arise at the intersection of systems that do not necessarily fit Mitchell's definition (the political system, for instance).

We take a two-pronged approach to explore the complexity gap. We first present the characteristics of complex systems that are most relevant to understanding the complex social problems of our times. Then, in the next section, we discuss the method of system dynamics, which we think, is especially suited to identify the roots of those problems and to suggest adequate courses of action. System dynamics is able to deal with the inter-domain complexity that underlies complex social phenomena and with situations of dynamic complexity. The latter is characterized by "subtle" links between causes and effects because of delays and multiple causation processes and the presence of multiple feedback loops fueled by nonlinear relationships (Martin, 2013; Nowotny, 2013).

We summarize the 15 main characteristics of complex social systems that are relevant for our purposes (Table II). We note that, as Mitchell (2011) warns, not all complex systems exhibit the characteristics shown in the table. Nonetheless, Table II may be a convenient checklist in the initial processes of diagnosing social problems and designing possible interventions.

The idea that complex systems from apparently disparate domains share abstract properties may come across as far-fetched. Nonetheless, consider two very different examples. First, this is how Arthur (2013, p. 5) describes the process of technological evolution:

> Novel technologies call forth further novel technologies: when computers arrive, they call forth or "demand" the further technologies of data storage, computer languages, computational algorithms and solid-state switching devices. And novel technologies make possible other novel technologies: when the vacuum tube arrives, it makes possible or "supplies" the further technologies of radio transmission and receiving, broadcasting, relay circuits, early computation and radar. And these novel technologies in turn demand and supply yet further technologies. It follows that a novel technology is not just a one-time disruption to equilibrium, it is a permanent ongoing generator and demander of further technologies that themselves generate and demand still further technologies. Notice again the self-reinforcing nature of this process. The result is not occasional disruption but ongoing waves of disruption causing disruptions, acting in parallel across the economy and at all scales within the economy. Technology change breeds further change endogenously and continually, and this throws the economy into a permanent state of disruption.

The description of how a technological change (or how a general change in any system) sets in motion a complex cascade of events and changes is far from rare when it comes to complex systems. Now, consider how Trochim *et al.* (2006, p. 538) describe the effects of a change in the area of tobacco control:

> At the policy level, it is reasonable to argue that the 1964 surgeon general's report on smoking has profound effects on the policy debate with consequences for smoking prevalence and

Characteristic	Implications
1. Presence of networks of heterogeneous agents interacting within the confluence of several systems	In all social ecosystems, networks of heterogeneous agents constantly interact within the confluence of several systems (natural, technological, cultural, social, etc.). Communication among agents typically occurs via sampling of available information. The latter percolates at different speeds and under the influence of specialized social actors (e.g. hubs, influencers and information brokers) through the various networks that comprise social life
2. Emergence	Use of simple rules by agents leads to complex behaviors of the system. Hence, the behavior of the whole is different and emerges from the behavior of agents. Examples include bee hives, the brain, the immune system, the internet and modern economies
3. Endogeneity	The dynamics of the system arise spontaneously from their internal structure. Self-reinforcing and balancing feedback loops define how the system behaves over time. Small, random perturbations can be amplified by the system's feedback structure, creating patterns in space and time. The lack of the endogenous point of view, which is almost a prerequisite to be a politician in modern world, leads to one-off policies that claim definitive but illusory victory over complex problems
4. Nonlinearity	Effects are rarely proportional to causes. Nonlinearities are the rule. What happens locally in a system, near the current operating point, often does not apply in other states of the system. The existence of tipping points and thresholds often leads to surprising behaviors
5. Scaling	Power laws (e.g. Pareto's law) are the rule in the natural world, and this may also be the case in the social world. Most social problems, for instance, are caused by a small percentage of groups or individuals
6. Different time scales	Changes in systems occur on many time scales, and they sometimes interact among themselves, as in the case of the tortilla riots
7. Path dependence	Decisions alter the state of the world, causing changes in the system and triggering others to act. The new situation then constrains the path for following courses of action. Hence, choosing a path often leads to irreversible consequences that determine the fate of the system, making it history-dependent. Public pension systems, public policies and decisions over standards are good examples of this
8. Delays and accumulation of stocks	Actions and policies usually require a long time horizon to manifest their results. Material (e.g. financial resources and people) and immaterial stocks (e.g. reputation and brand image) accumulate over the continuous passage of time. Often, systems are not in equilibrium
9. Adaptation, learning and exploitation	Capabilities and decision-making rules used by agents change over time. Adaptive systems may use focused and unfocused processes (balancing exploitation and

(*continued*)

Table II. Characteristics of complex social systems

Characteristic	Implications
	exploration). Agents strive to find points of exploitation in the system. In the end, all social systems will be gamed
10. Presence of surprising and counterintuitive behaviors	Causes and effects are distant in time and space. The natural tendency of human beings is to look for causes near the events they seek to explain. Attention is naturally drawn to symptoms instead of actual causes. Adequate policies are often not obvious. For instance, building more roads to alleviate car congestion leads to even more congestion over time
11. Policy resistance	The complexity of systems overwhelms our ability to understand them. Public policymakers use event-oriented mental models in their attempt to solve complex problems. The result is that many seemingly obvious solutions fail or worsen the situation, as systems counterbalance the forces applied to them
12. Temporal trade-off	The long-term response of a system is often different from its short-term response. High-leverage policies often cause worse-before-better behavior, while superficial solutions tend to produce small improvements and then make the underlying problem worse over time
13. Resilience	Complex social systems have different degrees of resilience. They typically absorb most of the "normal" disturbance from the outside
14. Local rationality	Bounded rational agents strive to reach the goals of their subsystems, which often are in contrast with the goals of the entire system. For instance, politicians work to maximize their electoral capital during short-term cycles of the political system. Often, they resort to policies that have high popular appeal but lead to decreases in the collective well-being in the long term
15. Balance of power and narratives	In any social ecosystem, there is a balance of power favoring some class of agents or networks. Groups who have access to political and economic channels often control the repertoire (stock) of collective mental models. Such repertoire is the central cog in the societal mechanisms of sense-making – perceiving and interpreting problems, opportunities and pressures for change. The control of narratives, however, is not absolute or definitive, as the case of tobacco in the past century illustrates

Sources: Adapted from Arthur (2013), Ford (2010), Forrester (1961, 1969, 1971, 1973), Furtado and Sakowski (2014), Mitchell (2011), Sterman (2000a, 2000b) and Truong, Saunders and Dong (2019)

Table II.

consumption to this day. The report itself was the product of a complex series of events that led to its production. In turn, it set off a cascade of events and changes. It is virtually impossible to determine the effects of that important event in isolation, as a part that is separable from the whole. For instance, the report was most likely an important catalyst in creating a public policy climate that enabled the litigation that led to the Tobacco Settlement Agreement several decades later, to increased taxation of cigarettes by states, to legal restrictions on smoking in public spaces and to tobacco counteradvertising. By the same token, the report may have led to unanticipated

> "negative" consequences by spurring the tobacco industry to adapt its product, marketing, lobbying and public relations, and perhaps indirectly contributed to the creation of front groups and covert efforts to undermine tobacco control research.

The complexity of social reality requires a grammar to understand how negative behaviors are produced by systems and how to prevent their occurrence. This grammar is provided by the field of system dynamics.

Systems thinking and system dynamics

The literature of systems thinking has a great deal of overlap with the complexity sciences. For instance, one point of overlap is the acknowledgment that a system is a functional whole in which different components produce an aggregate behavior that is not apparent from the performance of those components considered in isolation (Levine and Fitzgerald, 1992).

In the broad literature on systems thinking, there are different lines of research and theories. Some authors, for instance, have focused on structural elements of systems. Trochim *et al.* (2006) discuss two elements: the parts that comprise a system and their relationships. Cabrera and Cabrera (2015) and Cabrera *et al.* (2015) expand that approach by proposing four universal rules subsuming systems thinking: distinctions, systems, relationships and perspectives (DSRP). According to this framework, distinctions are the vectors of difference among things and ideas. Parts and whole comprise systems – studying the former often uncovers important and neglected aspects of a problem. Relationships may be correlations, causation or feedback loops. Perspectives represent the vantage point from which a view is enabled, shaping how a system is perceived and how problems are addressed.

Although the comprehension of structures through frameworks such as DSRP may lead to a richer understanding of systems, it clearly falls short of the potential of systems thinking. This is where the field of system dynamics makes its major contribution.

System dynamics was pioneered by Jay Forrester at Massachusetts Institute of Technology (Forrester, 1961), and it is especially useful when one needs to understand a system marked by feedback loops, nonlinear relationships and delays. Forrester developed the method by applying concepts from feedback control theory to the study of industrial systems, urban systems and even the world system.

Ford (2010, p. 7) defines system dynamics as "a methodology for studying and managing complex systems that change over time." The method uses computer modeling to focus the modeler's attention on the feedback loops that give rise to dynamic behaviors. Indeed, the concept of feedback loops is considered the fundamental building block of system dynamics models (Richardson, 1999).

System dynamics is essential to understand dynamic complexity. According to Ford (2010, p. 11):

> Climate change, pandemics, and boom and bust in real estate are complex dynamics that challenge our understanding. We are unable to anticipate the dynamic consequences of policies adopted today, especially when there are long delays between our actions and the system's reactions. Our understanding is also limited by the complexity of the feedback processes that control system behavior. Our actions may be partially erased by the system's internal responses, and the system's apparent resistance to our interventions is confusing. Sorting out the effects of delays and multiple feedbacks is beyond our cognitive abilities, so we look to the past for lessons. But how are we to interpret past patterns in climate change, pandemics and boom-and-bust cycles? Our understanding of the dynamics of historical patterns is limited by the same complexities that make it difficult to think about the future. There are many interpretations of past behavior, and we are left with limited understanding of both past trends and current problems.

The origins of the fundamental concepts used in system dynamics can be found in different theoretical bodies throughout the history of human thinking. Several landmark works in social sciences, biology and other fields have applied feedback-inspired ideas in previous centuries, leading to theoretical propositions such as the invisible hand and homeostasis (Richardson, 1999).

Systems dynamics overcomes the traditional concept of one-way causal chains found in many conceptual and methodological tools in the social sciences; instead, it deals with reciprocal chains of causality linking key variables through feedback loops. Feedback loops, in turn, are considered important units of analysis *per se* (Hirsch *et al.*, 2007).

System dynamics is based on models. A model is a substitute for a real system (Ford, 2010). A system dynamics model uses equations to represent the interconnections in a system. In many real-world systems, it is impossible to represent the entire system. Therefore, one needs a simplified model that captures the essential structure producing the dynamic behaviors of interest. Thus, system dynamics models represent the real system from a "10,000 meter view," which means that structures but not details are the relevant elements.

They also allow the carrying out of experiments that would be virtually impossible, too expensive or ethically forbidden in actual systems. Experiments represent the effects of policies aiming at changing problematic situations and providing learning through rapid feedback. They are especially useful when there is a group of different stakeholders with different perspectives and expertise trying to improve the system. Experiments uncover diverse patterns of behavior produced by a system. For instance, some systems generate an unusually sluggish response. Other systems show unexpectedly rapid responses to external disturbances.

Another hallmark of system dynamics is its transdisciplinary focus. Social problems do not respect disciplinary boundaries. The discipline usually draws from several sources of data, such as empirical and theoretical literature, primary quantitative or qualitative data, secondary data and the experience and viewpoints of people closer to the problems. As Forrester (1961) stressed, as the goal of developing a system dynamics model is to obtain answers to the problem under consideration, model building cannot be limited to the narrow boundaries of intellectual disciplines. Most systems involve the interplay of historical, psychological, economic, organizational, monetary, legal, technical and social factors. Therefore, the ability of system dynamics to integrate different academic and practical perspectives is one of its major strengths (Hirsch *et al.*, 2007).

Finally, it is important to note a crucial distinction between so-called ecological approaches, which focus on delivering multiple strategies aimed at multiple levels, and actual systemic approaches, which consider the dynamic intricacies that characterize complex social systems (Hawe *et al.*, 2009). The usage of ecological approaches in interventions may not be sufficient to produce substantial social change.

In sum, system dynamics has what we consider a perfect fit with disciplines concerned with social change.

The second gap: mindware

Not only has social marketing been operating within an individualistic paradigm, but also the extreme demands for measurability (by itself a reflection of US business culture) has been leading it to a focus only on observable behaviors. Nevertheless, there is another missing element in the social change equation, which speaks directly to how human beings make sense of the world: ideas or mental models.

Mental models are more than filters to interpret reality. They are a stock of interrelated beliefs and schemas that define the boundaries of problems and constrain the possible solutions. Ideas, as Keynes once recognized, rule the world. We use the term *mindware*, coined by Harvard educator David Perkins (Perkins, 1995), to refer to that stock of beliefs and schemas. Mindware also comprises rules, procedures and other forms of knowledge that are stored in memory and can be retrieved to make decisions and solve problems (Stanovich, 2010).

According to Stanovich (2010), two problems regarding mindware are critical. The first is the mindware gap. This occurs when the tools of rationality (scientific thinking, probabilistic thinking and logic) are absent or not fully learned. The second problem is contaminated mindware, the presence of beliefs not grounded on evidence, harmful for the person and for the society, although they are attractive and sticky or easily transmittable to others. The second problem appears to be more critical when it comes to mental models of complex social problems.

The repertoire of collective mindware in a society defines the lens applied to social problems and, importantly, what is ignored. Consider, for instance, the quest for continuous economic growth, which, in the end, reflects a goal that is impossible in a finite world. To preserve the environment and the future of our species, societies, especially developed ones, should have been moving to a mode of functioning based on equilibrium. However, all the conceptual infrastructure of our societies is engineered to promote growth. Societies demand increased services from governments, which play by electoral rules and depend on a growing economic substratum for the collection of taxes. Pressed by shareholders, firms strive to grow, incentivizing CEOs and workers with bonuses. Advertising, promotion and other tools are used to induce families to keep consuming. Products are updated in increasingly short time spans. Luxury markets keep expanding throughout the world. Eventually, the limits to growth will be reached – through pollution, food scarcity, limited resources or a population crisis. As Forrester (1973) emphasizes, human societies will face the consequences of physical or social stress caused by unsustainable growth, but they could choose the path of self-restraint to control growth and avoid collapse. This kind of self-restraint, we add, depends on the diffusion of a different type of mindware, which has not been marketed adequately.

Another example comes from Bales (2015), who argues that the cultural models available to make sense of complex problems such as climate change are simplistic and incomplete, leading to ineffective personal actions and support for ineffective policies, irrespective of the personal levels of involvement with such problems. In the case of human development, McLeroy *et al.* (1988) observe that the prevailing frameworks – both the models and the language – tend to put the focus (and the blame) on individual behaviors while ignoring the social and physical environments that maintain and reinforce inadequate behaviors.

Thus, mental models may hide important factors underlying a problem, leading to bias and ineffective policies. This is especially true when special interest groups and specialists with connections to powerful parties dominate the narrative on a complex issue, leading to what Baumgartner and Jones (2009) call a policy monopoly. Mindware competes in several venues that constitute the marketplace of ideas (e.g. media and academia). This marketplace is a tough one: human attention is scarce; there is a myriad of causes and ideas competing for it, and powerful economic interests sell narratives that are hard to oppose.

Monoliths of meaning

Words and associations matter. When the associations of ideas underlying mental models are very strong, the resulting schemas are difficult to change, leading, in some cases, to what we call *monoliths of meaning* – the associations are so entrenched in the public's minds that

attempting to change them requires high levels of concerted effort. Well-established schemas, for instance, tend to dominate subsequent, inconsistent information (Fiske and Taylor, 1991). Take the general concept of marketing. For decades, there has been resistance to its use in the non-profit and governmental world. Hunt (1976), among others, pointed out a long time ago that the major challenge in expanding marketing to social uses involved marketing the idea of marketing to non-marketers.

However, the issue is broader than merely convincing people that some repertoire of concepts could help them to achieve better results. It seems that the strong associations of marketing with the business world activate a conflict in schemas. The suggestive study of Heyman and Ariely (2004) identified that different norms apply to two markets that co-exist in our modern societies – the monetary market and the social one. They co-exist but they hardly mix. Elements strongly associated with the monetary market (such as financial incentives or the concept of marketing) may elicit resistance when applied in the context of a social market. Thus, broadening the concept of marketing means breaking the monolith of its meaning in the public's mind; something that seems to be very difficult considering the everyday reinforcement of its underlying association in modern economies.

Monoliths of meaning are common in prevailing mindware regarding complex social issues, such as poverty, limits to growth and corruption. Tackling these problems necessarily requires changing mental models that are deeply ingrained.

The study of mental models

Sterman (2002) argues that there are two concepts from the field of system dynamics that people find particularly difficult to grasp: first, that all decisions are based on models, and second, that all models are wrong. Mental models, in turn, are rarely formalized.

Accordingly, in the system dynamics literature, mental models have been defined as worldviews that represent information about the elements in a system, their connections and the rules that govern decision-making (Forrester, 1973, 1994). In other words, they are simplified knowledge structures concerning how some aspect of the world works (Gary and Wood, 2016). As we saw in Section 2.5, mental models constrain individual and collective perceptions. They determine how people (and social institutions) process information, evaluate alternatives of action and eventually make decisions. Mental images of the world determine the making of public policy as well as the socially shared understandings that legitimize it. We refer to mindware and mental models interchangeably throughout the text, as their definitions tap into the same construct.

The assumptions underlying mental models often result from the interaction between a malleable social reality and mental processes operating in confirmatory mode. In this sense, they tend to be rife with incompleteness and internal contradiction. Thus, mental models about the world tend to be fuzzy, partial and malleable (in the sense that they can be adjusted to fit existent beliefs or values). In fact, every human being looks at reality through a worldview, an internally set of (apparently) consistent beliefs, attitudes and values that acts as a filter, directing attention to information that confirms previous (often subconscious) expectations and shunning information that may challenge those expectations (Meadows *et al.*, 2004).

Mental models have been studied within different disciplines, such as psychology, strategic management, organization theory, system dynamics and others. Table III presents a compilation found in Gary and Wood (2016) of alternative labels for mental models found in the numerous disciplines that have researched the subject. Remarkably, there is no mention of mindware.

Very often, multiple mental models are used to analyze an issue, depending on the perspective of the involved party. Stroh (2015) cites the example of efforts to curb smoking, showing how the perspectives of patients, doctors and politicians may hover around the

Cognitive maps	Dominant logic
Interpretative schemes	Mindscapes
Industry recipes	Worldview
Implicit theories	Managerial lenses
Corporate theory	Mental pictures
Screens	Organizing frameworks
Routines	Perception filters
Cognitive representations	Analogies
Frames/strategic frames	Knowledge structures
Mental templates	Heuristics
Causal maps	Decision biases
Belief structures	Schema

Source: Gary and Wood (2016)

Table III.
Mental models and related concepts

lenses of defiance, fear, entitlement, ignorance and recognition (a common division also found in several other complex social problems, such as climate change). In such cases, the goal seems to be the promotion of the right mindware so that its perspective dominates the less favorable ones. Another possible approach is to map the intended set of associations into familiar schemas. For instance, Zolli and Healy (2012) report how the usage of a framework based on the familiar concept of financial portfolio helped in managing the complex challenge of natural ecosystem sustainability. Traditional frameworks often take those systems to the brink of collapse.

In sum, changing mental models or mindware is essential in the processes of social change. Changing them at the broader societal level, however, is difficult, time-consuming and messy. Thus, this goal has been neglected in social marketing programs that depend on short-term, measurable results to meet funding requirements. Nonetheless, it was never neglected by businesses that comprehend the importance of mindware in selling culturally legitimized products such as cigarettes and guns (Brandt, 2007).

Throwing the baby out with the bathwater: promotion of ideas in the social marketing toolbox

Ironically, for several years the promotion of ideas was part of a mainstream definition of social marketing. In the seminal paper that gave the discipline its name, Kotler and Zaltman (1971) describe social marketing as "the use of marketing principles and techniques to advance a social cause, idea or behavior." The inclusion of ideas (or social causes) as a legitimate object of social marketing persisted until the end of the 1980s. According to Kotler and Roberto (1989), the discipline is essentially a technology for social change management that involves the design, implementation and control of programs aimed at increasing the acceptability of a *social idea* or practice in one or more groups of target adopters.

As depicted in Figure 3, a social idea can be a belief (e.g. "cigarette smoking is hazardous to one's health"), an attitude (negative or positive evaluations of people, objects, ideas or events, such as "planned babies are better cared for than babies from accidental pregnancies") or a value, such as "human rights."

Over time, however, the concept of idea as a legitimate social product under the influence of social marketing dwindled. In one of their subsequent textbooks, Kotler *et al.* (2002) defined the focus on strict behavior change, relegating the role of ideas (knowledge, beliefs or attitudes) to a means of paving the way for behavior change, without specifying how this process could happen. On the one hand, the strict focus on behavior change seems a victory

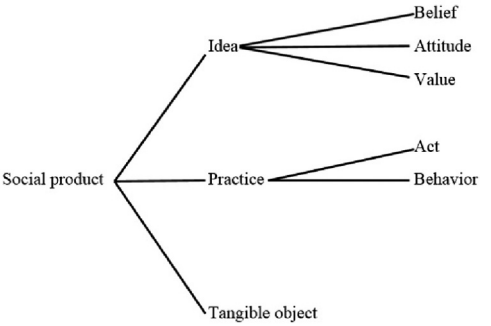


Figure 3.
Social marketing products

Source: Adapted from Kotler and Roberto (1989)

of the measurement paradigm so prevalent in business-inspired programs. Sponsors, grant providers and other social agents want concrete, short-term measurable results. Changes in attitudes in response to communication efforts, for instance, can easily dissipate and cannot substitute actual behavior change in many contexts. On the other hand, it seems that social marketing has thrown the baby out with the bathwater. Most complex social problems require a change in the prevalent mindware, and this requires a concerted effort to change collective ideas. Changing or shaping mental models may be a worthy goal *per se* in many cases, as industries selling cigarettes and guns have long known.

Some social marketing scholars have discussed possible channels for changing mental models, but they have not delved into detailed accounts of the underlying processes. Kotler and Roberto (1989) suggest mobilizing influence groups, such as governmental agencies, churches, consumer organizations, trade associations and educational institutions, classifying them as allies, opponents and neutrals. Then both marketing and political tactics could be used to influence them. Andreasen (2006) recognizes the role of social norms in producing social change. One example he gives is the role that journalists, opinion leaders and scriptwriters have in promoting public will for change. He also recommends using the same basic approach from downstream social marketing (a combination of strategies to deal with perceived benefits, costs, social norms and self-efficacy) to influence upstream social actors, such as media gate keepers and politicians. He provides no detailed description, however, of the processes by which social change could occur in this manner.

Gordon *et al.* (2011) recognize that several social marketing programs have sought to change values and attitudes as a prerequisite for behavior change. They advocate the publicizing of benefits and a shift in social norms. They also cite a "laundry list" that includes media advocacy, influencing policy change, regulation and law making, and building an evidence base for the intended change. Corner and Randall (2011) propose that social marketing programs aiming at combating climate change should focus on value-based campaigns (avoiding the usual approach of emphasizing economic values), social networks and education. Educating citizens could lead to stronger pro-environmental identities, which in turn, could lead to better acceptance of effective (but previously unpopular) policies.

Nonetheless, the focus on individual downstream behaviors has become a staple in social marketing. Gordon *et al.* (2011), for instance, emphasize that social marketing provides "a behavior change tool that stakeholders can use to target individual behavior change to promote specific causes." While this recommendation would also make sense when used to

target key upstream social actors (such as politicians), the authors clearly have downstream approaches in mind. Other important authors in the field (Kotler and Lee, 2016), while recognizing that social marketing can target upstream actors (such as politicians and policymakers), tend to focus on downstream interventions. As Wymer (2011) stresses – and this is the conclusion to be drawn here – there is little guidance on how to implement upstream social marketing programs.

Is it only social marketing?

The focus on downstream behaviors, the abandonment of ideas or mental models and the disregard of systemic factors causing problematic behaviors are the main limitations of the social marketing approach. According to Kotler and Lee (2009, p. 57), "perhaps the most challenging aspect of social marketing is that it relies heavily on voluntary compliance than legal, economic or coercive forms of influence." We, of course, disagree, but we also note that social marketing shares these drawbacks with similar disciplines interested in the promotion of social change.

Consider, for instance, behavioral economics. It has been (successfully) demonstrated that the main axioms of neoclassical economics are flawed, especially the *homo economicus* paradigm – the concept of human beings as cold, rational decision makers (Carvalho and Mazzon, 2013). By exposing the biases that guide actual decision-making and that are behind many social problems, and by proposing effective solutions that counter such biases, behavioral economists have gained the attention of businesses and governments throughout the world.

In this sense, Datta and Mullainathan (2014) propose a framework inspired by behavioral economics to orient the design of more effective public programs. Calling it behavioral design, they sketch an approach that includes the identification of "behavioral stress points," uses certain design principles (e.g. reducing the need for self-control and framing messages to match mental models) and uses prototyping and experimenting.

While that body of knowledge can easily be accommodated within the social marketing framework and vice versa – the disciplines are, after all, about changing human behavior – behavioral economics interventions also suffer from the same gaps discussed in this paper. For instance, Datta and Mullainathan (2014) discuss how behavioral economics could help in incentivizing farmers from poor countries to use fertilizers more effectively. The unstated assumption is that use of fertilizers is an adequate policy for addressing hunger in poor countries – something that Saeed (1994/2016) convincingly rebuts by examining the long-term, systemic consequences of such well-meaning policies.

In other words, both behavioral economics and social marketing-inspired interventions may incur the non-negligible risk of addressing only symptoms or points of low leverage for change in complex social systems. They are linear frameworks that fail to account for the inter-domain complexity, nonlinear dynamics and long-term interplay of variables that define all complex social problems faced by modern societies. They typically ignore the role of mindware in preventing or promoting social change.

Getting it right

A complexity approach to social problems must give birth to compelling mindware. The ensuing lenses and narratives may be promoted in the same way as industries market their products and services.

Susan Bales, founder of the prestigious FrameWorks Institute, gets it right when she discusses the role of cultural models on the perpetuation of social inequality (Bales, 2015). She states that the ability of social analysts to affect the world is constrained by the

perceptions that regular people bring to that reality. This realization calls for a two-sided approach: a science-based policy repertoire coupled with a science-based communication set of tools, with the aim of producing narrative solutions. People construct meaning and their mindware from associations, memories, parts of stories and near-fit hypotheses about how the world works. The corresponding collective blueprint (or collective mindware) is the main lens through which people interpret their social world.

An expert story requires a translated story if the agent of social change aims to really affect the world. In the case of inequality, for instance, a fatalistic worldview depresses engagement, obfuscates thinking about meaningful solutions and frames small individual gestures as the only available solution. Other cultural models that tend to frame the issue are individualism, little-picture thinking (i.e. ignorance of the role of systems and structures that characterize complex systems) and small solutions (i.e. when people resort to individual behavior change in an attempt to "solve" complex problems).

Available but wrong cultural models then lead people to take ineffective personal actions, and importantly, to support ineffective policies, regardless of their level of commitment to the problem under consideration (Bales, 2015). Thus, understanding how people think about an issue and their mental repertoires is essential for the creation of productive mindware and coherent narratives and for the reframing of strategies (or, as Kotler and Roberto, 1989 stated, dressing up the social idea through branding and symbolic packaging).

In the case of poverty, Bowles *et al.* (2006) stress that the conventional view on poverty that still informs much of the public debate has an undeniable individualistic flavor: the idea is that the mechanisms that determine an individual's socioeconomic prospects are under his or her control. This is the achievement model of income determination. It is clear nowadays that poverty traps arise from systemic mechanisms, but there has been no compelling narrative capable of changing the public's views on the issue.

In the case of child poverty, Raphael (2011) argues that in states such as Canada, UK and USA, governments tend to avoid interventions in the market economy, skewing the distribution of resources and inadvertently producing poverty. On the other hand, countries such as Norway, Sweden and France have a different worldview, with the practical consequence of having less poverty. It may come as a shock to many people that there are so many children living in poverty in countries such as the USA and Canada – 23 and 13 per cent, respectively, in relative poverty, according to a recent study (Innocenti Research Centre, 2012). Nations differ in how their institutions work to redistribute wealth and the extent to which governments invest in social infrastructure, factors that ultimately depend on the stock of beliefs that integrate the repertoire of collective mindware.

Banerjee and Duflo (2011) tackle the conflicting recipes for breaking enduring traps in poor countries. On the one hand, they argue, there are experts such as Jeffrey Sachs who claim that the key is to direct foreign aid toward malaria, infrastructure and other social problems to break the vicious circle of poverty. On the other hand, there are experts such as Willian Easterly who argue that aid does more bad than good, because it fosters corruption and undermines institutions. More than illustrating contrasting views, this battle of mindware exemplifies a set of typical characteristics in the discussion of complex problems: lack of consensus, presence of "heavyweight" thinkers behind the propositions, high-quality arguments and strong barriers to settling the disagreements empirically. These characteristics can be found in virtually any controversy related to complex modern social problems. Moreover, economic interests, as in the case of companies fighting the evidence in favor of climate change, or strongly entrenched ideological beliefs can support the propagation of misleading mindware (i.e. contrary to the bulk of scientific evidence), hindering the development of adequate policies.

Finally, promoting the right mindware is messy. It involves social advocacy and potentially dealing with political conflict. There are few indicators of progress in the short or medium term and no certainty of success, so financing this kind of intervention is more difficult. In a world obsessed with accountability and specific, measurable, achievable, relevant and time-bound indicators, how can social actors justify efforts to change the system through the promotion of mindware? Promoting simple behaviors, on the other hand, is easier: indicators of progress are black or white; there is the reward accrued from the feeling of doing something about a complex problem; there is no need to face political conflict; and the focus remains conveniently on individuals.

One promising alternative is the one advocated by Brooks (2018), who understands that embracing the marketplace of ideas is essential to induce social change. Indicators of success, according to his proposition, can be the "market" share of promoted op-eds and congressional testimonies.

Increasing the attractiveness of mindware

As we mentioned earlier, a promising strategy for fighting detrimental monoliths of meaning is to map the desired mindware onto a familiar schema. Framing is thus a common strategy for preventing the activation of strong mindware or for circumventing entrenched mindware. For instance, in the context of climate change, Baldwin and Lammers (2016) found that conservatives' attitudes and behaviors changed drastically when the messages compared the present environment with the past. In that case, the intervention piggybacked on the strong past-oriented inclination that characterizes conservative individuals.

Promotion of compelling ideas, dressed as attractive narratives, in an organized whole (the mindware), has the potential to change public discourse on relevant social topics. Commercial marketing has influenced public mindware for decades, resorting to what Carvalho and Mazzon (2015) call enabling factors. These factors of influence have been used as a powerful means to create acceptance of controversial products, such as cigarettes, alcohol and even marijuana. These products have been promoted in popular media for decades. In the case of cigarettes and alcohol, there is compelling evidence that exposure to them in cultural products (such as movies) explains subsequent adoption by teenagers (Pechmann *et al.*, 2012).

History is also full of examples of leaders who changed the prevailing mindware of a society (for better or worse), articulating new goals for the system, as was the case of Ronald Reagan and his anti-government discourse in the 1980s (Meadows, 1999).

At a more mundane level, the communicability of mindware may depend, among other factors, on its stickiness (how well it is retained in individuals' memories), pitchiness (whether it is likely to be pitched in the public arena) and its catchiness (whether it is likely to be caught by those to whom it is pitched), according to the influential work of Conway and Schaller (2007). We briefly explore these factors, which seem to explain the strong appeal of inadequate mindware.

Stickiness reflects, for instance, the presence of counterintuitive narratives. Ontological violations may have an advantage in terms of memorability over intuitive beliefs. However, such violations must occur only to a modest degree. If a cultural unit violates the shared mindware too much, people will not be able to make sense of or remember it at all. Thus, minimally counterintuitive narratives may enjoy an advantage in recall and cultural transmission.

Another influence on the communicability of cultural elements is the degree to which they quench epistemic needs. Human beings are driven to know things, and especially to know them with confidence. Epistemic needs compel people to communicate with others, not only to obtain information but also to validate their perceptions. Information bearing on

basic human needs tends to be present in such exchanges, including threat-relevant information and concerns such as effective child-rearing. Other goals, such as impression-management goals, can also influence the communicability of cultural elements. People tend to avoid the deliverance of bad news and prefer to communicate desirable information.

Catchiness, on the other hand, depends on several characteristics that influence the extent to which receivers attend to or ignore incoming information and the extent to which they are sufficiently persuaded by that information to the point of replicating it to others. Information that resolves disquieting feelings of uncertainty is one of those characteristics. Hence, in moments of crisis and heightened uncertainty among the population, there is greater opportunity for changes in mindware.

The need for new thinking in social marketing

In defending social marketing's solution for fighting poverty, Kotler and Lee (2009) state that the purpose of the discipline is to develop constructive approaches to support desired behavior change. This can be achieved, according to them, by increasing the audience's perception that the benefits of the new behavior outweigh the costs of adopting it. The new behavior must be perceived as having higher value than the current one. In fact, as already discussed, this approach suffers from an intrinsically limited perspective. Not surprisingly, most of the examples cited in Kotler and Lee's book refer to small villages or poor communities adopting specific behaviors that do not change the root causes of poverty.

Social marketing as a discipline has simplified the problem of bringing about societal change by thinking that upstream social actors can be influenced in the same way as downstream individuals. However, this schematic approach ignores how social change actually occurs, how networks of economic interests crystalize into political power, shaping convenient narratives in defense of the status quo and how systems produce undesirable behaviors. One has to only consider why the proposal of cap-and-trade markets as a way to curb the emission of carbon – which piggybacks on "sacred" cultural linchpins such as the concept of free market – did not get far. Meanwhile, social marketers have been promoting recycling and other feel-good behaviors that often worsen the underlying problem (Catlin and Wang, 2013).

There is a need for a discipline capable of identifying the systemic drivers of complex social problems and promoting solutions (including mindware) that address change at the correct points (or levers) of the systems.

Dibb (2014) points to the need of reaching out across discipline silos to achieve better results in the broader behavior change context. Along similar lines, the late Donela Meadows called attention to the fact that all disciplinary boundaries are artificial (Meadows, 2002). In fact, we think that an applied behavioral science must be able to integrate knowledge from all disciplines that study human behavior without allegiance to any specific tradition. In Meadows' own words:

> Defy the disciplines. [. . .] follow a system wherever it leads. It will be sure to lead across traditional disciplinary lines. To understand that system, you will have to be able to learn from – while not being limited by – economists and chemists and psychologists and theologians. You will have to penetrate their jargons, integrate what they tell you, recognize what they can honestly see through their particular lenses, and discard the distortions that come from the narrowness and incompleteness of their lenses. They won't make it easy for you.
>
> Seeing systems whole requires more than being "interdisciplinary" [. . .]. Interdisciplinary communication works only if there is a real problem to be solved, and if the representatives from the various disciplines are more committed to solving the problem than to being academically correct. They will have to go into learning mode, to admit ignorance and be willing to be taught, by each other and by the system.

We are not the first ones to notice some problems discussed in this paper. Others have perceived the gaps between existing disciplines and the complexity of modern social problems. Brychkov and Domegan (2017), for instance, point to the importance of incorporating concepts from systems science, such as feedback loops, into social marketing thinking.

Bammer (2017), in turn, proposes a new discipline, called integration and implementation science, to deal with complex societal problems. According to her proposal, the discipline would combine knowledge from different disciplines, assess which disciplines and stakeholders have relevant perspectives into the problem, identify the interconnections of elements driving the problem, decide how to address critical unknowns and finally, use research to support change. In addition, we note a growing trend toward the creation of disciplines that integrate knowledge from fields that are traditionally separate, such as ecofinance (Zolli and Healy, 2012) and ecological economics (Costanza *et al.*, 1997).

Our proposition encompasses the incorporation of the conceptual tools of the complexity sciences (in particular, of system dynamics), the promotion of mindware and the full adoption of a transdisciplinary stance, allowing the integration of a vast repertoire of disciplinary toolboxes.

This new thinking in social marketing should have the following characteristics:

- It adopts the concept of an integration and implementation science (Bammer, 2017). Complex problems do not respect academic boundaries. We need a discipline capable of integrating knowledge from a myriad of fields into actionable frameworks. The integration should overcome artificial boundaries (and tribal identity markers) between fields such as marketing, behavioral economics and social psychology, to name a few. In this sense, we may be talking about something like a meta-discipline.
- It focuses on systems and complexity drivers, taking into account how complex problems emerge, how they are embedded in tangled social ecosystems and how structures contribute to their persistence. Hence, it adopts the endogenous perspective that is essential to understand what lies behind the symptoms that often mislead social marketers. It uses system dynamics as a grammar to understand complex problems.
- In the same vein, it never ignores upstream social actors, such as media gatekeepers, influencers and politicians. A discipline concerned with social change should account for the role of powerful social actors in legitimizing the institutional framework of a society.

Conclusion

In 2013, complexity was the organizing theme for the annual Peter Drucker Forum in Austria. One of the startling conclusions of the event was that management science lacked frameworks to deal with the complex phenomena challenging modern organizations.

In this paper, we extend this conclusion from the Peter Drucker Forum to challenge the field of social marketing. When it comes to tame problems (e.g. organ donation and exercising), social marketing programs can produce consistent results. However, most problems that plague our modern societies have a distinctive complex nature that is not amenable to traditional social marketing interventions.

One could argue that social marketing should be concerned only with tame problems. However, this is not acknowledged within the discipline, which has been prone to making grandiose claims, as exemplified by books that promote the social marketing "solution" to poverty (Kotler and Lee, 2009) or "how to change the world" (Roberto, 2012). Moreover, the (narrow) downstream approach that dominates the discipline leads to low levers being

pulled in social systems while the structural determinants of problems continue to be ignored. Nowhere is this clearer than in Kotler and Lee's (2009, p. 5) assertion that:

> [. . .] our relentless focus and attention is on those poor who want to help themselves. What do they want and need that will move them out of poverty, even keep them out in the first place?

This point, while reflecting an individualistic paradigm and ignoring macro and meso determinants of the phenomenon, assumes that poor people have a sufficient degree of agency, which is typically not the case.

Certainly, the proposal made in this paper will face resistance. One could argue that it would be a simple matter of adapting the traditional repertoire of social marketing to account for the gaps discussed in this paper. We disagree. We see the discipline ill fitted to tackle the complex challenges of our times. For instance, the efforts to curb global warming cannot wait any longer, but our species keep pumping more carbon into the atmosphere year after year. Meanwhile, social marketers boast about the success of ineffective policies (such as recycling) or short-range interventions. The discipline can do better.

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